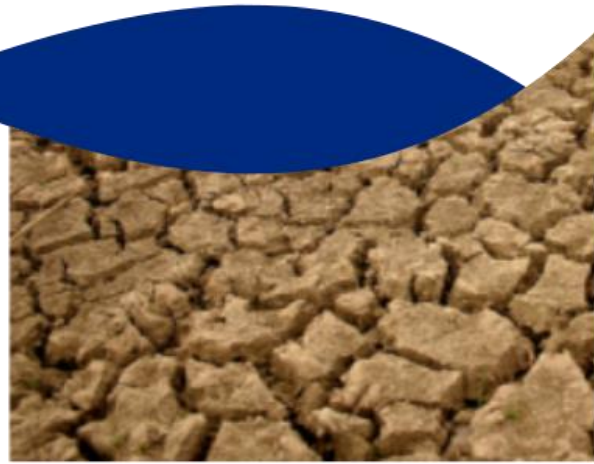




# *Madera County Local Hazard Mitigation Plan Update*

*October 2017*





## Executive Summary

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Madera County and three participating jurisdictions (cities of Chowchilla and Madera, and the North Fork Rancheria of Mono Indians) developed this Local Hazard Mitigation Plan (LHMP) update to make the County and its residents less vulnerable to future hazard events. This plan serves to update the 2011 Federal Emergency Management Agency (FEMA) approved Madera County LHMP and the 2011 City of Chowchilla LHMP. This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 so that Madera County would be eligible for the Federal Emergency Management Agency’s (FEMA) Pre-Disaster Mitigation and Hazard Mitigation Grant programs. This plan was also developed in order for the County and participating jurisdictions to be eligible for certain federal disaster assistance, specifically, the Federal Emergency Management Agency’s (FEMA) Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) Program, and the Flood Mitigation Assistance (FMA) Program.

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated. The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards.

### LHMP Plan Development Process

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. This plan documents the hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County will use to decrease vulnerability and increase resiliency and sustainability in the community.

This LHMP was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. The County and all participating jurisdictions followed a planning process prescribed by FEMA as detailed in Table ES-1.

**Table ES-1 Local Hazard Mitigation Planning Process**

DMA Process	Modified CRS Process
<b>1) Organize Resources</b>	
201.6(c)(1)	1) Organize the Planning Effort
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies

DMA Process	Modified CRS Process
<b>2) Assess Risks</b>	
201.6(c)(2)(i)	4) Identify the Hazards
201.6(c)(2)(ii)	5) Assess the Risks
<b>3) Develop the Mitigation Plan</b>	
201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
<b>4) Implement the Plan and Monitor Progress</b>	
201.6(c)(5)	9) Adopt the Plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan

The planning process began with the organizational phase to establish the Hazard Mitigation Planning Committee (HMPC) comprised of key County representatives, and other local and regional stakeholders; to involve the public; and to coordinate with other departments and agencies. A detailed risk assessment was then conducted followed by the development of a focused mitigation strategy for the Madera County Planning Area. Once approved by Cal OES and FEMA, this plan will be adopted and implemented by the County and all participating jurisdictions over the next five years.

### Risk Assessment

The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the County and participating jurisdictions, assessed the vulnerability of the Planning Area to these hazards, and examined the existing capabilities to mitigate them.

The Madera County Planning Area is vulnerable to numerous hazards that are identified, profiled, and analyzed in this plan. Floods, earthquakes, drought, landslides, wildfires, and other severe weather events are among the hazards that can have a significant impact on the County. Table ES-2 details the hazards identified for this Madera County LHMP Update.

**Table ES-2 Madera County Hazard Identification Assessment**

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests	Significant	Highly Likely	Critical	High	High
Avalanche	Limited	Highly likely	Negligible	Low	Low
Climate Change	Extensive	Likely	Critical	Medium	High
Dam Failure	Significant	Occasional	Catastrophic	High	Low
Drought and Water Shortage	Extensive	Likely/ Occasional	Critical	Medium	Low
Earthquake	Extensive	Unlikely	Critical	Medium	Low
Flood: 100/500-year	Extensive	Occasional/Unlikely	Critical	High	Medium
Flood: Localized/Stormwater	Significant	Highly Likely	Limited	Medium	Medium
Hazardous Materials Transportation (interstates, railroads, pipelines)	Limited	Likely	Limited	Medium	Low
Landslide, Debris & Mud Flows	Significant	Likely	Critical	Medium	Low
Levee Failure	Limited	Unlikely	Limited	Low	Low
Severe Weather: Extreme Cold, Snow, and Freeze	Significant	Highly Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Significant	Likely	Critical	Medium	Medium
Severe Weather: Heavy Rains and Storms (wind/tornado/hail, lightning)	Significant	Highly Likely	Critical	Medium	High
Subsidence	Significant	Likely	Negligible	Medium	Medium
Volcano	Significant	Unlikely	Limited	Low	Low
Wildfire (smoke, tree mortality, conflagration)	Extensive	Highly Likely	Catastrophic	High	High
<b>Geographic Extent</b>	<b>Magnitude/Severity</b>				
Limited: Less than 10% of planning area	Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths				
Significant: 10-50% of planning area	Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability				
Extensive: 50-100% of planning area	Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability				
<b>Probability of Future Occurrences</b>	<b>Significance</b>				
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.	Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid				
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.	Low: minimal potential impact				
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.	Medium: moderate potential impact				
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.	High: widespread potential impact				
	<b>Climate Change Impact:</b>				
	Low: Climate change is not likely to increase the probability of this hazard.				
	Medium: Climate change is likely to increase the probability of this hazard.				
	High: Climate change is very likely to increase the probability of this hazard.				

## Mitigation Strategy

Based on the results of the risk assessment, the participating jurisdictions and the HMPC developed a mitigation strategy for reducing the County's risk and vulnerability to hazards. The resulting Mitigation Strategy for the Madera County Planning Area is comprised of LHMP goals and objectives and a mitigation action plan which includes a series of mitigation action projects and implementation measures.

Based on the risk assessment, the HMPC identified goals and objectives for reducing the County's vulnerability to hazards. The goals and objectives of this multi-hazard mitigation plan are:

***Goal 1: Minimize risk and vulnerability of Madera County to hazards and protect lives and prevent losses to property, public health and safety, economy, and the environment.***

- Identify strategies for mitigating hazards to reduce adverse impacts and hazard related losses.
- Provide protection for existing and future development.
- Provide protection for critical facilities, utilities, and services and minimize disruption.
- Provide protection for the environment and natural and cultural resources.
- Prevent repetitive losses and reoccurring damages from happening.
- Minimize hazard related losses through master planning of communities.

***Goal 2: Increase community outreach, education, and awareness of risk and vulnerability to hazards and promote preparedness and engagement to reduce hazard-related losses.***

- Inform and educate residents and businesses about all hazards they are exposed to, where they occur, what they can do to mitigate exposure or damages.
- Emphasize preparedness and self-responsibility to residents.

***Goal 3: Improve communities' capabilities to prevent/mitigate hazard-related losses and to be prepared for, respond to, and recover from a disaster event.***

- Continued improvements to emergency services and public safety capabilities.
- Maintain coordination of disaster/emergency response plans and exercises with changing Department of Homeland Security/FEMA needs and with all agencies operating in Madera County.
- Develop/improve warning, evacuation, and sheltering procedures and information for residents, businesses, visitors, individuals with access and functional needs, and animals, with a focus on high risk areas.
- Improve/Maintain interagency communications. Ensure functionality and redundancy of communications, information technology, and other critical systems.
- Increase interoperability and use of shared resources and mutual aid among agencies operating in Madera County.
- Establish enhanced data collection and retention practices.
- Minimize the over dependence on governmental regulation and allow the public and markets to implement reasonable measures.
- Encourage more stable conditions that facilitate public and private stewardship.

***Goal 4: Increase and maintain wildfire prevention and protection in Madera County.***

- Reduce the wildfire risk and vulnerability in Madera County
- Reduce life safety issues, property loss, and damages associated with wildfires.
- Develop a countywide fuels reduction implementation strategy.
- Promote tree mortality mitigation activities.
- Promote and enhance fire-fighting capabilities (e.g., access roads, water supply, etc.)

***Goal 5: Improve community resiliency to drought conditions including establishing a sustainable water supply in Madera County.***

- Reduce the drought/water shortage risk and vulnerability in Madera County.
- Develop a comprehensive, countywide water plan to provide for existing development, to foster preservation of economic base, and to guide future development opportunities.
- Promote continued groundwater conservation.
- Increase water storage facilities to provide for consistent water supply and to mitigate flooding.
- Address drought impacts related to tree mortality to include dead tree removal that contributes to wildfire risk (i.e., increased fuel loads) and flood risk (i.e., downed trees blocking flood control facilities).

***Goal 6: Improve community resiliency to flooding in Madera County***

- Reduce the flood risk and vulnerability in Madera County.
- Reduce life safety issues, property loss, and damages associated with flooding.
- Review appropriate flood protection infrastructure improvements in both urban and non-urban areas to provide 100-year level of protection where feasible.

***Goal 7: Maintain FEMA eligibility for grant funding***

- Assure conformance to federal and state hazard mitigation initiatives and maximize potential for mitigation implementation.
- Position jurisdictions for grant funding through monitoring and communicating available grant programs, timelines, and processes to all communities.
- Reduce exposure to hazard-related losses through realistic mitigation project planning and implementation, ensuring that actions can be undertaken and sustained without excessive depletion of economic resources.

Actions to support these goals are shown on Table ES-3.

*Table ES-3 Madera County Planning Area Mitigation Actions*

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
<b>Madera County</b>						
<b>Multi-Hazard Actions</b>						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X		Prevention
Action 2. Improved Public Outreach	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X	X	Public Information
Action 3. Review and Bring Current County Plans	1, 2, 3, 4, 5, 6, 7	New action	X	X		Public Information
Action 4. Shelter Emergency Plan	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 5. Training & Exercises	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 6. Recovery Plan	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 7. Countywide GIS Data Base	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 8. Community Pet Education and Disaster Preparedness	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention Emergency Services
<b>Agricultural Actions</b>						
Action 9. Agriculture Emergency Plan	1, 2, 3, 7	New action	X	X		Prevention Emergency Services
<b>Climate Change Actions</b>						
Action 10. Climate Adaptation Plan	1, 2, 3, 7	New action	X	X		Prevention
<b>Dam Failure Actions</b>						
Action 11. Dam Monitoring	1, 2, 3, 7	New action	X	X		Prevention Emergency Services

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
<b>Drought Actions</b>						
Action 12. Well Rehabilitation Program	1, 2, 3, 5, 7	New action	X	X		Property Protection
Action 13. Public Water Systems	1, 2, 3, 5, 7	New action	X	X		Property Protection Natural Resource Protection
Action 14. Expand Surface Water Locations	1, 2, 3, 5, 7	New action	X	X		Property Protection Structural Projects
<b>Earthquake Actions</b>						
Action 15. Bridge Retrofits and Replacements	1, 2, 3, 6, 7	2011 action	X	X		Property Protection Structural Projects
<b>Flood Actions</b>						
Action 16. Relocate County fire station out of floodplain	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Structural Projects
Action 17. Relocation of Government Facilities in the Floodplain	1, 2, 3, 5, 7	2011 action	X	X	X	Property Protection Structural Projects
Action 18. Erosion Repair and Restoration Projects	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 19. Woody Debris Removals	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Natural Resource Protection
Action 20. Flood Insurance Promotion	1, 2, 3, 5, 7	New action	X	X	X	Prevention Public Information
Action 21. Stormwater Management Plan	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Structural Projects Natural Resource Protection



Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 22. Flood Studies and Action Project	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 23. Ash Slough Arundo Removal and Channel Clearing	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 24. Berenda Creek Arundo Removal, Channel Clearing and Levee Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 25. Berenda Slough Arundo Removal and Channel Clearing	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 26. Cottonwood Creek Channel Clearing and Levee Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 27. Dry Creek Channel Clearing and Levee/Embankment Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 28. Fresno River Channel Clearing and Levee/Embankment Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
<b>Hazardous Materials Actions</b>						
Action 29. Crude Oil Emergency Response	1, 2, 3, 7	New action	X	X		Emergency Services
Action 30. Hazardous Materials Decontamination Kits	1, 2, 3, 7	New action	X	X		Emergency Services
Action 31. Ethanol Emergency Response	1, 2, 3, 7	New action	X	X		Emergency Services
Action 32. Madera County ICS typing of Hazardous Materials Team	1, 2, 3, 7	New action	X	X		Emergency Services
Action 33. Mutual Aid Agreements	1, 2, 3, 7	New action	X	X		Emergency Services
Action 34. HAZ-MAT Response	1, 2, 3, 7	New action	X	X		Emergency Services
<b>Extreme Heat/Cold Actions</b>						
Action 35. Cooling/Warming Centers	1, 2, 3, 7	New action	X	X		Prevention Public Information
<b>Wind and Tornado Actions</b>						
Action 36. Woody Debris Removal - Roadway	1, 2, 3, 7	New action	X	X		Property Protection Natural Resource Protection
<b>Winter Storms/Snow Actions</b>						
Action 37. Snow Removal Plan	1, 2, 3, 7	New action	X	X		Property Protection
<b>Wildfire Actions</b>						
Action 38. Educate the public on fire safety and hazard reduction	1, 2, 3, 4, 7	New action	X	X		Public Information

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 39. Fuel Reduction	1, 2, 3, 4, 7	New action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 40. Pre-suppression plan and Wildland urban interface map	1, 2, 3, 4, 7	New action	X	X		Prevention Property Protection
Action 41. Fire Fighting Access Issues	1, 2, 3, 4, 7	New action	X	X		Property Protection Natural Resource Protection
Action 42. Tree Mortality	1, 2, 3, 4, 7	New action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 43. FireWise Communities	1, 2, 3, 4, 7	New action	X	X		Prevention Property Protection
Action 44. Community Chipping Program	1, 2, 3, 4, 7	New action	X	X		Prevention Property Protection
Action 45. Reforestation Projects	1, 2, 3, 4, 7	New action	X	X		Natural Resource Protection
<b>City of Chowchilla</b>						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X		Prevention
Action 2. Public awareness, education, outreach, and preparedness program enhancements for all hazards (simplify, multi-media, educate and clarify various emergency systems, messaging and training; promote self-responsibility)	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X	X	Public Information
Action 3. Conduct evacuation and shelter planning for all communities and populations (to include all critical hazards, at risk populations, medical, ADA, animals, and with outreach and security components)	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention Emergency Services

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 4.Enhance and maintain GIS mapping of City assets and critical facilities	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention Emergency Services
Action 5.Explore additional surface water resources for City	1, 2, 3, 5, 7	New Action	X	X		Property Protection Structural Projects
Action 6.Provide backup generators for wells	1, 2, 3, 7	New Action	X	X		Property Protection
Action 7. Evaluate joining the National Flood Insurance Program	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Natural Resource Protection
Action 8.Erosion repair	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Natural Resource Protection
Action 9.Implement stormwater master plans	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 10. Undergrounding of stormwater system – Downtown area	1, 2, 3, 6, 7	2011 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
<b>City of Madera</b>						
Action 1.Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention
Action 2.Installation of variable frequency drives onto wells to increase capacity	1, 2, 3, 5, 7	New Action	X	X		Property Protection
Action 3.Install backup motors for wells with an emphasis on critical facilities. Provide backup generators for wells.	1, 2, 3, 5, 7	New Action	X	X		Property Protection
Action 4.Install Variable Frequency Drives (VFD) on Existing City Wells to Increase Capacity	1, 2, 3, 5, 7	New Action	X	X		Property Protection
Action 5.Provide Backup Generators for City Wells	1, 2, 3, 5, 7	New Action	X	X		Property Protection

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 6. Implement Improvements Recommended in the Storm Drainage System Master Plan	1, 2, 3, 6, 7	2011 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 7. 4th Street Flooding Improvements Installed in accordance with that recommended in the Storm Drainage System Master Plan	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 8. Conduct New Studies/Modeling and Mapping of the Fresno River within the City's Growth Boundary	1, 2, 3, 6, 7	New Action	X	X	X	Prevention
<b>North Fork Rancheria</b>						
Action 1. Prescription Burning Projects	1, 3, 4, 7	New Action	X	X		Property Protection Natural Resource Protection
Action 2. Defensible Space Projects	1, 3, 4, 7	New Action	X	X		Property Protection Natural Resource Protection
Action 3. Community Emergency Preparedness Meeting	1, 3, 4, 7	New Action	X	X		Prevention Emergency Services



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***Annexes***

**Annex A:** City of Chowchilla

**Annex B:** City of Madera

**Annex C:** North Fork Rancheria

***Appendices***

**Appendix A:** Planning Process

**Appendix B:** References

**Appendix C:** Mitigation Strategy

**Appendix D:** Adoption Resolution

**Appendix E:** Wildfire History

**Appendix F:** Critical Facilities



## Abbreviations and Acronyms

Acronym	Definition
AB	Assembly Bill
AGL	Above Ground Level
ALERT	Automated Local Evaluation in Real Time
ALMIS	America's Labor Market Information System
APG	California Adaptation Planning Guide
AQI	Air Quality Index
BAM	Best Available Map
BLM	Bureau of Land Management
BMP	Best Management Practices
CA	California
CA-DWR	California Department of Water Resources
Cal-IPC	California Invasive Plant Council
Cal OES	California Office of Emergency Services
CAP	Climate Adaptation Plan
CAS	Climate Adaptation Strategy
CCSM	California Climate State Model
CDAA	California Disaster Assistance Act
CDEC	California Data Exchange Center
CDFA	California Department of Food & Agriculture
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CERT	Community Emergency Response Training
CFR	Code of Federal Regulations
CGS	California Geologic Survey
CHP	California Highway Patrol
CIP	Capital Improvements Plan
CLOMR	Conditional Letter of Map Revision
CNPS	California Native Plant Society
CNRA	California Natural Resource Agency
CRS	(National Flood Insurance Program's) Community Rating System
CRV	Content Replacement Values
CWPP	Community Wildfire Protection Plan
DAC	Disadvantaged Community
DMA	Disaster Mitigation Act of 2000

Acronym	Definition
DOF	Department of Finance
DOT	Department of Transportation
DSOD	Division of Safety of Dams
EAS	Emergency Alert System
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FHSZ	Fire Hazard Severity Zone
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance Program
FRA	Federal Responsibility Area
FSZ	Farmland Security Zone
FWS	US Fish and Wildlife Service
GFDL	Geophysical Fluid Dynamics Laboratory
GHG	Greenhouse Gases
GIS	Geographic Information Systems
Hazus	Hazards United States
HMGP	Hazard Mitigation Grant Program
HI	Heat Index
IBC	International Business Code
IPCC	Intergovernmental Panel on Climate Change
IRC	International Residential Code
LFPZ	Levee Flood Protection Zone
LHMP	Local Hazard Mitigation Plan
LMA	Local Maintenance Agency
LOMA	Letter of Map Amendment
LOMR	Letter of Map Revision
LRA	Local Responsibility Area
MHI	Median Household Income
MMI	Modified Mercalli Intensity Scale
MSL	Mean Sea Level
NASA	National Aerospace and Science Agency
NAVD 88	North America Vertical Datum 1988
NCDC	National Climactic Data Center
NDMC	National Drought Mitigation Center
NEPA	National Environmental Policy Act

Acronym	Definition
NFIP	National Flood Insurance Program
NGVD 29	National Geodetic Vertical Datum 1929
NIDIS	National Integrated Drought Information System
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPDP	National Performance of Dams Program
NPS	National Park Service
NWS	National Weather Service
OHP	Office of Historic Preservation
PDM	Pre-Disaster Mitigation Program
PG&E	Pacific Gas & Electric
PHMSA	Pipeline and Hazardous Materials Safety Administration
PMR	Physical Map Revision
PPI	Program for Public Information
PRP	Preferred Risk Policy
RAWS	Remote Automated Weather Stations
RL	Repetitive Loss
SB	Senate Bill
SBA	Small Business Administration
SDAC	Severely Disadvantaged Community
SFHA	Special Flood Hazard Area
SGMA	Sustainable Groundwater Management Act
SMP	Southeast Madera Plan
SOI	Sphere of Influence
SRA	State Responsibility Area
SRL	Severe Repetitive Loss
UCERF	Uniform California Earthquake Rupture Forecast
UHI	Urban Heat Island
ULDC	Urban Levee Design Criteria
ULOP	Urban Level of Protection Criteria
USACE	US Army Corp of Engineers
USBR	United States Bureau of Reclamation
USGS	United States Geologic Survey
USDA	United States Department of Agriculture
WA	Williamson Act
WMP	Wildlife Hazard Management Plan
WRCC	Western Regional Climate Center

Acronym	Definition
WUI	Wildland Urban Interface



# Chapter 1 Introduction

## 1.1 Purpose

Madera County and three other jurisdictions prepared this Local Hazard Mitigation Plan (LHMP) Update to the Federal Emergency Management Agency (FEMA) approved 2011 Madera County LHMP Update and the 2011 City of Chowchilla LHMP. The purpose of this combined Plan Update is to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community’s commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This LHMP Update was also developed, among other things, to ensure Madera County and participating jurisdictions’ continued eligibility for certain federal disaster assistance: specifically, the FEMA Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA).

## 1.2 Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses incurred by insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be reduced or even eliminated.

Hazard mitigation is defined by FEMA as “any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event.” The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of \$4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005).

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. This plan documents Madera County’s hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability in the community.

This Madera County LHMP Update is a multi-jurisdictional plan that geographically covers the entire area within Madera County’s jurisdictional boundaries (hereinafter referred to as the Planning Area). The following jurisdictions participated in the planning process and are seeking approval of the LHMP Update:

- Madera County\*
- City of Chowchilla\*\*

- City of Madera\*
- North Fork Rancheria of Mono Indians of California (North Fork Rancheria)\*
  - \* Participated in 2011 Madera County LHMP
  - \*\* Participated in their own 2011 City of Chowchilla LHMP

One plan participant from the 2011 Madera County Plan is not participating in this Plan Update:

- Madera County Office of Education

This LHMP Update was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). This planning effort also follows FEMA’s 2013 Plan Preparation Guidance. Because the Madera County Planning Area is subject to many kinds of hazards, access to FEMA grant programs is vital.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The Madera County Planning Area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and maintaining eligibility for mitigation-related federal funding.

### 1.3 Community Profile

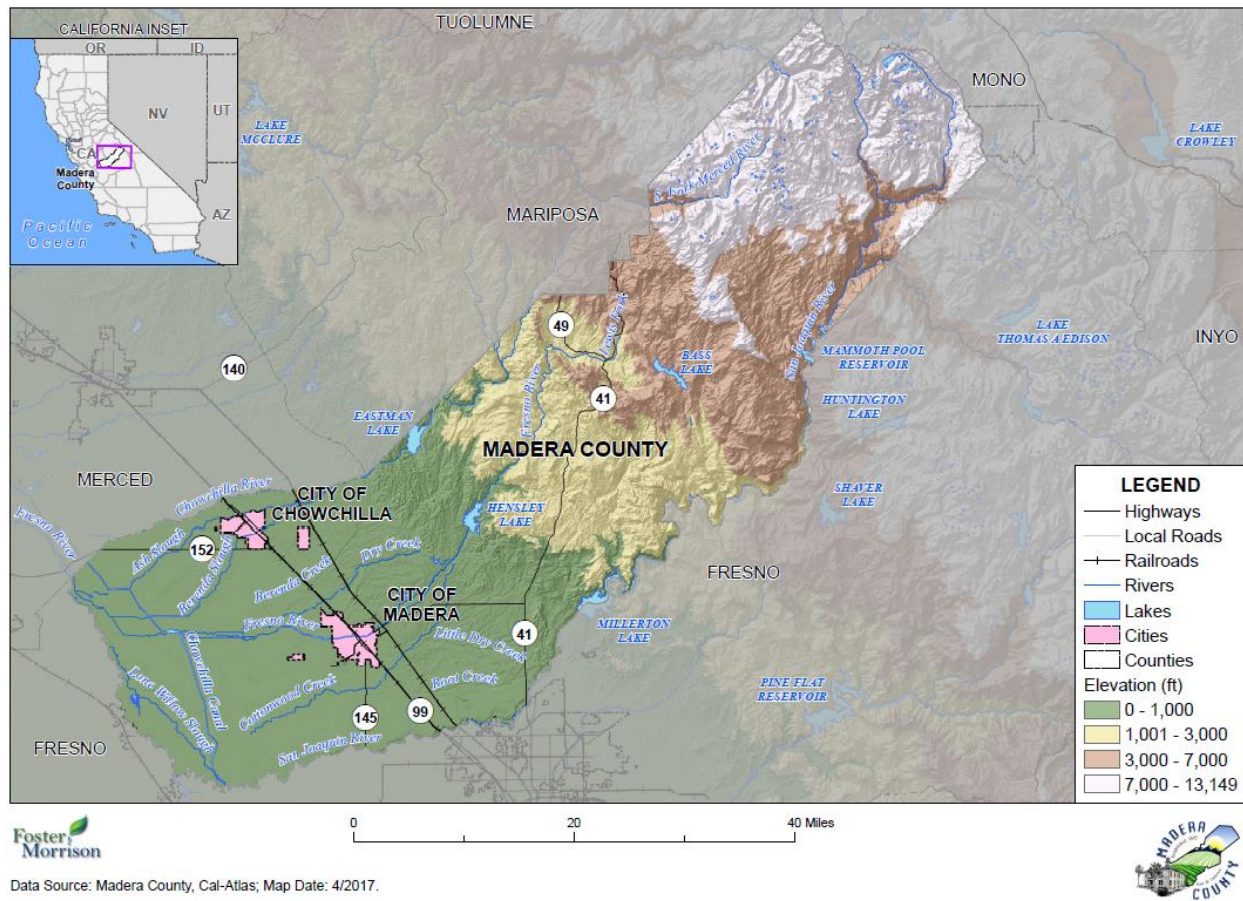
Madera County covers 2,147 square miles and is located in the geographic center of the State of California. It extends northeast from the center of the San Joaquin Valley to the summit of the Sierra Nevada. Madera County is bordered on the northeast by Tuolumne and Mono Counties, on the south by Fresno County, and on the northwest by Merced and Mariposa Counties. The San Joaquin River forms most of the boundary between Madera and Fresno Counties. The western third of the county is part of the nearly flat San Joaquin Valley which is oriented northwest to southeast and has a length of about 225 miles and an average width of about 50 miles. The elevation of the valley floor is approximately 180 feet and nearly flat. Elevations increase up the western slope of the Sierra Nevada to approximately 13,000 feet. Parts of Madera County are included in Yosemite National Park, Devil’s Postpile National Monument, and the Sierra National Forest. There are two incorporated communities in the County: the City of Chowchilla and the City of Madera. The County is also home to the North Fork Rancheria of Mono Indians of California.

In agricultural value, Madera County is the 12th most productive county in California. The tremendous value of agriculture is evident in the total crop value – \$2.27 billion in 2014, an increase of \$369 million over 2013, and \$1.16 billion more than in 2005. Madera County is an important producer of grapes, cotton, alfalfa, fruit, nuts, livestock, milk, poultry, and other agricultural products on approximately 660,700 acres

of harvested land. Agriculture accounts for approximately 30% of the employment in the County making it the largest industry.

A map of the County is shown in Figure 1-1.

*Figure 1-1 Madera County*



Data Source: Madera County, Cal-Atlas; Map Date: 4/2017.

### 1.3.1. History

Madera County was first inhabited by indigenous peoples between 10,000 and 20,000 years ago. The Valley region was occupied by several tribal entities including the Northern Valley Yokuts, the Foothill area was occupied by the Foothill Yokuts, and the mountainous areas were occupied by the Sierra Miwok and Monache Tribes.

Madera is the Spanish word for lumber or wood, the first major industry in the County. European settlers arrived in the early 1800s, but Madera County did not have a substantial population until the California Gold Rush. Evidence of the Gold Rush remains today in the names of some of Madera County's towns such as Coarsegold, Finegold, and Grub Gulch. The County was formed from a portion of Fresno County in a special election of the residents of the area, and was incorporated in 1893.

### 1.3.2. Geography and Climate

Madera County is located in central California. The western portion of the County lies in the Central Valley of California, and the eastern portion of the County is located in the Sierra Nevada mountains. Between the mountains and the Central Valley is an area of foothills. Madera County is bordered by Fresno County to the south and west, Merced and Mariposa Counties to the north, and Mono County to the east. The southern portion of Yosemite National Park is located in the northeast of Madera County.

Madera County is approximately 20 miles from the Fresno area, 166 miles from the Bay Area, and 240 miles from Los Angeles. The County occupies approximately 2,153 square miles, of which 2,136 square miles are land and the remaining 17 square miles are occupied by water. Elevations in Madera County range from 180 feet above sea level to 13,157 feet at Mount Ritter, the highest point in the County.

Madera County’s climate varies by location within the County. The climate in the Valley is warm and dry, with hot summers (temperatures in July normally reaching 100 degrees Fahrenheit) and fairly mild winters. The average rainfall is 12 inches. In the mountain communities, winters are colder, and summers not quite as hot. Above 7,000 feet, winters can be severe with year-round snow at the highest elevations. Fog is common in Madera County, particularly in the winter months but also can occur in the summer.

### 1.3.3. Population and Demographics

The California Department of Finance 2017 estimates for population of the County and its jurisdictions are shown in Table 1-1.

*Table 1-1 Madera County Population by Jurisdiction*

Jurisdiction	Total Population
City of Chowchilla	18,840
City of Madera	66,082
Unincorporated County	71,570
<b>Total</b>	<b>156,492</b>

Source: California Department of Finance, 2017 E-1 Report

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

*Table 1-2 Madera County – Select Social and Economic Statistics*

Statistic	Number
<b>Populations</b>	
Population under 5	7.9%
Population over 65	11.4
Median Age	33.0



Statistic	Number
White	62.6%
Black or African American	3.7%
American Indian or Alaska Native	2.7%
Asian	1.9%
Native Hawaiian or Pacific Islander	0.1%
Some Other Race	24.8%
Two or more races	4.2%
Median income	\$49,272
Mean Income	\$64,197
<b>Poverty rate</b>	
All families	19.3%
All people	23.5%
Unemployment Rate (May 2017)	7.2%

Source: 2010 US Census, 2015 US Census Bureau American Community Survey, Bureau of Labor Statistics

### 1.3.4. Economy and Tax Base

Madera County has a diverse economy. US Census estimate show economic characteristics for the County. These are shown in Table 1-3.

*Table 1-3 Madera County Civilian Employed Population 16 years and Over*

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	10,545	19.9%
Construction	2,917	5.5%
Manufacturing	4,580	8.6%
Wholesale trade	1,268	2.4%
Retail trade	5,160	9.7%
Transportation and warehousing, and utilities	2,495	4.7%
Information	770	1.5%
Finance and insurance, and real estate and rental and leasing	1,592	3.0%
Professional, scientific, and management, and administrative and waste management services	3,605	6.8%
Educational services, and health care and social assistance	10,250	19.3%
Arts, entertainment, and recreation, and accommodation and food services	4,32	8.0%
Other services, except public administration	2,323	4.4%
Public administration	3,199	6.0%

Source: US Census Bureau American Community Survey 2015 Estimates

Major employers in the County are shown in Table 1-4.

*Table 1-4 Major Employers in Madera County*

Employer Name	Location	Industry
Ardagh Group	Madera	Glass Containers
B A C	Madera	Assembly & Fabricating Service
Baltimore Aircoil Co	Madera	Refrigerating Equip-Commercial
Brake Parts Inc	Chowchilla	Brakes-Manufacturers
Certain Teed Corp	Chowchilla	Building Materials-Manufacturers
Chukchansi Gold Resort & Casino	Coarsegold	Resorts
Georgia-Pacific Madera	Madera	Paper-Manufacturers
Home Depot	Madera	Home Centers
JBT Food Tech	Madera	Food Processing Equipment & Supplies
Lamanuzzi & Pantaleo Cold Storage	Madera	Fruits & Vegetables-Growers & Shippers
Lion Brothers Farm-Newstone	Madera	Farming Service
Lowe's Home Improvement	Madera	Home Centers
Madera City Hall	Madera	Government Offices-City, Village & Township
Madera Community Hospital	Madera	Hospitals
Madera High School	Madera	Schools
Madera Packing Shed	Madera	Sheds-Tool & Utility
Madera South High School	Madera	Schools
Millview School	Madera	Schools
Mission Bell Winery	Madera	Wineries
Pines Resort	Bass Lake	Boats-Rental & Charter
Primerica Financial Svc	Madera	Financial Advisory Services
San Joaquin Wine Co Inc	Madera	Wineries
Span Construction Inc	Madera	Contractors-Equip/Supplies-Dealers/Services
Valley Children's Hospital	Madera	Hospitals
Valley State Prison for Women	Chowchilla	Government

Source: America's Labor Market Information System (ALMIS) Employer Database, 2017 1st Edition.

The County has a wide and varied tax base. Tax base information is tracked and maintained by the Madera County Assessor's Office. The following tables show the tax base for the County as well as for the incorporated jurisdictions. Table 1-5 shows the secured real property value by property type for the entire County. Table 1-6 shows the secured real property value by jurisdiction.

*Table 1-5 2016-2017 Madera County Planning Area Distribution of Value by Property Use*

Property Use	2016-2017 Value (\$)	Percent of Current Roll
Agricultural	\$3,650,750,703	28.5%
Commercial	\$1,694,810,036	13.2%
Government	\$36,565,689	0.3%
Industrial	\$382,833,332	3.0%
Institutional	\$93,562,141	0.7%
Residential	\$6,910,442,753	53.9%
Utilities	\$9,559,120	0.1%
Unknown	\$38,530,541	0.3%
<b>Totals</b>	<b>\$12,817,054,315</b>	<b>100.0%</b>

Source: Madera County Assessor's Office

*Table 1-6 Local Assessment Roll Totals by Jurisdiction*

Jurisdiction	2016-17 Value (\$)	Percent of Current Roll
City of Chowchilla	\$737,020,837	5.8%
City of Madera	\$2,734,671,647	21.3%
Unincorporated Area	\$9,345,361,831	72.9%
<b>Total Value</b>	<b>\$12,817,054,315</b>	<b>100.0%</b>

Source: Madera County Assessor's Office

## 1.4 Plan Organization

This Madera County 2017 LHMP Update is a multi-jurisdictional plan that geographically covers the entire area within Madera County's jurisdictional boundaries (i.e., the Planning Area). Participating jurisdictions within the Madera County Planning Area include: unincorporated Madera County; the two incorporated communities, the Cities of Chowchilla and Madera; and the North Fork Rancheria.

The Madera County Local Hazard Mitigation Plan update is organized as follows:

- Chapter 1: Introduction
- Chapter 2: What's New
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Jurisdictional Annexes
- Appendices

The **Base Plan** provides the overall framework for this multi-jurisdictional LHMP. It is the umbrella document that includes the planning process, methodologies, and procedural requirements for all participating jurisdictions (i.e., unincorporated County and all Jurisdictional Annexes). As such, Chapters

1-7 of the Base Plan apply to the unincorporated County, the two incorporated communities and the North Fork Rancheria as participants to this LHMP update seeking FEMA approval of the plan. Because this is a multi-jurisdictional plan, the Base Plan addresses the LHMP hazard mitigation planning elements for all participating jurisdictions and includes data, information, and analysis specific to: the Madera County Planning Area (which includes all participating jurisdictions and the entire geographic boundary of Madera County) and unincorporated Madera County.

The **Jurisdictional Annexes** detail the hazard mitigation planning elements specific to each participating jurisdiction to this 2017 Madera County LHMP Update. Each annex is not intended to be a standalone document, but appends to, supplements, and incorporates by reference the information contained in the Base Plan document. As such, all Chapters 1-7 of the Base Plan, including the planning process and other procedural requirements and planning elements apply to and were met by each participating jurisdiction. The Annexes provide additional information specific to each participating jurisdiction, with a focus on providing additional details on the risk assessment and mitigation strategy.

The **Appendices** provide additional information, data, and planning process documentation that applies to all participating jurisdictions (i.e., unincorporated County and all jurisdictional annexes) to this Madera County 2017 LHMP Update.



## Chapter 2 What's New

**Requirements §201.6(d)(3) and §201.7(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.**

The 2011 Madera County Local Hazard Mitigation Plan (LHMP) and the 2011 City of Chowchilla LHMP contained detailed descriptions of their planning processes, the risk assessments of identified hazards for the Madera County and City of Chowchilla Planning Areas and mitigation strategies for reducing the risk and vulnerability from these hazards. Since approval of these plans by FEMA, much progress has been made by the County, City of Chowchilla, and other participating jurisdictions on implementation of the mitigation strategies. As part of this 2017 LHMP Update, a thorough review and update of both County and City 2011 LHMPs was conducted to ensure that this update reflects current community conditions and priorities in order to realign the updated mitigation strategy for the next five-year planning period. This section of the plan includes the following:

- **What's New in the Plan Update.** Section 2.1 provides an overview of the approach to updating the plans and identifies new analyses, data and information included in this LHMP Update to reflect current community conditions. This includes a summary of new hazard and risk assessment data as it relates to the Madera County Planning Area as well as information on current and future development trends affecting community vulnerability and related issues. The actual updated data, discussions, and associated analyses are contained in their respected sections within this 2017 LHMP Update.
- **Summary of Significant Changes to Current Conditions and Hazard Mitigation Program Priorities.** Section 2.2 provides a summary of significant changes in current conditions, changes in vulnerability, and any resulting modifications to the community's mitigation program priorities.
- **2011 Mitigation Strategy Status and Successes.** Section 2.3 provides a description of the status of mitigation actions from the 2011 County and City Plans and also indicates whether a project is no longer relevant or is recommended for inclusion in the updated 2017 mitigation strategy. This section also highlights key mitigation success stories of the County, City of Chowchilla, and other participating jurisdictions since the 2011 LHMPs.

This What's New section provides documentation of Madera County Planning Area's progress or changes in their risk and vulnerability to hazards and their overall hazard mitigation program. Completion of this 2017 LHMP Update further provides documentation of the Madera County community's continued commitment and engagement in the mitigation planning process

### 2.1 What's New in the Plan Update

This LHMP Update involved a comprehensive review and update of each section of the 2011 Plans and includes an assessment of the success of the participating communities in evaluating, monitoring, and

implementing the mitigation strategy outlined in the initial plans. Only the information and data still valid from the 2011 LHMPs were carried forward as applicable into this combined 2017 LHMP Update.

Also to be noted, Chapter 7 Implementation and Maintenance of this plan update identifies key requirements for updating future plans:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

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

As part of its comprehensive review and update of each section of the plans, Madera County; the Cities of Chowchilla and Madera; and other jurisdictions recognized that updated data, if available, would enhance the analysis presented in the risk assessment and utilized in the development of the updated mitigation strategy. Highlights of new data used for this combined LHMP Update is identified below in this section and is also sourced in context within Chapter 4, Risk Assessment. Specific data used is sourced throughout this plan document. This new data and associated analysis provided valuable input for the development of the mitigation strategy presented in Chapter 5 of this Plan Update.

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

- The 2011 LHMPs for both Madera County and the City of Chowchilla were combined into a singular planning mechanism.
- Multiple new hazards were added – including agricultural hazards, climate change, localized flood, heavy rain and storms, and volcano.
- Climate change has been addressed as a stand-alone hazard as well as within the hazard profiles of each identified hazard to assist the County in considering climate change issues when identifying future mitigation actions for the Planning Area.
- New dam data provided by Cal OES was used for the dam inventory and analysis. This data included an updated hazard classification for identified dams. Values at risk to dam inundation was analyzed. Critical facilities and populations at risk to dams were tabulated.
- Water shortage impacts were added to the drought hazard for the County, to better align with the State of California Hazard Mitigation Plan and to reflect the significant issues related to drought conditions resulting from the current and ongoing drought within the County and State of California.
- More detailed GIS analysis was performed for earthquake, including a Hazus earthquake run to show risk and provide potential loss estimates to the County from earthquake.

- More detailed GIS analysis was performed for the flooding hazard for both 100- and 500-year floods, including values at risk, critical facilities at risk, population at risk, future development, and general community impacts.
- More detailed GIS analysis was performed for hazardous materials, including values at risk, critical facilities at risk, population at risk, future development, and general community impacts.
- More detail was added to the levee failure hazard.
- More detailed GIS analysis was performed for landslides, including values at risk, critical facilities at risk, population at risk, future development, and general community impacts.
- An entire rework of the risk assessment for each identified hazard. This included reworking the hazard profile and adding new hazard event occurrences; redoing the entire vulnerability analysis to add additional items and updating the vulnerability assessment based on more recent hazard data as well as using the most current parcel and assessor data for the existing built environment to develop loss estimates.
- Utilizing updated critical facility GIS mapping for the Planning Area to provide an updated inventory of critical facilities by jurisdiction and a GIS analysis of critical facilities to mapped hazards.
- An enhanced vulnerability assessment which added a GIS analysis of updated future development areas in the Planning Area and specific to each of the mapped hazards.
- A greater study of County mitigation capabilities was added.
- Incorporation and analysis of the new 2010 Census data was utilized for this LHMP Update.
- Also, as required by current FEMA planning guidance, an analysis of each jurisdictions' ongoing and continued compliance with the NFIP was included in this LHMP Update.

## 2.2 Summary of Significant Changes to Current Conditions, Planning Area Vulnerability, and Hazard Mitigation Priorities

This section provides a summary by hazard of significant changes in current conditions, Planning Area vulnerability, and any resulting modifications to the community's mitigation program priorities since the 2011 LHMPs:

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Agricultural Hazards			X

- Recent drought conditions have stressed local crops, timber, and grazing lands making them more susceptible to insect infestation, and other issues.
- Changing access and availability of water to agricultural users due to recent drought conditions has further impacted the ag industry
- Noxious weeds are more drought tolerant – better able to compete for water over local crops and vegetation and also increases wildfire risk.
- Drought increased the tree mortality in the County further impacting the wildfire hazard.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Climate Change			X

- NWS data indicates temperatures are increasing resulting in more extreme heat days.
- Snowpack levels have been occurring at higher elevations in recent years.
- Data also suggests that changing climate conditions influence multiple hazards, such as heat, flooding, and others, identified in the Planning Area as described in this LHMP Update.
- Climate change affects in the Planning Area include snow pack levels occurring at a higher elevations then found historically. This, along with recent drought conditions, have led to an increase in tree mortality. Higher snow and freeze levels do not kill the bark beetles in the lower elevations, thus contributing to increased levels of tree mortality.
- Other impacts include, impacts to food sources and food-related diseases, eco-system changes, public health issues, etc.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Dam Failure		X	

- With more people moving into dam inundation areas, the vulnerability increases due to an increase in potentially affected populations, but not due to an increased risk of dam failure. However, population growth in the last five years has been limited in Madera County, thus not notably affecting dam vulnerability in the Planning Area.
- However, future development projects such as those below the Millerton Dam include residential development in low-lying drainage areas. These developments include: 1,500 homes (DragonFly Country Club) and another 3,000 homes in the Tesoro Viejo area. These future development areas, unless constructed/developed to provide protection from the dam failure risk, will potentially increase the vulnerability of the Planning Area to dam failure.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Drought and Water Shortage			X

- Since the 2011 planning process, current drought conditions, including water supply access issues, have had a significant impact on the Madera County Planning Area and California. As a result, the drought hazard has become a significant priority for mitigation planning.
- State drought mandates, including conservations measures, to protect water supply throughout California have been implemented and continue within the Planning Area.
- Drought conditions have impacted water supply to the Planning Area, as evidenced by the number of wells going dry – at well over 300 dry wells in the last few years.



- Drought conditions have contributed to an increase in tree mortality issues and general increase in wildfire conditions. In Madera County alone, there are over 39 million dead trees.
- Water quality issues have been more of an issue with less flows in streams, combined with drawing down of water tables. Further, dry wells are now dirty, sandy water; there is not as much ground water available to act as a filter to these water supply sources.
- Drought conditions further impacted aquatic habitats, and other environmental systems due to a decrease in water availability and delivery to these resources.
- Although drought impacts were significant the first four years of the County’s last LHMP planning cycle, the winter storms of 2017 provided some relief from the most recent drought. The HMPC noted that the recent storms of 2017 helped the surface water source (some areas actually had new springs appear), but did nothing to restore the ground water supply in the County.
- The HMPC further noted that this hazard impacted the Agricultural industry, economically by making ground water delivery less available and requiring farmers to drill deeper wells to access the same amount of water. This costs the users money.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Earthquake		X	

- Overall, Madera County is in a low to moderate seismically active area, with areas in the upper Sierra Nevada region at a greater seismic risk; however, there is little development in these areas to significantly affect vulnerability of the Planning Area.
- The primary factor that might change the earthquake vulnerability is additional development and more people moving to the area. However adherence to California building codes should ensure sound development in these new development areas.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Flood: 1%/0.2% events		X	

- Overall, the net increase or decrease in vulnerability depends on the location within the Planning Area.
- The risk and vulnerability of 1% and 0.2% flood events remain somewhat constant, changing from year to year based on weather and new development in the Planning Area.
- With the winter storms of 2017, heavy rains and snow resulted in significant snowpack, full reservoirs and high rivers; however, the Planning Area did not experience significant flooding or inundation in the FEMA floodplains.
- Land use planning, flood control measures, and adherence to development requirements in identified floodplains have minimized additional exposure to this hazard in the Planning Area, even in years of heavy storms.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Flood: Localized Stormwater Flooding			X

- Increased development in unmapped flood hazard areas could result in a net increase in vulnerability should these areas experience increased stormwater/localized flooding. However, development requirements that require mitigation of stormwater runoff work to mitigate this hazard.
- Climate change issues may result in more localized flooding as the climate warms and more frequent, wetter, and greater intensity storms create more runoff.
- 2017 winter storms, including significant snow and heavy rains, resulted in more localized flooding throughout the Planning Area. The greatest evidence of localized flooding during the 2017 storms included the North Fork region, especially within the areas of the RV park, which is a fairly typical occurrence.
- The HMPC also noted that recent storms were of greater intensity than in past years, which also resulted in more significant localized stormwater flooding, but most areas were limited to 10-20 year storm levels.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Hazardous Materials Transportation			X

- With an improved economy leading to increased commerce statewide, the County experienced an increase in volumes and shipping of hazardous materials through the Planning Area. The HMPC noted that this is especially true with respect to rail transport through the County as there has been a notable increase in rail traffic of Bakken oil trains which carry oil cargo from Southern California to Colorado.
- The HMPC further noted that more transportation-related accidents have been occurring in the Planning Area, also likely as a result of the upturn in the economy resulting in less experienced drivers being hired.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Landslides, Rockfalls, and Debris Flows			X

- Over the last couple of years, with the severe drought, much of the vegetation along sloped areas is failing to thrive, thus there is a lack of vegetation to hold soil contributing to the landslide/mudslide potential.
- Combined with recent heavy rains from 2017 contributing to saturated soils, the landslide potential increased in the Planning Area, especially in post fire areas.
- Although as further noted, these landslide areas generally occur in remote, undeveloped areas that would have limited damages during a landslide.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Levee Failure			X

- Similar to other hazards, increased development in areas protected by levees could result in an increase in vulnerability.
- According to the HMPC, deferred maintenance on area levee systems, especially with the recent wet 2017 season, has resulted in an increase in the vulnerability of the County to levee failure.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Extreme Cold and Freeze		X	

- Similar to other weather hazards, the overall vulnerability of the Planning Area changes from year to year depending on the season. Since the 2011 LHMP, previous years of mild winters was followed by a 2017 winter season of heavy snow and cold weather.
- The HMPC further noted, that extreme cold and freeze and their impacts are mostly an agricultural issue.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Extreme Heat			X

- The HMPC noted that there has been an increase in severe heat days in recent years. The City of Madera further noted, that in 2017, this resulted in an increase in the number of days and extended hours for cooling center operations.
- Climate change issues will continue to increase heat related impacts.
- The heat, combined with drought conditions, has increased the potential for wildfires.
- Increased mortality of cattle/animals due to extreme heat conditions resulting in economic impacts.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Fog		X	

- This low priority hazard has not changed over the last five years.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Heavy Rains and Storms		X	

- Similar to other weather hazards, the overall vulnerability of the Planning Area changes from year to year depending on the season. Although the last five years have been on the mild side, the 2017 winter season brought significant and heavy rains causing adverse impacts to the County. The HMPC noted that during this last 2017 winter, the storms seemed to be more intense and more frequent than in years proceeding this last drought.
- Climate change brings renewed concern moving forward for heavy rains, storms and associated issues to the County.

2017 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Wind and Tornadoes		X	

- This hazard has not changed in the Planning Area over the last five years.

2016 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Winter Storms and Snow			X

- Similar to other weather hazards, the overall vulnerability of the Planning Area changes from year to year depending on the season. Since the 2011 LHMP, previous years of mild winters was followed by a 2017 winter season of heavy snow.

2016 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Volcano		X	

- This low priority hazard has not changed over the last five years.

2016 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Wildfire (Smoke, Tree Mortality)			X

- Compounded by current drought conditions, the wildfire hazard has substantially increased and is no longer just a seasonal issue. The wildfire season, including the potential for a catastrophic wildfire, is now a year around concern.
- The vulnerability of Madera County to increased occurrence of a devastating wildfire has increased as exacerbated by the recent drought, increases in tree mortality, and overall increase in wildfire conditions.

- The increased development in WUI areas within the County also contributes to an increase in vulnerability.
- With large wildfires occurring throughout California, the Planning Area has seen a significant change in air quality from smoke resulting in more recorded bad air days.
- Although the HMPC noted that even with an increase in wildfire risk and vulnerability due to recent conditions as described above, ongoing and aggressive wildfire mitigation activities in the Planning Area continue to effectively mitigate and prevent out-of-control, damaging wildfires (See Success Stories in this Section). This includes the County increasing the number of defensible space inspections which has been effective in reducing the amount of ground fuels that contribute to large, uncontrolled wildfires.

## 2.3 2011 LHMP Mitigation Strategy Successes and Status

Madera County and participating jurisdictions have been successful in implementing actions identified in the 2011 Madera County and City of Chowchilla LHMP Mitigation Strategies, thus, working diligently towards meeting their 2011 goals and objectives of:

### *Madera County 2011 LHMP Goals*

- Reduce the possibility of damages and losses due to seismic hazards, including ground shaking and earthquake-induced landslide
- Reduce the possibility of damages and losses due to weather-related hazards, including drought, flood, fog, heat, severe wind and tornado, and winter storm
- Reduce the possibility of damages and losses due to other hazards, including wildfire, dam failure, levee break, and hazardous material event

### *City of Chowchilla 2011 LHMP Goals*

- Reduce the possibility of damages and losses due to seismic hazards, including ground shaking and earthquakes
- Reduce the possibility of damages and losses due to weather-related hazards, including drought, flood, fog, severe heat, severe wind, tornado and winter storm
- Reduce the possibility of damages and losses due to other hazards, including wildland fire, dam failures, channel/waterway and levee breaks (within city limits) and hazardous materials

Where possible, Madera County and the City of Chowchilla used existing plans and programs to implement the 2011 mitigation strategies. Examples include implementation of wildfire mitigation actions through existing fire plans, implementation of flood mitigation actions through County programs including existing plans, studies, and projects, and implementation of a variety of projects through the County's Capital Improvement Program.

### 2.3.1. Success Stories

The County and participating jurisdictions have seen the successful implementation of projects from previous mitigation plans. A few examples are highlighted below.

*Road 620 Fuel Reduction Project*

This project is currently in progress. This project is a joint effort by the local CAL-FIRE Unit and the County Road’s department. This project is being done during regular duty personnel in turn costing no overtime. This project is to increase the protection of the Oakhurst Area.



Source: Madera County OES



Source: Madera County OES



Source: Madera County OES





Source: Madera County OES

### *Cedar Valley Fuel Reduction Project*

This project is currently in progress. This project is a joint effort by the local CAL-FIRE Unit, United States Forest Service and the County Road's department. This project is being done during regular duty personnel and augmented tree mortality staff/equipment.



Source: Madera County OES

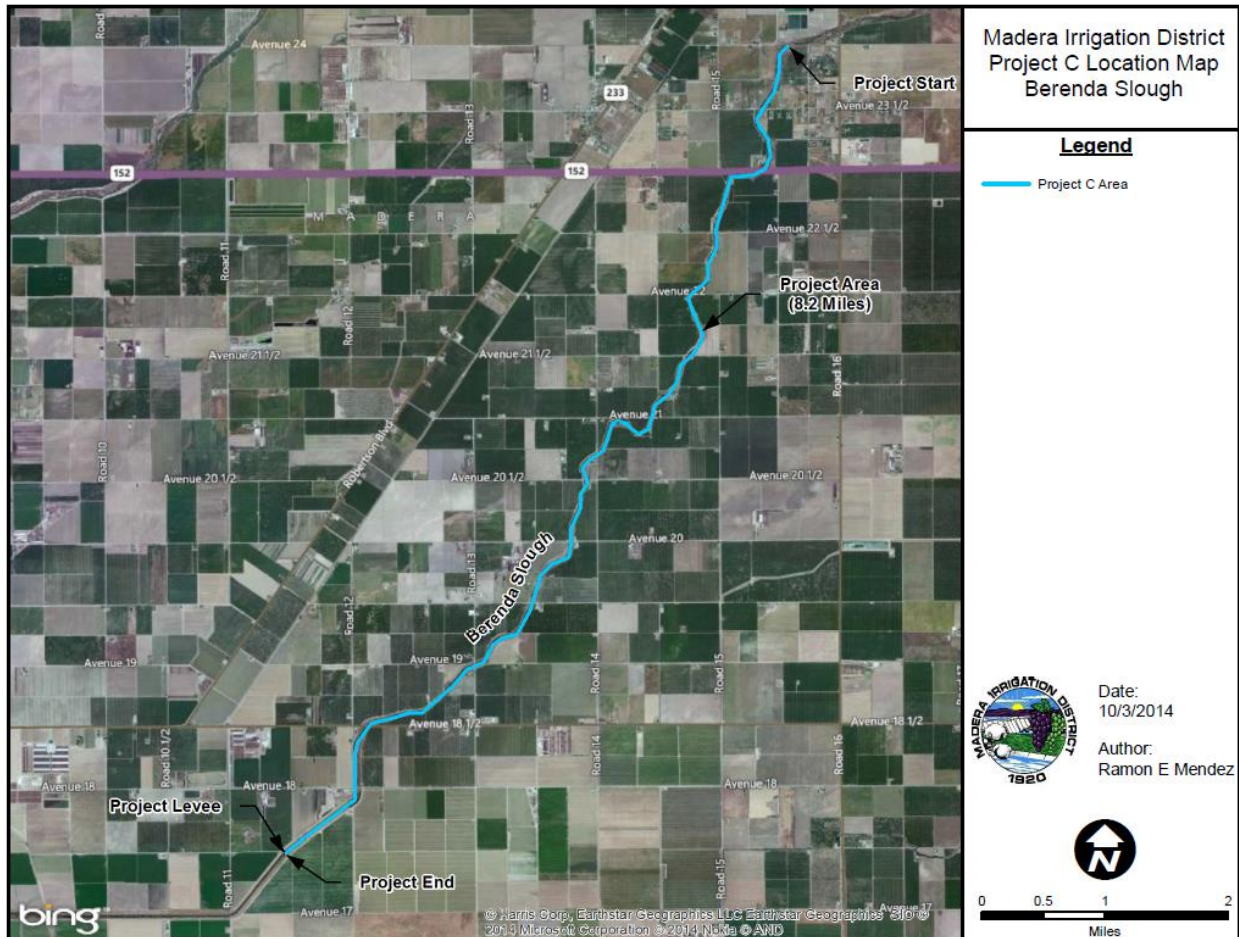


Source: Madera County OES

### *Arundo Removal*

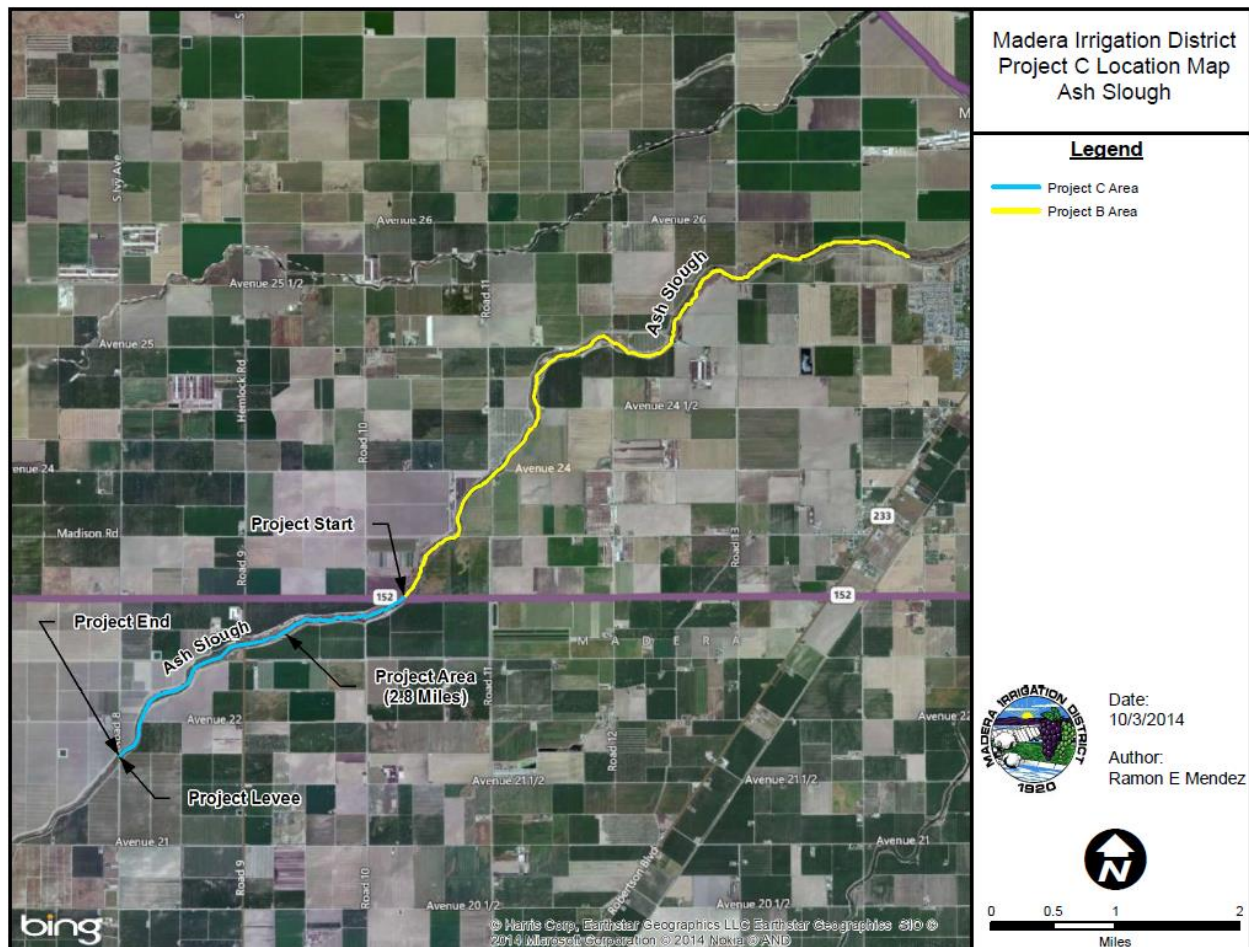
The City of Chowchilla, with grant funds, eradicated the arundo along the Ash Slough where it abuts the City limits behind the City Corporation yard and to the western City limits. After the major eradication was completed by a contractor, the City then took on the spot spraying for the following three or four years to completely eradicate the arundo. Madera County did the same along the Berenda Slough from about Avenue 23 ½ and to the south to the Madera County line (see Figure 2-1) using a \$2.7 million grant, as well as in the Ash Slough area not in the Chowchilla city limits (see Figure 2-2) using a \$2.5 million grant. Madera County in cooperation with Chowchilla Water District then provided the ongoing spraying to eradicate those areas that sprouted back up.

Figure 2-1 Arundo Removal – Berenda Slough



Source: Madera Irrigation District

Figure 2-2 Arundo Removal – Ash Slough



Source: Madera Irrigation District

Each of these areas in both Ash and Berenda sloughs were chosen due to the significant reduction in flow capabilities due to the overgrowth of the Arundo. With the recent years rain fall, run off and water releases from upstream dams, we found a very significant increase in the amount of water that could be sent down these two channels. With the increased capacities, there were certainly less flooding issues than had been seen in quite a number of years.

Though this increase in flow capacity did alleviate flooding issues, it also became apparent that the levees in the Chowchilla area should be reinforced. With the increased flow, erosion areas were more of a concern as these levees were built with significantly sandy soil that washes away easily.

When noticed, the Chowchilla Water District stepped in immediately to reinforce the sandy levees with broken concrete and hard pan they had on hand. In the future, the City will work to further reinforce these sandy areas with more stable materials.

*Figure 2-3 Ash Slough Before and After Arundo Removal*



Source: City of Chowchilla

### *Drought Response*

Due to the last five years of drought, the County, along with the state, has had an increased response to drought. The County has been providing a mechanism for homeowners with dry wells to have some assistance. With state funding, the County has been able to provide homeowners with dry wells, a temporary tank with potable water. The tank and water hauling is a short-term solution. The support from the state and County has allowed people to save money to work towards that long-term solution of drilling a new well. This funding source will end June of 2018.

### *Storm Drainage Improvements*

The City of Madera Streets & Storm Drainage Division at Public Works has worked on several projects to increase storm water basin percolation and drainage in an effort to mitigate localized flooding. This includes installation of dry wells, basin and drain inlet reconstruction and excavation projects, pump upgrades/repairs at various pump stations, and installation of new lines in various locations.

#### **2.3.2. 2011 Mitigation Strategy Update**

The 2011 Madera County LHMP mitigation strategy contained 17 separate mitigation actions for the County. Of the 17 County actions, 4 have been completed, 1 is completed but are still ongoing, 6 are ongoing, and 7 have not been started. The 2011 City of Chowchilla mitigation strategy contained 19 mitigation actions for the City of Chowchilla. Of the 19 City of Chowchilla actions, none have been completed, 10 are ongoing, and 9 have not been started. Because many of these projects, such as the various fuels management projects, are implemented on an annual or other continuous basis and some of the projects have yet to be funded or have otherwise not been initiated, 4 2011 Madera County actions and 3 2011 City of Chowchilla actions have been identified for inclusion in this LHMP Update.

Table 2-1 provides a status summary of the mitigation action projects from the 2011 Madera County LHMP. Table 2-2 provides a status summary of mitigation actions from the 2011 City of Chowchilla LHMP. Following the table is a description of the status of each project.

**Table 2-1 Madera County's 2011 LHMP Update: Mitigation Action Status Summary**

Mitigation Action	Complete	Ongoing	Not Started	Project in Plan Update
<b>Madera County Mitigation Actions</b>				
Seismically retrofit or replace County ramps and bridges that are categorized as structurally deficient by Caltrans and are necessary for first responders to use during an emergency.			X	N
Acquire, relocate, elevate, and/or floodproof critical facilities located within the 100-year floodplain.			X	Y
Reinforce County ramps, bridges, and roads from flooding through protection activities which may include elevating the road and installing culverts beneath the road or building a bridge across the area that experiences regular flooding.			X	N
Manage vegetation in areas within and adjacent to rights-of-way and in close proximity to critical facilities in order to reduce the risk of tree failure and property damage and avoid creation of wind acceleration corridors within vegetated areas.	X	X		N
Examine and mitigate County ramps, bridges, and roads that have been identified as being too narrow or having too many tight turns to ensure the safe transportation of truck loads.			X	N
Provide seismic retrofitting to existing water tanks and systems or a new engineered water distribution system serving both fire suppression and domestic water needs. Manage vegetation in areas within and adjacent to the access routes to water tanks and distribution systems within SRA/WUI areas. Reduce the potential of wildfire extension to these critical facilities.			X	Y
Design and implement a multihazard public awareness/education/outreach program addressing mitigation actions for high risk hazards (e.g., flood, wildfire)		X		Y
<b>City of Madera</b>				
Purchase land and create a drainage basin for the Southeast Madera Plan (SMP) area for expected 1,000 homes in 100-year floodplain.			X	N
Provide stormwater drainage improvements to reduce frequent flooding, such as downtown stormwater drains, basins, trunk lines, auxiliary pipes, and interconnections.	X	X		Y
Using HECRAS, analyses, update 100-year floodplain for Fresno River per earlier FEMA recommendation.			X	N
Mitigate potential damage to two bridges crossing the Fresno River due to scouring of piles and piers, leaving them exposed.		X		N
<b>North Fork Rancheria Actions</b>				
Stabilize landslide-prone areas through stability improvement measures, including interceptor drains, in situ soil piles, drained earth buttresses, and subdrains.	X			N
Develop a free annual tree chipping and tree pick-up day that encourages residents living in high windprone hazards areas to manage trees and shrubs at risk of falling on overhead power lines	X			N

Mitigation Action	Complete	Ongoing	Not Started	Project in Plan Update
Implement a fuel reduction program, such as the collection and disposal of dead fuel, within open spaces and around critical facilities and residential structures located within a SRA or LRA high or very high wildfire zone on tribal lands.		X		N
Create a vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation around their homes on tribal lands		X		N
In cooperation with other organizations, complete a fire break around the foothills communities and tribal lands.	X			N
Using the LHMP's data and in cooperation with other organizations help produce and disseminate a series of —What Next-What Ifl pamphlets throughout the county, including tribal citizens, that emphasizes mitigation		X		N

*Table 2-2 City of Chowchilla's 2011 LHMP Update: Mitigation Action Status Summary*

Mitigation Action	Complete	Ongoing	Not Started	Project in 2016 Update
<b>Multi-Hazard Mitigation Actions</b>				
Create a GIS-based pre-application review for new construction and major remodels in hazard areas, such levee break, high and/or very high wildfire areas.		X		N
Integrate the 2010 LHMP, in particular the hazard analysis and mitigation strategy sections, into Madera County's and the City of Madera's General Plans' Safety Element update process.			X	Y
Work with FEMA Region IX to address any floodplain management issues that may have arisen/arise from the City or Countywide DFIRM, Community Assessment visits and/or DWR		X		N
Public Awareness/Education/Outreach-Wildland fires, flooding, drought, severe ground shaking, earthquakes, etc.			X	Y
Using the LHMP's data and in cooperation with local agencies, the County of Madera, and including other state/federal agencies and organizations, help identify, produce, and disseminate a series of resource pamphlets throughout the City of Chowchilla that emphasize mitigation measures, resources, and contacts			X	N
<b>Drought Mitigation Actions</b>				
Develop a drought contingency plan to provide an effective and systematic means of assessing drought conditions, develop mitigation actions and programs to reduce risk in advance of drought, and develop response options that minimize hardships during drought.		X		N



Mitigation Action	Complete	Ongoing	Not Started	Project in 2016 Update
<b>Fog Mitigation Actions</b>				
Continue to work with weather forecasting and public safety agencies to provide warning and protective information to schools, residents, travelers, and visitors about the severe valley fog conditions.		X		N
<b>Flood Mitigation Actions</b>				
Seismically retrofit or replace City maintained ramps and bridge that are categorized as structurally deficient by Caltrans and necessary for first responders to use during an emergency			X	N
Provide seismic retrofitting to existing water tanks, systems or new engineered water distribution systems serving both fire suppression and domestic water needs. Manage vegetation in areas to access routes to water tanks and distribution systems within SRA areas.		X		N
Purchase land and create a drainage basin for identified areas in the City Plan area for large number of expected homes in future identified flood prone areas.		X		N
Provide stormwater drainage improvements to reduce frequent flooding, such as City downtown stormwater drains, basins (Truman Pond), trunk lines, auxiliary pipes, and interconnections			X	Y
<b>Hazardous Materials Actions</b>				
Continue to monitor the manufacturing, storage, and transport of hazardous materials by working with environmental health and public safety agencies to identify effective mitigation actions or requirements that will help reduce the risk of incidents, including the spread of released materials and bio-chemicals (such as Drive Thru Flu Shot Clinics).		X		N
Collect and review PG&E comprehensive inspection and monitoring programs including provided data to ensure the safety of natural gas transmission pipeline segments located in the City to identify potential third party like dig-ins from construction, potential corrosion, and ground movements. Work with other agencies for petroleum and fiber optic lines running through the City.		X		N
<b>Levy Failure Actions</b>				
Work with the County, DWR, Chowchilla Water District, and stakeholders to determine dam inundation areas of unmapped dams within the county that may affect the City of Chowchilla		X		N
<b>Severe Weather: Heavy Rains and Storms Mitigation Actions</b>				
Manage vegetation in areas within and adjacent to right-of ways and in close proximity to critical facilities in order to reduce the risk of tree failure and property damage. Avoid creation of wind acceleration corridors within vegetated areas.		X		N
Consideration of local programs options, such as annual tree chipping and tree pick-up day that encourages residents living in high wind prone hazard areas to manage trees and shrubs at risk of falling on overhead power lines.			X	N

Mitigation Action	Complete	Ongoing	Not Started	Project in 2016 Update
Bolt down the roofs of critical facilities in order to prevent wind damage			X	N
<b>Wildfire Mitigation Actions</b>				
Implement a fuel reduction program, such as the collection and disposal of dead fuel, within open spaces and around critical facilities and residential structures located within the SRA or LRA high or very high wildland fire zones, such as weed abatement programs and 5-year follow-up maintenance efforts to spray and remove bamboo ( <i>Arundo Donax</i> ) from Ash Slough Channel banks within city limits.			X	N
Create a vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation around their homes			X	N

## *Madera County 2011 LHMP Actions*

### **Madera County Mitigation Actions**

Seismically retrofit or replace County ramps and bridges that are categorized as structurally deficient by Caltrans and are necessary for first responders to use during an emergency.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This Project was not implemented due to constraints of staff time allocation and funding resources available.

**Acquire, relocate, elevate, and/or floodproof critical facilities located within the 100-year floodplain.**

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Some County Facilities were identified during normal operation conditions such as Fire Stations. With the locations that have been identified, County Staff have been working identifying funding sources for replacement or mitigation efforts.

**Reinforce County ramps, bridges, and roads from flooding through protection activities which may include elevating the road and installing culverts beneath the road or building a bridge across the area that experiences regular flooding.**

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Due to the winter storms of 2017, some county roads had suffered damage. Those locations and other pre-existing locations have been identified. County Roads is looking to locate funding source to make repairs and mitigation efforts.

**Manage vegetation in areas within and adjacent to rights-of-way and in close proximity to critical facilities in order to reduce the risk of tree failure and property damage and avoid creation of wind acceleration corridors within vegetated areas.**

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** The project was implemented in 2015 within the State Responsibility Area (SRA) and Federal Responsibility Area (FRA) due to the number of dead and dying trees in Eastern Madera County. Madera County Fire, CAL FIRE, Madera County Road Department, and U.S. Forest Service have been actively clearing dead and dying trees along the roadways of Eastern Madera County to minimize the risk of the trees falling and causing damage to county property, civilian property, critical infrastructure, and threat to life.

**Examine and mitigate County ramps, bridges, and roads that have been identified as being too narrow or having too many tight turns to ensure the safe transportation of truck loads.**

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This Project was not implemented due to constraints of staff time allocation and funding resources available.

Provide seismic retrofitting to existing water tanks and systems or a new engineered water distribution system serving both fire suppression and domestic water needs. Manage vegetation in areas within and adjacent to the access routes to water tanks and distribution systems within SRA/WUI areas. Reduce the potential of wildfire extension to these critical facilities.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This Project was not implemented due to constrain of staff time allocation and funding resources available. But the project was carried over to this newer plan.

Design and implement a multihazard public awareness/education/outreach program addressing mitigation actions for high risk hazards (e.g., flood, wildfire)

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This project has been implemented and is ongoing. CAL FIRE/Madera County Fire Department utilizes the ready, set, go public education program. We also conduct public education and awareness during our Defensible Space (PRC-4291) inspections as well as our weed abatement program in Madera County. The project has reduced the risk of life safety, and property damage but loss avoidance cannot be determined. County Staff has been working toward increased outreach to the community. Each year the capabilities increase. This year the Sheriff’s Office heavily used Nixle Messaging to the community. The Sheriff’s Office has increased the “prepare for wildfire” /evacuation preparation.

## City of Madera

Purchase land and create a drainage basin for the Southeast Madera Plan (SMP) area for expected 1,000 homes in 100-year floodplain.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** The status of this is not known. The SMP EIR proposed mitigation measures to protect the master plan community. This project will not be carried forward in the Plan Update.

Provide stormwater drainage improvements to reduce frequent flooding, such as downtown stormwater drains, basins, trunk lines, auxiliary pipes, and interconnections.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** The Storm Drainage Master Plan has been updated. It exclusively addresses 100-year storm runoff. Through Capital Projects contained in this, many of the issues that might be associated with road, bridges, etc. would be addressed as funding becomes available.

Using HECRAS, analyses, update 100-year floodplain for Fresno River per earlier FEMA recommendation.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** While City staff does not recall this as a

recommendation, it does support this effort and would be willing to participate in such study subject to available funds.

Mitigate potential damage to two bridges crossing the Fresno River due to scouring of piles and piers, leaving them exposed.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** The City is currently proceeding on a project that will address scouring and other issues at several bridges.

### North Fork Rancheria Actions

Stabilize landslide-prone areas through stability improvement measures, including interceptor drains, in situ soil piles, drained earth buttresses, and subdrains.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):**

Develop a free annual tree chipping and tree pick-up day that encourages residents living in high windprone hazards areas to manage trees and shrubs at risk of falling on overhead power lines

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):**

Implement a fuel reduction program, such as the collection and disposal of dead fuel, within open spaces and around critical facilities and residential structures located within a SRA or LRA high or very high wildfire zone on tribal lands.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):**

Create a vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation around their homes on tribal lands

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):**

In cooperation with other organizations, complete a fire break around the foothills communities and tribal lands.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):**

Using the LHMP's data and in cooperation with other organizations help produce and disseminate a series of —What Next-What Ifl pamphlets throughout the county, including tribal citizens, that emphasizes mitigation

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):**

## *City of Chowchilla 2011 Mitigation Actions*

### **Multi-Hazard Mitigation Actions**

Create a GIS-based pre-application review for new construction and major remodels in hazard areas, such levee break, high and/or very high wildfire areas.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This project was started by the previous PW director, but when he resigned the project was halted as no one in the organization has GIS skills. Current staff has some training in GIS but lack the expertise. Some of the zoning was completed, but that was done through the contracted planners company. The City is in dire need of a base GIS built system that someone can maintain.

Integrate the 2010 LHMP, in particular the hazard analysis and mitigation strategy sections, into Madera County's and the City of Madera's General Plans' Safety Element update process.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This was not implemented as the City here is more reactive than proactive. This is a direct effect of the layoffs from the housing crash, and the City has been unable to reach full capacity; therefore, information is not shared or used as accurately.

Work with FEMA Region IX to address any floodplain management issues that may have arisen/arise from the City or Countywide DFIRM, Community Assessment visits and/or DWR

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Portions of this were completed in regard to removal of the Arundo from Ash Slough, however the secondary cause is now the slough is essentially caving in on itself. This could cause for flooding for future years and water will be unable to move behind residential housing.

Public Awareness/Education/Outreach-Wildand fires, flooding, drought, severe ground shaking, earthquakes, etc.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Very limited personnel and the hazards that are listed above are not particularly relevant to the area.

Using the LHMP's data and in cooperation with local agencies, the County of Madera, and including other state/federal agencies and organizations, help identify, produce, and disseminate a series of resource pamphlets throughout the City of Chowchilla that emphasize mitigation measures, resources, and contacts

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Not started, and not sure why. Could be lack of funding to the City to implement these outreach programs.

## Drought Mitigation Actions

Develop a drought contingency plan to provide an effective and systematic means of assessing drought conditions, develop mitigation actions and programs to reduce risk in advance of drought, and develop response options that minimize hardships during drought.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Developed an Urban Water Master plan, implemented some water conservation measures, fined people for using water on non-watering day, and only allowed for homes to water 2 days a week.

## Fog Mitigation Actions

Continue to work with weather forecasting and public safety agencies to provide warning and protective information to schools, residents, travelers, and visitors about the severe valley fog conditions.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Ongoing process, although the fog in this area has subsided over the years and is not as unsafe as it used to be.

## Flood Mitigation Actions

Seismically retrofit or replace City maintained ramps and bridge that are categorized as structurally deficient by Caltrans and necessary for first responders to use during an emergency

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Status is unknown on this project.

Provide seismic retrofitting to existing water tanks, systems or new engineered water distribution systems serving both fire suppression and domestic water needs. Manage vegetation in areas to access routes to water tanks and distribution systems within SRA areas.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Water tank has started and will begin hopefully in the coming FY, along with, hopefully, the revamping of this the fire suppression and domestic water needs. This has been outsourced to a company to do a lot of our large projects.

Purchase land and create a drainage basin for identified areas in the City Plan area for large number of expected homes in future identified flood prone areas.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This was done and Truman Basin was purchased and began holding stormwater drainage.



Provide stormwater drainage improvements to reduce frequent flooding, such as City downtown stormwater drains, basins (Truman Pond), trunk lines, auxiliary pipes, and interconnections

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This is too large of a project for the City to take on without financial assistance from some type of funding, other than Truman pond. The storm drain issues, as stated above do not seem to be a top priority for the city as the city is, again, more reactive than proactive currently.

### Hazardous Materials Actions

Continue to monitor the manufacturing, storage, and transport of hazardous materials by working with environmental health and public safety agencies to identify effective mitigation actions or requirements that will help reduce the risk of incidents, including the spread of released materials and bio-chemicals (such as Drive Thru Flu Shot Clinics).

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Ongoing. It is not known if anything directly is being done in the City, but the County provides a lot of this information to the residents of Chowchilla.

Collect and review PG&E comprehensive inspection and monitoring programs including provided data to ensure the safety of natural gas transmission pipeline segments located in the City to identify potential third party like dig-ins from construction, potential corrosion, and ground movements. Work with other agencies for petroleum and fiber optic lines running through the City.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Ongoing: this is done every time the City is to develop or dig into the ground. For example, before anyone can do any work the worker has to call in the USA. This is where PG&E will come out and mark the ground to let the City worker know where the underground lines are. The City has been fortunate to follow the rules, and the City has very minimal cuts in other lines.

### Levee Failure Actions

Work with the County, DWR, Chowchilla Water District, and stakeholders to determine dam inundation areas of unmapped dams within the county that may affect the City of Chowchilla

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This is ongoing: as this information has to be collected from the Army Corp of Engineers (Eastman and Hensley) and Bureau of Reclamation (Friant)

## Severe Weather: Heavy Rains and Storms Mitigation Actions

Manage vegetation in areas within and adjacent to right-of-ways and in close proximity to critical facilities in order to reduce the risk of tree failure and property damage. Avoid creation of wind acceleration corridors within vegetated areas.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** This is ongoing; not much information on this in the overall project scope.

Consideration of local programs options, such as annual tree chipping and tree pick-up day that encourages residents living in high wind prone hazard areas to manage trees and shrubs at risk of falling on overhead power lines.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Project status is unknown.

Bolt down the roofs of critical facilities in order to prevent wind damage

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Has not started, again lack of personnel and lack of funding to complete this project.

## Wildfire Mitigation Actions

Implement a fuel reduction program, such as the collection and disposal of dead fuel, within open spaces and around critical facilities and residential structures located within the SRA or LRA high or very high wildland fire zones, such as weed abatement programs and 5-year follow-up maintenance efforts to spray and remove bamboo (*Arundo Donax*) from Ash Slough Channel banks within city limits.

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Did remove *Arundo*, as a grant was received to remove the *Arundo* from Ash slough. But as stated above, the secondary issue is the slough is beginning to cave in on itself. Other than that, not much else has been done.

Create a vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation around their homes

**Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):** Not started, same as above lack of personnel and lack of funding.



## Chapter 3 Planning Process

Requirements §201.6(b), §201.6(c)(1), §201.7(c)(1), and §201.7(c)(1)(ii), (iii) and (iv): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- 1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- 2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- 3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Madera County and three other jurisdictions, in conjunction with a planning committee, prepared this Local Hazard Mitigation Plan (LHMP) Update to the Federal Emergency Management Agency (FEMA)-approved 2011 Madera County LHMP and the 2011 City of Chowchilla LHMP.

Madera County and the City of Chowchilla recognized importance and need of the update process for their respective 2011 LHMPs and initiated the development of a combined 2017 LHMP Update. After receiving a grant from FEMA, which served as the primary funding source for this plan, the County contracted with Foster Morrison Consulting, Ltd. (Foster Morrison) to facilitate and develop the plan. Jeanine Foster, a professional planner with Foster Morrison, was the project manager in charge of overseeing the planning process and the development of this LHMP Update. Chris Morrison, also a professional planner with Foster Morrison, was the lead planner for the development of this Update. The Foster Morrison's team's role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC) as defined by the Disaster Mitigation Act (DMA);
- Meet the DMA requirements as established by federal regulations and following FEMA's planning guidance;
- Support objectives under the National Flood Insurance Program's (NFIPs) Community Rating System (CRS), and the Flood Mitigation Assistance (FMA) program;
- Facilitate the entire planning process;
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment that data;
- Assist in facilitating the public input process;
- Produce the draft and final plan documents; and
- Coordinate with the California Office of Emergency Services (Cal OES) and FEMA Region IX plan reviews.

## 3.1 Local Government Participation

Madera County; the two incorporated communities, the cities of Chowchilla and Madera; and the North Fork Rancheria made a commitment to this 2017 LHMP Update, as participating jurisdictions. The DMA planning regulations and guidance stress that each local government (participating jurisdiction) seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the Madera County Planning Area’s HMPC, “participation” meant the following:

- Providing facilities and printed materials for meetings;
- Attending and participating in the HMPC meetings;
- Completing and returning the Data Collection Worksheets;
- Collecting and providing other requested data (as available);
- Coordinating information sharing between internal and external agencies;
- Managing administrative details;
- Making decisions on plan process and content;
- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts; including annexes
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by the governing boards.

The County and all jurisdictions with annexes to this plan seeking FEMA approval met all of these participation requirements. In most cases one or more representatives for each jurisdiction attended the HMPC meetings described in Table 3-2 and also brought together a local planning team to help collect data, identify mitigation actions and implementation strategies, and review and provide data on plan drafts, as detailed in Table 3-1.

As described specific individuals representing Madera County, incorporated communities, and the North Fork Rancheria participating in this LHMP Update were actively involved throughout this planning process as identified in Appendix A in the sign-in sheets for the meetings and as evident through the data, information and input provided by HMPC representatives to the development of this LHMP Update. This Chapter 3 and Appendix A provides additional information and documentation of the planning process and participants to this LHMP Update.

## 3.2 The 10-Step Planning Process

Foster Morrison established the planning process for updating the 2011 Madera County and City of Chowchilla LHMPs using the DMA planning requirements and FEMA’s associated guidance. This guidance is structured around a four-phase process:

1. Organize Resources;
2. Assess Risks;

3. Develop the Mitigation Plan; and
4. Implement the Plan and Monitor Progress.

Into this process, Foster Morrison integrated a more detailed 10-step planning process used for FEMA’s CRS and FMA programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA’s Hazard Mitigation Grant Program (HMGP); Pre-Disaster Mitigation (PDM) program; CRS program; FMA Program; Severe Repetitive Loss (SRL) program; and new flood control projects authorized by the U.S. Army Corps of Engineers (USACE).

Table 3-1 shows how the modified 10-step process fits into FEMA’s four-phase process. The sections that follow describe each planning step in more detail.

***Table 3-1 Mitigation Planning Processes Used to Develop the Madera County Local Hazard Mitigation Plan***

DMA Process	Modified DMA/CRS Process
<b>1) Organize Resources</b>	
201.6(c)(1)/201.7(c)(1)*	1) Organize the Planning Effort
201.6(b)(1)/201.7(c)(1)(i)*	2) Involve the Public
201.6(b)(2) and (3)/ 201.7(c)(1)(ii), (iii) and (iv)*	3) Coordinate with Other Departments and Agencies
<b>2) Assess Risks</b>	
201.6(c)(2)(i)/201.7(c)(2)(i)*	4) Identify the Hazards
201.6(c)(2)(ii)/201.7(c)(2)(ii)	5) Assess the Risks
<b>3) Develop the Mitigation Plan</b>	
201.6(c)(3)(i)/201.7(c)(3)(i)*	6) Set Goals
201.6(c)(3)(ii)/201.7(c)(3)(ii)*	7) Review Possible Activities
201.6(c)(3)(iii)/201.7(c)(3)(iii)*	8) Draft an Action Plan
<b>4) Implement the Plan and Monitor Progress</b>	
201.6(c)(5)/201.7(c)(5)*	9) Adopt the Plan
201.6(c)(4)/201.7(c)(4)*	10) Implement, Evaluate, and Revise the Plan

\*Items under the DMA process with a 201.7 indicate they apply to the tribal requirements for the North Fork Rancheria. More information can be found in their annex to this plan.

This LHMP Update involved a comprehensive review and update of each section of the 2011 LHMPs for Madera County and the City of Chowchilla and includes an assessment of the success of the participating communities in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plans, as previously described in more detail in Chapter 2 and Chapter 4.

Although the North Fork Rancheria participated in this 2017 LHMP Update, it should be noted that they recently received a FEMA grant and have started the process of developing their own North Fork Rancheria LHMP. Thus, any data gaps or deficiencies identified specific to the Tribe in this LHMP Update, will be addressed in their standalone LHMP.

The process followed to update the plans is detailed in the above table and the sections that follow and is in conformance with the latest DMA planning guidance. As part of this LHMP Update, all sections of the plans were reviewed and updated to reflect new data, processes, participating jurisdictions, and resulting mitigation strategies. Only the information and data still valid from the 2011 Plans were carried forward as applicable into this LHMP Update.

### 3.2.1. Phase 1: Organize Resources

#### *Planning Step 1: Organize the Planning Effort*

With Madera County's, incorporated communities', and the North Fork Rancheria's commitment to participate in the DMA planning process, Foster Morrison worked with Madera County Sheriff's Office of Emergency Services (County OES), as overall project lead, to establish the framework and organization for development of the plan. An initial meeting was held with County OES to discuss the organizational and process aspects of this Plan Update process.

The initial kick-off meeting was held on March 16, 2017. Invitations to the kickoff meeting was extended to key county departments, the incorporated communities, tribal organizations, and special districts located within the planning area, as well as to other federal, state, and local stakeholders that might have an interest in participating in the planning process. Representatives from participating jurisdictions and HMPC members to the 2011 LHMPs were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of initial invitees is included in Appendix A.

The HMPC was established as a result of the initial meeting, as well as through interest generated through the initial public meeting and outreach conducted for this project as detailed later in this section. The HMPC, comprising key county, city, tribal, special district, and other government and stakeholder representatives and the public, developed the plan with leadership from the County OES and facilitation by Foster Morrison. Each participating jurisdiction seeking FEMA approval of the plan had representation on the HMPC. The following participated on the HMPC:

#### **Madera County\***

- Agricultural Commissioner
- Animal Services
- Assessor's Office
- Behavioral Health
- County Counsel
- County Jail
- Fire Department
- Information Technology
- Office of Education
- Office of Emergency Services
- Public Health
- Probation
- Risk Management

## Incorporated Communities

- City of Chowchilla\*
- City of Madera\*

## Other Government and Stakeholder Representatives:

- North Fork Rancheria\*
- American Red Cross
- AENG
- California Department of Fish and Wildlife
- Cal Fire
- Cal OES

\*Indicates participating jurisdiction seeking FEMA approval of this plan

A list of participating HMPC representatives for each participating jurisdiction is included in Appendix A. The above list of HMPC members also includes several other government and stakeholder representatives that were invited to participate and contributed to the planning process. This list includes all HMPC members that attended one or more HMPC meetings detailed in Table 3-2. In addition to providing representation on the HMPC, participating jurisdictions formulated their own internal planning teams to collect and provide requested data and to conduct timely reviews of the draft documents as further detailed in each annex to this plan and as detailed in the list of HMPC representatives for Madera County. The internal planning teams from all participating jurisdictions were called upon to collect and provide requested data and to conduct timely reviews of the draft documents. Note that the above list of HMPC members also includes several other government and stakeholder representatives that contributed to the planning process. Specific participants from these other agencies are identified above and documented in Appendix A.

## Meetings

The planning process officially began with a kick-off meeting held in the Madera County offices on March 16, 2017, followed by public kick-off meeting held the same day at 6:00 pm at the Madera County's Sheriff's Office, Emergency Operations Center (EOC). The meetings covered the scope of work and an introduction to the DMA planning requirements. During the HMPC meetings, participants were provided with data collection worksheets to facilitate the collection of information necessary to support development of the LHMP Update. Using FEMA guidance, these worksheets were designed to capture information on past hazard events, identify hazards of concern to each of the participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, record possible mitigation actions, and to capture information on the status of mitigation action items from the 2011 Plans. A copy of the worksheets for this project are included in Appendix A. The County and each jurisdiction seeking FEMA approval of this Plan Update completed and returned the worksheets to Foster Morrison for incorporation into the plan document.

During the planning process, the HMPC communicated through face-to-face meetings, email, telephone conversations, Dropbox websites, and through a County developed webpage dedicated to the plan development process. This later website was developed to provide information to the HMPC, the public and all other stakeholders on the LHMP Update process. Draft documents were also posted on these

websites so that the HMPC members and the public could easily access and review them. The LHMP website can be accessed at:

- Madera County – <http://www.madera-county.com/index.php/lhmp>

The HMPC met formally four times during the planning period (February 2017 – September 2017) which adequately covers the four phases of DMA and the 10-Step CRS planning process. The formal meetings held and topics discussed are described in Table 3-2. Agendas and sign-in sheets for each of the meetings are included in Appendix A.

*Table 3-2 HMPC Meetings*

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
HMPC #1 Kick-off Meeting	<ol style="list-style-type: none"> <li>1) Introduction to DMA and the planning process</li> <li>2) Overview of current LHMP;</li> <li>3) Organize Resources (CRS Steps 1, 2, &amp; 3): the role of the HMPC, planning for public involvement, coordinating with other agencies/stakeholders</li> <li>4) Introduction to Hazard Identification</li> </ol>	3/16/2017	Madera County Sheriff's Office, Emergency Operations Center
HMPC #2	<ol style="list-style-type: none"> <li>1) Risk assessment overview and work session               <ul style="list-style-type: none"> <li>-CRS Step 4: Assess the Hazard</li> <li>-CRS Step 5: Assess the Problem</li> </ul> </li> <li>2) Review and update of mitigation goals               <ul style="list-style-type: none"> <li>-CRS Step 6: Set Goals</li> </ul> </li> </ol>	6/1/ 2017	Madera County Sheriff's Office, Emergency Operations Center
HMPC #3	<ol style="list-style-type: none"> <li>1) Review of mitigation alternatives               <ul style="list-style-type: none"> <li>--CRS Step 7: Review possible activities</li> </ul> </li> <li>2) Review and update of mitigation actions from the 2011 Plans</li> <li>3) Identify updated list of mitigation actions by hazard</li> <li>4) Review of mitigation selection criteria</li> <li>5) Update and prioritize mitigation actions</li> <li>6) Mitigation Action Strategy Implementation and Draft Action Development               <ul style="list-style-type: none"> <li>-CRS Step 8: Draft an Action Plan</li> </ul> </li> </ol>	6/2/2017	Madera County Sheriff's Office, Emergency Operations Center
HMPC #4	<ol style="list-style-type: none"> <li>1) Review of final HMPC, jurisdictional and public comments and input to plan</li> <li>2) Review and documentation of changed conditions, vulnerabilities and mitigation priorities</li> <li>3) CRS Step 8: Draft an Action Plan</li> <li>4) CRS Step 9 &amp; 10: Plan maintenance and Implementation Procedures</li> </ol>	9/22/2017	Madera County Sheriff's Office, Emergency Operations Center

### *Planning Step 2: Involve the Public*

Public stakeholders are defined as any stakeholders not attached to the local governments considered as participating jurisdictions to this LHMP Update. Up-front coordination discussions with the Madera County OES and the HMPC established the initial plan for public involvement. Public involvement activities for this LHMP Update included press releases, social media communications, stakeholder and public meetings, development of an LHMP webpage and associated website postings, and the collection of



public and stakeholder comments on the draft plan through a variety of mechanisms. Information provided to the public included an overview of the mitigation status and successes resulting from implementation of the 2011 plans as well as information on the processes, new risk assessment data, and proposed mitigation strategies for this LHMP Update. As part of the plan development process, a Public Involvement Strategy was also developed to ensure a meaningful public process. At the planning team kick-off meetings, the HMPC discussed additional strategies for public involvement and agreed to an approach using established public information mechanisms and resources within the community.

### Early Public Meeting

Public outreach for this Plan Update began at the beginning of the plan development process with an advertisement placed in the local newspaper and other local outreach methods to inform the public of the purpose of the DMA and the hazard mitigation planning process for the Madera County Planning Area and to invite the public to an early public meeting held in Madera County to kick-off the project on March 16, 2017 at the Madera County Sheriff's Office, EOC.

### Final Public Meeting

The first draft of the plan was provided to the HMPC in July of 2017, with a public review draft provided in August of 2017. A public meeting was held on September 21, 2017 to present the draft LHMP and to collect public comments on the plan prior to finalization and submittal to Cal OES/FEMA. Public meetings were advertised in a variety of ways to maximize outreach efforts to the public at large and included a press release, an advertisement in a local newspaper, placement on the County website, and through other outreach mechanisms inviting the public to attend the public meetings. The press release and associated outreach advertising the final public meetings included information on the date, location and time of the meeting, where the draft plan could be accessed in the community, and how to provide comments on the draft plan. In addition to a copy of the draft plan being placed on the County website in advance of these meetings, hard copies of the draft of the plan were made available to interested parties at five Madera County Public Libraries.

Figure 3-1 Public Outreach on Sierra News Online Website

The screenshot shows the Sierra News Online website interface. At the top, there is a navigation bar with links for HEADLINES, COMMUNITY, CALENDAR, MOUNTAIN LIVING, MY TOWN, ENTERTAINMENT, THINGS TO DO, and ABOUT SNO. The main content area features a news article titled "Madera County Invites Input On Hazard Mitigation Plan". The article text includes:

**Madera County Invites Input On Hazard Mitigation Plan**

Posted by: gina clappator | September 15, 2017 - 5:14 pm | 1,162 Views

MADERA COUNTY — The public is invited to participate in updating the plan to deal with the next disaster in Madera County.

The County is partnering with incorporated communities, districts and others to develop an update to their 2011 Local Hazard Mitigation Plan.

Floods, drought, wildfires, earthquakes and severe weather are just a few of the natural hazards we face, and though they cannot be prevented, a Hazard Mitigation Plan forms the foundation for a long-term strategy, at the community level, to reduce disaster losses by breaking the repeated cycle of damage and reconstruction.

FEMA (Federal Emergency Management Agency) defines Hazard Mitigation as any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.

Importantly, only communities with a FEMA-approved Hazard Mitigation Plan are eligible to apply for both pre- and post-disaster mitigation grant funding.

The process began in March with an initial public and planning meeting and the establishment of a planning committee comprised of representatives from the County, cities, special districts, and other key stakeholders. The plan is scheduled to be finalized and submitted to Cal OES and FEMA in September.

Public Review Draft –

The Public Review Draft of the LHMP Update is available online (pdf format) at <http://www.madera-county.com/index.php/lhmp>. It is also available (in printed copy) at the following Madera County locations:

- Madera County Library  
121 N. G Street In Madera  
(559)675-7871
- Chowchilla Branch Library  
300 Kings Avenue In Chowchilla  
(559)665-2630
- Madera Rancho Branch Library  
37167 Avenue 12, Suite 4C, In Madera  
(559)645-1214
- North Fork Branch Library  
32908 Road 200, In North Fork  
(559)877-2387

The sidebar on the left contains a "NEWS IN PICTURES" section with a grid of small images and a "Thank YOU Firefighters!" advertisement. The right sidebar features several advertisements, including "MOUNTAIN COMFORTS Stoves & Fireplaces Wood Gas Pellet" and "When you have the right financial advisor, life can be brilliant."

Source: Sierra News

Documentation to support the final public meeting can be found in Appendix A. In addition to advertisement for public participation, notices of meetings were sent directly to all persons on the HMPC

contact list and also to other agency and key stakeholders with an interest in the Madera County Planning Area. The majority of these people reside in Madera County or in surrounding communities. Because this is a multi-jurisdictional planning effort, all public outreach activities for this Plan Update were conducted in cooperation with and on behalf of Madera County, the incorporated communities, and the North Fork Rancheria. The formal public meetings for this project are summarized in Table 3-3.

*Table 3-3 Schedule of Public and Stakeholder Meetings*

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Early Public Meeting	1) Intro to DMA and mitigation planning 2) 2017 LHMP Update Process	3/16/2017	Madera County Sheriff's Office, Emergency Operations Center
Final Public Meeting	1) Presentation of Draft LHMP and solicitation of public and stakeholder comments	9/21/2017	Madera County Sheriff's Office, Emergency Operations Center

Where appropriate, stakeholder and public comments and recommendations were incorporated into the final plan throughout the plan development process, including the sections that address mitigation goals and strategies. Two formal comments were submitted on the draft plan. Emails of these comments and the HMPC's response to comments and how they were addressed in the LHMP Update are included in Appendix A. All press releases, newspaper advertisements and articles, website postings, and public outreach efforts are on file with the Madera County OES and are included in Appendix A.

The draft plan is currently available online on the Madera County website at: <http://www.madera-county.com/index.php/lhmp>. The public outreach activities described here were conducted with participation from and on behalf of all jurisdictions participating in this LHMP Update.

***Planning Step 3: Coordinate with Other Departments and Agencies***

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

- American Red Cross
- Big Sandy Rancheria
- Bureau of Indian Affairs
- CAL FIRE
- Cal OES
- California Department of Water Resources
- California Department of Fish and Wildlife
- Central Valley Animal Evacuation Team
- Cold Spring Rancheria
- Emergency Services Departments

- Incorporated communities in Madera County
- Fire Protection Districts
- Fire Departments
- Fire Safe Alliance
- Fresno EMS
- Madera CHP
- Mariposa County Sheriff's Office
- National Weather Service
- Neighboring Communities
- NFIP Program Coordinators
- PG&E
- Pistoresi Ambulance
- RDMHS Chapter 5
- Sierra Ambulance
- Sierra National Forest
- Valley Children's Hospital
- Water Districts

Coordination with key agencies, organizations, and advisory groups throughout the planning process allowed the HMPC to review common problems, development policies, and mitigation strategies as well as to review any conflicts or inconsistencies with regional mitigation policies, plans, programs and regulations. Coordination involved contacting these agencies through a variety of mechanisms and informing them on how to participate in the Plan Update process and if they had any expertise or assistance they could lend to the planning process, risk assessment, or specific mitigation strategies. Coordination with these groups included, holding face-to-face meetings, sending e-mails, some with follow up phone calls; and making phone calls alone to out of area agencies. These groups and agencies were solicited asking for their assistance and input, telling them how to become involved in the LHMP Update process, and inviting them to HMPC meetings.

In addition, as part of the overall stakeholder and agency coordination effort, the HMPC coordinated with and utilized input to the LHMP update from the following agencies:

- Cal-Adapt
- Cal OES
- CAL FIRE
- California Department of Finance
- California Department of Water Resources
- California Geological Survey
- FEMA Region IX
- Library of Congress
- National Oceanic and Atmospheric Association
- National Performance of Dams Program
- National Register of Historic Places
- National Resource Conservation Service
- National Response Center
- National Weather Service
- United States Army Corps of Engineers
- United States Bureau of Indian Affairs
- United States Bureau of Land Management

- United States Bureau of Reclamation
- United States Department of Agriculture
- United States Farm Service Agency
- United States Forest Service
- United States Geological Survey
- Western Regional Climate Center

Several opportunities were provided for the groups listed above to participate in the planning process. At the beginning of the planning process, invitations were extended to many of these groups to actively participate on the HMPC. Specific participants from these groups are detailed in Appendix A. Others assisted in the process by providing data directly as requested in the Data Worksheets or through data contained on their websites or as maintained by their offices. Further as part of the public outreach process, these groups were invited to attend the public meetings and to review and comment on the plan prior to submittal to CAL OES and FEMA.

### Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Madera County uses a variety of comprehensive planning mechanisms, such as general plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- BIA plans
- CAL FIRE plans
- CAL OES plans
- California Department of Finance demographic documents
- California DWR plans
- County CWPP
- Emergency Operations Plans
- FEMA mitigation planning documents
- Flood Insurance Studies
- General Plans – County and City
- National Weather Service documents
- Stormwater Master Plans
- US Department of Interior Plans
- US Fish and Wildlife reports
- USGS Reports

Specific source documents are referenced at the beginning of each section of Chapter 4 and Appendix B. These and other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Data from these plans and documents were incorporated into the risk assessment and hazard vulnerability sections of the plan. Where the data from the existing studies and reports is used in this Plan Update, the source document is referenced throughout this Plan Update. The data was also

used in determining the capability of the community in being able to implement certain mitigation strategies. Appendix B, References, provides a detailed list of references used in the preparation of this Plan Update.

### **3.2.2. Phase 2: Assess Risks**

#### ***Planning Steps 4 and 5: Identify the Hazards and Assess the Risks***

Foster Morrison led the HMPC in a research effort to identify, document, and profile all the hazards that have, or could have, an impact the planning area. Starting with the 2011 plans, natural hazards of concern were added, deleted, and modified for this LHMP Update. Data collection worksheets and jurisdictional annexes were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities.

The HMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process, methodologies, and results are included in Chapter 4 Risk Assessment.

### **3.2.3. Phase 3: Develop the Mitigation Plan**

#### ***Planning Steps 6 and 7: Set Goals and Review Possible Activities***

Foster Morrison facilitated brainstorming and discussion sessions with the HMPC that described the purpose and process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Chapter 5 Mitigation Strategy. Additional documentation on the process the HMPC used to develop the goals and strategy is in Appendix C.

#### ***Planning Step 8: Draft an Action Plan***

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, a complete first draft of the plan was developed. This complete draft was provided for HMPC review and comment via a Dropbox web link. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the second public review draft, which was advertised and distributed to collect public input and comments. The HMPC integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the CAL OES and FEMA Region IX to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

### 3.2.4. Phase 4: Implement the Plan and Monitor Progress

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

In order to secure buy-in and officially implement the plan, the plan was adopted by the governing boards of each participating jurisdiction using the sample resolution contained in Appendix D.

#### *Planning Step 10: Implement, Evaluate, and Revise the Plan*

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the planning process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead manager and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Chapter 7 Plan Implementation and Maintenance.

Finally, there are numerous organizations within the Madera County Planning Area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the implementation and ongoing success of this plan and mitigation in Madera County and is addressed further in Chapter 7.

#### **Implementation and Maintenance Process: 2011**

The 2011 Madera County, California Local Hazard Mitigation Plan Update included a process for plan maintenance and implementation of the mitigation strategy as well as formal updates to the plan document. The 2011 process called for annual reviews with the status of mitigation strategy implementation documented in annual mitigation strategy project progress reports and annual review questionnaires. In addition, the 2011 process called for a formal plan update as required by DMA regulations every 5 years. In accordance with the process outlined in the 2011 plan, formal annual reviews were by the Madera County OES and other participating jurisdictions, and this LHMP update, once complete, will meet the DMA formal update requirements.

Specifically, Madera County's and the City of Chowchilla's existing plans were completed and adopted by the County in 2011. It was anticipated that in compliance with the five-year update requirement, the next complete update of the plan would be in 2016. This current Plan Update process was initiated in February 2017, and finished in September 2017 with the submittal of this LHMP update to Cal OES and FEMA Region IX.

As stated, documented reviews of the 2011 plan took place on an annual basis by the County and participating jurisdictions, and the 2011 LHMP was integrated into other planning mechanisms in the County. The entire LHMP was adopted and incorporated by reference into the Madera County General Plan Safety Element as part of their General Plan Update Process. For those jurisdictions who have not yet updated their Safety Element, this LHMP Update will be adopted/incorporated by reference into the respective Safety Element updates. The risk assessment portion of the 2011 LHMP was relied on and further integrated into other planning mechanisms. Table 3-4 lists the planning mechanism the 2011 LHMP

was integrated into by Madera County. Each of the jurisdictional annexes have similar tables that show how the 2011 plans were specifically integrated into their local community planning mechanisms.

*Table 3-4 Incorporation of Madera County LHMP into Other Planning Mechanisms*

Planning Mechanism 2011 LHMP Was Incorporated or Implemented Through	Details
Madera County General Plan	The County adopted the 2011 LHMP Update into the Safety Element of the General Plan.
Madera County EOP	The 2011 LHMP and its hazard information is utilized in the County Emergency Operations Plan updates.

The plan implementation and maintenance process as set forth in the 2011 plans have been updated for this LHMP update. The revised update implementation and maintenance process for the Madera County 2017 LHMP update is set forth in Chapter 7 of this Plan Update document. A strategy for continued public involvement for this update process is also included in Chapter 7.





## Chapter 4 Risk Assessment

**Requirement §201.6(c)(2) and §201.7(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.**

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. “It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.”

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction’s potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

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

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

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

- **Section 4.1: Hazard Identification: Natural Hazards** identifies the natural hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Section 4.2: Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences.
- **Section 4.3: Vulnerability Assessment** assesses the planning areas’ exposure to natural hazards; considering assets at risk, critical facilities, future development trends, and, where possible, estimates potential hazard losses.
- **Section 4.4: Capability Assessment** inventories existing mitigation activities and policies, regulations, plans, and projects that pertain to mitigation and can affect net vulnerability.

This risk assessment covers the entire geographical extent of Madera County, including the incorporated communities and other participating jurisdictions (known as the Planning Area). Since this plan is a multi-jurisdictional plan, the Hazard Mitigation Planning Committee (HMPC) is required to evaluate how the hazards and risks vary from jurisdiction to jurisdiction and across the Planning Area. While these differences are noted in this chapter, they are expanded upon in the annexes of the participating

jurisdictions. If no additional data is provided in an annex, it should be assumed that the risk and potential impacts to the affected jurisdiction are similar to those described here for the entire Madera County Planning Area.

It should be noted here that while the North Fork Rancheria participated in this 2017 LHMP Update, due to the lack of any mapped GIS data, including any tribal land boundaries, they are addressed in this Base Plan as part of the Unincorporated County. Additional information on their hazard risks and vulnerabilities are included in their Jurisdictional Annex. Further, the North Fork Rancheria recently received a FEMA grant and have started the process of developing their own North Fork Rancheria LHMP. Thus, any data gaps or deficiencies identified specific to the North Fork Rancheria in this LHMP Update, will be addressed in their standalone LHMP.

This LHMP Update involved a comprehensive review and update of each section of the 2011 risk assessments. As part of the risk assessment update, new data was used, where available, and new analyses were conducted. Where data from existing studies and reports was used, the source is referenced throughout this risk assessment. Refinements, changes, and new methodologies used in the development of this risk assessment update are summarized in Chapter 2 What's New and also detailed in this Risk Assessment portion of the plan.

## 4.1 Hazard Identification: Natural Hazards

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

The Madera County HMPC conducted a hazard identification study to determine the hazards that threaten the Planning Area. This section details the methodology and results of this effort.

### *Data Sources*

The following data sources were used for this Hazard Identification: Natural Hazards portion of the plan:

- HMPC input
- 2013 State of California Hazard Mitigation Plan
- FEMA Disaster Declaration Database

### 4.1.1. Results and Methodology

Using existing natural hazards data and input gained through planning meetings, the HMPC agreed upon a list of natural hazards that could affect the Madera County Planning Area. Hazards data from the California Office of Emergency Services (Cal OES), FEMA, California Department of Water Resources, the National Oceanic and Atmospheric Administration (NOAA), and many other sources were examined to assess the significance of these hazards to the Planning Area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage. The natural hazards evaluated as part of this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

Only the more significant (or priority) hazards have a more detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment.

The following hazards in Table 4-1, listed alphabetically were identified and investigated for this LHMP Update. As a starting point, the updated California State Hazard Mitigation Plan was consulted to evaluate the applicability of new hazards of concern to the State to the Madera County Planning Area. Building upon this effort, hazards from the past plan were also identified, and comments explain how hazards were updated from the previous plan. Most hazards from the 2011 plan were profiled in this plan, with the exception of human health hazards, pandemic hazards, and airborne hazards, which have been eliminated from further consideration in this natural hazards plan, as they were determined to be of low significance to the County and/or better captured in other local planning efforts. New hazards include agricultural hazards, climate change, localized flooding, heavy rains and storms, and volcano.

*Table 4-1 Madera County Hazard Identification and Comparison*

2017 Hazards	2011 Hazards	Comment
Ag Hazards: Severe Weather/Insect Pests	–	New hazard
Climate Change	–	New hazard
Dam Failure	Dam Failure	Additional analysis was performed. Critical facilities and populations at risk were overlaid on the inundation maps.
Drought and Water Shortage	Drought	Additional discussion of impacts to the County was included in the vulnerability section.
Earthquake	Seismic Hazards: Ground Shaking	A Hazus analysis was performed to estimate vulnerability in the County to earthquake.
Flood: 1% and 0.2% Annual Chance	Flood	Additional analysis was added for loss estimates, flooded acres, populations at risk, and critical facilities at risk.
Flood: Localized/Stormwater	–	New hazard
Hazardous Materials Transportation	Hazardous Materials Event	Greater GIS analysis was performed that included a wider buffer zone.
Landslides, Rockfalls, and Debris Flows	Seismic Hazards: Earthquake induced landslide	Similar analysis was performed.
Levee Failure	Levee Break	A larger discussion of levee failure was added to this Plan Update.
Severe Weather: Extreme Cold and Freeze	Part of winter storm hazard.	Cold and freeze were broken out from the winter storms hazard and given additional discussion in the vulnerability section.
Severe Weather: Extreme Heat	Heat	Similar analysis was performed.
Severe Weather: Fog	Fog	Similar analysis was performed.
Severe Weather: Heavy Rains and Storms	–	New hazard
Severe Weather: Wind and Tornado	Severe Wind and Tornado	Similar analysis was performed.

2017 Hazards	2011 Hazards	Comment
Severe Weather: Winter Storms/Snow	Winter Storm	Winter storms were broken out from the cold and freeze hazard and given additional discussion in the vulnerability section.
Volcano	–	New hazard
Wildfire (smoke, tree mortality)	Wildfire	The smoke and tree mortality discussions were added. Greater GIS analysis was performed.

Table 4-2 was completed by Madera County and HMPC to identify, profile, and rate the significance of identified hazards. Only the more significant (or priority) hazards have a more detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment. Table 4-44 in Section 4.2.20 Natural Hazards Summary provides an overview of these significant hazards.

*Table 4-2 Madera County Hazard Identification Assessment*

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests	Extensive	Highly Likely	Limited	Medium	Medium
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Limited	Occasional	Critical	High	Low
Drought and Water Shortage	Extensive	Likely/Occasional	Limited	Medium	Medium
Earthquake	Significant	Occasional	Critical	Medium	Low
Flood: 1% and 0.2% Annual Chance	Significant	Occasional/Unlikely	Critical	Medium	Low
Flood: Localized/Stormwater	Limited	Highly Likely	Negligible	Medium	Low
Hazardous Materials Transportation	Limited	Likely	Limited	Medium	Low
Landslides, Rockfalls, and Debris Flows	Limited	Highly Likely	Limited	Low	Low
Levee Failure	Limited	Occasional	Limited	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Fog	Significant	Highly Likely	Critical	Low	Medium
Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Winter Storms/Snow	Extensive	Highly Likely	Limited	Medium	Medium
Volcano	Limited	Unlikely	Limited	Low	Low
Wildfire (smoke, tree mortality)	Significant	Highly Likely	Catastrophic	High	High
<b>Geographic Extent</b> Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		<b>Magnitude/Severity</b> Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid			
<b>Probability of Future Occurrences</b> Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		<b>Significance</b> Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact			
		<b>Climate Change Impact:</b> Low: Climate change is not likely to increase the probability of this hazard. Medium: Climate change is likely to increase the probability of this hazard. High: Climate change is very likely to increase the probability of this hazard.			

### 4.1.2. Disaster Declaration History

One method the HMPC used to identify hazards was the researching of past events that triggered federal and/or state emergency or disaster declarations in the Planning Area. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

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

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans. These are discussed in Section 4.2.6.

Based on the disaster declaration history provided in Table 4-3, Madera County is among the many counties in California susceptible to disaster. Details on federal and state disaster declarations were obtained by the HMPC, FEMA, and Cal OES and compiled in chronological order in Table 4-3. A review of state declared disasters indicates that Madera County received 27 state declarations between 1950 and 2016. Of the 27 state declarations: 11 were associated with floods; 3 were for drought; 3 were for freeze; 3 were for flood, landslide, and mudflows, 2 were economic, 1 was for agricultural disease, 1 was for fire; 1 was for road damage (related to flood); 1 was for storms, and 1 was from tsunami (a statewide declaration). A review of federal disasters shows 19 federal FEMA disaster declarations. Of these 19 federal declarations: 7 were associated with flooding; 4 were for wildfire; 3 were for freeze; 2 were for flood, landslide, and mudflows; 1 was for drought, 1 was for economic (a nationwide declaration for Katrina evacuations), and 1 was for storms. A summary of federal and state disaster declarations by disaster type is shown in Table 4-4.

*Table 4-3 Madera County State and Federal Disasters Declaration, 1950-2017*

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
2016/2017	2016/2017 Winter Storms	Flood, Landslide, Mud Flows	Storms	–	1/23/2017	–
2014	California Drought	Drought	Drought	GP 2014-13	1/17/2014	–
2014	Courtney Fire	Fire	Fire	DR-5078	–	9/14/2014
2014	Junction Fire	Fire	Fire	DR-5074	–	8/19/2014
2010	December 2010 Statewide Storms	Storms	Storms	DR-1952	12/21/2010, 12/23/2010, 12/24/2010, 12/30/2010	1/26/2010
2008	Central Valley Drought	Drought	Drought	GP 2008-03	6/12/2008	–
2007	Severe Freeze	Freeze	Freeze	DR-1689	–	3/13/2007
2006	2006 June Storms	Flood	Storms	DR 1646	–	6/5/2006
2005	Quartz Fire	Fire	Fire	FM-2571	–	7/25/2005
2005	Hurricane Katrina Evacuations	Economic	Hurricane	EM-3248 2005	–	9/13/2005
2003	State Road Damage	Road Damage	Flood	GP 2003	1/1/2003	–
2001	Energy Emergency	Economic	Greed	GP 2001	1/1/2001	–
1998/1999	Citrus Crop Damage	Freeze	Freeze	DR-1267 GP 98-02	12/29/1998	2/9/1999
1998	1998 Winter Storms	Flood	Storms	GP 98-01	2/26/1998, 4/16/1998, 5/15/1998	–
1997	1997 January Floods	Flood	Storms	DR-1155	1/2/97-1/31/97	1/4/1997
1995	Severe Winter Storms	Flood, Landslide, Mud Flows	Storms	DR-1046	1/6/95-3/14/95	3/12/1995
1995	1995 Severe Winter Storms	Flood	Storms	DR-1044	1/6/95-3/14/95	1/13/1995
1993	Severe Winter Storms	Flood, Landslide, Mud Flows	Storms	DR-979	1/7/1993	2/3/1993
1990/1991	1990 Freeze	Freeze	Freeze	DR-894	12/19/90-1/18/91	2/11/1991
1986	1986 Storms	Flood	Storms	DR-758	2/18-86-3/12/86	2/18/1986
1982/1983	Winter Storms	Flood	Flood	DR-677	12/8/1982	2/9/1983



Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
1982	Rain Causing Agricultural Losses	Agricultural	Storms	GP	10/26/1982	–
1982	Heavy Rains and Flooding	Flood	Storms	DC 82-03	4/1/1982	–
1979	Gasoline Shortage	Economic	OPEC	–	5/8/1979-11/13/79	–
1977	Drought	Drought	Drought	DR-3023	–	1/20/1977
1976	1976 Drought	Drought	Drought	–	2/9/76-7/6/76	–
1972	1972 Freeze	Freeze	Freeze	–	4/17/72, 5/22/72, 5/31/72	–
1969	1969 Storms	Flood	Storms	DR-253	1/23/69-3/12/69	1/26/1969
1965	1965 Fires	Fire	Fire	–	9/18/1965	–
1964	1964 Tsunami	Tsunami	Earthquake	–	9/15/1964	–
1963	1963 Floods	Flood	Storms	–	2/14/1964	–
1961	1961 Widespread Fires	Fire	Fire	–	–	9/18/1961
1958	1958 February Storms and Floods	Flood	Storms	CDO 58-03	2/26/1958	–
1955	1955 Floods	Flood	Flood	DR-47	12/22/1955	12/23/1955
1950	1950 Floods	Flood	Flood	OCD 50-01	11/21/1950	–

Source: Cal OES, FEMA

*Table 4-4 Madera County Disaster Declaration History 1950 to 2017 Summary by Disaster Type*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Agricultural Disease	0	–	1	1982
Drought	1	1977	3	1976, 2008, 2014
Economic	1	2005	2	1979, 2001
Fire	4	1961, 2005, 2014 (two times)	1	1965
Flood	7	1955, 1969, 1982/1983, 1986, 1995, 1997, 2006	11	1950, 1955, 1958, 1964, 1969, 1982/1983 (two times), 1986, 1995, 1997, 1998
Flood, Landslide, Mud Flows	2	1993, 1995	3	1993, 1995, 2016/2017
Freeze	3	1990/1991, 1998/1999, 2007	3	1972, 1990/1991, 1998/1999

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Road Damage	0	–	1	2003
Storms	1	2010	1	2010
Tsunami	0	–	1	1964
<b>Totals</b>	<b>19</b>	–	<b>27</b>	–

Source: Cal OES, FEMA

This disaster history suggests that Madera County experiences a major event worthy of a federal disaster declaration every 3.5 years. The County has a 28.5 percent chance of receiving a federal disaster declaration in any given year.

### *Disasters since 2011*

There have been two FEMA federal disaster declarations since the 2011 plan, both from wildfires. There have been two additional state disaster declarations since 2011, one for drought in 2014 and one for severe winter weather/storms in 2016/2017.

## 4.2 Hazard Profiles

**Requirement §201.6(c)(2)(i) and §201.7(c)(2)(i): [The risk assessment shall include a] description of the...location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.**

The hazards identified in Section 4.1 Hazard Identification: Natural Hazards, are profiled individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources. These profiles set the stage for Section 4.3 Vulnerability Assessment, where the vulnerability is quantified for each of the priority hazards.

Each hazard is profiled in the following format:

- **Hazard/Problem Description**—This section gives a description of the hazard and associated issues followed by details on the hazard specific to the Madera County Planning Area. Where known, this includes information on the hazard extent, area, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary effects.
- **Past Occurrences**—This section contains information on historical incidents, including impacts where known. The extent or location of the hazard within or near the Madera County Planning Area is also included here. Historical incident worksheets were used to capture information from participating jurisdictions on past occurrences.
- **Frequency/Likelihood of Future Occurrence**—The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of the event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of experiencing a drought in

any given year). The likelihood of future occurrences is categorized into one of the following classifications:

- ✓ **Highly Likely**—Near 100 percent chance of occurrence in next year or happens every year
  - ✓ **Likely**—Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less
  - ✓ **Occasional**—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years
  - ✓ **Unlikely**—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years
- **Climate Change**—This section contains the effects of climate change (if applicable). The possible ramifications of climate change on the hazard are discussed.

**Section 4.2.20 Natural Hazards Summary** provides an initial assessment of the profiles and assigns a level of significance or priority to each hazard. Those hazards determined to be of high or medium significance were characterized as priority hazards that required further evaluation in Section 4.3 Vulnerability Assessment. Those hazards that occur infrequently or have little or no impact on the Planning Area were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency and resulting damage, including deaths/injuries and property, crop, and economic damage. The ability of a community to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used by the HMPC to prioritize those hazards of greatest significance to the Planning Area, enabling the County to focus resources where they are most needed.

The following sections provide profiles of the natural hazards that the HMPC identified in Section 4.1 Hazard Identification. The severe weather hazards are discussed first because it is the secondary hazards generated by severe weather (e.g., flood and wildfire) that can result in the most significant losses. The other hazards follow alphabetically.

### *Data Sources*

The following data sources formed the basis for this Hazard Profiles portion of the plan:

- 2013 State of California Multi-Hazard Mitigation Plan
- CAL FIRE Wildfire History Database
- Cal-Adapt
- California Climate Adaptation Strategy
- California Department of Water Resources Best Available Maps
- California Department of Water Resources Division of Safety of Dams
- California Division of Mines and Geology
- California's Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources.
- Climate Change and Health Profile Report – Madera County
- Climate Change Impacts in the United States
- Draft Environmental Impact Report for the California State Prison Madera County
- Enhanced Fujita Scale. National Oceanic and Atmospheric Administration Storm Prediction Center.
- Federal Emergency Management Agency – Wind Zones in the United States

- Federal Emergency Management Agency: Building Performance Assessment: Oklahoma and Kansas Tornadoes
- Federal Emergency Management Agency: Multi-Hazard Identification and Risk Assessment.
- Galloway, Jr Dr. Gerald E. Levees in History: The Levee Challenge. Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.
- Intergovernmental Panel on Climate Change
- Johnstone, J. and Dawson, T. Climatic context and ecological implications of summer fog decline in the coast redwood region. Proceedings of the National Academy of Sciences, January 7, 2010.
- Madera County Community Wildfire Protection Plan
- Madera County Emergency Operations Plan
- Madera County General Plan
- Madera County Housing Element
- Madera-Mariposa-Merced Fire Plan
- National Aeronautics and Space Administration
- National Climate Assessment
- National Climatic Data Center Storm Events Database.
- National Drought Mitigation Center
- National Flood Insurance Program
- National Integrated Drought Information System
- National Oceanic and Atmospheric Administration Storm Prediction Center
- National Oceanic and Atmospheric Administration's National Climatic Data Center
- National Park Service
- National Performance of Dams Program
- National Weather Service Heat Index
- North Sierra Precipitation Index
- Public Policy Institute of California. If drought continues: Environment and poor rural communities most likely to suffer. [press release].
- Sacramento Bee
- State of California Department of Conservation Farmland Mapping and Monitoring Program
- Underwood, E. Models predict longer, deeper US droughts. Science, 347(6223) 707 DOI: 10.1126/science.347.6223.707. 2015.
- United State Geologic Survey. Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093, 1977.
- US Army Corps of Engineers
- US Bureau of Reclamation
- US Department of Agriculture Secretarial Disasters Declarations
- US Department of Transportation Pipeline and Hazardous Materials Safety Administration
- US Drought Monitor
- United States Geological Survey Publication 2014-3120
- United States Geological Survey Open File Report 2015-3009
- USA Today
- Western Regional Climate Center

#### 4.2.1. Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs in the Madera County Planning Area as localized storms that bring heavy rain, lightning, and strong winds.

The National Oceanic and Atmospheric Administration’s National Climatic Data Center (NCDC) has been tracking severe weather since 1950. Their Storm Events Database contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 1,162 severe weather events that occurred in Madera County between January 1, 1950, and December 31, 2016. Table 4-5 summarizes these events.

*Table 4-5 NCDC Severe Weather Events for Madera County 1950-12/31/2016\**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Cold/Wind Chill	3	0	0	0	0	\$0	\$0
Debris Flows	13	0	0	0	0	\$26,000	\$0
Dense Fog	219	0	10	53	56	\$4,760,000	\$0
Drought	117	0	0	0	0	\$0	\$0
Dust Devil	1	0	0	0	0	\$500	\$0
Dust Storm	4	0	0	0	0	\$0	\$0
Excessive Heat	2	0	0	0	0	\$0	\$0
Extreme Cold/Wind Chill	4	0	0	0	0	\$0	\$0
Flash Flood	2	0	0	0	0	\$25,000	\$0
Flood	33	0	0	0	0	\$6,098,000	\$5,800,000
Frost/Freeze	121	0	0	0	0	\$100,000	\$352,955,000
Funnel Cloud	14	0	0	0	0	\$0	\$0
Hail	21	0	0	0	4	\$110,000	\$3,656,000
Heat	37	32	0	10	0	\$170,000	\$224,801,000
Heavy Rain	34	0	0	0	0	\$201,000	\$49,060,000
Heavy Snow	75	0	0	0	0	\$0	\$0
Heavy Wind	2	0	0	0	0	\$0	\$0
High Wind	32	0	0	0	4	\$11,795,000	\$150,000
Landslide	2	0	0	0	0	\$28,000	\$0
Lightning	7	0	0	0	0	\$32,500	\$0
Strong Wind	64	0	0	0	0	\$1,473,400	\$57,000
Thunderstorm Winds	14	0	0	0	0	\$161,000	\$7,800,000
Tornado	8	0	0	0	0	\$147,750	\$30,000
Wildfire	97	0	1	0	7	\$47,328,000	\$0

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Winter Storm	181	2	0	0	0	\$3,125,000	\$0
Winter Weather	55	0	1	0	0	\$282,000	\$0
<b>Total</b>	<b>1,162</b>	<b>34</b>	<b>12</b>	<b>63</b>	<b>71</b>	<b>\$75,863,150</b>	<b>\$644,309,000</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas

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

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

- Extreme Cold and Freeze
- Extreme Heat
- Fog
- Heavy Rains and Storms (winds, hail, and lightning)
- Wind and Tornado
- Winter Storms/Snow

The western third of the County is part of the nearly flat San Joaquin Valley which is oriented northwest to southeast and has a length of about 225 miles and an average width of about 50 miles. The elevation of the valley floor is approximately 180 feet and nearly flat. Elevations increase up the western slope of the Sierra Nevada to approximately 13,000 feet. Parts of Madera County are included in Yosemite National Park, Devil's Postpile National Monument, and the Sierra National Forest. Due to these elevation changes, the climates vary by season and location. Madera County experiences warmer, dryer California temperatures in the summer to colder weather in the winter. Due to size of the County and changes in elevation and climate, weather conditions can vary greatly across the County. For purposes of this hazard profile, the County will be divided into two distinct sections, as applicable: western Madera County, which is predominantly below an elevation of 2,500 feet above msl; and eastern Madera County, which is generally above 2,500 feet above msl ranging to above 12,000 feet above msl and receives more snowfall. The profiles that follow provide information, where possible, from two weather stations located in these two different parts of the County: Madera (elevation: 300 feet above msl) in west Madera County and Mammoth Lakes Ranger Station (elevation: 7,900 feet above msl), in eastern Madera County.

#### 4.2.2. Severe Weather: Extreme Cold and Freeze

##### *Hazard/Problem Description*

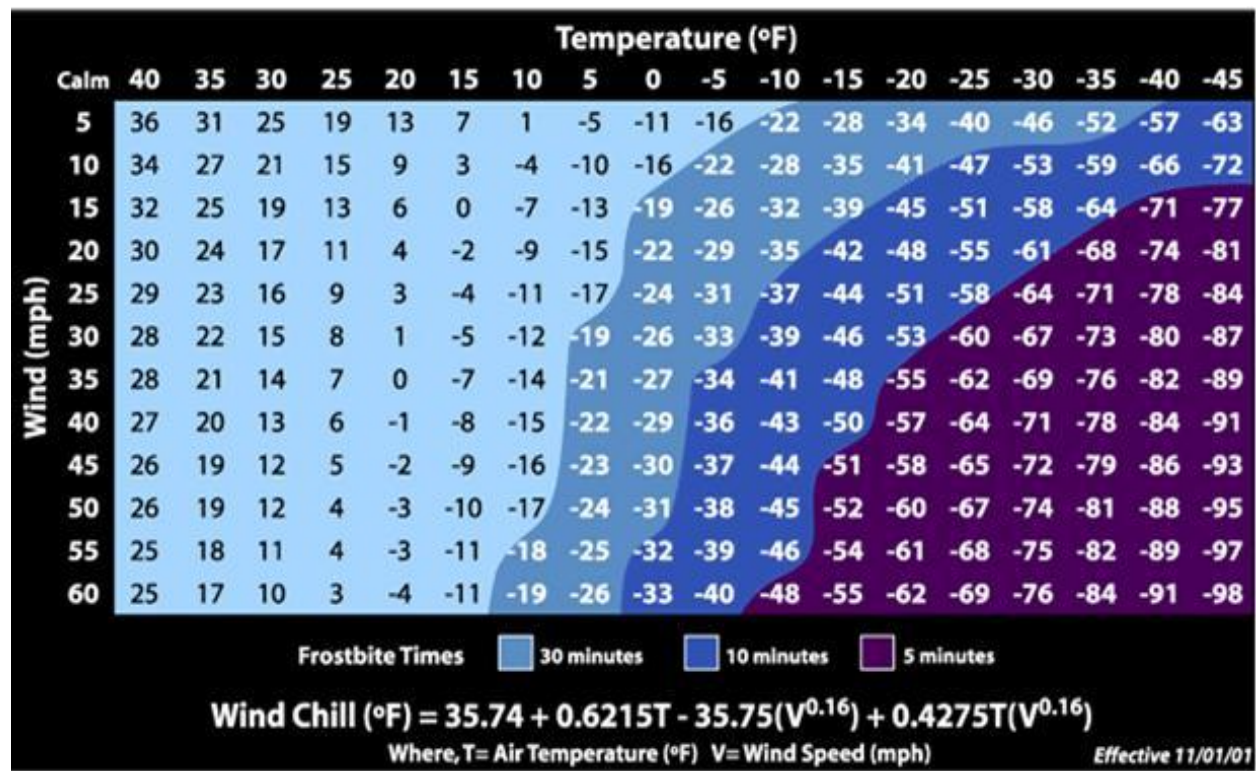
According to the NWS and the Western Regional Climate Center (WRCC), winter events can include extreme cold and freeze conditions. Heavy accumulations of ice can bring down trees, electrical wires,

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

Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures can cause significant damage to the agricultural industry. The effects of freezing temperatures on agriculture in Madera County are discussed further in Section 4.2.6 Agricultural Hazards.

In 2001, the NWS implemented an updated Wind Chill Temperature index (shown in Figure 4-1), which is reproduced below. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4-1 Wind Chill Temperature Chart



Source: National Weather Service

### Temperature Inversion

Periodically Madera County experiences temperature inversions. Temperature inversion layers are areas where the normal decrease in air temperature with increasing altitude is reversed and air above the ground is warmer than the air below it. According to the NOAA, inversion layers are significant to meteorology

because they block atmospheric flow which causes the air over an area experiencing an inversion to become stable. During an inversion episode, temperatures increase with increasing altitude. The warm inversion layer then acts as a cap and stops atmospheric mixing.

Topography can also play a role in creating a temperature inversion since it can sometimes cause cold air to flow from mountain peaks down into valleys. This cold air then pushes under the warmer air rising from the valley, creating the inversion. Some of the most significant consequences of temperature inversions are the extreme weather conditions they can sometimes create. One example of these is freezing rain. This phenomenon develops with a temperature inversion in a cold area because snow melts as it moves through the warm inversion layer. The precipitation then continues to fall and passes through the cold layer of air near the ground. When it moves through this final cold air mass it becomes "super-cooled" (cooled below freezing without becoming solid).

Intense thunderstorms and tornadoes (discussed in Section 4.2.5) are also associated with inversions because of the intense energy that is released after an inversion blocks an area's normal convection patterns. Fog can be a result of inversions as well (discussed in Section 4.2.4)

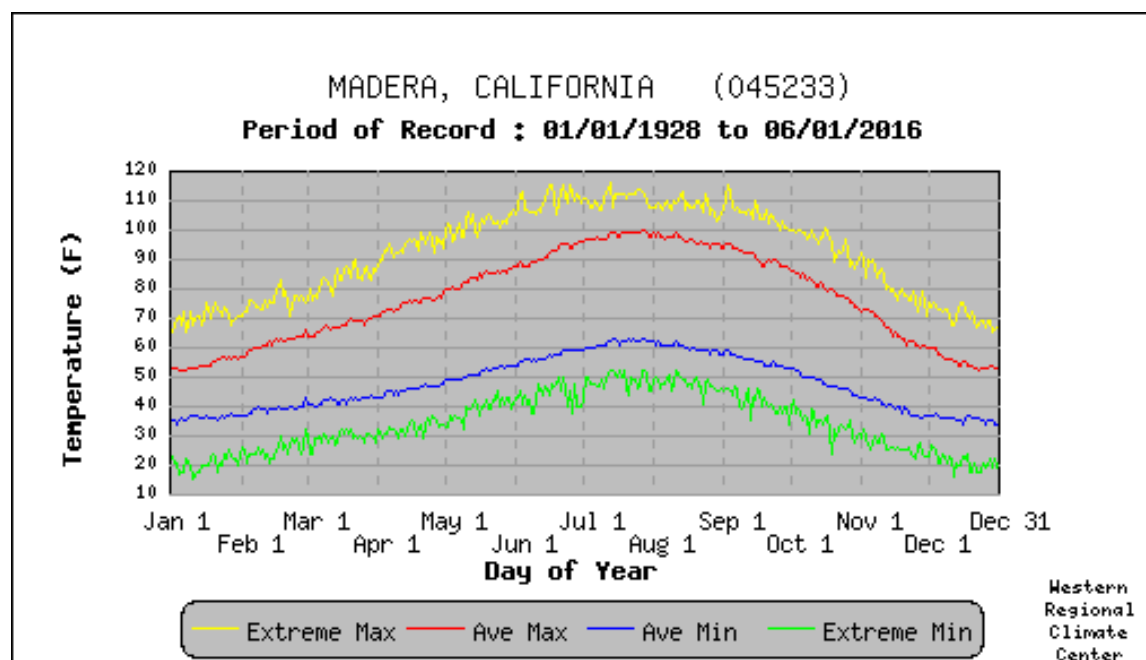
The WRCC maintains data on weather normal and extremes in the western United States. WRCC data for the County is summarized below for both the eastern and western portions of the County.

#### **Madera County—West (Madera Weather Station, Period of Record 1928 to 2016)**

According to the WRCC, in the western portion of Madera County, monthly average low temperatures in the coldest months (November through April) range from the mid-30s to the upper 40s. The lowest recorded daily extreme was 15°F on January 10, 1949. In a typical year, low temperatures fall below 32°F on 30.7 days.



Figure 4-2 Madera County—West Daily Temperature Averages and Extremes



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

Table 4-6 Madera County – West Record Low Temperatures

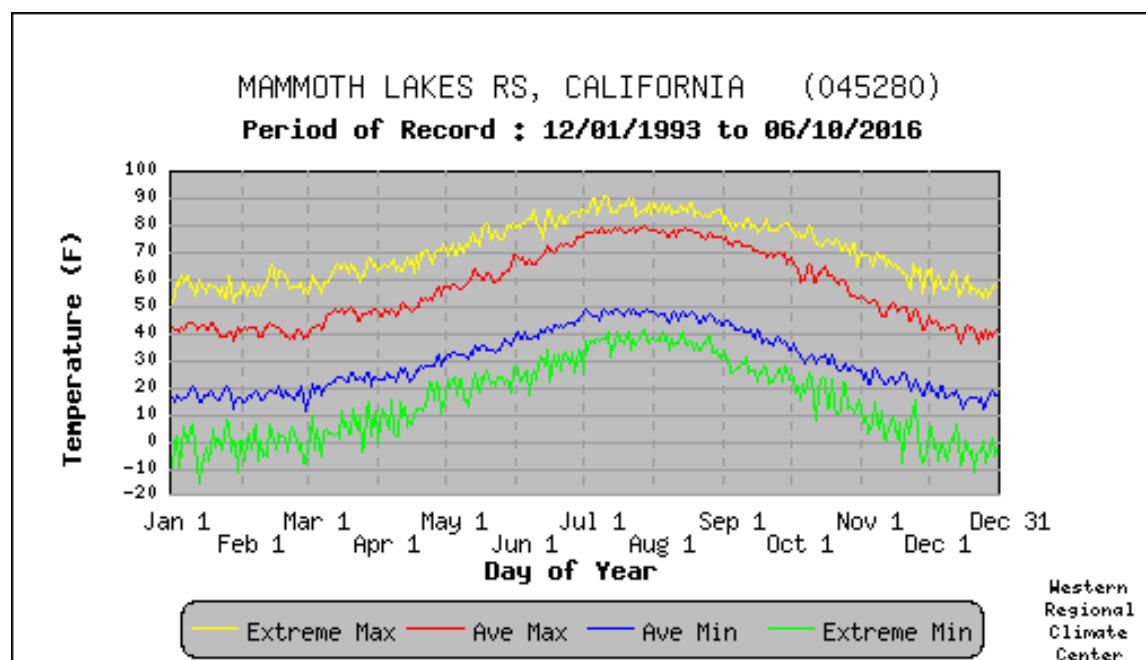
Month	Record High	Date	Month	Record High	Date
January	15°	1/10/1949	July	42°	7/1/1963
February	21°	2/13/1949	August	39°	8/11/1977
March	24°	3/3/1951	September	34°	9/30/1950
April	29°	4/3/1945	October	24°	10/19/1949
May	33°	5/2/1959	November	22°	11/25/1931
June	38°	6/26/1933	December	16°	12/12/1932

Source: Western Regional Climate Center

### Madera County—East (Mammoth Lakes Ranger Station Weather Station, Period of Record 1993 to 2016)

According to the WRCC, in the eastern portion of Madera County, monthly average low temperatures in the coldest months (November through April) range from the mid-30s to the upper 40s. The lowest recorded daily extreme was 15°F on January 10, 1949. In a typical year, low temperatures fall below 32°F on 30.7 days.

Figure 4-3 Madera County—East Daily Temperature Averages and Extremes



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

Table 4-7 Madera County – East Record Low Temperatures

Month	Record High	Date	Month	Record High	Date
January	-16°	1/13/2007	July	25°	7/1/1997
February	-7°	2/8/2001	August	30°	8/31/1999
March	-6°	3/7/1998	September	21°	9/21/2004
April	2°	4/9/1999	October	8°	10/12/2008
May	13°	5/11/2000	November	-8°	11/19/1994
June	17°	6/7/1995	December	-12°	12/21/1998

Source: Western Regional Climate Center

### Past Occurrences

### Disaster Declaration History

State and federal disaster declarations related to extreme cold and freeze are shown in Table 4-8.

*Table 4-8 Madera County Freeze Disaster Declarations 1950 to 2017*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Freeze	3	1990/1991, 1998/1999, 2007	3	1972, 1990/1991, 1998/1999
<b>Totals</b>	<b>3</b>	–	<b>3</b>	–

Source: Cal OES, FEMA

## NCDC Events

The NCDC data recorded 128 freeze and snow incidents for Madera County since 1993. A summary of these events is shown in Table 4-9. Specific events from the NCDC database that caused injuries, deaths, or damages in Madera County are discussed below the table.

*Table 4-9 NCDC Cold and Freeze Events in Madera County 1993 to 12/31/2016\**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Cold/Wind Chill	3	0	0	0	0	\$0	\$0
Extreme Cold/Wind Chill	4	0	0	0	0	\$0	\$0
Frost/Freeze	121	0	0	0	0	\$100,000	\$352,955,000
<b>Total</b>	<b>128</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>\$100,000</b>	<b>\$352,955,000</b>

Source: NCDC

\*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

- **February 16, 2006** – After a very mild January that encouraged earlier-than-normal deciduous orchard blooming, daytime high temperatures in Interior Central California on the 15<sup>th</sup> were much below normal following a dry cold-frontal passage. Temperatures on the night of the 15<sup>th</sup> and morning of the 16<sup>th</sup> plunged to the mid to upper 20s throughout the Central and South San Joaquin Valley. Many agricultural reporting stations were less than 27°F with coldest locations less than 25°F. Temperature durations less than 28°F exceeded 6 hours in several locations. Early deciduous nut blooms and fruit-set were damaged by the cold air despite grower attempts at freeze mitigation. Temperatures moderated on the morning of the 17<sup>th</sup> but still dropped to as low as 28°F in the coldest locations continuing the damage on area agriculture. Around \$4.2 million in damages was reported due to this freeze event.
- **December 8, 2011** – Widespread freezing temperatures continued into December 8<sup>th</sup> across the San Joaquin Valley. Seven consecutive days of freezing temperatures took its toll on the citrus crop in the San Joaquin Valley. According to Citrus Growers' Association California Citrus Mutual, about 35 percent of the mandarin orange crop was lost to frost and freeze damage. The news was a little better for the navel crop, about 15 percent were not expected to make it. Initial estimates were not expected to be severe, however after several weeks of inspecting the citrus crop, it was determined that damages were much worse than first expected. In the south San Joaquin Valley, \$100 million in damages was estimated. 87 million dollars was spent to protect crops from the extended frost and freeze.
- **December 5<sup>th</sup> through 10<sup>th</sup>, 2013** – A cold front brought colder weather to the region on December 3<sup>rd</sup>, followed by a stronger system on December 6<sup>th</sup> and 7<sup>th</sup>. The first storm brought gusty winds to the mountains and desert, as well as light rain and drizzle over the San Joaquin Valley. Some light snow

fell in Yosemite and other parts of the Sierra Nevada. Daytime high temperatures cooled to below normal in quite a few locations, especially north of Kern County, due to increased cloud cover and light precipitation. Behind the cold front, an arctic airmass brought freezing temperatures to the central and southern San Joaquin Valley. Well below normal minimum temperatures commenced on December 4th and continued until the 6th as a modified Arctic airmass was entrenched in the region. Low temperatures dropped below 20 degrees in some San Joaquin Valley locations during the mornings of the 5th and 6th, such as Madera, where the low reached 19 degrees. Daytime high temperatures were generally a few degrees below average until the 6th. The long duration hard freeze across the San Joaquin Valley during the period December 4-9 resulted in extensive crop damage, especially to the citrus crop. Local estimates were eventually reported as being \$441 Million as reported by California Citrus Mutual. By the evening of the 6th, a low pressure system approached the northern part of the central California interior, and its associated cold front brought rain to the San Joaquin Valley and snow as low as the lower Sierra Nevada foothills during the overnight hours. Snow levels reached around 1,500 feet by the morning of the 7th, except some light snow flurries were reported in Three Rivers, at an elevation just below 900 feet. Several inches of snow fell as low as 2000 feet in the Sierra Nevada foothills, including near Coarsegold (4.5 inches at 2,296 feet) and Oakhurst.

### Hazard Mitigation Planning Team Events

In 1997, there was a large amount snowfall. This impacted the mountain area. This required a snow response from the Sheriff's Office. The Sheriffs had an influx of welfare checks where they had to hike or snow shoe into residences to check on people.

### *Likelihood of Future Occurrence*

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

### Climate Change and Extreme Cold/Freeze

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

### 4.2.3. Severe Weather: Extreme Heat

#### *Hazard/Problem Description*

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980 more than 1,250 people died.

Extreme heat can also affect the agricultural industry. Extreme heat as it affects agriculture in Madera County is discussed further in the agricultural hazards discussion in Section 4.2.6.

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

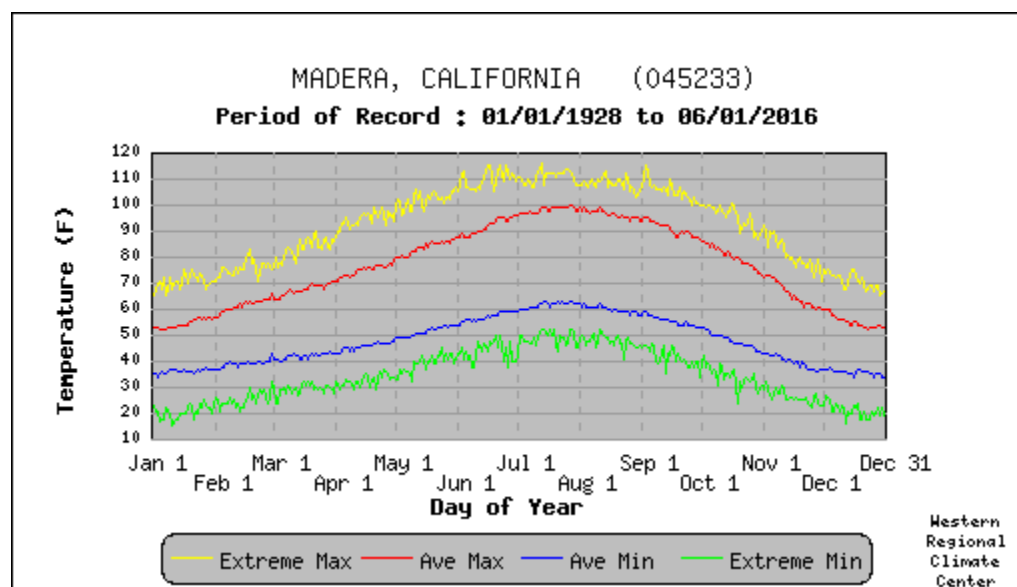
Heat emergencies are often slow to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more “typical” disaster scenarios. While heat waves are obviously less dramatic, they are potentially more deadly. According to the 2013 California State Hazard Mitigation Plan, the worst single heat wave event in California occurred in Southern California in 1955, when an eight-day heat wave resulted in 946 deaths.

The WRCC maintains data on weather normal and extremes in the western United States. WRCC data for the County is summarized below for the western and eastern portions of the County.

### Madera County—West (Madera Weather Station, Period of Record 1928 to 2016)

According to the WRCC, in the western portion of Madera County, monthly average maximum temperatures in the warmest months (May through October) range from the mid-80s to the upper 90s. The highest recorded daily extreme was 116°F on July 13, 1916. In a typical year, maximum temperatures exceed 90°F on 104.8 days.

*Figure 4-4 Madera County—West Daily Temperature Averages and Extremes*



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

*Table 4-10 Madera County – West Record High Temperatures*

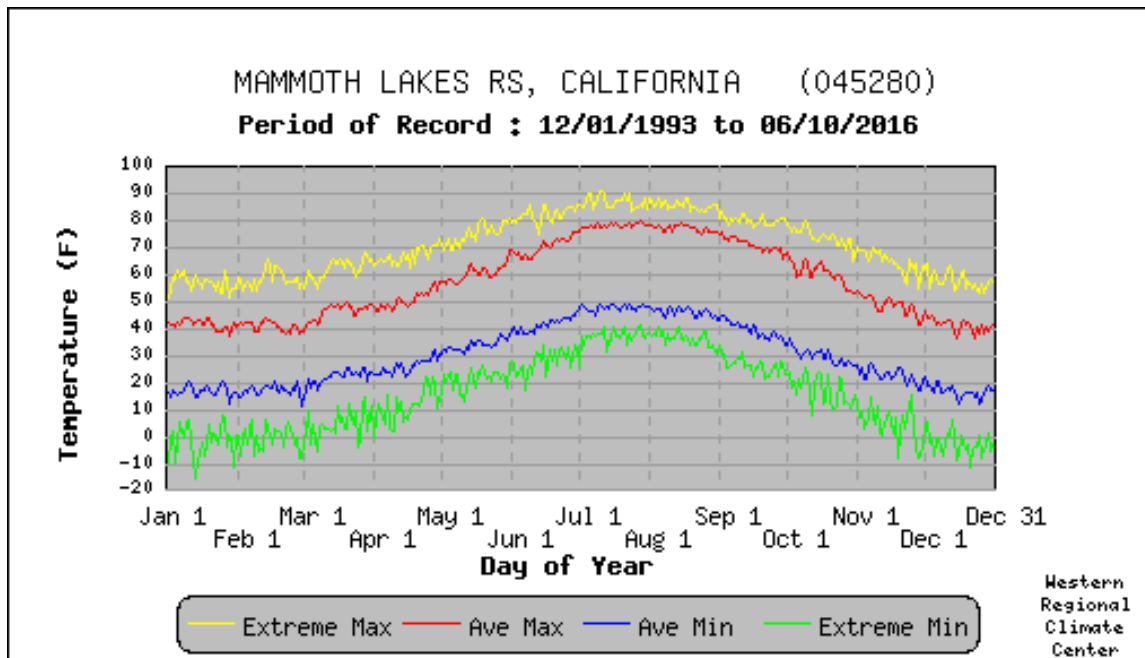
Month	Record High	Date	Month	Record High	Date
January	79°	1/28/1981	July	116°	7/13/1961
February	83°	2/18/1920	August	113°	8/14/1933
March	90°	3/22/1960	September	115°	9/3/1955
April	99°	4/20/1934	October	101°	10/16/1961
May	107°	5/3/1950	November	92°	11/1/1949
June	115°	6/25/1957	December	75°	12/1/1958

Source: Western Regional Climate Center

**Madera County—East (Mammoth Lakes Ranger Station Weather Station, Period of Record 1993 to 2016)**

According to the WRCC, in the eastern portion of Madera County, monthly average maximum temperatures in the warmest months (May through October) range from the low 60s to the mid 70s. The highest recorded daily extreme was 1°*F* on July 10, 2002. In a typical year, maximum temperatures exceed 90°*F* on 0.3 days.

*Figure 4-5 Madera County—East Daily Temperature Averages and Extremes*



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

*Table 4-11 Madera County – East Record High Temperatures*

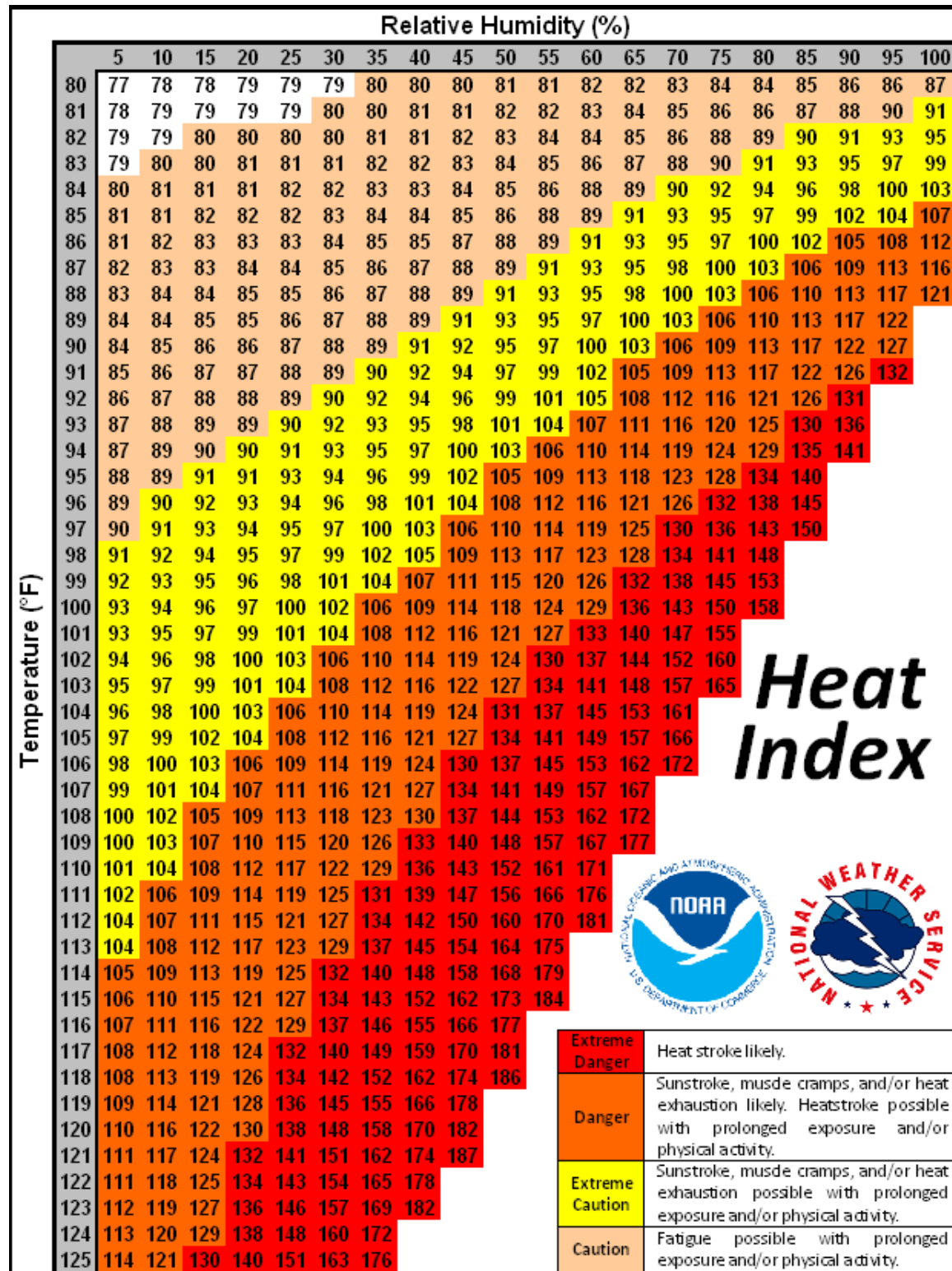
Month	Record High	Date	Month	Record High	Date
January	61°	1/21/2012	July	91°	7/11/2002
February	58°	2/28/1995	August	88°	8/28/1998
March	66°	3/31/1997	September	82°	9/14/2000
April	73°	4/11/1996	October	80°	10/9/1996
May	81°	5/29/2001	November	70°	11/2/1997
June	86°	6/30/2000	December	64°	12/2/2008

Source: Western Regional Climate Center

Figure 4-6 shows the Heat Index (HI) that the National Weather Service uses to show the relationship between heat and relative humidity. The Heat Index describes how hot the heat-humidity combination makes it feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the HI rises, so do health risks.

- When the HI is 90°F, heat exhaustion is possible with prolonged exposure and/or physical activity.
- When it is 90°-105°F, heat exhaustion is probable with the possibility of sunstroke or heat cramps with prolonged exposure and/or physical activity.
- When it is 105°-129°F, sunstroke, heat cramps or heat exhaustion is likely, and heatstroke is possible with prolonged exposure and/or physical activity.
- When it is 130°F and higher, heatstroke and sunstroke are extremely likely with continued exposure. Physical activity and prolonged exposure to the heat increase the risks.

Figure 4-6 Heat Index



Source: National Weather Service

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



The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Table 4-12.

*Table 4-12 National Weather Service Heat Risk Categories*

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

Source: National Weather Service

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

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

### *Past Occurrences*

### Disaster Declaration History

There have been no federal or state disaster declarations in Madera County related to extreme heat, according to Table 4-3.

### NCDC Events

The NCDC data shows 39 extreme heat incidents for Madera County since 1993. These are shown in Table 4-13. Specific events that caused damages, injuries, or deaths, are detailed below the table.

*Table 4-13 NCDC Extreme Heat Events in Madera County 1993 to 12/31/2016\**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Excessive Heat	2	0	0	0	0	\$0	\$0
Heat	37	32	0	10	0	\$170,000	\$224,801,000

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
<b>Total</b>	<b>39</b>	<b>32</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>\$170,000</b>	<b>\$224,801,000</b>

Source: NCDC

\*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

- **July 9, 2002** – Strong high pressure over the Western United States coupled with subtropical moisture flowing northwestward into Central California produced near-record high temperatures, record high minimum temperatures, and Heat Index readings above 105°F from the 9<sup>th</sup> through the 15<sup>th</sup> of the month. Humidities were elevated while temperatures reached over 100°F in locations throughout the Central and Southern San Joaquin Valley during this period. As an example, on one of the hottest days, the 11<sup>th</sup>, the highest temperatures included 109°F in nearby Fresno. Two deaths occurred, but the locations of those who died were not available.
- **July 16, 2006** – Arguably one of the hottest spells widespread across California, including interior Central California, in the last 75 years occurred during a warm period that spanned from the 16<sup>th</sup> through the 27<sup>th</sup> of the month. Fresno City had 12 days in a row where maximum temperatures were at or above 105°F. Numerous daily maximum and high minimum temperature records were both reset including the all-time high minimum temperature record for Fresno at 90°F on the 23<sup>rd</sup> from that of 86°F set in August of 1908. During the 5-day period from the 22<sup>nd</sup> through the 26<sup>th</sup>, Fresno had temperatures of 110°F+ each day. The Southwest San Joaquin Valley maximum temperatures had 110°F+ readings for a 6-day period from the 21<sup>st</sup> through the 26<sup>th</sup>. Minimum temperatures during that warmest portion of the heat spell lowered only into the 80s for much of the Central and South San Joaquin Valley. Even the high foothill areas and Kern County Mountains were impacted as Yosemite Valley in the Southern Sierra Nevada at the 4000-foot elevation had maximum temperatures of 100°F+ from the 22<sup>nd</sup> through the 27<sup>th</sup> with a 105°F high on the 26<sup>th</sup>. Peak energy use in the state hit an all-time record, 6,165 Megawatts, even though several thousand customers in Central California went without power and air conditioning for hours. Among the documented instances of power loss during the heat event, nearby Fresno had 11,000 power customers without electricity on the 22<sup>nd</sup> and 14,000 on the 23<sup>rd</sup>. With accompanying high humidities, consistent light or calm winds, and long durations of high temperatures, the heat resulted in many deaths among residents of Interior Central California as well as a tremendous toll on area agriculture and specifically the dairy and cattle industry. Up to 57 people died as a result of the excessive heat in the Interior Central California 7-county area. Many but not all of these deaths were among the elderly and in urban areas. Milk and egg production losses were estimated at 10 to 15% during the heat spell along with an increase in livestock deaths (16,500 cows) and poultry deaths (700,000 chickens and 160,000 turkeys). Diminished yield in produce from field crops and orchards undoubtedly occurred and losses could only be estimated due to difficulties in assessing. In addition to the loss of livestock and poultry due to the heat, area counties declared local emergencies due to rendering problems caused by the high number of livestock and poultry carcasses.

## Hazard Mitigation Planning Team Events

The Planning Team noted that extreme heat occurs annually, but events that caused damages or injuries were unknown.

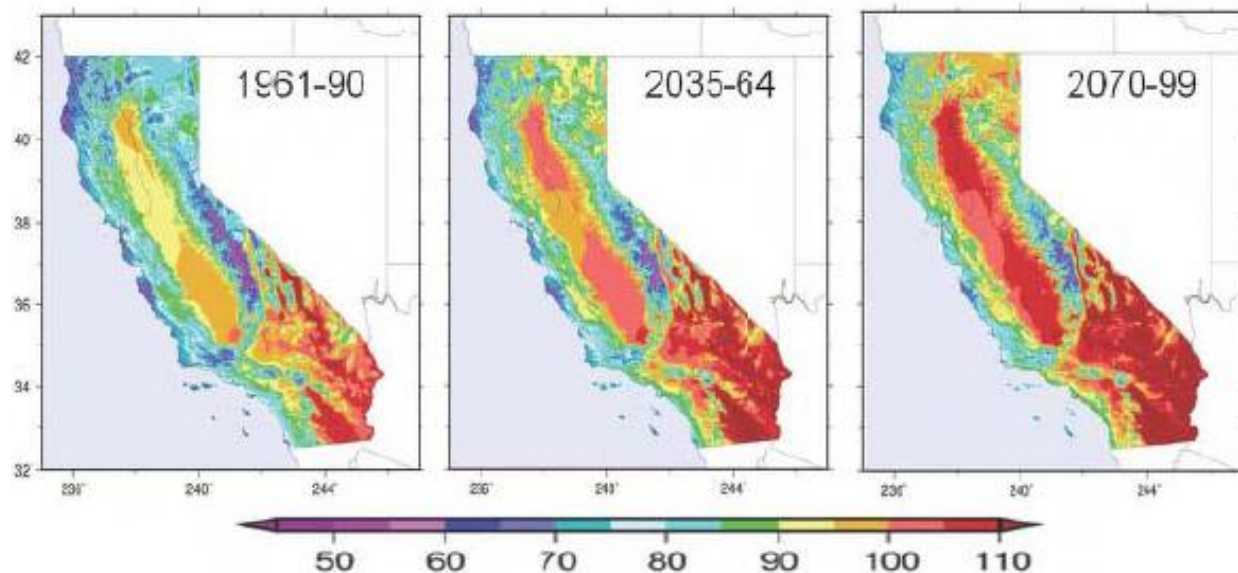
### *Likelihood of Future Occurrence*

**Highly Likely**—Temperature extremes are likely to continue to occur annually in the Madera County Planning Area. Extreme heat is less likely in eastern portions of the county at higher elevations, than in the western portion. Temperatures at or above 90°F are common most summer days in the western part of the County.

### **Climate Change and Extreme Heat**

The CAS, citing a California Energy Commission study, states that “over the past 15 years, heat waves have claimed more lives in California than all other declared disaster events combined.” This study shows that California is getting warmer, leading to an increased frequency, magnitude, and duration of heat waves as shown in Figure 4-7.

*Figure 4-7 California Historical and Projected Temperature Increases – 1961 to 2099*



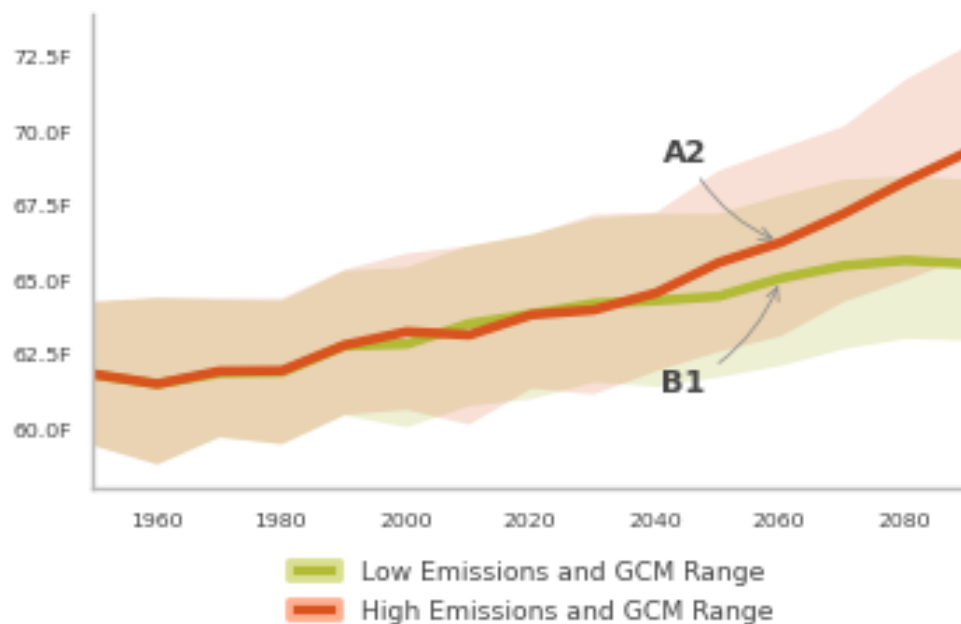
Source: Dan Cayan; California Climate Adaptation Strategy

As temperatures increase, California and Madera County will face increased risk of death from dehydration, heat stroke, heat exhaustion, heart attack, stroke and respiratory distress caused by extreme heat. According to the CAS report and the 2013 State of California Hazard Mitigation Plan, by 2100, hotter temperatures are expected throughout the state, with projected increases of 3-5.5°F (under a lower emissions scenario) to 8-10.5°F (under a higher emissions scenario). These changes could lead to an increase in deaths related to extreme heat in Madera County.

Cal Adapt noted that overall temperatures are expected to rise substantially throughout this century. During the next few decades, scenarios project average temperature to rise between 1 and 6.1°F; however, the projected temperature increases begin to diverge at mid-century so that, by the end of the century, the temperature increases projected in the higher emissions scenario (A2) are approximately twice as high as those projected in the lower emissions scenario (B1).

These projections also differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the state's ecosystem health, agricultural production, water use and availability, and energy demand. Future temperature estimates from Cal-Adapt are shown in Figure 4-8.

*Figure 4-8 Madera County – Future Temperature Estimates in High and Low Emission Scenarios*



Source: Cal-Adapt – Temperature: Decadal Averages Map

#### 4.2.4. Severe Weather: Fog

##### *Hazard/Problem Description*

Fog is a collection of water droplets or ice crystals suspended in the air at or near the Earth's surface. Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. Fog can form in a number of ways, depending on how the cooling that caused the condensation occurred. The most common types in the County are radiation and advection fog.

##### Radiation Fog

This type of fog forms at night under clear skies with calm winds when heat absorbed by the earth's surface during the day is radiated into space. As the earth's surface continues to cool, provided a deep enough layer of moist air is present near the ground, the humidity will reach 100% and fog will form. Radiation fog varies in depth from 3 feet to about 1,000 feet and is always found at ground level and usually remains stationary. This type of fog can reduce visibility to near zero at times and make driving very hazardous.

One of the most dangerous types of radiation fog unique to the Planning Area is tule fog. It forms on clear nights when the ground is moist and the wind is near calm. On nights like this, the ground cools rapidly. In turn, the moist air above it cools and causes water vapor to condense. Once it has formed, the air must

be heated enough to either evaporate the fog or lift it above the surface so that visibilities improve. It can cover large areas, as seen in Figure 4-9, with Madera County's location approximated with the black oval. The fog layer in tule fog often builds to several hundred feet thick, and can effectively block out incoming sunlight.

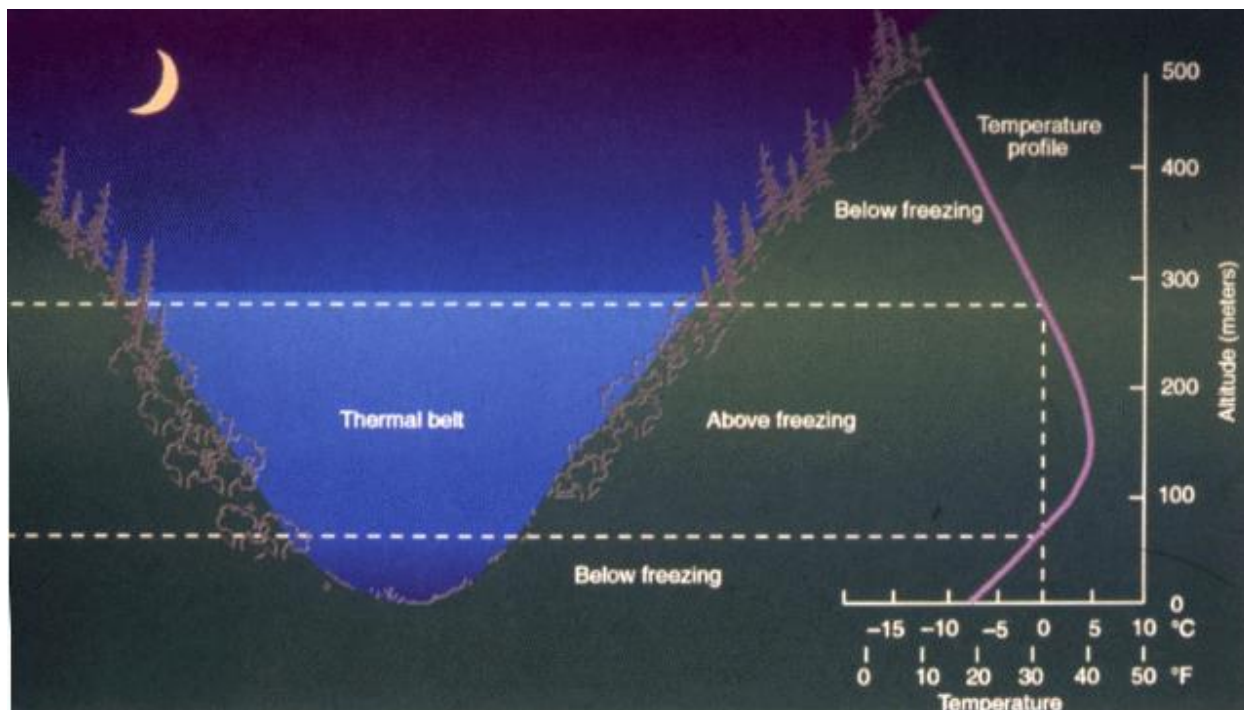
*Figure 4-9 Tule Fog in the Central and San Joaquin Valley of California*



Source: University of California Santa Barbara Department of Geology.

The Great Valley of California (the Sacramento and San Joaquin Valleys) is essentially a closed air basin. Therefore, the introduction of moisture is not removed from the valley air basin unless pushed or lifted out by atmospheric processes. By the late fall, cool season frontal passages begin to bring rain to the valley floor thereby adding low-level atmospheric moisture. High pressure building aloft behind frontal passages after a significant rain event provides moisture at low atmospheric levels, light wind, clear skies, and a temperature inversion aloft. This can be seen in Figure 4-10.

*Figure 4-10 Temperature Inversion Affecting Fog in Valleys like the San Joaquin Valley*



Source: University of California Santa Barbara Department of Geology.

This inversion limits vertical air movement from the valley air basin. Radiational cooling of the ground during the long nights cools the adjacent air and forms fog as temperatures reach dew points. The lack of strong sunshine during the fall and winter daytime hours does not provide sufficient incoming energy to always evaporate the overnight fog development. Thus, fog can and does last several days at a time until the atmosphere provides some form of additional drying or mixing. The combination of the previous mentioned parameters and circumstances provides for a rather dense fog where visibility is often limited to mere feet. It is situations like these that often lead to multi-car accidents where one car follows another into a fog bank. Another area prone to fatal accidents is intersections across major roads or heavily traveled roads, where the cross traffic does not have to stop.

### Advection Fog

Advection fog often looks like radiation fog and is also the result of condensation. However, the condensation in this case is caused not by a reduction in surface temperature, but rather by the horizontal movement of warm moist air over a cold surface. This means that advection fog can sometimes be distinguished from radiation fog by its horizontal motion along the ground.

The fog season in Madera County is typically in the late fall and winter (November through March) but can occur as late as May. Fog typically forms rapidly in the early morning hours. Fog can have devastating effects on transportation corridors in the County. Severe fog incidents can close roads, cause accidents, and impair the effectiveness of emergency responders. These accidents can cause multiple injuries and deaths and can have serious implications for human health and the environment if a hazardous waste shipment is involved.

### *Past Occurrences*

#### Disaster Declaration History

There are no fog related FEMA federal or Cal OES state disaster declarations for Madera County, as shown in Table 4-3.

#### NCDC Events

The NCDC data recorded no fog incidents for Madera County since 1993.

#### Hazard Mitigation Planning Team Events

The HMPC noted the following past events of fog in the County:

- According to data from the California Highway Patrol, 68 fog-related collisions occurred on Highway 99 in Madera County between 1997 – 2008, resulting in three casualties and three persons injured (California Highway Patrol, 2008).
- Additionally, one news report from November 2006 blamed fog for an accident on Highway 145 in Madera County that killed three persons. Regionally, fog has been blamed for some large vehicle accidents. For example, on November 3, 2007, dense fog was blamed for a 100-car pileup in Fresno County on Highway 99 that resulted in two casualties.

### *Likelihood of Future Occurrence*

**Highly Likely** – Based on input from the HMPC, it is likely that major fog events will continue to occur annually in Madera County; thus, the future occurrence of severe fog is highly likely.

#### Climate Change and Fog

It is currently unclear if climate change will have any effect on fog issues in the future. Limited data and research (Johnstone and Dawson in the Proceedings of the National Academy of Sciences) performed for redwood regions in California suggests that the occurrence of summertime fog has declined by 33% over the course of the 20th century.

## 4.2.5. Severe Weather: Heavy Rains and Storms

### *Hazard/Problem Description*

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

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

According to the HMPC, short-term, heavy storms can cause both widespread flooding as well as extensive localized drainage issues. With the increased growth of the area, the lack of adequate drainage systems has become an increasingly important issue. In addition to the flooding that often occurs during these storms, strong winds, when combined with saturated ground conditions, can down very mature trees.

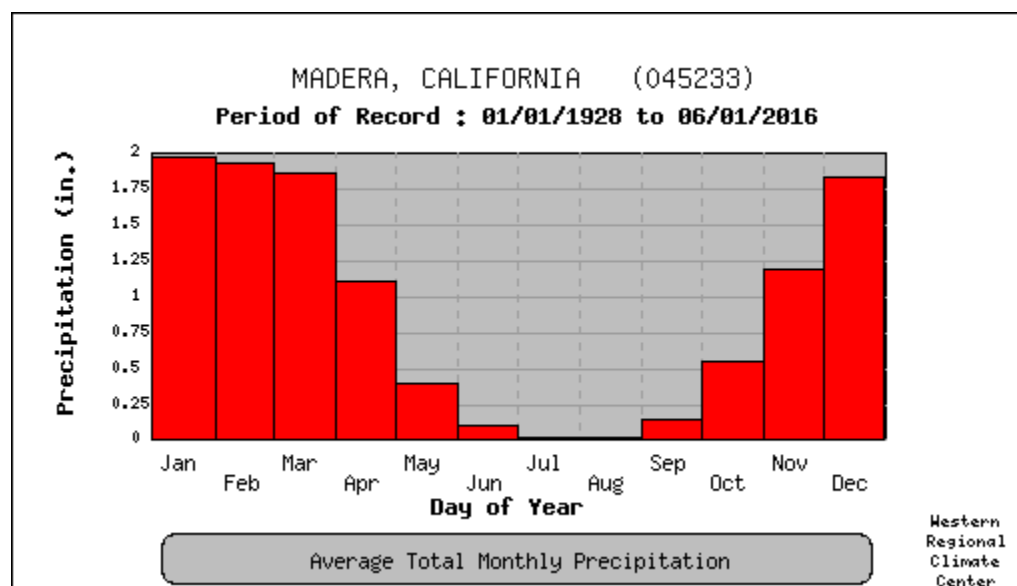
Information from the two representative weather stations introduced in Section 0 Severe Weather: General, is summarized below.

### **Madera County—West (Madera Weather Station, Period of Record 1928 to 2016)**

According to the WRCC, average annual precipitation in the western side of Madera County is 10.99 inches per year. The highest recorded annual precipitation is 22.13 inches in 1983; the highest recorded precipitation for a 24-hour period is 2.60 inches on May 5, 2006. The lowest recorded annual precipitation was 4.73 inches in 1932. Average monthly precipitation for western Madera County is shown in Figure 4-11. Daily average and extreme precipitations are shown in Figure 4-12.

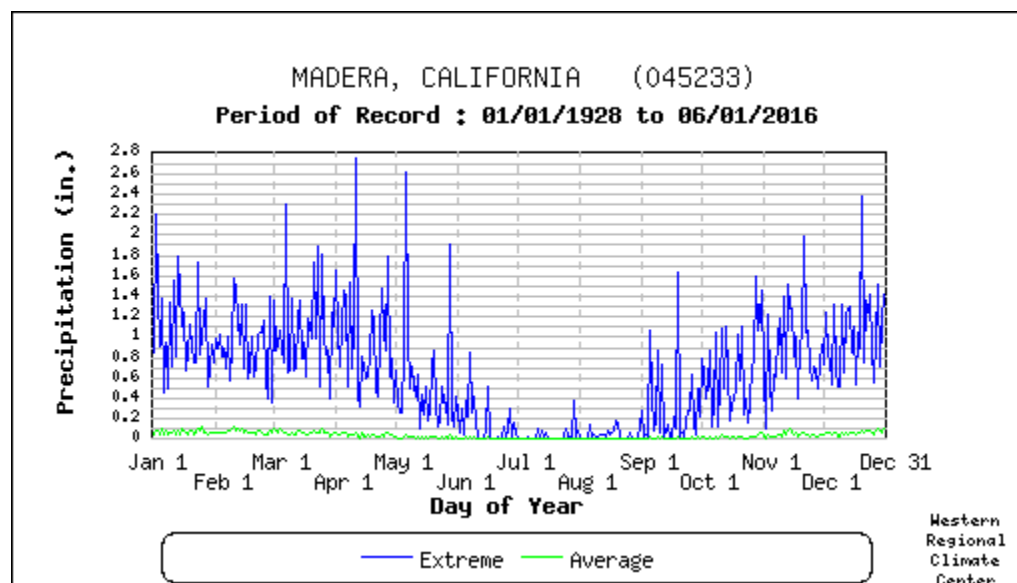


Figure 4-11 Madera County—West Monthly Average Total Precipitation



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

Figure 4-12 Madera County—West Daily Average and Extreme Precipitation

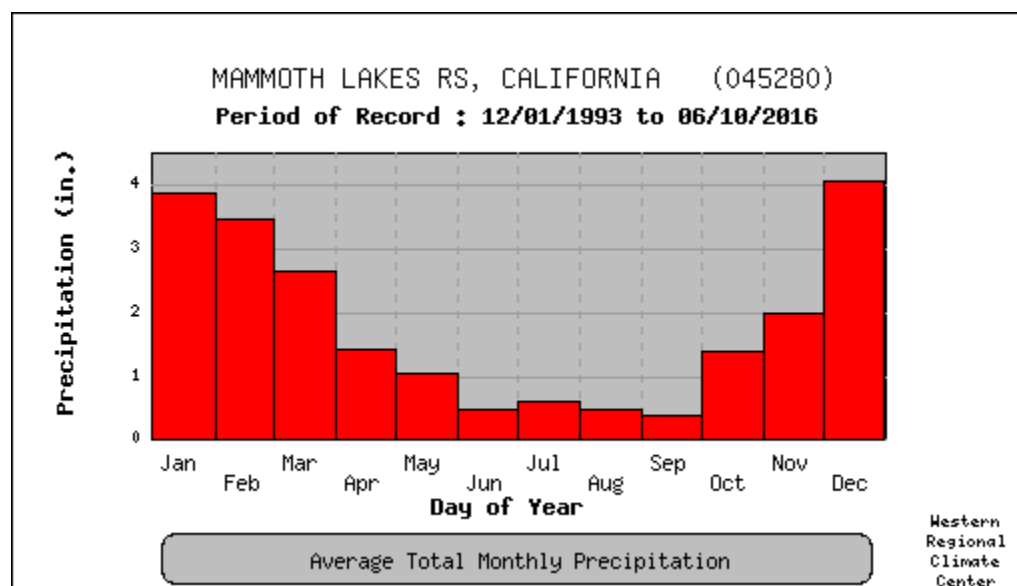


Source: Western Regional Climate Center, [www.wrcc.dri.edu/](http://www.wrcc.dri.edu/)

### Madera County—East (Mammoth Lakes Ranger Station, Period of Record 1993 to 2016)

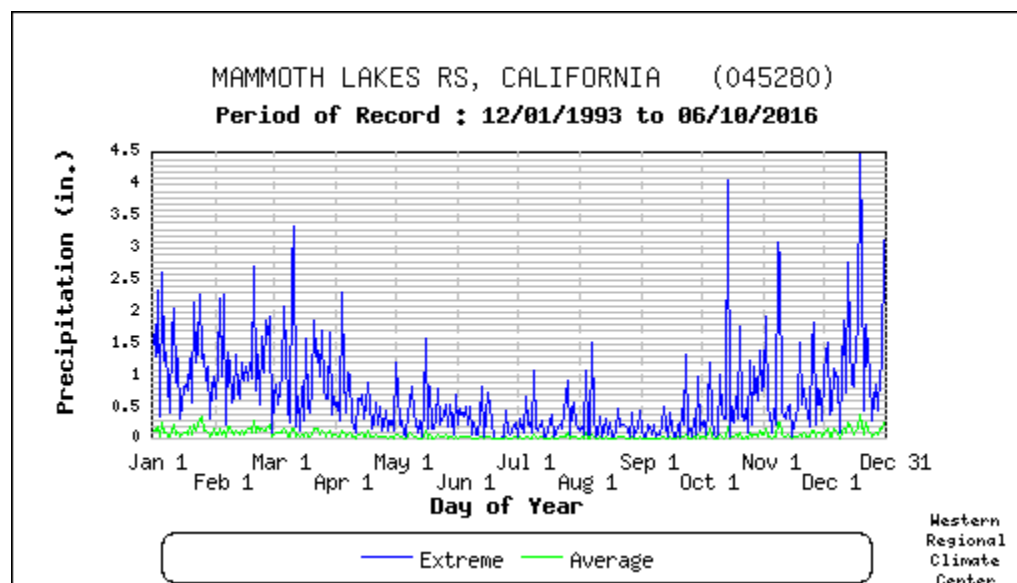
According to the WRCC, average annual precipitation in the eastern portion of Madera County is 22.95 inches per year. The highest recorded annual precipitation is 39.96 inches in 1996; the highest recorded precipitation for a 24-hour period is 4.48 inches on December 19, 2010. The lowest recorded annual precipitation is 14.34 inches in 1999. Average yearly precipitation for eastern Madera County is shown in Figure 4-13. Daily average and extreme precipitations are shown in Figure 4-14.

*Figure 4-13 Madera County—East Monthly Average Total Precipitation*



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

*Figure 4-14 Madera County—East Daily Average and Extreme Precipitation*



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

## Hail

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

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4-14 indicates the hailstone measurements utilized by the National Weather Service.

*Table 4-14 Hailstone Measurements*

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

## Lightning

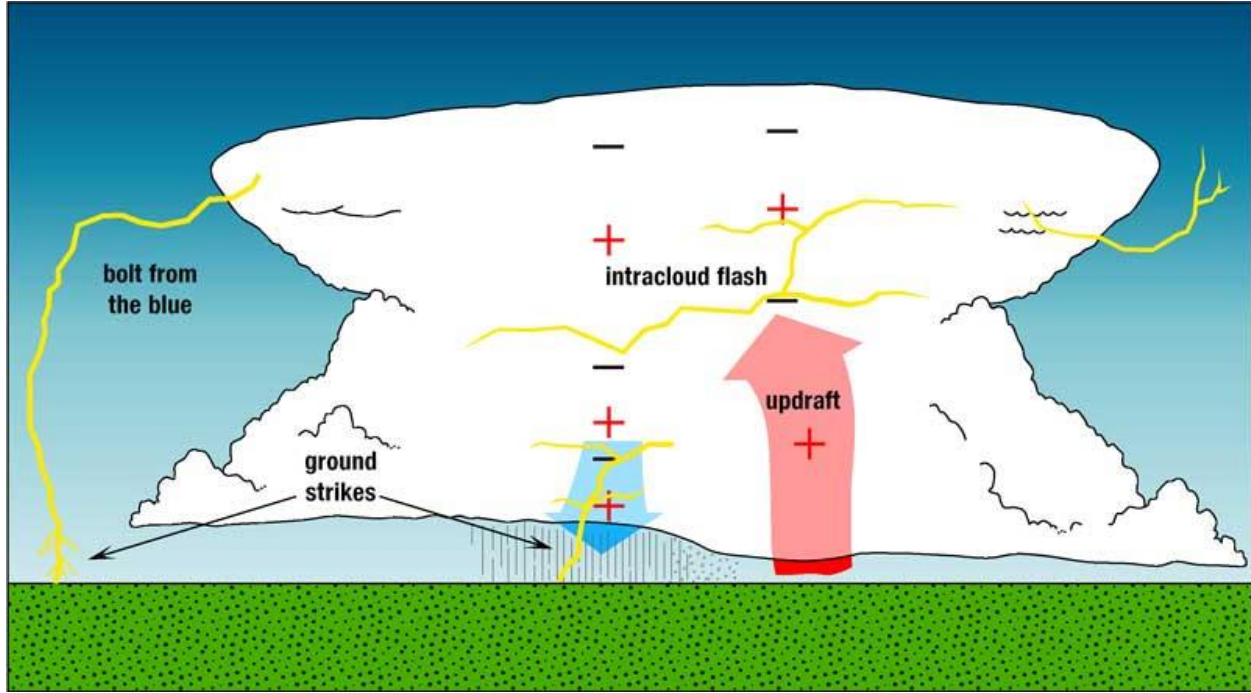
Lightning is defined by the NWS as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck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

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

Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is also less common. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat (see Figure

4-15). Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage.

*Figure 4-15 Cloud to Ground Lightning*



Source: National Weather Service

Lightning in the County is also a concern due to the number of fires that have been started by lightning strikes. Wildfire is discussed in more detail in Section 4.2.19.

### *Past Occurrences*

#### **Disaster Declaration History**

A search of FEMA and Cal OES disaster declarations turned up one state and federal disaster declaration in 2010. These are shown in Table 4-15.

*Table 4-15 Madera County Heavy Rain and Storm Disaster Declarations 1950-2016*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Storms	1	2010	1	2010
<b>Totals</b>	<b>1</b>	<b>–</b>	<b>1</b>	<b>–</b>

Source: Cal OES, FEMA

## NCDC Events

The NCDC data recorded 76 hail, heavy rain, lightning, and thunderstorm wind incidents for Madera County since 1950. A summary of these events is shown in Table 4-16. Non-thunderstorm wind events are discussed in Section 4.2.6, and past events for those hazards are captured in the past events section of that hazard profile. Events in the NCDC database specific to Madera County showing damages, deaths, or injuries are detailed below the table.

*Table 4-16 NCDC Heavy Rains and Storms Events in Madera County 1950-12/31/2016*

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Hail	21	0	0	0	4	\$110,000	\$3,656,000
Heavy Rain	34	0	0	0	0	\$201,000	\$49,060,000
Lightning	7	0	0	0	0	\$32,500	\$0
Thunderstorm Winds	14	0	0	0	0	\$161,000	\$7,800,000
<b>Total</b>	<b>76</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>\$504,500</b>	<b>\$60,516,000</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas

- **April 1, 1997** – A thunderstorm produced gusty wind raising dust, damaging a car port, and moving a vehicle in the road in the Madera Knolls area 2 miles north of Madera. Witnesses report a gust front with little wind before and diminishing wind after the event. Unconfirmed gustnado with the event as radar indicated the thunderstorm cell to the north of the area. Wind speed unable to be determined.
- **February 27, 2000** – Hail from the day's severe weather activity lead to a multiple-car accident on heavily travelled State Highway 99 on the northbound on-ramp from Avenue 12 in Madera County. \$30,000 in damages and 4 injuries were attributed to the hailstorm.
- **April 1-30, 2003**– April and the first half of May 2003 in the Central and Southern San Joaquin Valley was marked by unusual and persistent cool, wet weather. Normally summer agricultural operations are in full swing by the 1st week in April. Despite a relatively dry November through March period for the area, the month of April was the 7th wettest with 2.84" of rain (2.08" above normal) since records began in Fresno in 1888 and the wettest since 1978 when 2.85" fell. The average temperature of 58.6F in Fresno for April was the coldest since 57.2F in 1976. Other sites in the San Joaquin Valley were similarly affected leading to the crop damage assessments. Cherries were the hardest hit in Fresno County; cotton planting was hurt the most in Madera County; and, alfalfa the worst in Kings County. In total, \$13.2 million in damages were due to this weather, though not all in Madera County.
- **April 4, 2003** – Hail varying from pea-size to 5/8" fell on Highway 99 from northwest of Madera southeastward into the Fresno metropolitan area. Traffic was brought to a standstill due to the heavy rain and small hail due to this cell. Several traffic accidents were attributed to the event. \$50,000 in damages were attributed to this hailstorm, but no injuries or deaths occurred.
- **May 1 to 15, 2003** – As reported in the April 2003 time period, abnormally cool and wet weather persisted well into the Spring in the Central San Joaquin Valley. In addition to the damage reported in the April report to various crops in the Central San Joaquin Valley, the Madera and Kings County Ag Commissioners also reported that the wheat crop in their respective counties were additionally afflicted with striped rust disease due to the cool, wet April and early May. An additional \$7.81 million in damages were reported, though not all in Madera County.

- **May 5, 2005** – Madera received 1.42" of rain during a 24-hour period ending by early on the 6th with over half of that occurring between Noon and 3 PM PST on the 5th from afternoon thunderstorms. Water collecting on a roof in downtown Madera led to its collapse and subsequent damage in mid-afternoon. Numerous locations around Madera had street flooding with other reported flooding in Madera County including a freeway offramp in the city of Madera as well as rural roadway flooding 14 miles east of Madera. Chowchilla, in Madera County, reported 1.34" in the 24-hour period ending on the 6th. Over \$200,000 in property damages were reported due to the storm.
- **April 2, 2006** – Interior Central California came under an inclement weather period where rain fell daily for the first 5 days of the month. Rainfall accumulations were quite substantial and combined with already saturated soils led to extensive urban and rural ponding as well as several cases of local flooding due to high water in small streams, canals, and creeks. Within the first 5 days of the month, Bald Mountain received over 14 inches of rain in the Madera County portion of the S. Sierra Nevada. The near-continual inclement weather through March and into early April took its toll on area agriculture due to flooded fields, heavy rain on field crop produce and deciduous orchard fruit, much below normal temperatures, and hail events. In total, \$16.6 million in crop damages were reported, though not all in Madera County.
- **May 27, 2009** – A trained SKYWARN weather spotter reported numerous windshields broken in the Coarsegold area and along SR 41 near the Chukchansi Casino due to large hail.
- **October 3, 2010** – Showers and thunderstorms redeveloped during the afternoon and evening of the 3rd. On the night of the 3rd, and into the early morning hours of the 4th, quite a few thunderstorms developed over the Hanford and Visalia areas, and spread northward into Fresno, Madera, and Mariposa. Lightning was quite frequent with these storms, and large hail about the size of half-dollars (1.25 inches) was reported near Mariposa around 1:00 AM on the 4th. Tree down and roof damage to a house in Yosemite Lakes Park. \$75,000 in damages were reported.

### Hazard Mitigation Planning Team Events

The Planning Team noted that heavy rains and storms are an annual occurrence, but noted no other events that caused damages, deaths, or injuries that weren't covered above.

### *Likelihood of Future Occurrence*

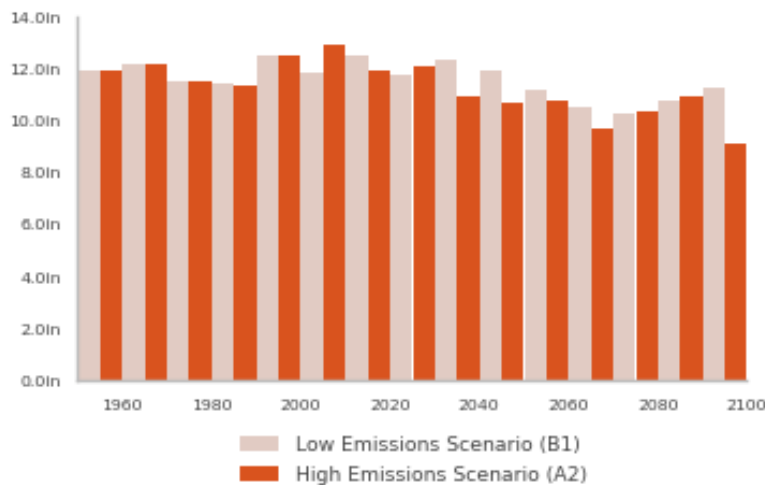
**Highly Likely** – Based on NCDC data and HMPC input, 76 heavy rain, hail, lightning, tornado, and thunderstorm wind incidents over a 67-year period (1950-2016) equates to a severe storm event every year and a 100 percent chance of a severe storm in any given year. This database doesn't report all heavy rain, hail, lightning, or thunderstorm wind events. Severe weather, including heavy rains and storms, is a well-documented seasonal occurrence that will continue to occur annually in the Madera County Planning Area.

### Climate Change and Heavy Rains and Storms

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

Cal-Adapt noted that, on average, the projections show little change in total annual precipitation in California. Furthermore, among several models, precipitation projections do not show a consistent trend during the next century. The Mediterranean seasonal precipitation pattern is expected to continue, with most precipitation falling during winter from North Pacific storms. One of the four climate models projects slightly wetter winters, and another projects slightly drier winters with a 10 to 20 percent decrease in total annual precipitation. However, even modest changes would have a significant impact because California ecosystems are conditioned to historical precipitation levels and water resources are nearly fully utilized. Future precipitation estimates for the County are shown in Figure 4-16.

*Figure 4-16 Madera County– Future Precipitation Estimates: High and Low Emission Scenarios*



Source: Cal-Adapt – Precipitation: Decadal Averages Map

#### 4.2.6. Severe Weather: Wind and Tornado

##### *Hazard/Problem Description*

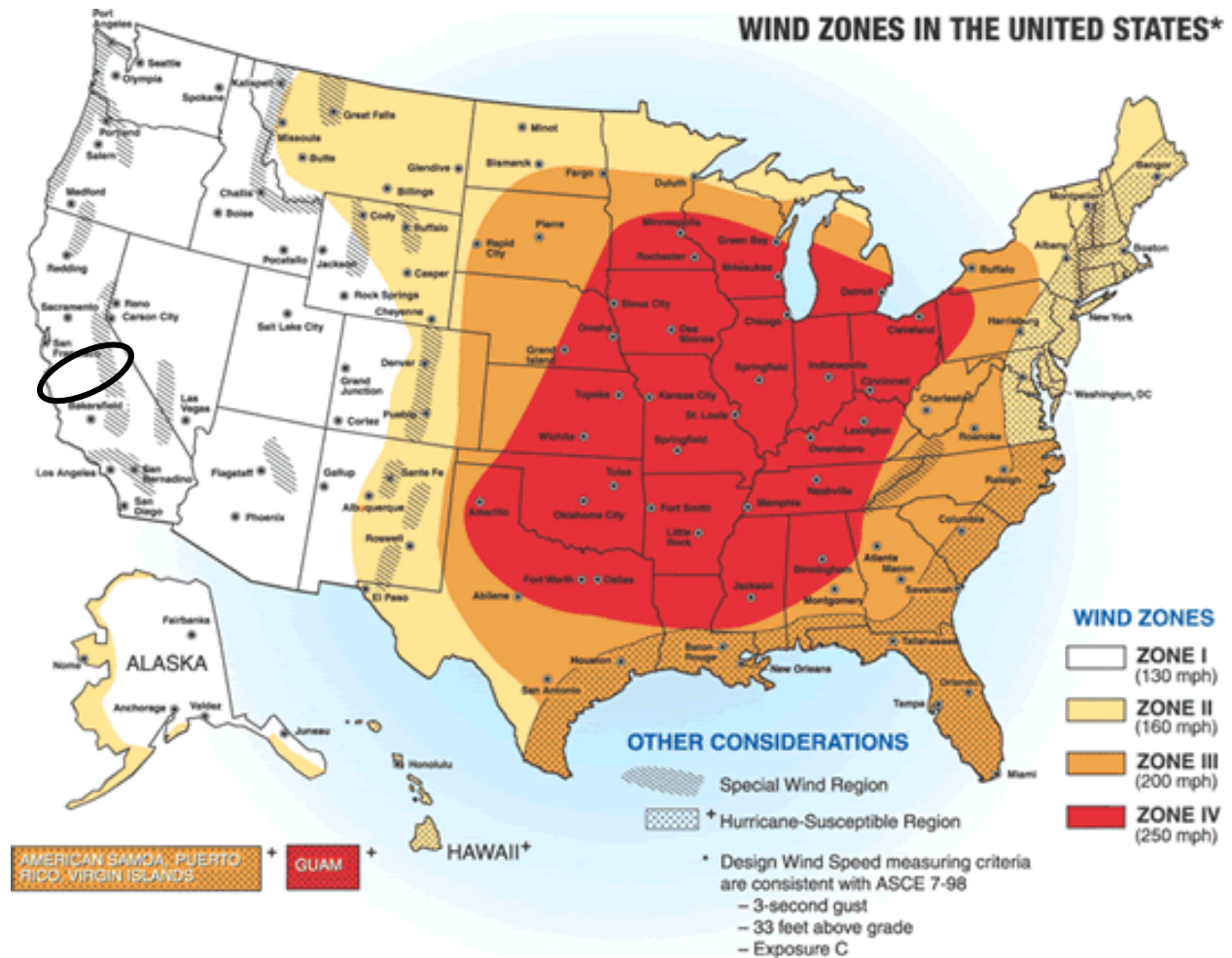
##### Winds

High winds, often accompanying severe storms and thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss.

The Planning Area is subject to significant, non-tornadic (straight-line), winds. High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. These winds may occur as part of a seasonal climate pattern or in relation to other severe weather events such as thunderstorms. Straight-line winds may also exacerbate existing weather conditions by increasing the effect on temperature and decreasing visibility due to the movement of particulate matters through the air, as in dust and snow storms. The winds may also exacerbate fire conditions by drying out the ground cover, propelling fuel around the region, and increasing the ferocity of exiting fires. These winds may damage crops, push automobiles off roads, damage roofs and structures, and cause secondary damage due to flying debris.

Figure 4-17 depicts wind zones for the United States. The map denotes that Madera County falls into Zone I, which is characterized by high winds of up to 130 mph. Portions of the County also fall into a Special Wind Region.

*Figure 4-17 Wind Zones in the United States*



Source: Federal Emergency Management Agency

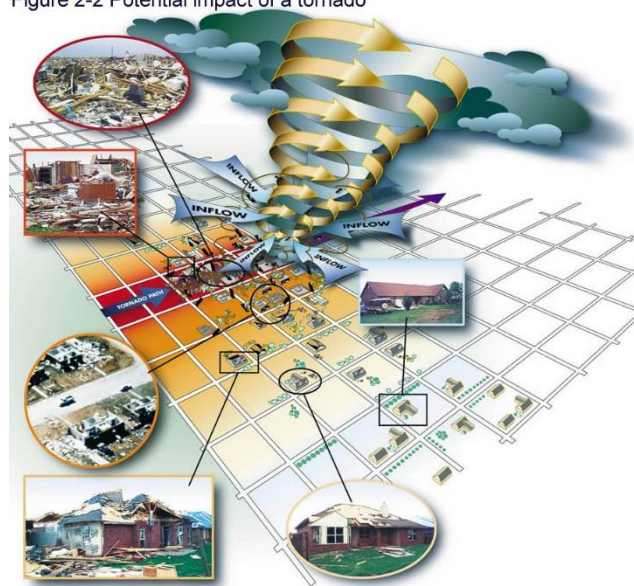
## Tornadoes

Tornadoes and funnel clouds can also occur during these types of severe storms. Tornadoes are another severe weather hazard that can affect the Madera County Planning Area, primarily during the rainy season in the late fall and early spring. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential across a path only 300 yards wide or less as 300-mile-wide hurricanes. Figure 4-18 illustrates the potential impact and damage from a tornado.



Figure 4-18 Potential Impact and Damage from a Tornado

Figure 2-2 Potential impact of a tornado



## Potential Impact and Damage From a Tornado

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

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

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

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. Table 4-17 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4-18 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4-17 Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

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

**Table 4-18 Enhanced Fujita Scale**

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

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

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

### *Past Occurrences*

### **Disaster Declaration History**

There have been no state or federal disaster declarations related to high winds or tornadoes in Madera County, according to Table 4-3.

### **NCDC Events**

The NCDC data recorded 139 high wind and tornado incidents for Madera County since 1950. A summary of these events is shown in Table 4-19. Events in the NCDC database specific to Madera County showing damages, deaths, or injuries are detailed below the table.

**Table 4-19 NCDC High Wind and Tornado Events in Madera County 1950-12/31/2016**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Dust Devil	1	0	0	0	0	\$500	\$0
Dust Storm	4	0	0	0	0	\$0	\$0
Funnel Cloud	14	0	0	0	0	\$0	\$0
Heavy Wind	2	0	0	0	0	\$0	\$0

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
High Wind	32	0	0	0	4	\$11,795,000	\$150,000
Strong Wind	64	0	0	0	0	\$1,473,400	\$57,000
Thunderstorm Winds	14	0	0	0	0	\$161,000	\$7,800,000
Tornado	8	0	0	0	0	\$147,750	\$30,000
<b>Total</b>	<b>139</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>\$13,577,650</b>	<b>\$8,037,000</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas

- **January 10, 2001** – The west side of the Central San Joaquin Valley had measured wind to 37 MPH at Los Banos in a pre-frontal environment while the east side of the Central San Joaquin Valley had reports of gust to 39 MPH at Merced and 37 MPH at Madera. Rain and wind on the valley floor did lead to a 6-vehicle pileup in nearby Fresno.
- **March 4, 2001** – In the vicinity of Coarsegold and other foothill communities of the Southern Sierra Nevada gusty wind up to 55 MPH caused power lines to be downed and resulted in the loss of power to 15,000 utility customers. In total, \$100,000 damages were reported in Madera County.
- **February 2, 2004** – About three dozen telephone poles were toppled by heavy wind 2.5 miles NNW of Easton south of Fresno. Additional power poles were toppled just east of Madera. Locally heavy rain with the mid-afternoon frontal passage also indirectly caused numerous vehicle accidents on flooding roads.
- **November 21, 2004** – Into the morning of the 21st the winds shifted to northeast and developed a classic “Mono Wind” event (NE to SW offshore wind flow) through the Southern Sierra Nevada Mountains and Foothills in the vicinity of Yosemite. Trees were downed in the forests in and around El Portal and Foresta in Mariposa County with some property damage occurring due to the gusty wind in Madera County foothill communities of Oakhurst and Ponderosa Basin. During the morning hours of the 21<sup>st</sup> there were 3,600 mountain customers without power due to downed power lines in at least 24 locations. In total, \$100,000 damages were reported in Madera County.
- **October 3, 2010** – On the night of the 3rd, and into the early morning hours of the 4th, quite a few thunderstorms developed over the Hanford and Visalia areas, and spread northward into Fresno, Madera, and Mariposa. Lightning was quite frequent with these storms, and large hail of 1.25 inches was reported near Mariposa around 1:00 AM on the 4th.
- **December 1, 2011** – December began with an upper-level trough over the region and a low pressure center over the Desert Southwest. Northeast winds flowed around the low and knocked over numerous power line poles and trees throughout the central San Joaquin Valley, the Sierra Nevada foothills and Yosemite National Park. Fresno was also hit hard by power outages due to downed poles; this prompted a local emergency in the city during the afternoon of the 1st. Fresno County reported about \$2 million in damages due to the strong winds. Numerous large trees were downed in Yosemite National Park, with power outages and blocked roads in Yosemite Valley. Officials at Devils Postpile National Monument in eastern Madera County reported widespread forest destruction in the monument with numerous large trees downed. In addition, roads were closed for months and several outbuildings were also damaged. An automated station at the summit of Mammoth Mountain a few miles to the east of Devils Postpile recorded sustained wind speed of 150 mph, and gusts in excess of 150 mph (the limit of the anemometer). Therefore, wind gusts with this storm were estimated around 200 mph at the peak of the event early on December 1<sup>st</sup>. Red's Meadow in Devils Postpile is aligned in a NNE to SSW direction which favored the extreme downslope wind pattern from the nearby Sierra Peaks during this

storm. The historic magnitude and duration of this event was caused primarily by an extreme pressure gradient set up between strong low pressure in the desert SW and strong high pressure off the Pacific NW coast. This high wind event was known as a severe and relatively rare Mono Wind event; where winds flow over the Sierra Nevada and down into the foothills from the east instead of the typical westerly direction. These winds allow the air to warm adiabatically; temperatures rose dramatically in much of the San Joaquin Valley compared to the previous day. In all, \$10 million in damages were sustained, though not all in Madera County.

## Hazard Mitigation Planning Team Events

The Planning Team noted that winds are an annual occurrence in the County. Tornadoes may happen, but are more rare. The Planning Team noted no other events that caused damages, injuries, or deaths that were not covered above.

### *Likelihood of Future Occurrence*

**Highly Likely** – Based on NCDC data and HMPC input, 139 wind and tornado incidents over a 67-year period (1950-2016) equates to a severe wind event every year and a 100 percent chance of a severe wind event in any given year. Winds and, to a lesser extent, tornadoes are well-documented seasonal occurrence that will continue to occur annually in the Madera County Planning Area.

## Climate Change and High Winds/Tornadoes

According to the CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual events is likely to increase during the 21st century. This may bring stronger thunderstorm winds. The number of tornadoes is not projected to change.

### 4.2.7. Severe Weather: Winter Storms and Snow

#### *Hazard/Problem Description*

According to the NWS and the WRCC, winter snow storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, closing roads, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

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

The western portion of the Madera County Planning Area does experience rare snowfall on a seasonal basis; however, the and eastern portions of the County receive an abundance of snow, mostly between the months

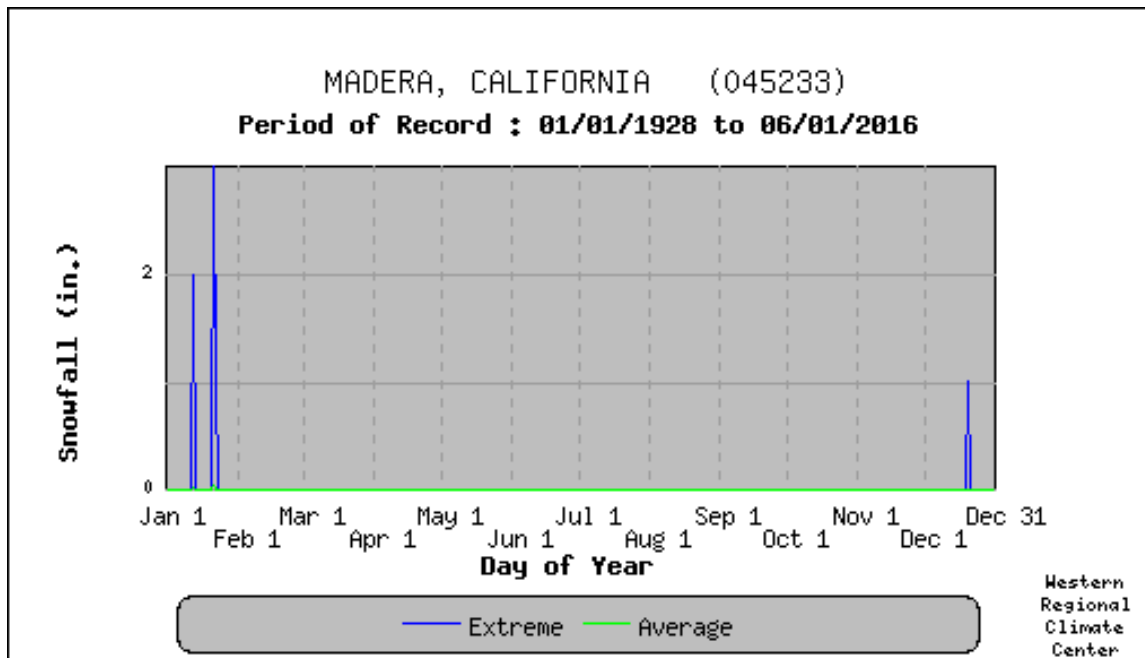
of November through March. Winter snow storms in this part of the County, including strong winds and blizzard conditions, can result in localized power and phone outages and closures of streets, highways, schools, businesses, and nonessential government operations. During periods of heavy snow there is also an increase in the number and severity of traffic accidents. People can become isolated in their homes and vehicles and are unable to receive essential services. Snow removal costs can impact budgets significantly. Heavy snowfall during winter can lead to flooding or landslides during the spring if the area snowpack melts too quickly and can also create numerous challenges for emergency responders. The HMPC noted that Bass Lake can have problems with buried fire hydrants, but snow has to remain for more than 24 hours.

Information from the two representative weather stations introduced in Section 0 Severe Weather: General is summarized below for the western and eastern portions of the County.

**Madera County—West (Madera Weather Station, Period of Record 1928 to 2016)**

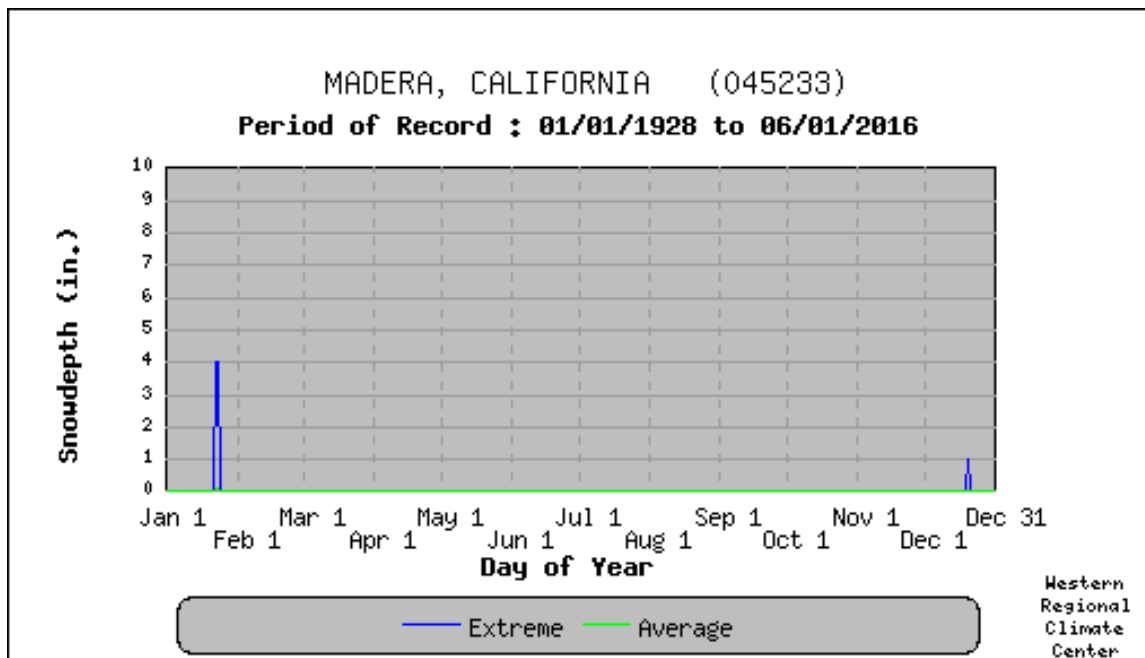
According to the WRCC, in the western portion of Madera County, average snowfall is 0.1 inches, as shown in Figure 4-19. The highest annual snowfall fell in 1962, when 4.0 inches fell. Highest monthly snowfall accumulation came in January of 1962, when 4.0 inches fell. Average snowdepths in January through March fall at 0.1 inches. This can be seen in Figure 4-20.

*Figure 4-19 Madera County—West Snowfall Averages and Extremes*



Source: Western Regional Climate Center

Figure 4-20 Madera County—West Snowdepth Averages and Extremes

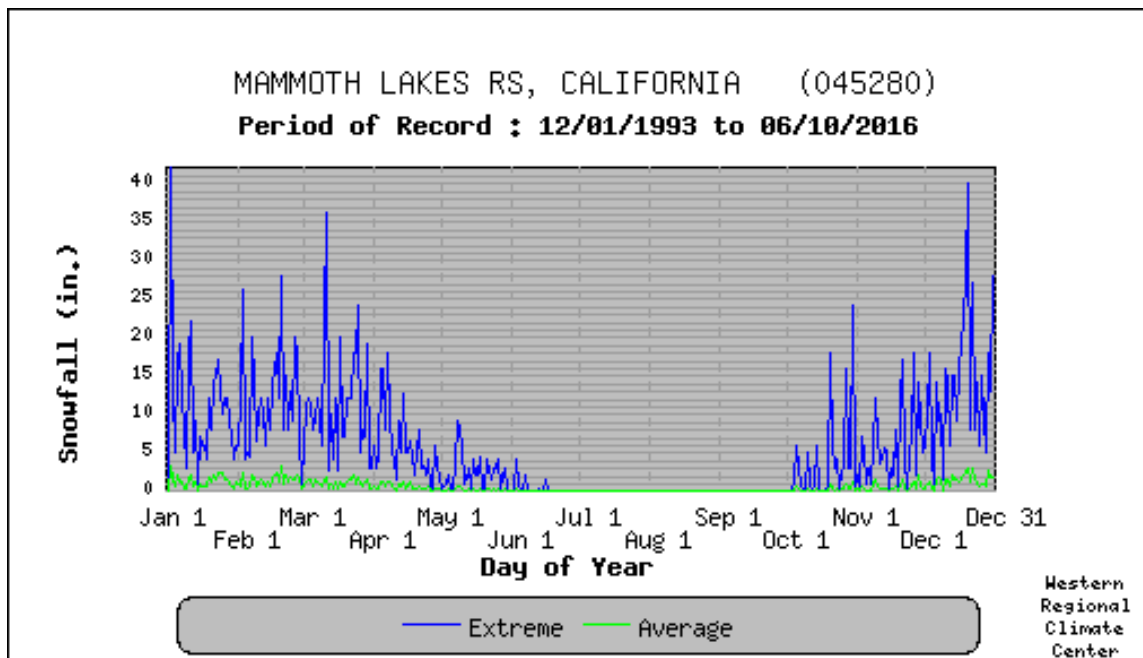


Source: Western Regional Climate Center

### Madera County—East (Mammoth Lakes Ranger Station Weather Station, Period of Record 1993 to 2016)

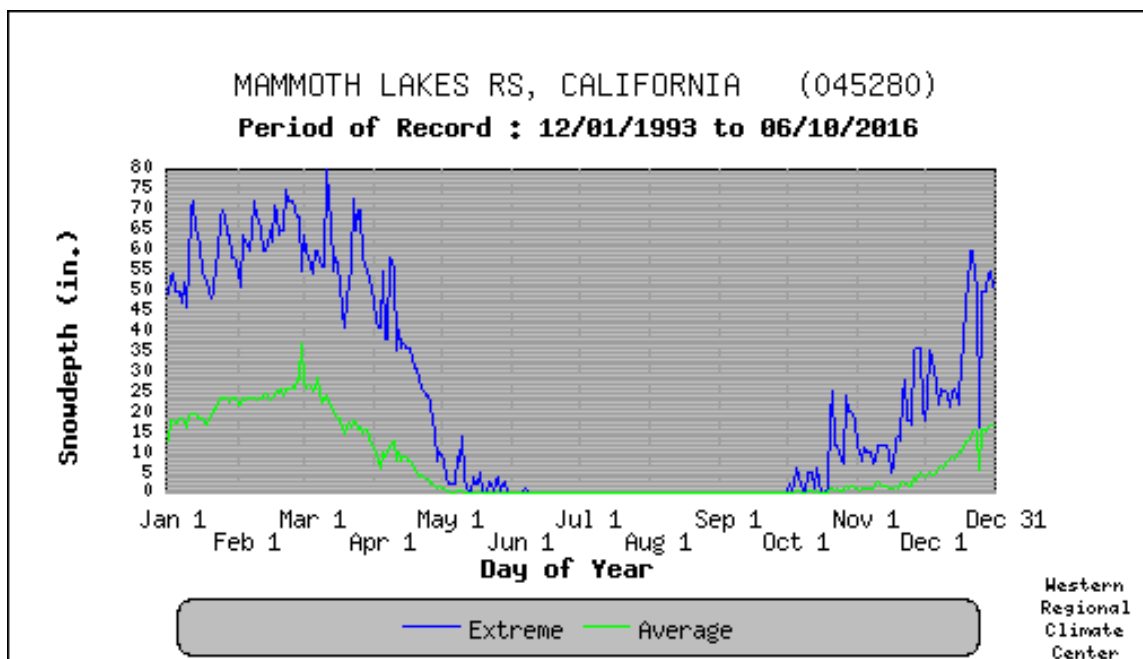
According to the WRCC, average snowfall on the eastern side of the County is 206 inches, as shown in Figure 4-21. The highest annual snowfall fell in 2010, when 303.8 inches fell. Highest monthly snowfall accumulation came in February of 1988, when 140.0 inches fell. Average snowdepths in January through March fall between 18 and 30 inches. This can be seen in Figure 4-22.

Figure 4-21 Madera County—East Snowfall Averages and Extremes



Source: Western Regional Climate Center

Figure 4-22 Madera County—East Snowdepth Averages and Extremes

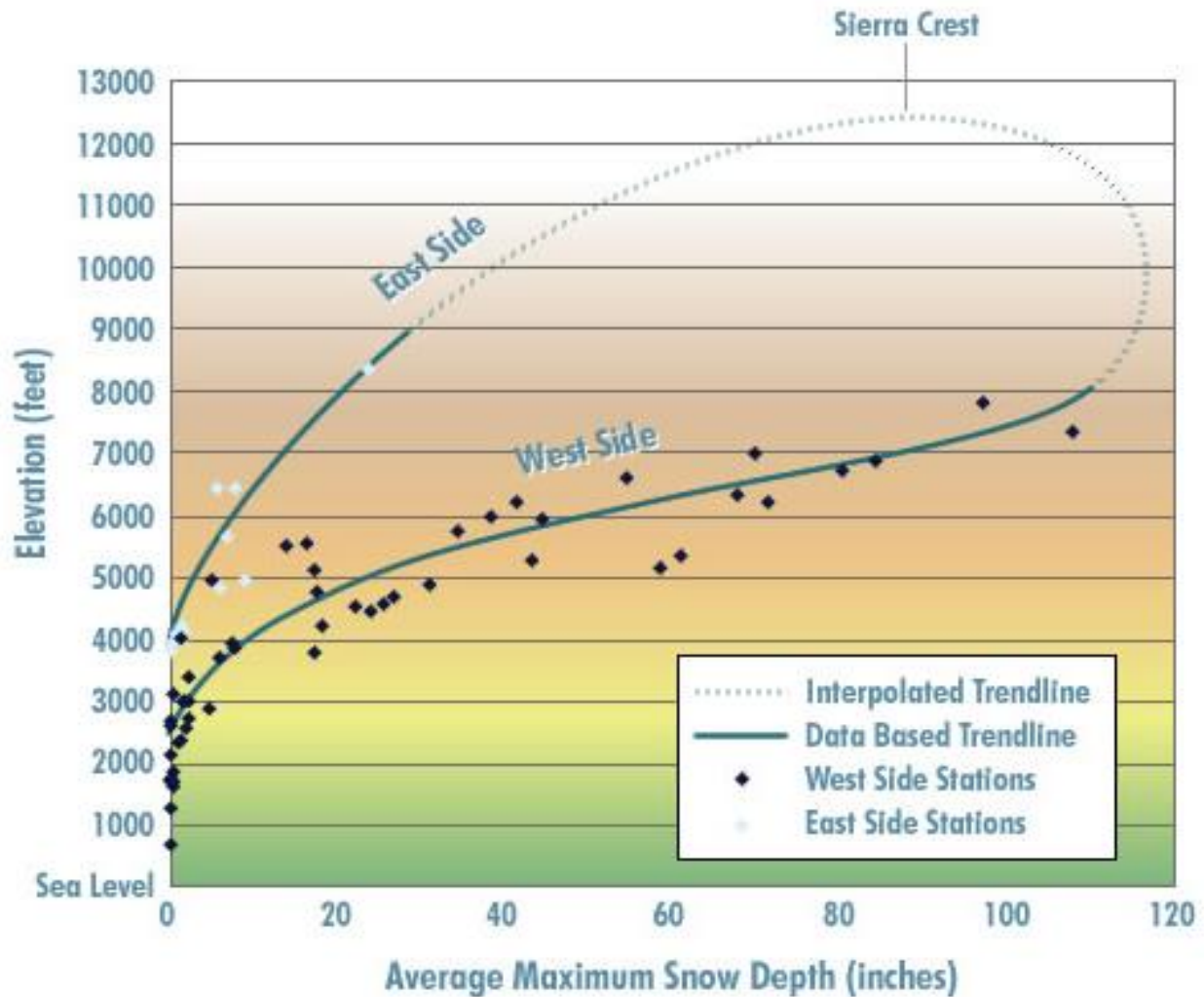


Source: Western Regional Climate Center

Snow accumulation does not directly follow precipitation in the Sierra Nevadas. While the greatest total precipitation occurs in the northern part of the range, the greatest snow accumulation occurs in the central and high southern parts of the range, due to higher elevations and colder temperatures which inhibit snow melt. The western slope of the Sierra Nevada acts as trap for winter storms, wringing out the moisture

before it can get to the east side. Weather stations located on the west side begin registering measurable snow between 2,500 and 3,000 feet elevation. On the east side, measurable snow accumulation doesn't begin until about 4,000 feet and increases more slowly with altitude. Snow depths drop dramatically on the east side of the range due to the rain shadow effect as illustrated in the comparative east side/west side snow depth chart shown on Figure 4-23.

Figure 4-23 Snow Accumulation with Directional Variations

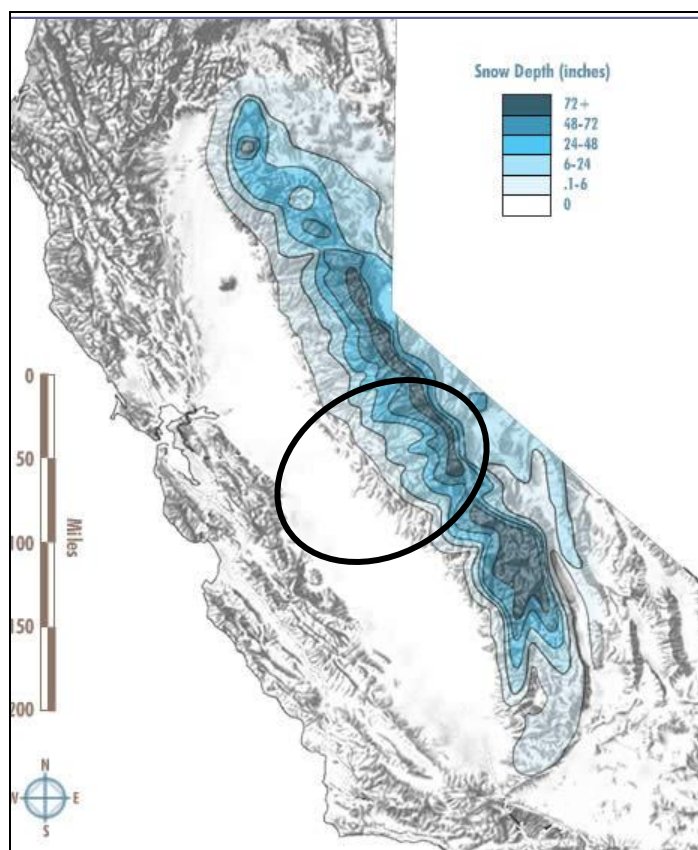


Source: [http://www.sierranevadaphotos.com/geography/east\\_west\\_snow\\_depth.html](http://www.sierranevadaphotos.com/geography/east_west_snow_depth.html)

Figure 4-24 shows the average maximum measured snow depth in the Sierra Nevada for the month of March (the month of greatest average snow depths).



*Figure 4-24 Average Maximum Snow Depths of Sierra Nevada Mountains in March*



Source: [http://www.sierranavadaphotos.com/geography/snow\\_depth.asp](http://www.sierranavadaphotos.com/geography/snow_depth.asp)

## *Past Occurrences*

### Disaster Declaration History

There have been no state and federal disaster declarations related to winter storm and snow, as shown in Table 4-3.

### NCDC Events

The NCDC data recorded 311 winter storm and snow incidents for Madera County since 1993. A summary of these events is shown in Table 4-20. Specific events from the NCDC database that caused injuries, deaths, or damages in Madera County are discussed below the table.

*Table 4-20 NCDC Winter Storm and Cold Events in Madera County 1993 to 12/31/2016\**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Heavy Snow	75	0	0	0	0	\$0	\$0
Winter Storm	181	2	0	0	0	\$3,125,000	\$0
Winter Weather	55	0	1	0	0	\$282,000	\$0

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
<b>Total</b>	<b>311</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>\$3,407,000</b>	<b>\$0</b>

Source: NCDC

\*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

- **March 20 to 25, 2011** – The heavy rains caused some road flooding on the San Joaquin Valley floor, as well as on Interstate 5 north of Fort Tejon before the mountain rain turned to snow. Up to 4 feet of snow fell at Frazier Park; the strong winds created drifts as high as 6 feet deep. Snow caused the closure of Interstate 5 over the Grapevine, and snow even fell on the Temblors and Diablo Range along the west side of the San Joaquin Valley. In Yosemite National Park and the surrounding area, winds toppled trees and downed power lines, and the combination of heavy snow and rock slides closed roads into the Park. This was the first time since the floods of January 1997, that Yosemite National Park was closed due to weather. Heavy snow and downed oak trees also plagued the El Portal and Wawona areas. Due to the power outages, Yosemite park officials evacuated some visitors to the park for a period of time due to the extensive impacts from this storm. In total \$3.0 million in damages was reported.

### Hazard Mitigation Planning Team Events

The Planning Team noted that winter storms occur each year, with varying degrees of strength. Much of the eastern County is in areas that see large amounts of snow. These areas are more sparsely populated, and people who reside there are prepared for the snows. No other events with damages, deaths, or injuries were noted by the Planning Team.

### *Likelihood of Future Occurrence*

**Highly Likely**—Extreme cold and freeze are likely to continue to occur annually in the Madera County Planning Area. This is primarily true for the eastern portion of the County where elevations are higher. Closure of roads and highways due to blowing snow is a common and annual event above 5,000 feet in the Sierra Nevada.

### Climate Change and Snow

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

## 4.2.8. Agricultural Hazards

### *Hazard/Problem Description*

Agriculture has always been an integral part of Madera County and the industry continues to grow and change along with the County. In agricultural value, the 2015 Madera County Agricultural Commissioner

Crop Report noted that Madera County is the 9<sup>th</sup> most productive county in California. Madera County is an important producer of grapes, cotton, alfalfa, fruit, nuts, livestock, milk, poultry, and other agricultural products on approximately 660,700 acres of harvested land. Agriculture accounts for approximately 30% of the employment in the County making it the largest industry.

Today, the soils and climate of Madera County make it an ideal area to sustain many agricultural endeavors. Agriculture in Madera County is a mosaic of farm land intermingled with other uses in the rural setting which typifies the County. This land provides marketable products, open space, wildlife habitat, watershed and an aesthetic environment.

### Important Farmland

According to the California Department of Conservation’s Farmland Mapping and Monitoring Program (FMPP), the County has approximately 97,962 acres of prime farmland, 85,056 acres of farmland of statewide importance, 176,042 acres of unique farmland, 10,315 acres of farmland of local importance, and 389,942 acres of grazing land. These numbers have been slightly reduced since 2004 due to increased development in the County. (see Table 4-21).

*Table 4-21 Madera County Farmland Inventory, 2004 and 2014*

Soil Category	2004 Acres	2014 Acres
Prime Farmland	99,561	97,962
Farmland of Statewide Importance	86,040	85,056
Unique Farmland	163,888	176,042
Farmland of Local Importance	18,799	10,315
Grazing Land	399,290	389,942
Urban and Built-Up Land	24,975	28,730
Water	62,425	66,978
Other Land	6,063	6,051
<b>Total Area Inventoried</b>	<b>861,041</b>	<b>861,076</b>

Source: State of California Department of Conservation Farmland Mapping and Monitoring Program, [www.conservation.ca.gov/](http://www.conservation.ca.gov/)

### Madera County Agriculture Industry

According to the 2015 crop report, the gross value of all production for the County was \$2,017,446,000. This was a decrease of \$248,435,000 (10.96%) over the 2014 production. This was mainly due to a decrease in some commodity prices as market prices stabilized. Crop values can vary from year to year due to the variables of production, markets, and weather conditions. Almonds (nut meats and hulls) retained the top crop rank for the sixth year in a row, with a value of \$787,609,000; although there was a decrease in the price per ton from 2014, this was somewhat offset by an increase of acreage. Grapes overtook milk for second place, and milk took the third spot. Pistachios came in fourth, while cattle and calves came in at the fifth ranking.

A summation of crop values from 2010-2015 is shown in Table 4-22.

*Table 4-22 Madera County Crop Values 2010 to 2015*

INDUSTRY	2010 Value	2011 Value	2012 Value	2013 Value	2014 Value	2015 Value
Apiary Products	\$27,690,000	\$28,758,000	\$30,840,000	\$33,873,000	\$41,567,000	\$46,542,000
Field Crops	\$46,416,000	\$111,256,000	\$104,406,000	\$87,592,000	\$80,092,000	\$73,570,000
Fruit & Nut Crops	\$832,521,000	\$923,749,000	\$1,137,095,000	\$1,268,362,000	\$1,506,631,000	\$1,402,939,000
Forest Products	\$453,000	\$486,000	\$1,090,000	\$1,265,000	\$501,000	\$1,055,000
Livestock/Poultry	\$104,832,000	\$107,721,000	\$117,440,000	\$114,935,000	\$142,600,000	\$154,021,000
Livestock/Poultry Products	\$255,975,000	\$344,433,000	\$296,599,000	\$330,928,000	\$422,034,000	\$262,057,000
Nursery Products	\$24,445,000	\$19,057,000	\$17,109,000	\$18,908,000	\$23,178,000	\$26,725,000
Vegetable Crops	\$23,275,000	\$34,061,000	\$34,832,000	\$40,681,000	\$49,278,000	\$50,537,000
<b>Grand Total</b>	<b>\$1,348,505,000</b>	<b>\$1,569,521</b>	<b>\$1,739,411</b>	<b>\$1,896,544,000</b>	<b>\$2,017,446,000</b>	<b>\$2,265,881,000</b>

Source: Madera County Agricultural Commissioner's Reports, 2010-2014

According to the HMPC, agricultural losses occur on an annual basis and are usually associated with severe weather events, including heavy rains, floods, heat, and drought. The 2013 State of California Multi-Hazard Mitigation Plan attributes most of the agricultural disasters statewide to drought, freeze, and insect infestations. Other agricultural hazards include fires, floods, crop and livestock disease, and noxious weeds.

### Natural Disasters and Severe Weather

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

### Insect Pests

Madera County is threatened by a number of insects that, under the right circumstances, can cause severe economic and environmental harm to the agricultural industry. Insects of concern to plants and crops include:

- Caribbean Fruit Fly
- Mediterranean Fruit Fly)
- Melon Fly
- Mexican Fruit Fly
- Olive Fruit Fly
- Oriental Fruit Fly
- Apple Maggot
- Gypsy Moth

- Japanese Beetle
- Khapra Beetle
- European Corn Borer
- European Pine Shoot Moth

The Madera County Department of Agriculture traps and monitors all of these agricultural pests. Pest detection is a proactive program that seeks to identify exotic, invasive insects. These pests have a wide host ranges and are difficult and costly to manage once established. Early detection is essential for quick and efficient eradication. Public participation is critical to the success of this program, since staff relies on the goodwill of property owners who allow traps to be placed on their properties. The Integrated Pest Control Program strives to eradicate small infestations of new pests before they become widespread. Currently, Pink Bollworm (*Pectinophora gossypiella*), a non-established and economically significant pest of cotton, is controlled by post-season plowdown of cotton plants. This ensures destruction of habitat for the destructive pest. The Glassy-Winged Sharpshooter Program utilizes traps and surveys to detect and control the pest. The sharpshooter is particularly threatening to Madera County agriculture because it is a vector for Pierce's Disease, a potentially catastrophic disease of vineyards. This office devotes time to trapping, as well as inspecting incoming shipments of plant material which may be carrying the sharpshooter or its egg masses.

## Weeds

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

*Table 4-23 Madera County Weeds of Concern*

Species of Concern					
<b>High</b>					
Giant reed	Red brome	Downy brome	Spotted knapweed	Yellow starthistle	Jubatagrass
Pampasgrass	Scottish broom	Water hyacinth	French broom	English ivy	Perennial pepperweed
South American spongeplant	Creeping water primrose	Parrotfeather	Eurasian watermilfoil	Himalayan blackberry	Red sesbania
Spanish broom	Medusahead	Saltcedar			
<b>Medium</b>					
Russian knapweed	Tree of heaven	Australian saltbush	Wild oat	Black mustard	Ripgut brome
Lepidium halepense	Diffuse knapweed	Malta starthistle	Rush skeletonweed	Bull thistle	Poison hemlock
Bermudagrass	Hedgehod dogtailgrass	Common and Fuller's teasel	Stinkwort	Tasmanian blue gum	Tall fescue
Edible fig	Cutleaf geranium	Shortpod mustard	Common velvet grass	Mediterranean barley	Hare barley

Species of Concern					
Klamathweed	Rough catsear	Ox-eye daisy	Italian ryegrass	Pennyroyal	Tree tobacco
Bermuda buttercup	Hardinggrass	Curlyleaf pondweed	Red sorrel	Chinese tallowtree	London rocket
Hedgeparsely	Rose clover	Big periwinkle	Rattail fescue		

Source: California Invasive Plant Council

Noxious weeds have been introduced in the Planning Area by a variety of means, including through commercial nurseries. An absence of natural controls, combined with the aggressive growth characteristics and unpalatability of many of these weeds, allows these weeds to dominate and replace more desirable native vegetation. Negative effects of weeds include the following:

- Loss of wildlife habitat and reduced wildlife numbers;
- Loss of native plant species;
- Reduced livestock grazing capacity;
- Increased soil erosion and topsoil loss;
- Diminished water quality and fish habitat;
- Reduced cropland and farmland production; and
- Reduced land value and sale potential.

According to the HMPC, the consequences of agricultural disasters to the Planning Area include ruined plant crops, dead livestock, ruined feed and agricultural equipment, monetary loss, job loss, and possible multi-year effects (i.e., trees might not produce if damaged, loss of markets, food shortages, increased prices, possible spread of disease to people, and loss or contamination of animal products). When these hazards cause a mass die-off of livestock, other issues occur that include the disposal of animals, depopulation of affected herds, decontamination, and resource problems. Those disasters related to severe weather may also require the evacuation and sheltering of animal populations. Overall, any type of severe agricultural disaster can have significant economic impacts on both the agricultural community and the entire Madera County Planning Area.

### *Past Occurrences*

### **Disaster Declaration History**

State and federal disaster declarations due to agricultural disasters are shown in Table 4-24.

*Table 4-24 Madera County Agricultural Disaster Declaration History 1950-2017*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Agricultural Disease	0	–	1	1982

Source: Cal OES, FEMA

In addition to the state and federal disaster declarations, the USDA issues Secretarial Disaster Declarations due to agricultural damages. The Madera County Department of Agriculture and the USDA provided information on disaster declarations from 2012 through 2016. These are shown in Table 4-25.

*Table 4-25 Madera County – USDA Disaster Declarations*

Disaster Declaration Number	Disaster Cause	Primary or Contiguous County	Crop Disaster Year
S3268	Drought-FAST TRACK	Primary	2012
S3320	Hailstorm, rain, cold temperatures	Contiguous	2012
S3452	Drought	Contiguous	2012
S3491	Drought-FAST TRACK	Contiguous	2013
S3626	Drought-FAST TRACK	Primary	2014
S3743	Drought	Primary	2014
S3784	Drought-FAST TRACK	Primary	2015
S3943	Drought	Primary	2015
S3952	Drought-FAST TRACK	Primary	2016
S4144	Drought-FAST TRACK	Primary	2017

Source: Madera County Agricultural Commissioner, US Farm Service Agency

## NCDC Events

The NCDC does not track agriculture events.

## Hazard Mitigation Planning Team Events

The Planning Team noted that agriculture events occur yearly, though with varying levels of damages.

### *Likelihood of Future Occurrence*

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

## Climate Change and Agricultural Hazards

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

### 4.2.9. Climate Change

#### *Hazard/Problem Description*

Climate change is the distinct change in measures of weather patterns over a long period of time, ranging from decades to millions of years. More specifically, it may be a change in average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the average. While the Earth’s climate has cycled over its 4.5-billion-year age, these natural cycles

have taken place gradually over millennia, and the Holocene, the most recent epoch in which human civilization developed, has been characterized by a highly stable climate – until recently.

This LHMP Update is concerned with human-induced climate change that has been rapidly warming the Earth at rates unprecedented in the last 1,000 years. Since industrialization began in the 19th century, the burning of fossil fuels (coal, oil, and natural gas) at escalating quantities has released vast amounts of carbon dioxide and other greenhouse gases responsible for trapping heat in the atmosphere, increasing the average temperature of the Earth. Secondary impacts include changes in precipitation patterns, the global water cycle, melting glaciers and ice caps, and rising sea levels. According to the Intergovernmental Panel on Climate Change (IPCC), climate change will “increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems” if unchecked.

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

Climate change adaptation is a key priority of the State of California. The 2013 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state’s infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

In Madera County, the HMPC noted that each year it seems to get a bit warmer and snow seems to start at higher levels. It was also noted that 2017 was one of the wettest years ever, and storms seem to occur at a greater intensity. California’s Adaptation Planning Guide: Understanding Regional Characteristics has divide California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Madera County falls within the Northern Central Valley Region characterized as a largely agricultural, inland region. Agriculture is the predominant economic activity. The region’s agricultural activity is one of the most productive in the nation. Table 4-26 provides a summary of Cal-Adapt Climate Projections for the North Sierra Region.

*Table 4-26 Madera County Planning Area – Cal Adapt Climate Projections*

Effect	Ranges
Temperature Change, 1990-2100	January increase in average temperature of 4°F to 6°F and between 8°F and 12°F by 2100. July increase in average temperature of 6°F to 7°F in 2050 and 12°F to 15°F by 2100. (Modeled high temperatures (Modeled average temperatures; high emissions scenario)
Precipitation	Annual precipitation is projected to decline by approximately 1 to 2 inches by 2050 and 3 to 6 inches by 2100. (CCSM3 climate model; high carbon emissions scenario)



Effect	Ranges
Heat wave	Heat wave is defined as five days over 102°F to 105°F, except in the mountainous areas to the east. Two to three more heat waves per year are expected by 2050 with five to eight more by 2100.
Wildfire	By 2085, the north and eastern portions of the region will experience an increase in wildfire risk, more than 4 times current levels in some areas. (GFDL climate model; high carbon emissions scenario)

Source: Cal-Adapt

## *Past Occurrences*

### Disaster Declaration History

Climate change has never been directly linked to any declared disasters.

### NCDC Events

The NCDC does not track climate change events.

### Hazard Mitigation Planning Team Events

In Madera County, the HMPC noted that each year it seems to get a bit warmer and snow seems to start at higher levels.

## *Likelihood of Future Occurrence*

**Likely** – Climate change is virtually certain to continue without immediate and effective global action. According to NASA, 2016 was on track to be the hottest year on record, and 15 of the 17 hottest years ever have occurred since 2000. Without significant global action to reduce greenhouse gas emissions, the Intergovernmental Panel on Climate Change (IPCC) concludes in its Fifth Assessment Synthesis Report (2014) that average global temperatures is likely to exceed 1.5 C by the end of the 21st century, with consequences for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges.

## Climate Scenarios

The United Nations IPCC developed several greenhouse gas (GHG) emissions scenarios based on differing sets of assumptions about future economic growth, population growth, fossil fuel use, and other factors. The emissions scenarios range from “business-as-usual” (i.e., minimal change in the current emissions trends) to more progressive (i.e., international leaders implement aggressive emissions reductions policies). Each of these scenarios leads to a corresponding GHG concentration, which is then used in climate models to examine how the climate may react to varying levels of GHGs. Climate researchers use many global climate models to assess the potential changes in climate due to increased GHGs.

## Key Uncertainties Associated with Climate Projections

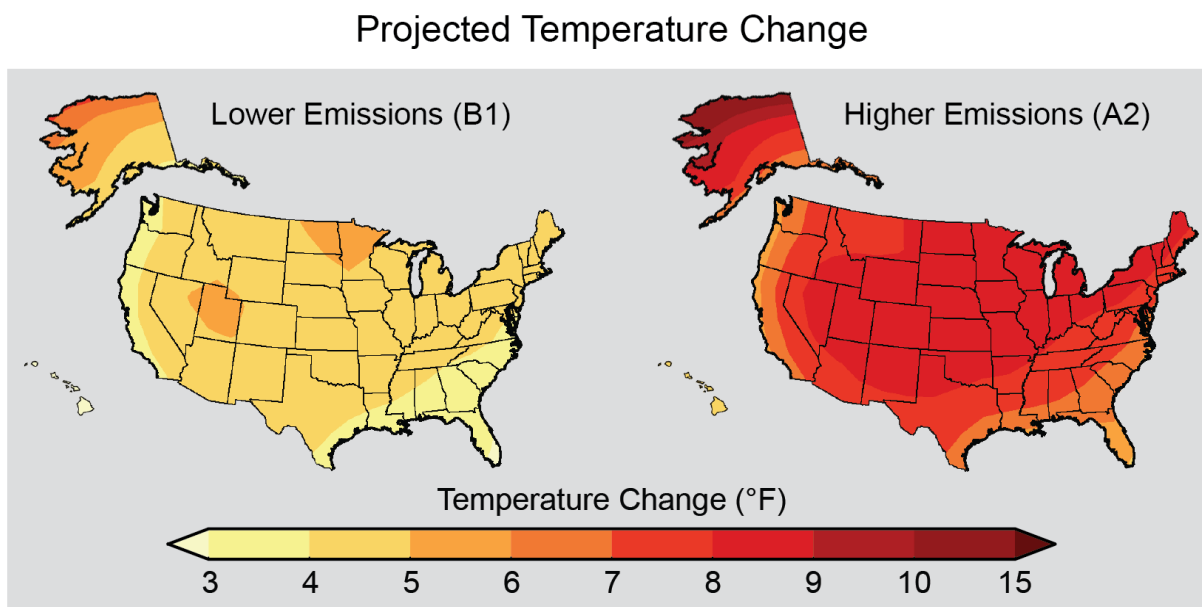
- Climate projections and impacts, like other types of research about future conditions, are characterized by uncertainty. Climate projection uncertainties include but are not limited to:
  - ✓ Levels of future greenhouse gas concentrations and other radiatively important gases and aerosols,
  - ✓ Sensitivity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

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

The following maps (shown in and) are excerpts from the Global Climate Change Impacts report that show the magnitude of the observed and projected changes in annual average temperature. It is important to discuss these projected temperature changes, as heat is a major driver of climate and climate related phenomena. The map for the period around 2000 shows that most areas of the United States have warmed 1 to 2°F compared to the 1960s and 1970s. Although not reflected in these maps of annual average temperature, this warming has generally resulted in longer warm seasons and shorter, less intense cold seasons. The average warming for the country as a whole is shown on the thermometers adjacent to each map. By the end of the century, the average U.S. temperature is projected to increase by approximately 7 to 11°F under the higher emissions scenario and by approximately 4 to 6.5°F under the lower emissions scenario.

Maps show projected change in average surface air temperature in the later part of this century (2071-2099) relative to the later part of the last century (1970-1999) under a scenario that assumes substantial reductions in heat trapping gases and a higher emissions scenario that assumes continued increases in global emissions. These are shown in Figure 4-25.

Figure 4-25 Projected Temperature Change – Lower and Higher Emissions Scenario



Source: National Climate Assessment

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

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

- Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in Madera County and the rest of California, which are likely to increase the risk of mortality and morbidity due to heat-related illness and exacerbation of existing chronic health conditions. Those most at risk and vulnerable to climate-related illness are the elderly, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, infants, the socially or economically disadvantaged, and those who work outdoors.
- Higher temperatures will melt the Sierra snowpack earlier and drive the snowline higher, resulting in less snowpack to supply water to California users.
- Droughts are likely to become more frequent and persistent in the 21st century.
- Intense rainfall events, periodically ones with larger than historical runoff, will continue to affect California with more frequent and/or more extensive flooding.
- Storms and snowmelt may coincide and produce higher winter runoff from the landward side, while accelerating sea-level rise will produce higher storm surges during coastal storms. Together, these

changes may increase the probability of floods and levee and dam failures, along with creating issues related to salt water intrusion.

- Warmer weather, reduced snowpack, and earlier snowmelt can be expected to increase wildfire through fuel hazards and ignition risks. These changes can also increase plant moisture stress and insect populations, both of which affect forest health and reduce forest resilience to wildfires. An increase in wildfire intensity and extent will increase public safety risks, property damage, fire suppression and emergency response costs to government, watershed and water quality impacts, vegetation conversions and habitat fragmentation.

#### 4.2.10. Dam Failure

##### *Hazard/Problem Description*

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

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

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

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

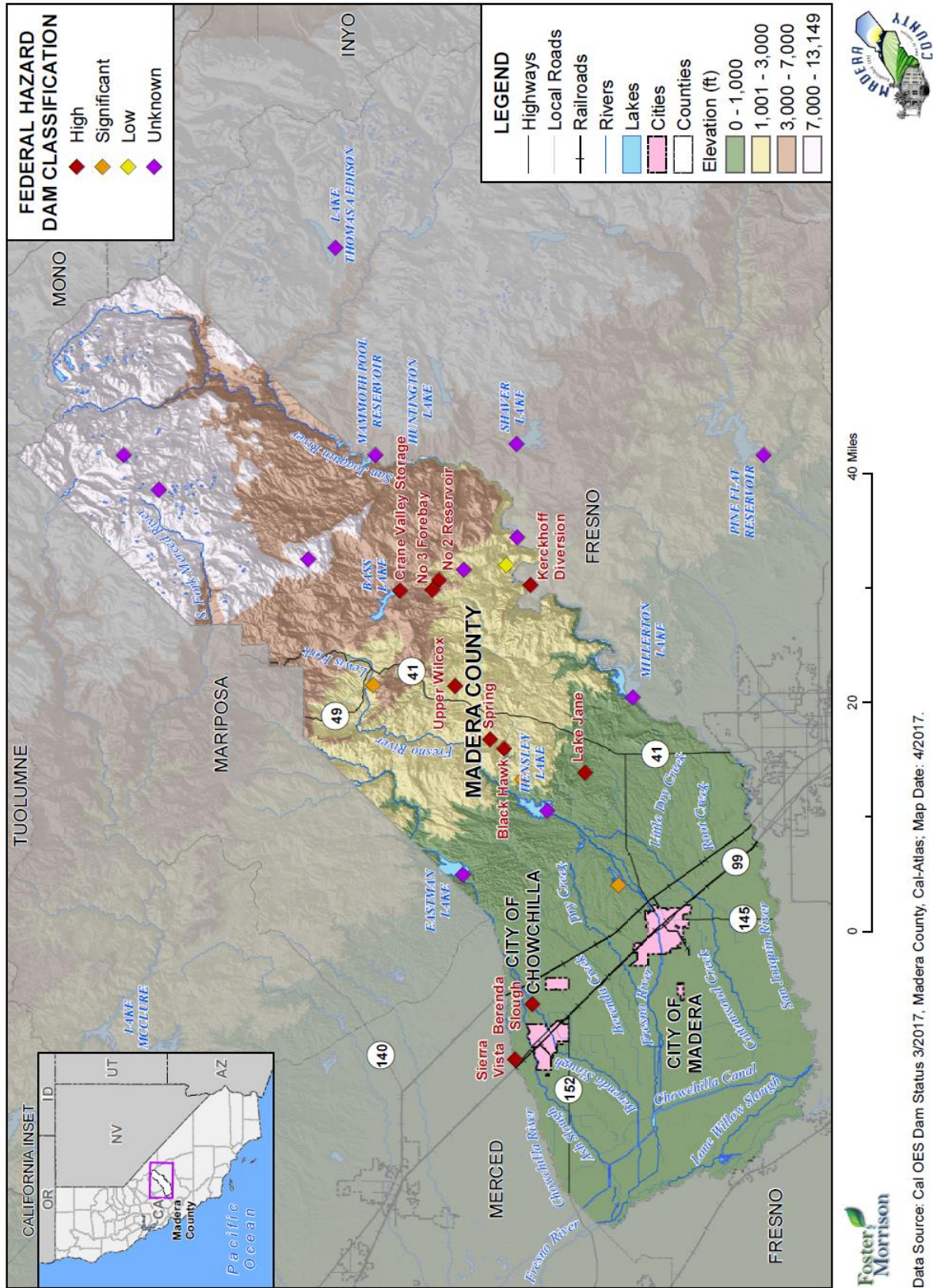
In general, there are three types of dams: concrete arch or hydraulic fill, earth and rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously; the flood wave builds up rapidly to a peak then gradually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

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

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

According to data provided by Madera County, Cal DWR, and Cal OES, there are 20 dams in Madera County constructed for flood control, storage, electrical generation, and recreational purposes. Of the 20 dams, 10 are rated as High Hazard, 2 as Significant Hazard, 1 as Low Hazard, and 7 were not rated. Dams in the County are owned and/or operated by a variety of entities. Figure 4-26 identifies the 20 dams located in the Madera County Planning Area.

Figure 4-26 Madera County Dam Inventory and Dams of Concern



*Table 4-27 Madera County Dam Inventory*

Name	Significance	Dam Type	Purpose	Structural Height (ft)	Maximum Storage (acre-ft)
Berenda Slough	High	Rockfill	Irrigation	18	960
Black Hawk	High	Rockfill	Water Supply	45	740
Buchanan**	–	Earth, Rockfill	Flood Control	180	105,000
Chilkoot	–	–	Hydroelectric	11	308
Crane Valley Storage	High	Rockfill	Hydroelectric	146	45,400
Hidden***	–	Earth	Flood Control	141	90,000
Kerckhoff Diversion	High	Arch	Hydroelectric	115	4250
Lake Jane	High	Rockfill	Irrigation	37	182
Madera Lake	Significant	Rockfill	Irrigation	31	2300
McClure Lake	–	–	–	–	–
Middle Lake	Significant	Rockfill	Irrigation	26	74
No 1 Forebay	Low	Rockfill	Hydroelectric	18	69
No 2 Reservoir	High	–	–	–	–
No 3 Forebay	High	Rockfill	Hydroelectric	40	19
North Fork Effluent	–	–	–	–	–
Oakhurst Wastewater Treatment	Significant	–	–	40	19
Rutherford Lake	–	–	–	–	–
Sierra Vista	High	Rockfill	Irrigation	12	90
Spring	High	Rockfill	Water Supply	41	152
Upper Wilcox	High	–	–	48	200

Source: Cal OES and the National Performance of Dams Program

\*One Acre Foot=326,000 gallons

\*\*Eastman Lake / Buchanan Dam: The lake has a capacity of 150,000 acre-feet. When the dam releases the flows because it may be at full capacity or because of contracts with the Water Districts, then the main water courses are the Ash Slough, Berenda Slough, Chowchilla River.

\*\*\* Hensley Lake / Hidden Dam: The lake has a capacity of 90,000 acre-feet. When the dam releases the flows because of full capacity or because of existing water contracts, then the main water courses/conveyances are Berenda Creek, Dry Creek, Fresno River, and a few Canals.

There are also six additional facilities outside of Madera County with the potential to impact the Madera County Planning Area. These high hazard dams were shown on Figure 4-26. Details of these dams are shown on Table 4-27.

*Table 4-28 Madera County – Nearby Dams of Concern*

Name	Location	Significance	Dam Type	Purpose	Structural Height (ft)	Maximum Storage (acre-ft)
Friant Dam	Fresno County	High	Gravity	Irrigation	323	520,500
Pine Flat Dam	Fresno County	High	Gravity	Flood Control	418	1,000,000
Redinger Lake (Big Creek Dam #7)	Fresno County	High	Gravity	Hydroelectric	254	23,120
Mammoth Pool	Fresno County	High	Rockfill	Hydroelectric	418	113,520
Edison (Vermillion)	Fresno County	High	Rockfill	Hydroelectric	168	125,035
Shaver	Fresno County	High	Rockfill	Hydroelectric	183	135,600

Source: Cal OES and the National Performance of Dams Program

\*One Acre Foot=326,000 gallons

### *Past Occurrences*

#### **Disaster Declaration History**

There have been no disasters declarations related to dam failure in Madera County.

#### **NCDC Events**

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

#### **National Performance of Dams Program Events**

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

#### **Hazard Mitigation Planning Team Events**

According to the HMPC, there have been no uncontrolled release from area dams.

### *Likelihood of Future Occurrence*

**Occasional**—The County remains at risk to dam breaches/failures from numerous dams under a variety of ownership and control and of varying ages and conditions. Although, there is no history of past dam failures, given the number and types of dams in the County and their ages, a potential exists for future dam issues, including failures, that would affect the Madera County Planning Area. Thus, the HMPC determined the likelihood of future occurrence to be Occasional. In addition to the aging dam infrastructure, this



ranking was based on the recent issues with the Oroville dam, that was at risk of overtopping and failure during the winter 2017 storms. There is concern that many of the State’s older dams, including those in Madera County, could start experiencing similar problems.

### Climate Change and Dam Failure

Increases in both precipitation and heat causing snow melt could increase the potential for dam failure and uncontrolled releases in Madera County.

#### 4.2.11. Drought and Water Shortage

##### *Hazard/Problem Description*

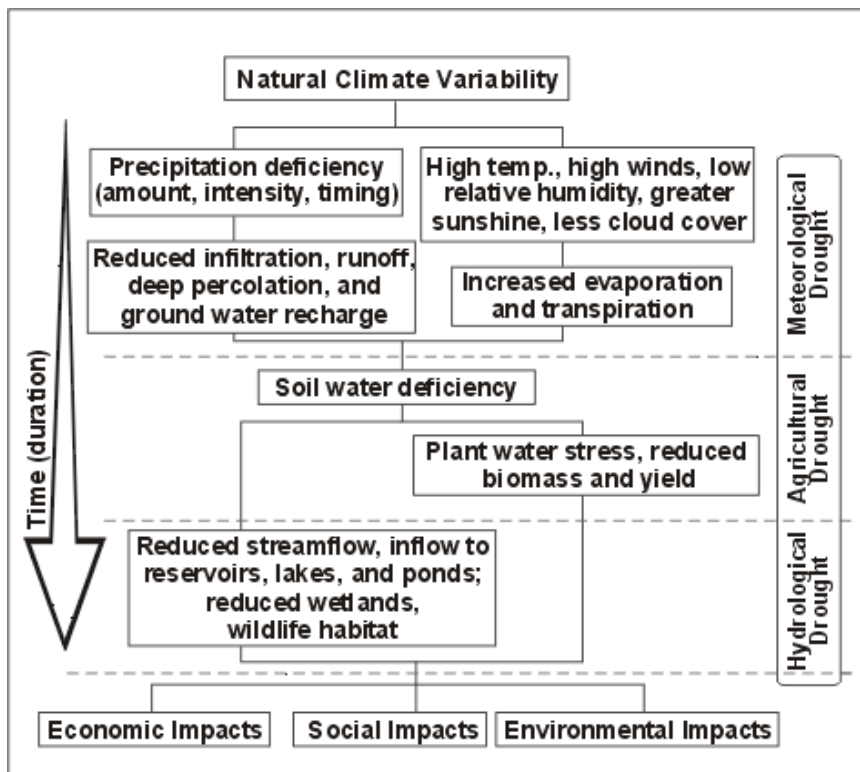
##### Drought

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

Drought is a complex issue involving (see Figure 4-27) many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area’s usual water-consuming activities. Drought can often be defined regionally based on its effects:

- Meteorological drought is usually defined by a period of below average water supply.
- Agricultural drought occurs when there is an inadequate water supply to meet the needs of the state’s crops and other agricultural operations such as livestock.
- Hydrological drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.
- Socioeconomic drought occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

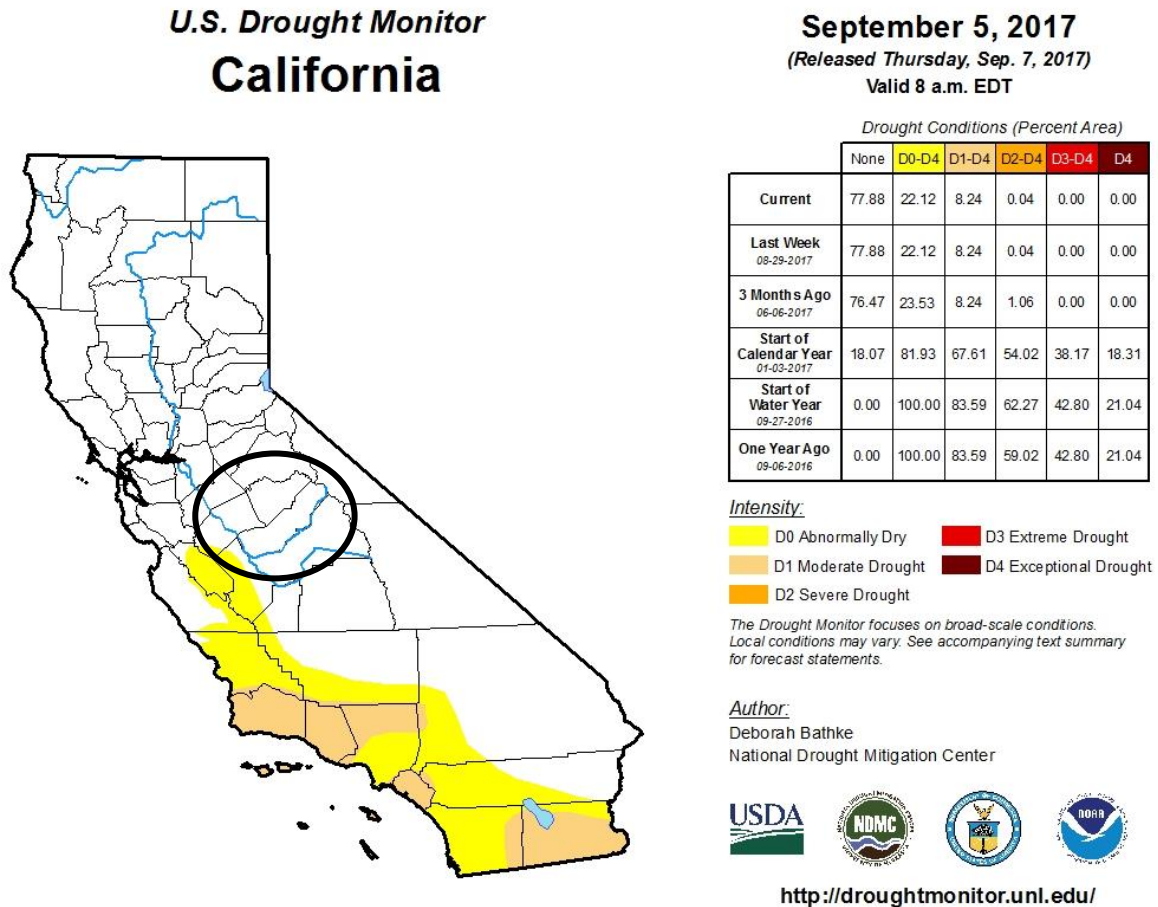
Figure 4-27 Causes and Impact of Drought



Source: National Drought Mitigation Center

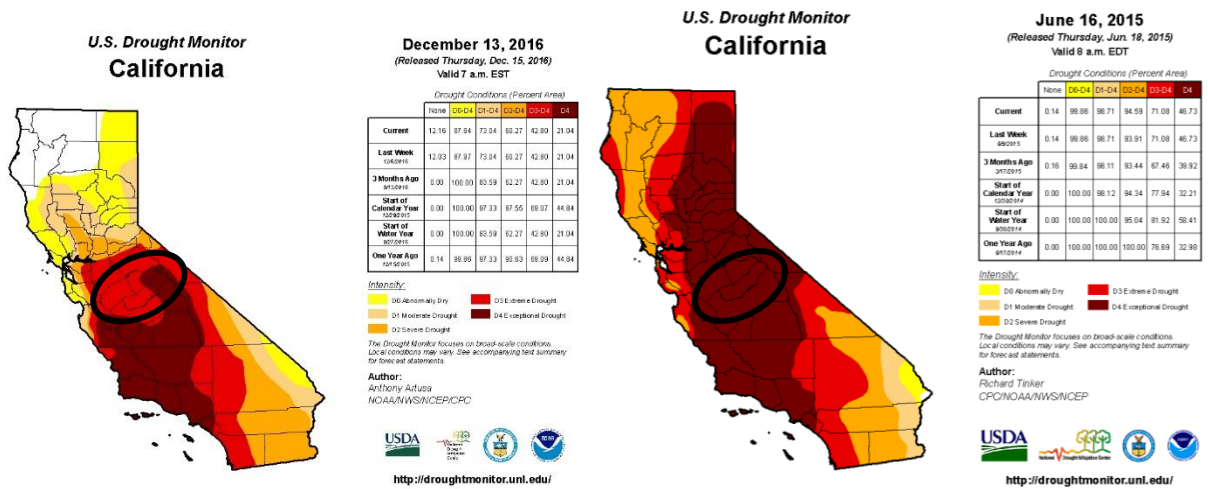
Drought in the United States is monitored by the National Integrated Drought Information System (NIDIS). A major component of this portal is the U.S. Drought Monitor. The Drought Monitor concept was developed jointly by the NOAA’s Climate Prediction Center, the NDMC, and the USDA’s Joint Agricultural Weather Facility in the late 1990s as a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents current drought conditions. The final outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are intimately familiar with the conditions in their respective regions. A snapshot of the drought conditions in California and the Planning Area can be found in Figure 4-28. A snapshot from 2015 and 2016 is shown in Figure 4-29.

Figure 4-28 Current Drought Status in Madera County



Source: US Drought Monitor

Figure 4-29 Previous Drought Status in Madera County



Source: US Drought Monitor

The California Department of Water Resources (DWR) says the following about drought:

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

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

Drought is not initially recognized as a problem because it normally originates in what is considered good weather, which typically includes a dry late spring and summer in Mediterranean climates, such as in California. This is particularly true in Sierra Nevada counties where drought impacts are delayed for most of the population by the wealth of stored surface and ground water. The drought complications normally appear more than a year after a drought begins. In most areas of California, ranchers that rely on rainfall to support forage for their livestock are the earliest and most affected by drought. Even below normal water years could affect ranchers depending on the timing and duration of precipitation events. It is difficult to quantitatively assess drought impacts to Madera County because not many county-specific studies have been conducted. Some factors to consider include the impacts of fallowed agricultural land, habitat loss and associated effects on wildlife, and the drawdown of the groundwater table. The most direct and likely most difficult drought impact to quantify is to local economies, especially agricultural economies. The State has conducted some empirical studies on the economic effects of fallowed lands with regard to water purchased by the State's Water Bank; but these studies do not quantitatively address the situation in Madera County. It can be assumed, however, that the loss of production in one sector of the economy would affect other sectors.

The drawdown of the groundwater table is one factor that has been recognized to occur during repeated dry years. Lowering of groundwater levels results in the need to deepen wells, which subsequently lead to increased pumping costs. These costs are a major consideration for residents relying on domestic wells and agricultural producers that irrigate with groundwater and/or use it for frost protection. Some communities in higher elevations with shallow bedrock do not have a significant source of groundwater.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, during a drought, allocations go down and water costs increase, which results in reduced water availability. Voluntary conservation measures are a normal and ongoing part of system operations and actively implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding and erosion.

## Water Shortage

Southern San Joaquin Valley counties, including Madera County, generally have sufficient groundwater and surface water supplies to mitigate even the severest droughts of the past century. Many other areas of the State, however, also place demands on these water resources during severe drought.

### *Past Occurrences*

#### Disaster Declaration History

There has been one federal and three state disaster related to drought and water shortage in Madera County, as shown in Table 4-29.

*Table 4-29 Madera County Drought Disaster Declaration 1950 to 2017*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Drought	1	1977	3	1976, 2008, 2014

Source: Cal OES, FEMA

#### 2014 Governor's Drought Declaration

California's ongoing response to its five-year drought has been guided by a series of executive orders issued by Governor Edmund G. Brown Jr. that are listed below beginning with the most recent and continuing in reverse chronological order:

- Executive Order B-37-16, May 9, 2016: The Governor's latest drought-related executive order established a new water use efficiency framework for California. The order bolstered the state's drought resilience and preparedness by establishing longer-term water conservation measures that include permanent monthly water use reporting, new urban water use targets, reducing system leaks and eliminating clearly wasteful practices, strengthening urban drought contingency plans and improving agricultural water management and drought plans.
- Executive Order B-36-15, November 13, 2015: This executive order called for additional actions to build on the State's ongoing response to record dry conditions and assist recovery efforts from 2015's devastating wildfires.
- Executive Order B-29-15, April 1, 2015: Key provisions included ordering the State Water Resources Control Board (Board) to impose restrictions to achieve a 25-percent reduction in potable urban water usage through February 28, 2016; directing the California Department of Water Resources (DWR) to lead a statewide initiative, in partnership with local agencies, to collectively replace 50 million square feet of lawns and ornamental turf with drought tolerant landscapes, and directing the California Energy Commission to implement a statewide appliance rebate program to provide monetary incentives for the replacement of inefficient household devices.
- Executive Order B-28-14, December 22, 2014: The order cited paragraph 9 of the January 17, 2014 Proclamation and paragraph 19 of the April 25, 2014 Proclamation (both are linked below) and extended the operation of the provisions in these paragraphs through May 31, 2016.

- Executive Order B-27-14, October 6, 2014: The order directed State agencies to assist local governments in their response to wildfires during California’s drought conditions.
- Executive Order B-26-14, September 18, 2014: The order facilitated efforts to provide water to families in dire need as extreme drought continued throughout California.
- Proclamation of a Continued State of Emergency, April 25, 2014: The order strengthened the State’s ability to manage water and habitat effectively in drought conditions and called on all Californians to redouble their efforts to conserve water.
- Drought State of Emergency, January 17, 2014: The Governor proclaimed a State of Emergency and directed State officials to take all necessary actions to make water immediately available. Key measures in the proclamation included:
  - ✓ Asking all Californians to reduce water consumption by 20 percent and referring residents and water agencies to the Save Our Water campaign – [www.saveourwater.com](http://www.saveourwater.com) – for practical advice on how to do so;
  - ✓ Directing local water suppliers to immediately implement local water shortage contingency plans;
  - ✓ Ordering the Board to consider petitions for consolidation of places of use for the State Water Project and Central Valley Project, which could streamline water transfers and exchanges between water users;
  - ✓ Directing DWR and the Board to accelerate funding for projects that could break ground in 2014 and enhance water supplies;
  - ✓ Ordering the Board to put water rights holders across the state on notice that they may be directed to cease or reduce water diversions based on water shortages;
  - ✓ Asking the Board to consider modifying requirements for releases of water from reservoirs or diversion limitations so that water may be conserved in reservoirs to protect cold water supplies for salmon, maintain water supplies and improve water quality.

## NCDC Events

There have been 117 NCDC drought events in Madera County. 7 were from the 2000/2001 drought, 5 were from the 2003/2004 drought, and 105 were from 2014-2016 drought. No damages, injuries, or losses were reported in the NCDC database for drought in Madera County.

## Hazard Mitigation Planning Team Events

Historically, California has experienced multiple severe droughts. According to the DWR, droughts exceeding three years are relatively rare in Northern California, the source of much of the State’s developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large northern California reservoirs. Table 4-30 compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77, 1987-92, and 2007-09 droughts. Figure 4-30 depicts California’s Multi-Year Historical Dry Periods, 1850-2000.

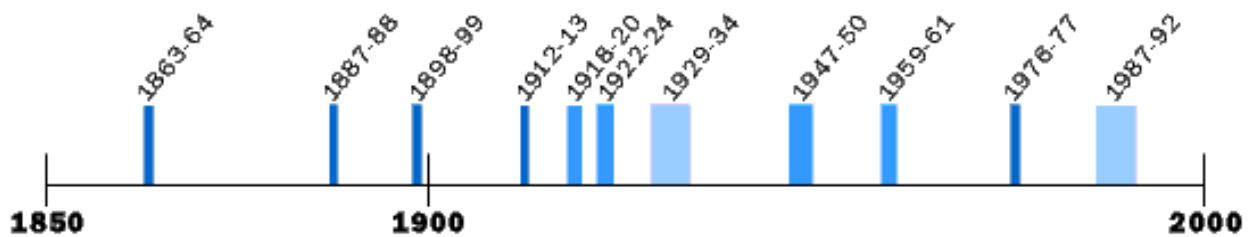
*Table 4-30 Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys*

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

Source: California’s Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources. Available at: <http://www.water.ca.gov/drought/docs/DroughtReport2010.pdf>

\*maf=million acre feet

*Figure 4-30 California’s Multi-Year Historical Dry Periods, 1850-2000*

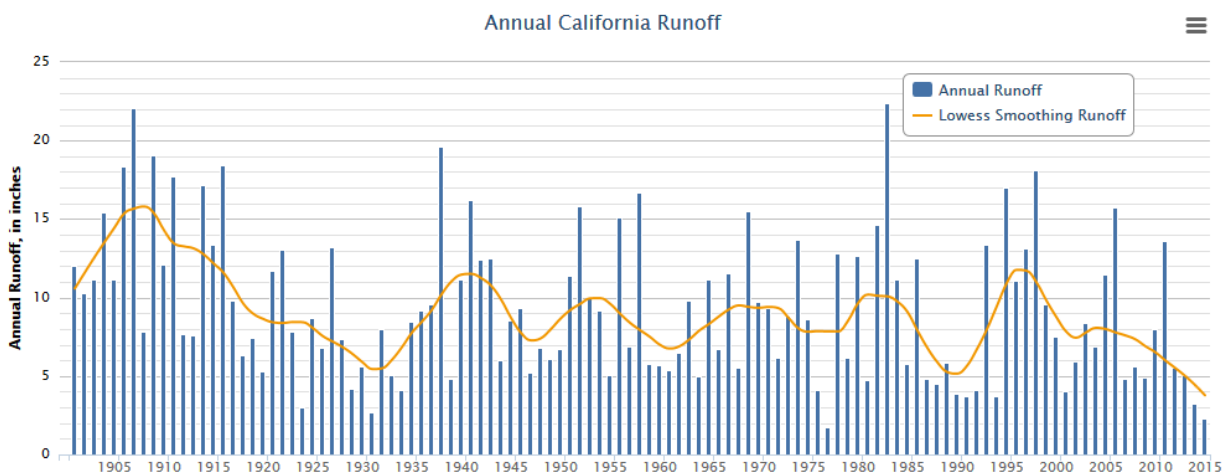


Source: California Department of Water Resources, [www.water.ca.gov/](http://www.water.ca.gov/)

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

Figure 4-31 depicts runoff for the State from 1900 to 2015. This gives a historical context for the 2014-2015 drought to past droughts

*Figure 4-31 Annual California Runoff –1900 to 2015*



2015 water year data are provisional and subject to change

Source: California DWR

The HMPC noted that during the 2014 drought that was just declared over by the California Governor in April 2017, the County experienced significant economic impacts, many associated with the recreational

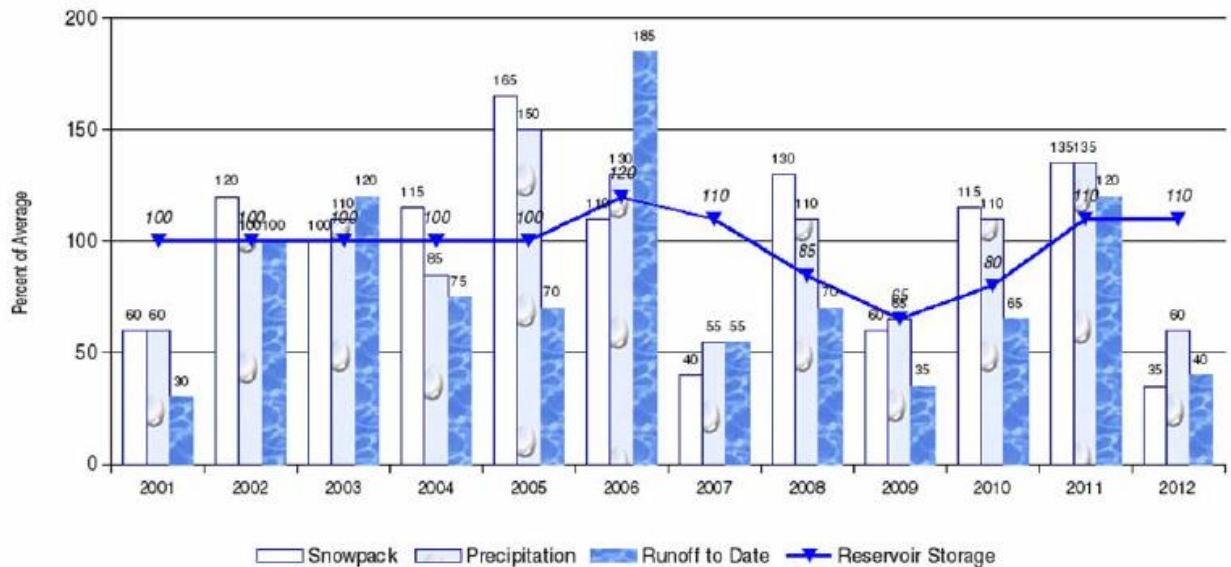
industry as well as the agricultural industry. In addition, the recent drought increased tree mortality in the County associated with both dying trees due to lack of moisture and those infected with Bark Beetle and other pests. Drought also compounded the wildfire risk throughout the County.

The County has an Emergency Drinking Water Plan in place. The last two years the county has supported about 200 residences with dry wells. This was with trucking in water and bulk storage tanks.

### Water Shortage

Figure 4-32 illustrates several indicators commonly used to evaluate water conditions in California. The percent of average values are determined by measurements made in each of the ten major hydrologic regions. The chart describes water conditions in California between 2001 and 2012. The chart illustrates the cyclical nature of weather patterns in California. Snow pack and precipitation increased between 2005 and 2006, began decreasing in late 2006, and began to show signs of recovery in 2009.

*Figure 4-32 Water Supply Conditions, 2001 to 2012*



Source: 2013 State of California Hazard Mitigation Plan

Beginning in 2012, snowpack levels in California dropped dramatically. 2015 estimates place snowpack as 5 percent of normal levels. Snowpack measurements have been kept in California since 1950 and nothing in the historic record comes close to 2015’s severely depleted level. The previous record for the lowest snowpack level in California, 25 percent of normal, was set both in 1976-77 and 2013-2014. In “normal” years, the snowpack supplies about 30 percent of California’s water needs, according to the California Department of Water Resources. Snowpack levels began to increase in 2016, and in 2017 snowpack increased to the largest in 22 years, according to the State Department of Water Resources.

With a reduction in water, water supply issues based on water rights becomes more evident. Some agricultural uses, such as grapes and almonds, are severely impacted through limited water supply. Drought and water supply issues will continue to be a concern to the Planning Area. Irrigation of agricultural lands continues to be a concern in the Planning Area. Also noted by the HMPC, several areas within the County



had ground water wells go dry affecting water supply to County residents. Much of this was attributed to dewatering activities conducted by active mining operations which further depleted the already reduced ground water table in areas due to drought conditions.

### *Likelihood of Future Occurrence*

#### **Drought**

**Likely**—Historical drought data for the Madera County Planning Area and region indicate there have been 5 significant droughts in the last 84 years. This equates to a drought every 16.8 years on average or a 6.0 percent chance of a drought in any given year. However, based on this data and given the multi-year length of droughts, the HMPC determined that future drought occurrence in the Planning Area is likely.

#### **Water Shortage**

**Occasional** — Recent historical data for water shortage indicates that Madera County may at some time be at risk to both short and prolonged periods of water shortage. Based on this it is possible that water shortages will affect the County in the future during extreme drought conditions.

### *Climate Change and Drought and Water Shortage*

Climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21st century due to climate change. The experiences of California during recent years underscore the need to examine more closely the state’s water storage, distribution, management, conservation, and use policies. The Climate Adaptation Strategy (CAS) stresses the need for public policy development addressing long term climate change impacts on water supplies. The CAS notes that climate change is likely to significantly diminish California’s future water supply, stating that:

*California must change its water management and uses because climate change will likely create greater competition for limited water supplies needed by the environment, agriculture, and cities.*

The regional implications of declining water supplies as a long-term public policy issue are recognized in a Southern California Association of Governments July 2009 publication of essays examining climate change topics. In one essay, Dan Cayan observes:

*In one form or another, many of Southern California’s climate concerns radiate from efforts to secure an adequate fresh water supply...Of all the areas of North America, Southern California’s annual receipt of precipitation is the most volatile – we only occasionally see a “normal” year, and in the last few we have swung from very wet in 2005 to very dry in 2007 and 2008....Southern California has special challenges because it is the most urban of the California water user regions and, regionwide, we import more than two-thirds of the water that we consume.*

Members of the HMPC noted a report published in Science magazine in 2015 that stated:

*Given current greenhouse gas emissions, the chances of a 35+ year “megadrought” striking the Southwest by 2100 are above 80 percent.*

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

## 4.2.12. Earthquake

### *Hazard/Problem Description*

An earthquake is caused by a sudden slip on a fault. Stresses in the earth’s outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth’s crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake’s magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see Table 4-31). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

*Table 4-31 Modified Mercalli Intensity (MMI) Scale*

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

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

California is seismically active because it sits on the boundary between two of the earth’s tectonic plates. Most of the state - everything east of the San Andreas Fault - is on the North American Plate. The cities of Monterey, Santa Barbara, Los Angeles, and San Diego are on the Pacific Plate, which is constantly moving northwest past the North American Plate. The relative rate of movement is about two inches per year. The San Andreas Fault is considered the boundary between the two plates, although some of the motion is taken up on faults as far away as central Utah.

## Faults

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

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

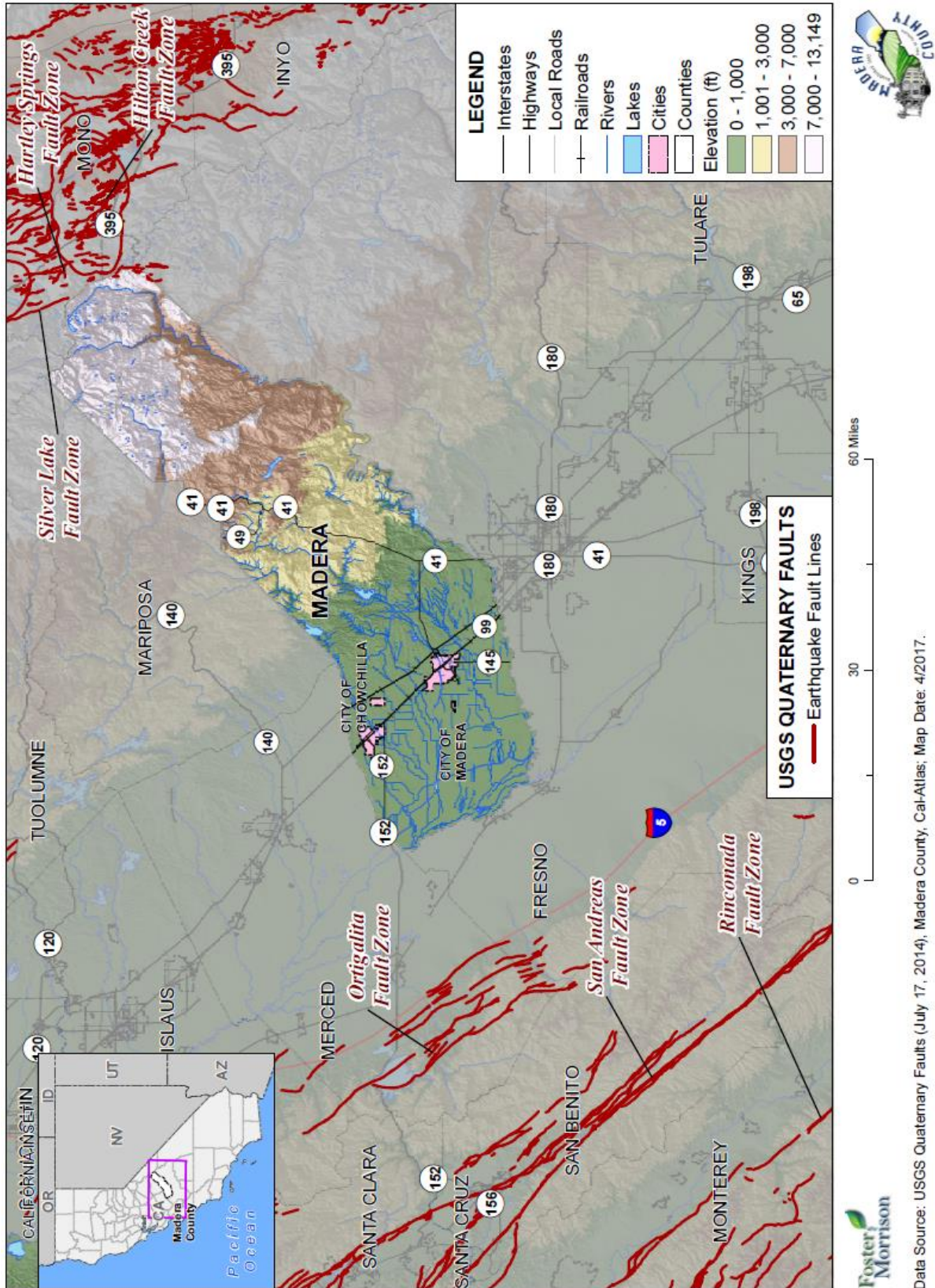
Madera County is in the Central Valley, Foothill, and Sierra Nevada regions of California, and in an area crossed by very few faults. The General Plan noted that one fault does cross through the southeastern portion of Madera County; this is an unnamed fault that is part of the Hartley Springs Fault Zone. Other major fault and fault zones nearby are described in Table 4-32. Figure 4-33 shows fault locations in and near Madera County.

*Table 4-32 Faults in and near Madera County*

Location to Madera County	Fault Name
Near eastern border	Hartley Springs Fault Zone
	Hilton Creek Fault
	Silver Lake Fault
Approximately 35 miles west	Ortugalita Fault Zone
Approximately 40 miles west	San Andreas Fault Zone
Approximately 50 miles west	Rinconada Fault Zone

Source: California Geological Survey

Figure 4-33 Active Faults in and near Madera County



Data Source: USGS Quaternary Faults (July 17, 2014), Madera County, Cal-Atlas; Map Date: 4/2017.

## Earthquake Hazards

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction. This section briefly discusses issues related to types of seismic hazards.

### Ground Shaking

Ground shaking is motion that occurs as a result of energy released during faulting. The damage or collapse of buildings and other structures caused by ground shaking is among the most serious seismic hazards. Damage to structures from this vibration, or ground shaking, is caused by the transmission of earthquake vibrations from the ground to the structure. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the underlying soil and rock, building materials and workmanship, earthquake magnitude and location of epicenter, and the character and duration of ground motion.

Actual ground breakage generally affects only those buildings directly over or nearby the fault. Ground shaking generally has a much greater impact over a greater geographical area than ground breakage. The amount of breakage and shaking is a function of earthquake magnitude, type of bedrock, depth and type of soil, general topography, and groundwater. The valley portion of Madera County is located on alluvium deposits, which tend to experience greater groundshaking intensities than areas located on hard rock. Therefore, structures located in the valley will tend to suffer greater damage from groundshaking than those located in the foothill and mountain areas. However, there are alluvium valleys and weathered or decomposed zones scattered throughout the mountainous portion of the county which could also experience stronger intensities than the surrounding solid rock areas. The geological characteristics of an area can thus be a greater hazard than its distance to the epicenter of the quake.

### Seismic Structural Safety

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

The susceptibility of a structure to damage from ground shaking is also related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions which affect low-rise buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium can cushion low-

rise buildings, but it can also accentuate the motion in tall buildings. The amplified motion resulting from softer alluvial soils can also severely damage older masonry buildings.

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

### **Liquefaction Potential**

Liquefaction is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged ground shaking. Areas most prone to liquefaction are those that are water saturated (e.g., where the water table is less than 30 feet below the surface) and consist of relatively uniform sands that are loose to medium density. In addition to necessary soil conditions, the ground acceleration and duration of the earthquake must be of sufficient energy to induce liquefaction.

Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, tilting, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation. Also of particular concern in terms of developed and newly developing areas are fill areas that have been poorly compacted.

Areas most prone to liquefaction are those which are water-saturated (specifically where the water table is less than 30 feet below the surface), and consist of relatively uniform sands that are of loose to medium density. Of particular concern in terms of developed and developing areas are fill areas that have been poorly consolidated. Although there are areas of Madera County where the water table is at 30 feet or less below the surface, soil types in the area are not conducive to liquefaction because they are either too coarse in texture or too high in clay content. In other words, the soil types mitigate against the potential for liquefaction.

### **Settlement**

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

### **Other Hazards**

Earthquakes can also cause landslides and dam failures. Earthquakes may cause landslides (discussed in Section 4.2.14), particularly during the wet season, in areas of high water or saturated soils. Finally, earthquakes can cause dams to fail (see Section 4.2.9 Dam Failure).

## Earthquakes in Madera County

Seismicity varies greatly between the two major geologic provinces represented in Madera County. The Central Valley is an area of relatively low tectonic activity bordered by mountain ranges on either side. The Sierra Nevadas, partly within Madera County, are the result of movement of tectonic plates which resulted in the creation of the mountain range. The Coast Ranges on the west side of the Central Valley are also a result of these forces, and continued movement of Pacific and North American tectonic plates continues to elevate the ranges. Most of the seismic hazards in Madera County result from movement along faults associated with the creation these ranges.

The Draft Environmental Impact Report for a state prison project near Fairmead identified faults within a 100-mile radius of the project site. Since Fairmead is centrally located along Highway 99 within the county, this information provides a good indicator of the potential seismic activity which might be felt within Madera County. Fifteen active faults (including the San Andreas and Owens Valley systems) were identified in the Preliminary Geotechnical Investigation. Four of the faults lie along the eastern portion of the Sierra Nevada Range, approximately 75 miles to the northeast of Fairmead. These are the Parker Lake, Hartley Springs, Hilton Creek, and Mono Valley Faults. The remaining faults are in the western portion of the San Joaquin Valley, as well as within the Coast Range, approximately 47 miles west of Fairmead. Most of the remaining 11 faults are "associated with the San Andreas, Calaveras, Hayward, and Rinconada Fault Systems that collectively form the tectonic plate boundary" of the Central Valley. These can be seen on Table 4-33 along with the maximum probable earthquake event associated with each fault.

Table 4-33 Maximum Probable Earthquake Events in or near Madera County

Fault or Fault System	Distance and Direction from Fairmead area (miles)	Fault Length (miles)	Slip Rate (mm/year)	Recurrence Interval (years)	Maximum Credible Magnitude and Intensity		Maximum Probable Magnitude and Intensity	
					(M)	(MM)	(M)	(MM)
Calaveras	71, NW	19	7.0	150	7.00	V	6.50	V
Greenville	73, NW	17	0.7	3,585	7.00	V	5.25	IV
Hartley Springs	75, NE	10	0.2	8,424	6.75	V	4.75	III
Hayward	81, NW	31	4.0	556	7.00	V	6.75	IV
Hilton Creek Region	81, NE	10	2.0	554	7.00	V	6.50	IV
Los Positas	91, NW	8	1.6	872	6.50	IV	4.50	III
Mono Valley	81, NE	18	7.5	557	7.00	V	6.50	IV
Ortogonalita	47, SW	13	0.04	10,000	6.75	VI	4.50	IV
Parker Lake	72, NE	21	0.5	3,083	6.75	V	5.75	III
Rinconada	84, SW	75	2.4	140	7.00	V	6.00	IV
San Andreas (Creep)	67, SW	22	34	140	7.00	VI	6.00	IV
San Andreas (Mojave)	95, SW	202	34	345	8.50	VI	8.25	V
San Andreas (North)	84, W	52	34	228	8.00	VI	7.50	V
San Juan	98, SW	40	NA	NA	7.25	IV	6.25	III
Sargent	76, W	24	1.0	NA	7.00	V	5.75	IV

M = magnitude, as measured by the Richter scale

MM = intensity, as measured by the Modified Mercalli scale (see Table 7-1)

NA = not available

Source: Draft Environmental Impact Report for the California State Prison Madera County

In addition, the Clovis fault, although there is no historic evidence of its activity, is considered to be active within quaternary time (within the past two million years), and is thus classified as "potentially active." This fault lies approximately six miles south of the Madera County line, in Fresno County. Activity along this fault could potentially generate more seismic activity in Madera County than the San Andreas or Owens Valley fault systems. In particular, a strong earthquake on the Clovis fault could affect southern Madera County. However, because of the lack of historic activity along the Clovis fault, there is inadequate evidence for assessing maximum earthquake impacts.



## Past Occurrences

### Disaster Declaration History

There have been no state or federal disaster declarations related to earthquake in Madera County, according to Table 4-3.

### NCDC Events

Earthquake events are not tracked by the NCDC database.

### USGS Events

The USGS National Earthquake Information Center database contains data on earthquakes in the Madera County area. Table 4-34 shows the approximate distances earthquakes can be felt away from the epicenter. According to the table, a magnitude 5.0 earthquake could be felt up to 90 miles away. The USGS database was searched for magnitude 5.0 or greater on the Richter Scale within 90 miles of the City of Madera in Madera County. These results are detailed in Table 4-35.

*Table 4-34 Approximate Relationships between Earthquake Magnitude and Intensity*

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

\*Modified Mercalli Intensity Scale.

Source: United State Geologic Survey, Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093, 1977.

*Table 4-35 Magnitude 5.0 Earthquakes within 90 Miles of Madera County\**

Date	Richter Magnitude	Location
10/21/2012	5.29	Central California
9/29/2004	5.04	7km WSW of Parkfield, California
9/28/2004	5.97	18km N of Shandon, California
5/15/1999	5.5	Central California
8/12/1998	5.1	Central California
10/24/1990	5.8	Central California
4/18/1990	5.4	Northern California
2/20/1988	5.1	Central California

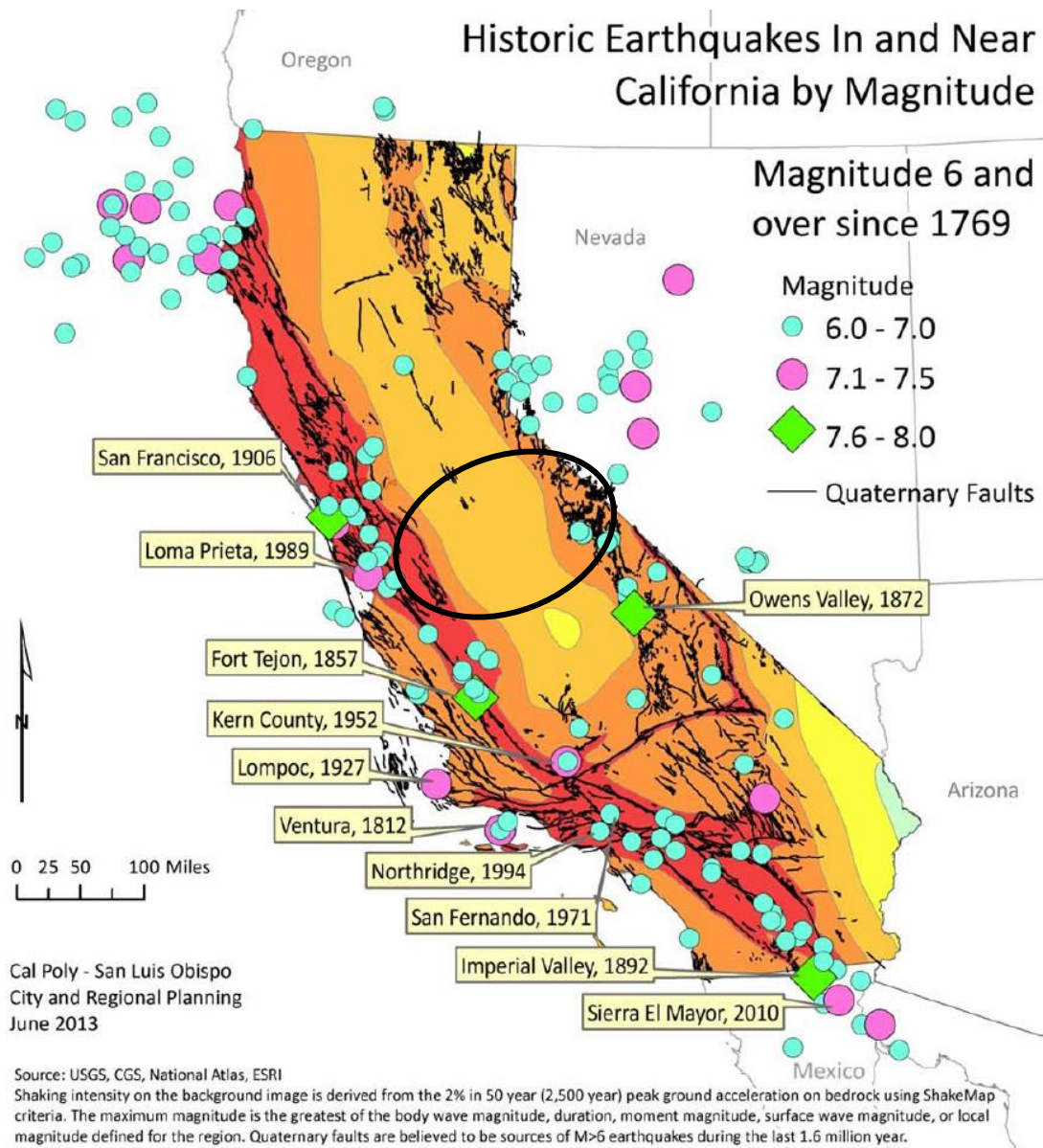
Date	Richter Magnitude	Location
2/14/1987	5.3	Central California
1/26/1986	5.5	Central California
8/4/1985	5.6	Central California
3/25/1985	5.1	Central California
11/26/1984	5.6	Central California
11/23/1984	6.1	Central California
4/24/1984	6.2	Northern California
9/9/1983	5.47	Central California
7/25/1983	5.04	Central California
7/22/1983	5.37	Central California
7/3/1983	5.3	Central California
6/11/1983	5.4	Central California
5/9/1983	5.2	Central California
5/2/1983	6.7	Central California
1/7/1983	5.4	Long Valley area, California
10/25/1982	5.4	Central California
9/30/1981	5.9	Central California
8/1/1980	5.4	Central California
5/27/1980	6.2	Central California
5/26/1980	5.7	Central California
5/25/1980	6.47	21km ENE of Mammoth Lakes, CA
8/6/1979	5.8	Northern California
10/4/1978	5.1	Central California
11/28/1974	5.2	Central California
6/28/1966	5.47	8km N of Cholame, CA
4/9/1961	5.9	Central California
11/16/1956	5	28km NE of King City, CA

Source: USGS

\*Search dates 1950 – May 1, 2017

Figure 4-34 shows major historical earthquakes in California from 1769 to 2010.

Figure 4-34 Historic Earthquakes in California and Madera County



Created by: C. Schuldt: (5.2--Historic Earthquakes in and Near California.mxd)

MMI	Damage	Effects
X	Very Heavy	Some well-built, wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
IX	Heavy	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
VIII	Moderate to Heavy	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
VII	Moderate	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly-built or badly designed structures; some chimneys broken.
VI	Light	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
V	Very Light	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

Source: 2013 State of California Multi-Hazard Mitigation Plan

## Hazard Mitigation Planning Team Events

The Planning Team noted that any earthquakes in the Mammoth Basin or West side of Fresno County are felt by residents. There has been no reportable damage after incidents, just basic reports of ground rolling.

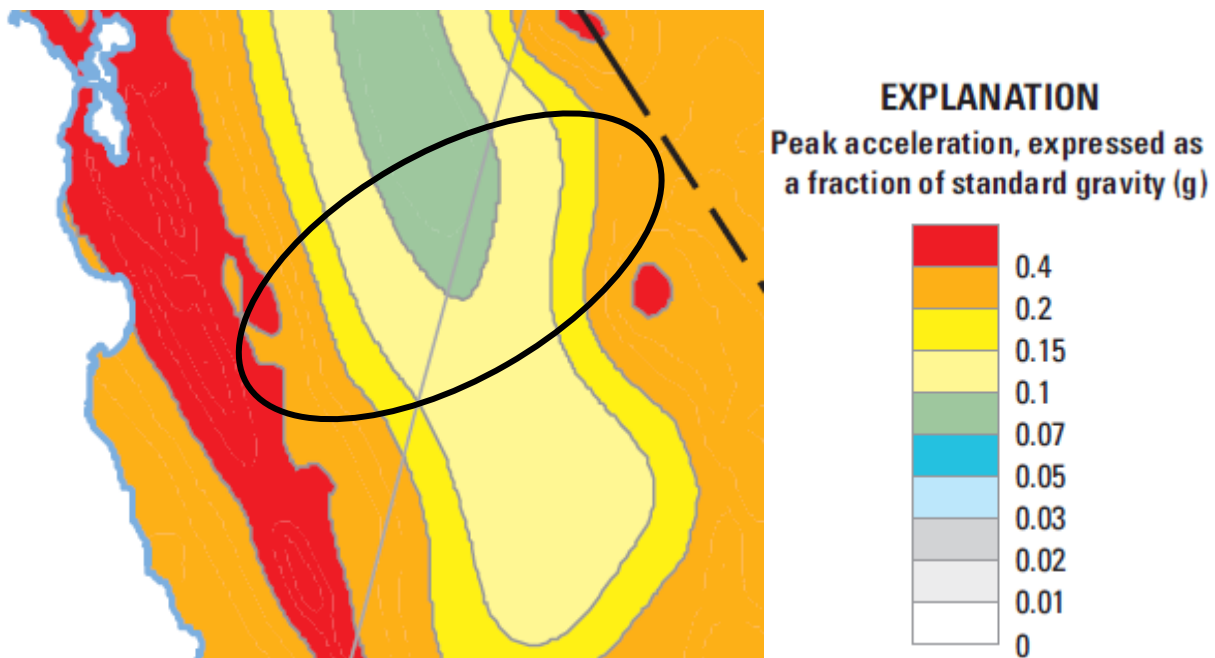
### *Likelihood of Future Occurrence*

**Occasional** — The western half of Madera County is in the lowest Earthquake Shaking Potential for California. It is likely that the region will be impacted by future seismic activity and with the exception of the far eastern edge of the County, the magnitude of the incident is not likely to be severe.

### Mapping of Future Occurrences

The U.S. Geological Survey (USGS) issues National Seismic Hazard Maps as reports every few years. These maps provide various acceleration and probabilities for time periods. Figure 4-35 depicts the peak horizontal acceleration (%g) with 10% probability of exceedance in 50 years (a 500-year event) for the planning region. The figure demonstrates that the County falls in the 7%g (gray) in the west, and in the 10%g area (tan) in the extreme eastern portion of the County. This data indicates that the expected severity of earthquakes in the region is limited, as damage from earthquakes typically occurs at peak accelerations of 30%g or greater.

*Figure 4-35 Peak Horizontal Acceleration with 10% Probability of Occurrence in 50 Years*

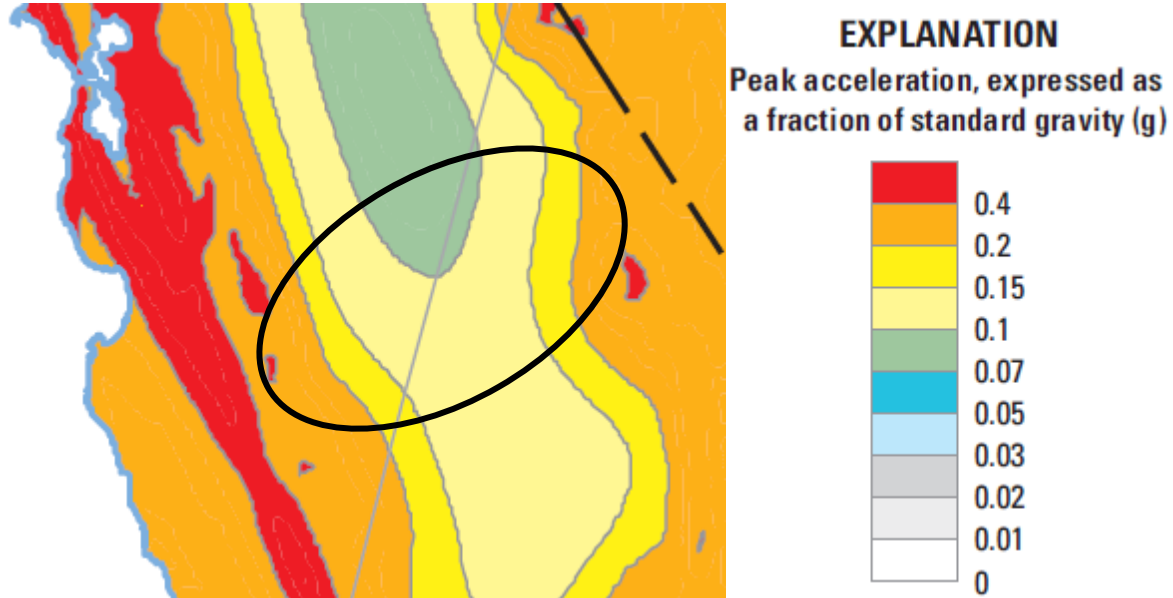


Source: USGS National Seismic Hazard Maps

Figure 4-36 depicts the peak horizontal acceleration (%g) with 2% probability of exceedance in 50 years (a 2,500-year event) for the County. The figure demonstrates that the County falls in the 7%g (gray) in the west, and in the 10%g area (tan) in the extreme eastern portion of the County. This data indicates that the

expected severity of earthquakes in the region is moderate, as damage from earthquakes typically occurs at peak accelerations of 30%g or greater.

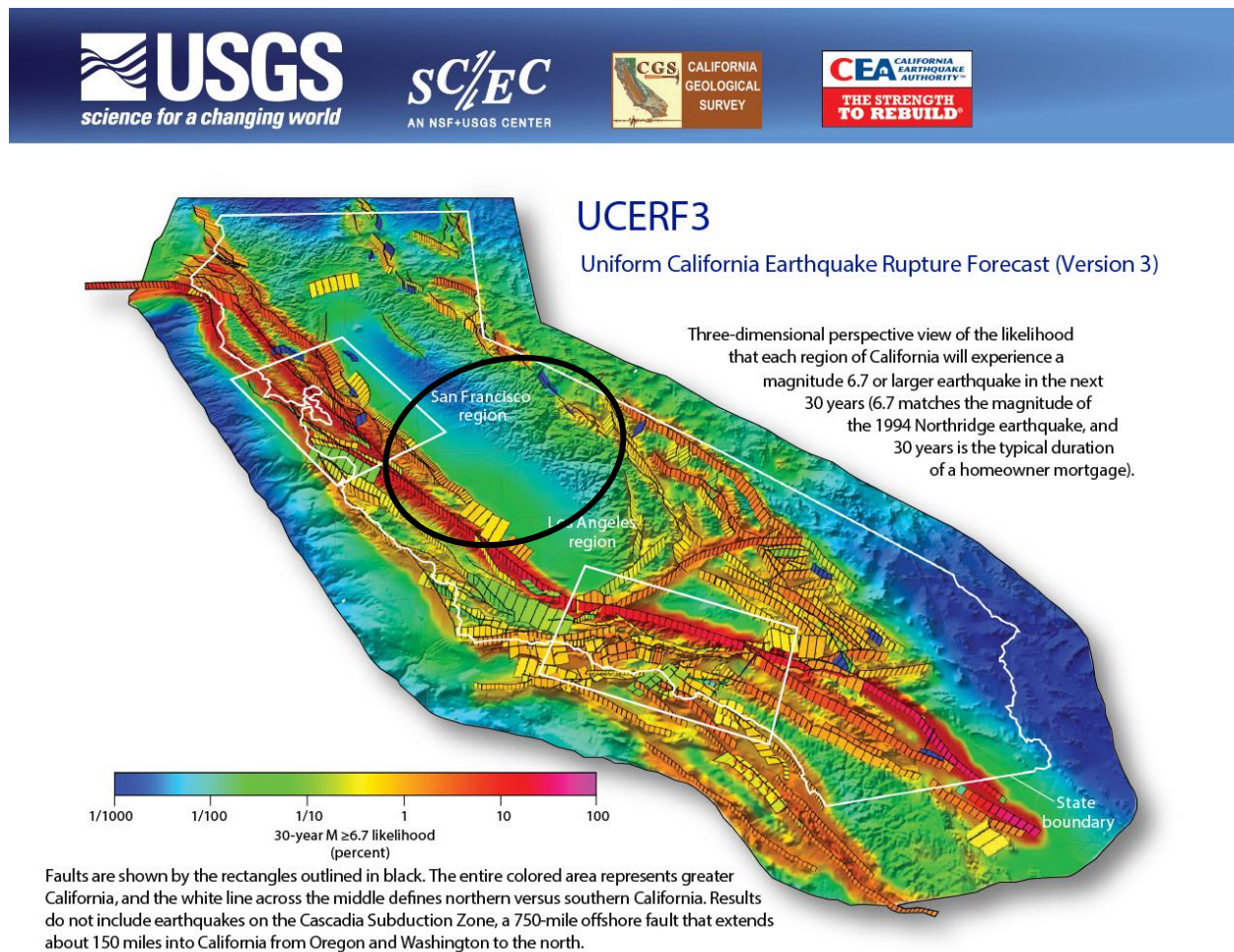
*Figure 4-36 Peak Horizontal Acceleration with 2% Probability of Occurrence in 50 Years*



Source: USGS National Seismic Hazard Maps

In 2014, the United States Geological Survey (USGS) and the California Geological Survey (CGS) released the time-dependent version of the Uniform California Earthquake Rupture Forecast (UCERF III) model. The UCERF III results have helped to reduce the uncertainty in estimated 30-year probabilities of strong ground motions in California. The UCERF map is shown in Figure 4-37 and indicates that Madera County has a low to moderate risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of occasional.

Figure 4-37 Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame



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

## Climate Change and Earthquake

Climate changes is unlikely to increase earthquake frequency or strength.

### 4.2.13. Flood: 1% and 0.2% Annual Chance

#### *Hazard/Problem Description*

Flooding is the rising and overflowing of a body of water onto normally dry land. History clearly highlights floods as one of the most frequent natural hazards impacting Madera County. Floods are among the most costly natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. A car will float in less than two feet of moving water and can be swept downstream into deeper waters. This is one reason floods kill more people trapped in vehicles than anywhere else. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can

transport large objects downstream which can damage or remove stationary structures, such as dam spillways. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts from any type of flooding.

## Health Hazards from Flooding

Certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and hogs are kept or their wastes are kept can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e. coli and other disease-causing agents.

The second type of health problem arises after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

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

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

## Warning and Evacuation Procedures

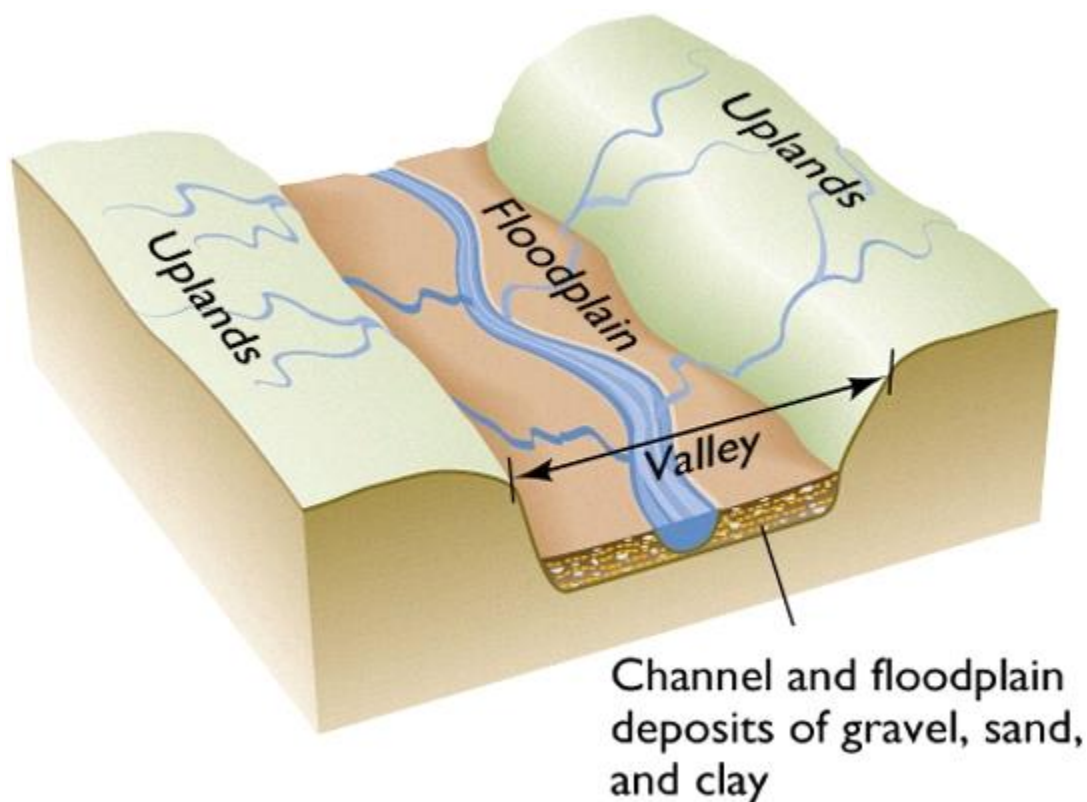
The County uses field monitoring as the best gauge for response. County departments do use remote monitoring as much as possible to reduce staff time. When a possibility of impact to the county residences is suspected, the Sheriff's Department uses a system known as MCALERT. MCALERT is powered by Everbridge Company. McLaren is an opt in system from residents and takes the landline 911 numbers.

When an alert is issued in the case of evacuations, the Sheriff's Department follows up with a personal contact from Sheriff's Office Staff such as Patrol Deputies and/or Volunteers.

## Floodplains

The area adjacent to a channel is the floodplain (see Figure 4-38). Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to that area that is inundated by the 1% annual chance (100-year) flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 1% annual chance flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

*Figure 4-38 Floodplain Schematic*



Source: FEMA

The Madera County Planning Area is susceptible to various types of flood events as described below.

- **Riverine flooding** – Riverine flooding, defined as when a watercourse exceeds its “bank-full” capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain



large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Madera County Planning Area, riverine flooding is largely caused by heavy and continued rains, often combined with snowmelt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. The warning time associated with slow rise floods assists in life and property protection.

- **Flash flooding** – Flash flooding describes localized floods of great volume and short duration. This type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods often require immediate evacuation within the hour and thus early threat identification and warning is critical for saving lives
- **Localized/Stormwater flooding** – Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems. More on localized flooding can be found in Section 4.2.14.
- **Dam failure flooding** – Flooding from failure of one or more upstream dams is also a concern to the Madera County Planning Area. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result, and there could be associated health concerns as well as problems with the identification and burial of the deceased. Dam failure is further addressed in Section 4.2.9 Dam Failure.

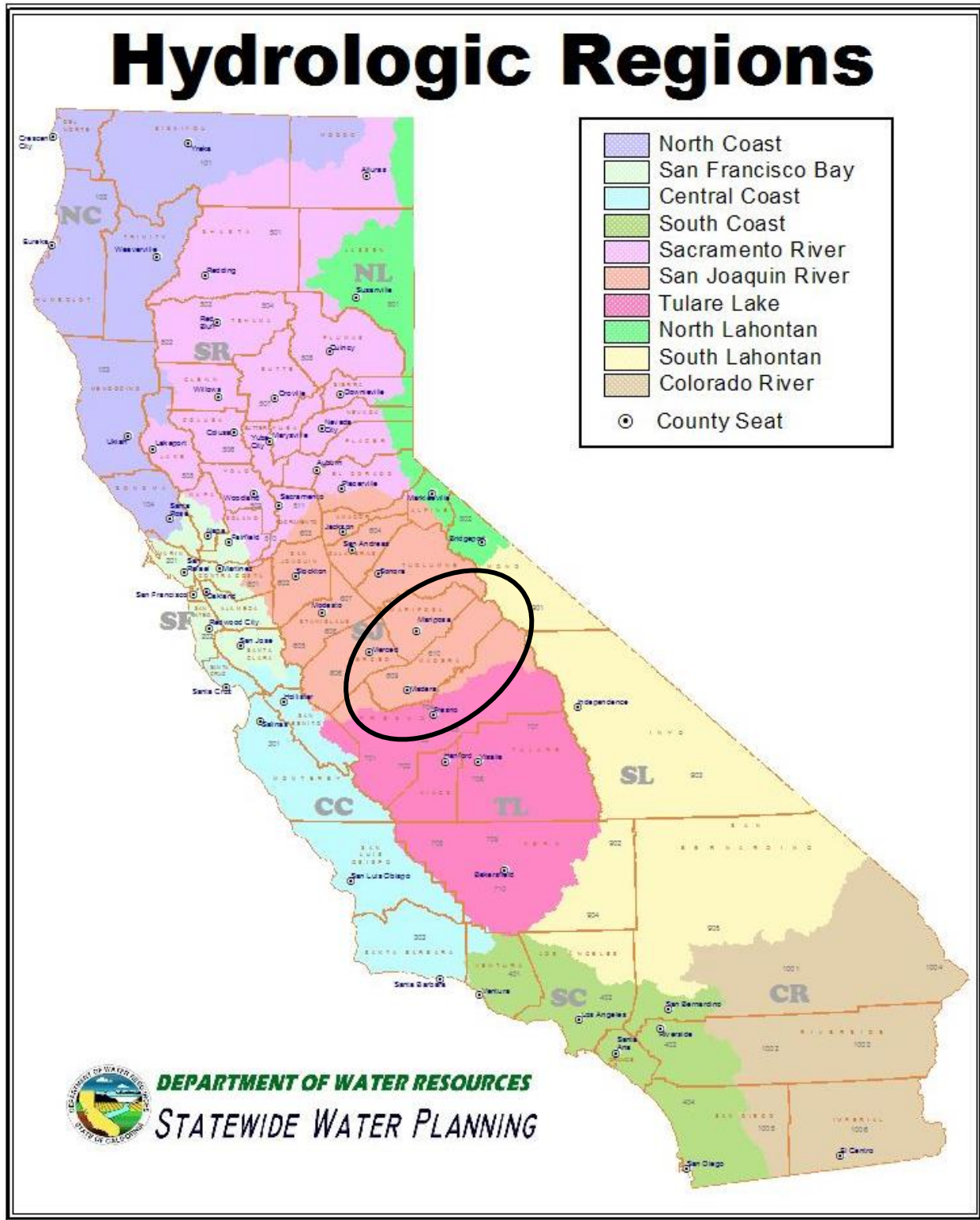
## Major Sources of Flooding

California has 10 hydrologic regions. Madera County sits in the San Joaquin hydrologic region.

- The San Joaquin River hydrologic region is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes. The Madera subbasin consists of lands overlying the alluvium in Madera County. The subbasin is bounded on the south by the San Joaquin River, on the west by the eastern boundary of the Columbia Canal Service area, on the north by the south boundary of the Chowchilla subbasin, and on the east by the crystalline bedrock of the Sierra Nevada foothills. Major streams in the area include the San Joaquin and Fresno Rivers. Average annual precipitation is 11 inches throughout the majority of the subbasin and 15 inches in the Sierra foothills.

A map of the California's hydrological regions is provided in Figure 4-39.

Figure 4-39 California Hydrologic Regions



Source: California Department of Water Resources

## The Madera County Waterway System

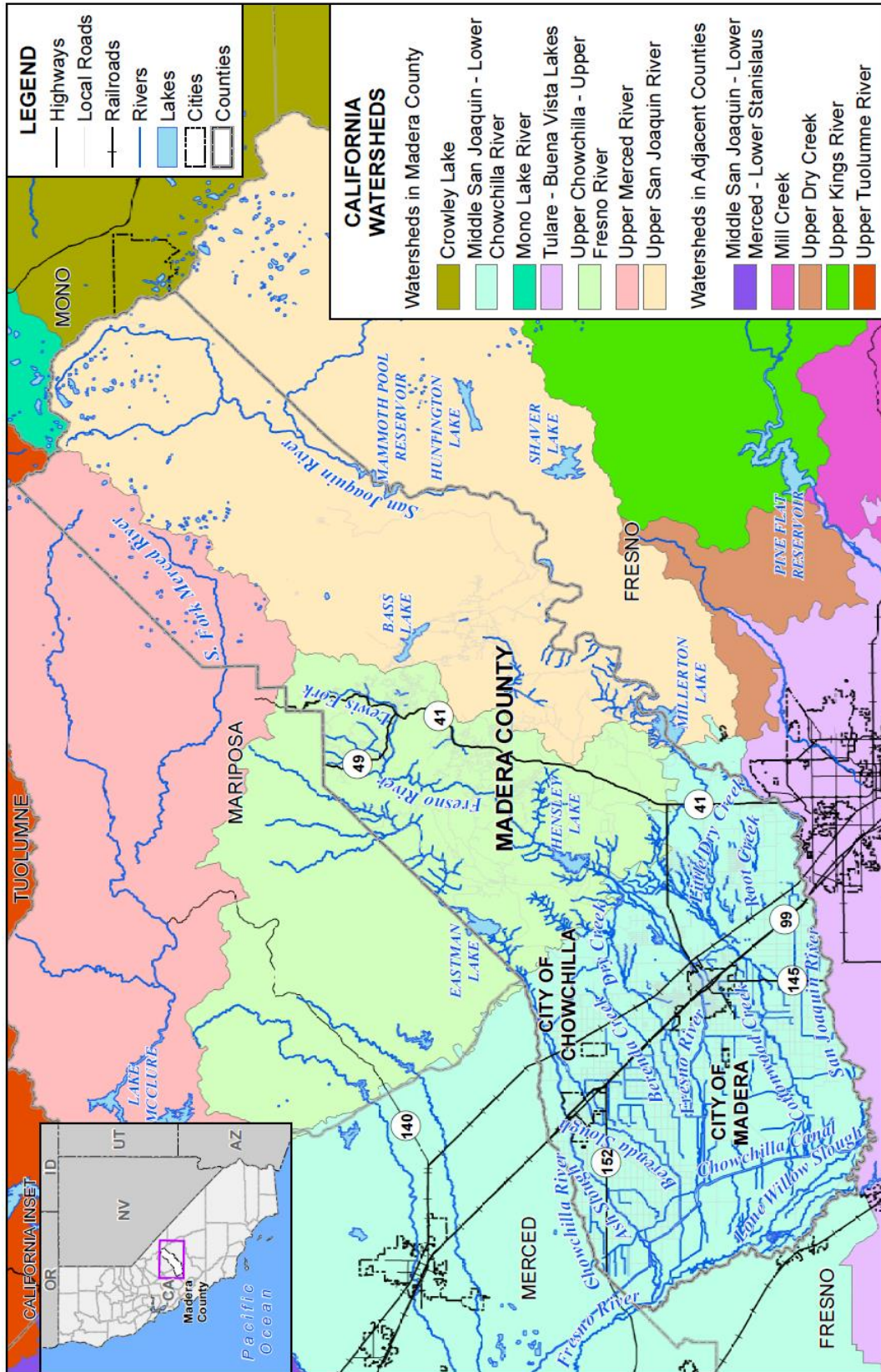
Madera County encompasses multiple rivers, streams, creeks, and associated watersheds. The County is situated in a region that dramatically drops in elevation from the eastern portion (Sierra Nevada) to the western portion, where excess rain on snow can contribute to downstream flooding. Damaging floods in Madera County occur primarily in the developed areas of the county. Flood flows generally follow defined stream channels, drainages, and watersheds. Various flood protection measures are either in place or planned to protect Madera County from future flood events. Existing flood protection measures include a system of dams, pumping plants, channel improvements, floodway bypasses, detention and retention structures, and other improvements.

Madera County crosses 7 watersheds. These include the following watersheds:

- Tulare-Buena Vista Lakes Watershed
- Middle San Joaquin-Lower Chowchilla River Watershed
- Upper San Joaquin River Watershed
- Upper Chowchilla-Upper Fresno River Watershed
- Upper Merced River Watershed
- Mono Lake River Watershed
- Crowley Lake Watershed

Figure 4-40 illustrates the primary watersheds of Madera County, as well as the primary waterways in the County.

Figure 4-40 Primary Watersheds and Waterways in Madera County



Data Source: California Interagency Watershed Map of 1999 (Calwater 2.2, updated May 2004, "calw221"), Madera County, Cal-Atlas; Map Date: 4/2017.

The General Plan and the FEMA Flood Insurance Study noted that entire county generally has excellent drainage. The eastern side of the San Joaquin Valley is a series of overlapping alluvial fans, each with a large mass of coarse, permeable deposits spread outward beneath the valley floor from the point where the stream leaves the foothills. These alluvial fans are deposits of well sorted sand and gravel which were deposited outside the major stream channels on the alluvial plain. The areas between the major alluvial fans are characterized by poorly sorted, fine grained sands and gravels that were deposited by creeks between major streams.

The San Joaquin River watershed, which drains a large area on the western slope of the Sierra Nevada in Fresno and Madera Counties, is bounded on the north by the Merced and Fresno Rivers' watershed and on the south by the Kings River watershed. Its upper reach has several main forks. The North and Middle Forks originate in Madera County near Devils Postpile National Monument, and the South Fork begins in northern Kings Canyon National Park in Fresno County. The forks join at an elevation of approximately 3,600 feet to form the main stem, which flows southwesterly to the valley floor then northwesterly down the valley trough to the Delta. At the Delta, the San Joaquin River and its tributaries drain over 16,700 square miles.

The San Joaquin and Fresno Rivers are regulated. Water supplies for irrigation are assured by the Friant Dam, on the San Joaquin River, and the 37-mile-long Madera Canal. Both are features of the Central Valley Project. In the late 1920s, farmers in Madera County formed their own irrigation district.

## Flood Protection Measures

### *City of Madera*

The FIS noted that Hidden Lake Dam, completed in September 1976, regulates flood flows in the Fresno River. Under normal operation, the 1-percent annual-chance discharge is low enough that flooding is largely contained in the stream channel. However, for flooding of the 0.2-percent annual-chance magnitude Hidden Lake Dam does not provide adequate protection.

A flood barrier at the Cottonwood Creek overflow channel, in the form of a highway embankment, was constructed in approximately 1975. This embankment serves to limit any spills to Cottonwood Creek to the capacity of the 96-inch diameter culvert through the embankment. Such spills cannot exceed a few hundred cubic feet per second (cfs) even during rare uncontrolled flows from Hidden Reservoir, and thus are not a significant factor in the City of Madera's flood control program.

### *Oakhurst Community*

There are no major flood-protection measures in the study area. Road crossings appear to be adequately elevated and the bridge and culverts are generally of sufficient size that they do not significantly increase the flood hazard for the area. The stream restoration and maintenance activities included in the Oakhurst River Parkway project may result in some lessening of the flood-hazard potential in the area.

### *Madera County (Unincorporated Areas)*

San Joaquin River drains an area of 1,680 square miles at Friant Dam, which forms the 520,500 acre-foot Millerton Lake. The dam is operated by the U.S. Bureau of Reclamation (USBR) as part of the Central Valley Project's Friant Unit, including Friant Dam, Millerton Lake, Friant-Kern Canal and Madera Canal. Friant Dam is operated for water supply and flood management. Several dams upstream of Friant are owned and operated by Southern California Edison and Pacific Gas and Electric Company for power generation. The combined storage capacity of the upstream dams is 609,530 acre-feet. Though this storage has a considerable ability to reduce rain and snowmelt floods, it does not include any flood management reservation.

Major releases from Friant Dam to San Joaquin River occur from March to May to maintain capacity in Millerton Lake for rainfall and snowmelt. Up to 170,000 acre-feet of the available storage in Millerton Lake may be reserved for rainfall runoff, while 390,000 acre-feet are available for snowmelt. During flood flows, the dam can also divert water to the Friant-Kern Canal and Madera Canal when capacity is available and there is a place to release the flood flows. Cottonwood Creek and Little Dry Creek, which enter into the San Joaquin River below Friant Dam, can add to the Friant Dam releases in the river. Friant Dam maintains a flow of 8,000 cfs, the design-flow capacity of the river from Friant Dam to the Chowchilla Bypass, or less below Little Dry Creek.

No existing flood protection measures have been undertaken on Cottonwood, Root, Dry, and Schmidt Creeks, Schmidt Creek Tributary, and Madera Ranchos North and South. A master drainage plan has been prepared for the Madera Ranchos-Root Creek area.

There are levees in the County to assist in the protection against flooding. Levees in the County are discussed in the levee profile in Section 4.2.17.

### **Madera County Flood Mapping**

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

#### **FEMA Floodplain Mapping**

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and regulations. Floodplain studies that may be approved by FEMA include federally funded studies; studies developed by state, city, and regional public agencies; and technical studies generated by private interests as part of property annexation and land development efforts. Such studies (i.e. FIS) may include entire stream reaches or limited stream sections depending on the nature and scope of a study. A general overview of floodplain mapping is provided in the following paragraphs. Details on the NFIP and mapping specific to the County and participating jurisdictions are in Section 4.3 Vulnerability Assessment and in the jurisdictional annexes.

### *Flood Insurance Study (FIS)*

The FIS develops flood-risk data for various areas of the community that will be used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Madera County FIS is dated September 26, 2008. The FIS covers both the unincorporated and incorporated areas of the County.

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

The FIRM is designed for flood insurance and floodplain management applications. For flood insurance, the FIRM designates flood insurance rate zones to assign premium rates for flood insurance policies. For floodplain management, the FIRM delineates 1% and 0.2% annual chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation. The County FIRMs have been replaced by digital flood insurance rate maps (DFIRMs) as part of FEMA's Map Modernization program, which is discussed further below.

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

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

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

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

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

DFIRMs for Madera County have been developed, are dated September 26, 2008, and are being used for the flood analysis for this LHMP Update.

### **California Department of Water Resources Best Available Maps (BAM)**

Also to be considered when evaluating the flood risks in Madera County are various floodplain maps developed by the California Department of Water Resources (DWR) for various areas throughout California, and in the Sacramento-San Joaquin Valley cities and counties. The FEMA regulatory maps provide just one perspective on flood risks in Madera County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 1% and 0.5% (200-year) annual chance floodplains for areas located within the Sacramento-San Joaquin (SAC-SJ) Valley

watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 0.2% annual chance floodplains.

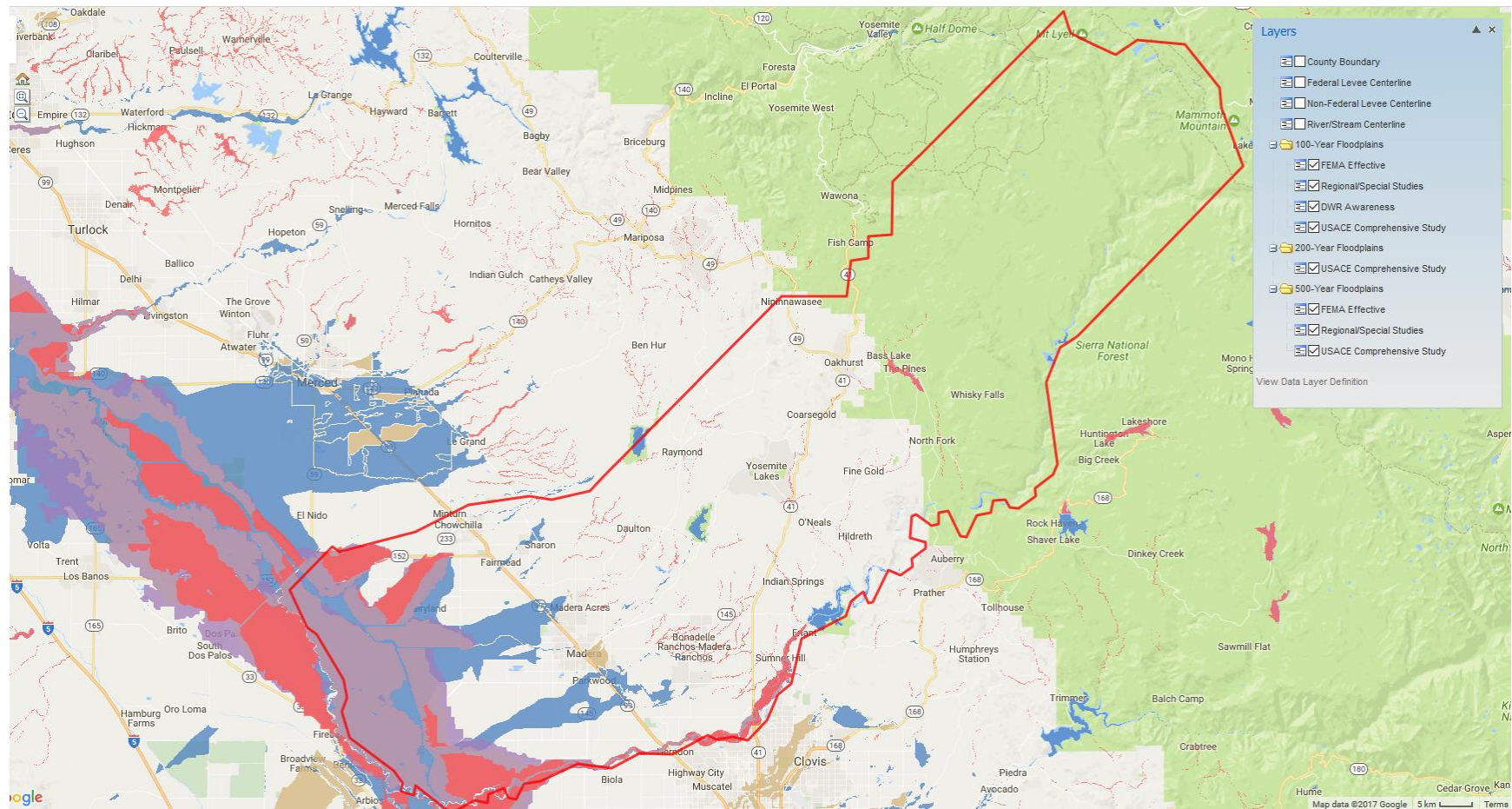
Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 1% annual chance flood risk, the BAMs are provided for informational purposes and are intended to reflect current 1%, 0.5% (200-year) as applicable, and 0.2% annual chance flood risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 1% annual chance floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 1% annual chance floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 1%, 0.5%, and 0.2% annual chance floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

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

Figure 4-41 shows the BAM for the Madera County Planning Area. BAM maps for each jurisdiction are included in their respective annexes.



Figure 4-41 Madera County Planning Area – Flood Awareness (Best Available) Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1% (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

## Past Occurrences

### Disaster Declaration History

Madera County has seen multiple disaster declarations related to flooding. This can be seen in Table 4-36.

*Table 4-36 Madera County Flood Disaster Declarations 1950 to 2017*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood	7	1955, 1969, 1982/1983, 1986, 1995, 1997, 2006	11	1950, 1955, 1958, 1964, 1969, 1982/1983 (two times), 1986, 1995, 1997, 1998
Flood, Landslide, Mud Flows	2	1993, 1995	3	1993, 1995, 2016/2017
Road Damage	0	–	1	2003
<b>Totals</b>	<b>9</b>	–	<b>15</b>	–

Source: Cal OES, FEMA

### NCDC Events

The NCDC tracks flooding events for the County. Events have been tracked for flooding since 1993. Table 4-37 shows events in Madera County since 1993. Information on specific events from this table that affected Madera County are described below the table.

*Table 4-37 NCDC Flood Events in Madera County 1993 to 12/31/2016*

Date	Event	Deaths (direct)	Injuries (direct)	Property Damage	Crop Damage	Injuries (indirect)	Deaths (indirect)
10/29/2007	Flash Flood	0	0	\$25,000	\$0	0	0
5/27/2009	Flash Flood	0	0	\$0	\$0	0	0
1/26/1997	Flood	0	0	\$0	\$0	0	0
2/3/1998	Flood	0	0	\$0	\$0	0	0
3/13/1998	Flood	0	0	\$0	\$0	0	0
6/6/1998	Flood	0	0	\$0	\$0	0	0
11/12/2001	Flood	0	0	\$0	\$0	0	0
11/8/2002	Flood	0	0	\$25,000	\$0	0	0
11/8/2002	Flood	0	0	\$100,000	\$0	0	0
12/19/2002	Flood	0	0	\$0	\$0	0	0
8/25/2003	Flood	0	0	\$0	\$0	0	0
1/9/2005	Flood	0	0	\$250,000	\$0	0	0
1/9/2005	Flood	0	0	\$10,000	\$0	0	0
1/10/2005	Flood	0	0	\$200,000	\$0	0	0

Date	Event	Deaths (direct)	Injuries (direct)	Property Damage	Crop Damage	Injuries (indirect)	Deaths (indirect)
3/22/2005	Flood	0	0	\$2,250,000	\$0	0	0
3/22/2005	Flood	0	0	\$250,000	\$0	0	0
5/16/2005	Flood	0	0	\$100,000	\$0	0	0
5/20/2005	Flood	0	0	\$0	\$0	0	0
6/1/2005	Flood	0	0	\$0	\$0	0	0
12/31/2005	Flood	0	0	\$0	\$0	0	0
1/2/2006	Flood	0	0	\$10,000	\$0	0	0
4/3/2006	Flood	0	0	\$0	\$0	0	0
4/4/2006	Flood	0	0	\$0	\$0	0	0
4/5/2006	Flood	0	0	\$2,750,000	\$5,800,000	0	0
1/23/2008	Flood	0	0	\$0	\$0	0	0
12/17/2010	Flood	0	0	\$35,000	\$0	0	0
12/29/2010	Flood	0	0	\$75,000	\$0	0	0
1/2/2011	Flood	0	0	\$0	\$0	0	0
1/2/2011	Flood	0	0	\$5,000	\$0	0	0
1/2/2011	Flood	0	0	\$5,000	\$0	0	0
3/24/2011	Flood	0	0	\$3,000	\$0	0	0
3/24/2011	Flood	0	0	\$2,000	\$0	0	0
3/24/2011	Flood	0	0	\$3,000	\$0	0	0
11/17/2012	Flood	0	0	\$0	\$0	0	0
11/30/2012	Flood	0	0	\$25,000	\$0	0	0
<b>Totals</b>		<b>0</b>	<b>0</b>	<b>\$6,123,000</b>	<b>\$5,800,000</b>	<b>0</b>	<b>0</b>

Source: NCDC

- **January 9<sup>th</sup> and 10<sup>th</sup>, 2005** – Saturated soils due to a multiple-day precipitation event loosed rocks onto roadways at numerous locations in the foothills and mountains of Mariposa, Madera, Fresno, and Tulare Counties by the 10th of the month. Throughout the area many roadways had ponded water and debris due to rainfall and subsequent water movement. \$250,000 in damages were reported, though most of it was in Mariposa County.
- **March 22, 2005** – Over 4 inches of rain fell in a 24-hour period ending late on the 22nd in the Mariposa County area of Central California with Mariposa specifically reporting 3.22" of rain. Numerous small creeks flooded in Mariposa, Merced, and Madera Counties. Flooding caused damage to structures within the town of Mariposa and several bridges and roads in and around Hornitos, Merced Falls, and Catheys Valley in Merced and Mariposa Counties. The creeks that flooded in Mariposa County included Mariposa, Burns, Bear, and Owens Creeks. In Madera County, Finegold Creek near North Fork ran full from the event. \$2.25 million in damages were reported as a result, though not all damages occurred in Madera County.
- **March 3, 2006** – Madera reported street flooding in the downtown area with 1.56" received from the day's rain.

- **April 5, 2006** – The Berenda Slough had its banks fail between 11:30 and 12:30 on the 4<sup>th</sup> resulting in widespread water over farmland in Madera County southwest of Chowchilla. Flooding of this type and in this location had not occurred in at least the last 76 years as any high water flows had safely moved past the area within the banks of the area sloughs, creeks, and rivers. In total, \$2.75 million of property damage and \$5.8 million of crop damages was attributed to this flooding.

## FIS Events

The FIS noted the following:

### *City of Madera*

The Madera area is known to have experienced many floods in the past. Historical data available indicate that floods occurred in the study area in 1861-62, 1867-68, 1911, and 1914. Records show that floods occurred in 11 of the past 38 years prior to the construction of Hidden Dam in September of 1976. Flooding occurred in 1938, 1943, 1945, 1950, 1952, 1955, 1956, 1958, 1962, 1963, and 1969. Since the operation of Hidden Dam in September of 1976, no floods have occurred in the study area.

The floods that occurred in December 1955 and February 1969 were of about equal magnitude and the most severe known in the study area. During the January 1969 storm, the levee system at the head of Cottonwood Creek overflow channel was overtopped and floodwater from Fresno River spilled into Cottonwood Creek at the rate of about 1,000 cubic feet per second (cfs). This overflow was considerably less than that which occurred during the December 1955 flood when the levees were breached. Consequently, Fresno River flood flow through the City of Madera in January 1969 (about 15,000 cfs) was considerably greater than in December 1955. However, flooding in January 1969 was minor compared to the February 1969 flooding, which was characterized in newspaper accounts as “five times the waters and ten times the damage” of the January 1969 event.

### *Oakhurst Community*

There are no known documented significant flood problems in the community of Oakhurst. Anecdotal information from local residents indicated that there has been localized flooding, including an area along the north side of China Creek approximately 3,000 feet upstream of the Fresno River.

### *Madera County (Unincorporated Areas)*

Cottonwood, Root, Dry, and Schmidt Creeks, Schmidt Creek Tributary, and Madera Ranchos North and South do not have perennial flow. They are all dry from May through October. All of the channels of these streams are poorly defined. Floods produce high flows and large volumes of water that exceed channel capacities and spread overland. In the developed area in the upper reaches of Madera Ranchos North and South, significant flooding occurred in the winter storm of 1983. There was no record made of flow amounts during that storm. Significant flooding in 1997 revealed new flood plains. A restudy of the San Joaquin River from SH-99 to SH-145 within the unincorporated areas of Madera County was conducted after floods along the river indicated a significant increase in the river's hydrology. This created a need to update the existing floodplain maps. DWR provided estimated high-water marks from the 1997 flooding of the San Joaquin River from Gravelly Ford to SH-99.

## Hazard Mitigation Planning Team Events

**2011** – Flood event damaged mainly the Fresno River (near the bypass). At least 7 sites were identified to have seepage (boils). Several entities helped out and built temporary boil sack rings in all areas which alleviated the damages at least temporarily. In 2014, the County obtained a \$2.5 million grant to repair these critical sites. This grant was under Proposition 1E.

**February 8, 2017** – Water billowed through the town of North Fork Tuesday, overrunning creek beds, crushing trees, and threatening all in its path. At Bass Lake Mobile Home Park the water came just feet away from submerging belongings. As the downpour continued mandatory evacuation orders started to come down. The following areas were affected by the evacuation: East Side of Church Street; and the Bass Lake Mobile Home Park.

During the winter storms of **2017**, there was some localized flooding along the Fresno River near Road 426. A Local RV Resort along the river allowed some Yurts to be placed close to the river which flowed down stream. The Yurts ended up blocking the water flow under a bridge cross which caused county staff to remove them to increase water flows.

### *Likelihood of Future Occurrence*

#### **1% Annual Chance Flood**

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

#### **0.2% Annual Chance Flood**

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

### *Climate Change and Flood*

According to the CAS, climate change may affect flooding in Madera County. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is possible that average soil moisture and runoff could decline, however, due to increasing temperature, evapotranspiration rates, and spacing between rainfall events. Reduced snowpack and increased number of intense rainfall events are likely to put additional pressure on water infrastructure which could increase the chance of flooding associated with breaches or failures of flood control structures such as levees and dams. Future precipitation projections was shown in Figure 4-16 in Section 4.2.5.

## 4.2.14. Flood: Localized Flooding

### *Hazard/Problem Description*

Localized, stormwater flooding also occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration. Flooding is more severe when previous rainfall has created saturated ground conditions. Urban storm drainpipes and pump stations have a finite capacity. When rainfall exceeds this capacity, or the system is clogged, water accumulates in the street until it reaches a level of overland release. This type of flooding may occur when intense storms occur over areas of development.

In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. The amount and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. These areas and the types of damage are presented in Table 4-38. The HMPC noted that the river overflows out of its banks near Church Street, as well as at Road 225 and Redinger Lake. The Ash and Brenda Sloughs cause flooding to roads that run across of them. Most of them are low water crossing. After water enters the sloughs, the roads that cross them are closed and detour plans are formed. The areas of constant flooding normally tie up staff time due to evacuation notifications and security of evacuated residences.

*Table 4-38 Unincorporated Madera County Localized Flooding Areas*

Road Name	Flooding	Pavement Deterioration	Washouts	High Water/ Creek Crossing	Landslides/ Mudslides	Debris
Church St	Y			Y		
Road 225 at Redinger Lake	Y	Y	Y	Y	Y	Y
Ash Slough	Y	Y	Y	Y		
Berenda Slough	Y		Y	Y		Y
Road 621 at High Point Court	Y	Y	Y			
Cottonwood Creek			Y			Y
Berenda Creek			Y			Y

Source: Madera County

### *Past Occurrences*

### **Disaster Declarations**

There are no state or federal disaster declarations for localized flooding in Madera County, according to Table 4-3.

## NCDC Events

The past occurrences of localized flooding are included in the 100-/500-year flood hazard profile in Section 4.2.13.

## Hazard Mitigation Planning Team Events

The Planning Team noted no specific events of localized flooding, but they noted that localized flooding does occur with some regularity in those locations denoted in Table 4-38.

### *Likelihood of Future Occurrence*

**Highly Likely**—With respect to the localized, stormwater flood issues, the potential for flooding may increase as storm water is channelized due to land development. Such changes can create localized flooding problems in and outside of natural floodplains by altering or confining natural drainage channels. Urban storm drainage systems have a finite capacity. When rainfall exceeds this capacity or systems clog, water accumulates in the street until it reaches a level of overland release. With increasing urbanization of Madera County, combined with older infrastructure, this type of flooding will continue to occur on an annual basis during heavy rains.

### *Climate Change and Localized Flood*

While average annual rainfall may decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century, increasing the likelihood of overwhelming stormwater systems built to historical rainfall averages. This makes localized flooding more likely.

## 4.2.15. Hazardous Materials Transport

### *Hazard/Problem Description*

According to the Environmental Protection Agency (EPA), a hazardous material is any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in any form; gas, solid, or liquid. Environmental or atmospheric conditions can influence hazardous materials if they are uncontained.

The U.S. Occupational Safety and Health Administration's (OSHA) definition of hazardous material includes any substance or chemical which is a "health hazard" or "physical hazard," including: chemicals which are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents which act on the hematopoietic system; agents which damage the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapors, mists or smoke which may have any of the previously mentioned characteristics.

The EPA incorporates the OSHA definition, and adds any item or chemical which can cause harm to people, plants, or animals when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging,

injecting, escaping, leaching, dumping or disposing into the environment. The EPA maintains a list of 366 chemicals that are considered extremely hazardous substances (EHS). This list was developed under the Superfund Amendments and Reauthorization Act. The presence of EHSs in amounts in excess of a threshold planning quantity requires that certain emergency planning activities be conducted.

A release or spill of bulk hazardous materials could result in fire, explosion, toxic cloud or direct contamination of water, people, and property. The effects may involve a local site or many square miles. Health problems may be immediate, such as corrosive effects on skin and lungs, or be gradual, such as the development of cancer from a carcinogen. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material.

Accidents involving the transportation of hazardous materials could be just as catastrophic as accidents involving stored chemicals, possibly more so, since the location of a transportation accident is not predictable. The U.S. Department of Transportation divides hazardous materials into nine major hazard classes. A hazard class is a group of materials that share a common major hazardous property, i.e., radioactivity, flammability, etc. These hazard classes include:

- Class 1—Explosives
- Class 2—Compressed Gases
- Class 3—Flammable Liquids
- Class 4—Flammable Solids; Spontaneously Combustible Materials; Dangers When Wet Materials/Water-Reactive Substances
- Class 5—Oxidizing Substances and Organic Peroxides
- Class 6—Toxic Substances and Infectious Substances
- Class 7—Radioactive Materials
- Class 8—Corrosives
- Class 9—Miscellaneous Hazardous Materials/Products, Substances, or Organisms

Highways and railways constitute a major threat due to the myriad chemicals and hazardous substances, including radioactive materials, transported in vehicles, trucks, and rail cars. Much of the hazardous materials transported through Madera County are carried by truck on the State Highway or on railway systems. Figure 4-72 in Section 4.3.10 shows the roadways and railroads and pipelines that are involved in the transportation of hazardous materials through the County. The General Plan Background Report noted that there are four major state highways in the County: Highways 99, 152, 145, and 41. It was noted that Highway 49 also is a hazardous materials route. In terms of the current transport situation, the major routes are Highway 99 and the two railroads (Southern Pacific and Burlington Northern Santa Fe), which transport thousands of tons of hazardous materials each year. Most of the suitable sites for future treatment, storage, or disposal facilities are on or near Highways 99 or 152. In addition, Southern Pacific and Burlington Northern Santa Fe Railroads cross most of the site areas. Highway 145, which links Highways 41 and 99, crosses the city of Madera before intersecting Highway 99; as such, the potential for spills caused by accidents to affect large numbers of people is great.

Some of the hazardous materials transported through the County may bypass identified hazardous materials routes. Chemicals supporting local industries, such as agriculture operations and agriculture support operations, may transport hazardous materials to and from the facilities and fields on other area roads that



are not shown on Figure 4-72. In addition, while most routes are known, the County has not quantified the amount of hazardous materials that are transported through it en route to adjoining counties or states.

### *Past Occurrences*

### Disaster Declaration History

There have been no federal or state disaster declarations for hazardous materials transportation incidents in Madera County.

### NCDC Events

The NCDC does not track hazardous materials events.

### PHMSA Events

The United States Department of Transportation Pipeline and Hazardous Materials Safety Administration’s (PHMSA) Office of Hazardous Materials Safety performs a range of functions to support the safe transport of hazardous material. One of these functions is the tracking of hazardous materials incidents in the United States. The database was searched for hazardous materials incidents in Madera County. A summary of rail and highway incidents since 1970 in the Madera County Planning Area are shown in Table 4-39. 15 separate events were contained in the database.

*Table 4-39 Madera County Hazardous Materials Incidents by Jurisdiction Since 1970*

Date of Incident	Incident City	Incident Route	Mode of Transportation	Transportation Phase	Commodity Short Name	Quantity Released	Amount of Damages
11/5/1974	Chowchilla	Unknown	Highway	N/A	Nitro Carbo Nitrate	100 lbs	\$0
2/8/1976	Madera	Unknown	Highway	N/A	Ammonium Nitrate	29,580 lbs	\$0
6/1/1976	Madera	Unknown	Rail	N/A	Dinitrophenol Solutions	0 gal.	\$0
4/12/1977	Chowchilla	Unknown	Highway	N/A	Organic Phosphate	100 lbs	\$0
9/24/1978	Madera	Unknown	Highway	N/A	Toluene Diisocyanate	5 gal.	\$0
10/10/1978	Chowchilla	Unknown	Highway	N/A	Sodium Chlorate	1,013 gal.	\$0
9/19/1980	Madera	Unknown	Highway	N/A	Gasoline	50 gal.	\$0
3/13/1984	Madera	Unknown	Highway	N/A	Ammonia Solution	1,200 gal.	\$0
2/16/1988	Chowchilla	Unknown	Highway	N/A	Ammonia Anhydrous	1,875 gal.	\$0
6/13/1988	Madera	Unknown	Highway	N/A	Sodium Hydroxide	4 gal.	\$0
6/30/1995	Madera	2980 Falcon Drive	Highway	Unloading	Resin Solution Flammable	31.25 gal.	\$0

Date of Incident	Incident City	Incident Route	Mode of Transportation	Transportation Phase	Commodity Short Name	Quantity Released	Amount of Damages
8/14/1995	Madera	Falcon Drive	Highway	N/A	Resin Solution Flammable	0.5 gal.	\$0
7/13/2006	Madera	Unknown	Highway	In Transit	Resin Solution Flammable	0.25 gal.	\$0
11/11/2006	Madera	Milepost: 183.30	Rail	In Transit Storage	Ferric Chloride Solution	50 gal.	\$27,224
6/22/2007	Madera	31740 Avenue 12	Highway	Unloading	Sulfuric Acid	3 gal.	\$8,005
<b>Totals</b>							<b>\$542,732</b>

Source: PHMSA Database – Search dates 01/01/1970 – 05/01/2017

## Hazard Mitigation Planning Team Events

The Planning Team noted no other events. They also stated that there may be underreporting of these events due to not having a State recognized hazmat team in the County. Madera County depends on neighboring counties to fill this need.

### *Likelihood of Future Occurrence*

**Likely** – Given that 15 hazardous materials incidents have happened in transport through the County in the past 47 years (and many small releases go unreported to national databases), it is likely a hazardous materials incident will occur in Madera County every 3.1 years. However, according to Caltrans, most incidences are related to releases during loading and unloading of cargo, and during transport, of fluids from the transporting vehicles themselves and not the cargo. Thus, the likelihood of a significant hazardous materials release within the County is more limited and difficult to predict.

## Climate Change and Hazardous Materials

Climate change is unlikely to affect hazardous materials transportation incidents.

### 4.2.16. Landslides, Rockfalls, and Debris Flows

#### *Hazard/Problem Description*

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

The susceptibility of an area to landslides depends on many variables including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and

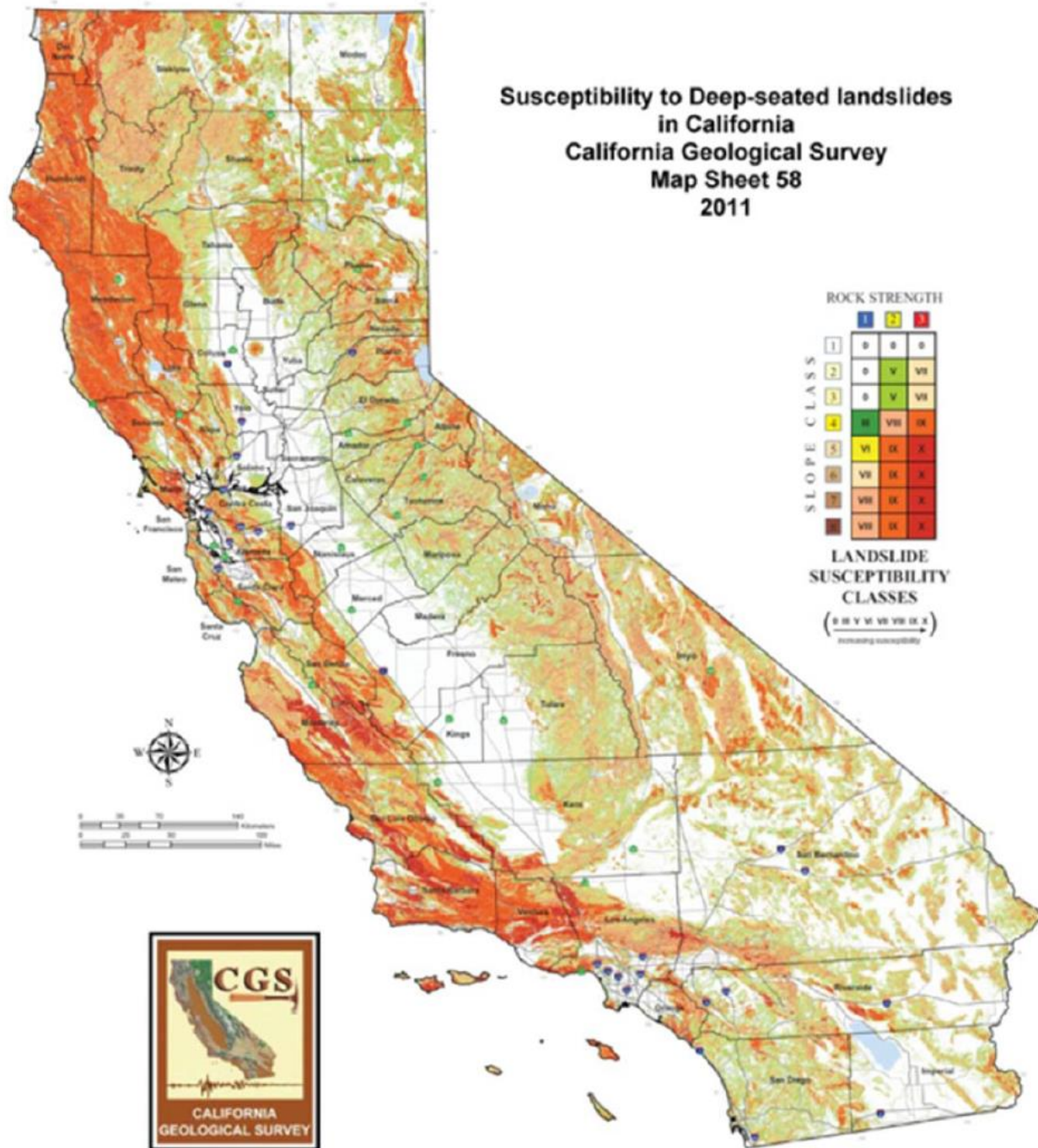
proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas.

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

Triggers such as an earthquake, heavy rainfall and human activities can set a landslide in motion. The General Plan Background Report noted that although slope movements can occur in any type of rock material, certain bedrock formations exhibit a high susceptibility to such movement. Areas of minimal risk are mainly flatlands, valley bottoms, and areas of minimal topographic relief; and areas consisting of hillside and mountainous terrain of competent igneous and metamorphic rocks and sedimentary rocks with favorable bedding and composition (a relatively stable category that includes much of the Sierras). Risk zones in the County include dip slopes (natural slopes parallel to bedding in sedimentary rocks), complexly folded metamorphic rocks, and zones of fractured rock; and several areas of the Sierras which consist of weak, landslide-prone rock and existing landslides. In summary, landslide hazards within the county are confined to the foothills and mountainous terrain, and the steep banks of the rivers which pass through the valley floor.

Figure 4-42 was developed for the 2013 State of California Multi-Hazard Mitigation Plan. It indicates that most areas throughout Madera County are at low to moderate risk for landslides and an area in the central and eastern portions of the County is at high risk for landslides.

Figure 4-42 Landslide Risk Zones



Source: 2013 State of California Multi-Hazard Mitigation Plan

### Reactivation of Inactive Slides

The California Geological Survey noted that after movement, most landslides attain a degree of stability, but a landslide reacts with remarkable sensitivity to changes brought on by nature and human-related activities. Equilibrium can be upset by increasing the driving force (i.e. overloading the head of the slide)

or by decreasing the resisting force (i.e. removing support from in front of the slide, in the area called the toe). This is apparent every winter to road maintenance crews who remove the toe of a fresh slide from the highway only to leave the slide in a poised and precarious state for the next triggering rain. The same is true where new roads are constructed across the toe of an old inactive slide; or where grading on a residential tract is completed with satisfactory precautions, only to have grading during utility, sidewalk, house or yard construction remove toe support from a creep or slide area.

Triggering devices such as water, ground shaking, and grading activities are not the basic causes that create the unstable condition and determine the dimension of the slide. Rather, it is the effect of these triggering devices on the basic environmental conditions; the relationship of rock type and geologic structure to, most importantly, slope height and slope angle.

### *Past Occurrences*

#### **Disaster Declaration History**

There have been two federal and three state disaster declarations associated with landslides in Madera County. This can be seen in Table 4-40.

*Table 4-40 Madera County Landslide Disaster Declarations 1950-2017*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood, Landslide, Mud Flows	2	1993, 1995	3	1993, 1995, 2016/2017

Source: Cal OES, FEMA

#### **NCDC Events**

The NCDC contains two records for landslide. Due to the regional nature of the NCDC reporting, this event did not occur in Madera County, but in Merced and Kern counties. No damages or effects were noted for Madera County.

#### **Hazard Mitigation Planning Team Events**

The Planning Team noted that a small slide-prone area along Highway 41 between Coarsegold and Oakhurst exists, and occurs in a mountain pass. This is in addition to Road 200 between Road 201 and the town of North Fork. There have been landslides in this area because it is also a mountain pass. There have been slides in each location in the past, but specific dates and damages were unknown.

### *Likelihood of Future Occurrence*

**Highly Likely**—Based on data provided by the HMPC, minor landslides have occurred in the past, probably over the last several hundred years, as evidenced both by past deposits exposed in erosion gullies and recent landslide events. Many landslides in Madera County happen in uninhabited locations. With significant rainfall, additional failures are likely to occur within identified landslide hazard areas. Given

the topography within the County, landslides will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

## Climate Change and Landslide and Debris Flows

According to the CAS, climate change may result in precipitation extremes (i.e., wetter wet periods and drier dry periods). More information on precipitation increases can be found in Section 4.2.5. While total average annual rainfall may decrease only slightly, rainfall is predicted to occur in fewer, more intense precipitation events. The combination of a generally drier climate in the future, which will increase the chance of drought and wildfires, and the occasional extreme downpour is likely to cause more mudslides and landslides.

### 4.2.17. Levee Failure

#### *Hazard/Problem Description*

A levee is a raised area that runs along the banks of a river, stream, or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower stream channel, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the stream bank, raising the level of the land around the stream. To construct a man-made levee, workers place dirt or concrete along the stream banks, creating an embankment. This embankment is flat at the top (usually drivable), and slopes at an angle down to the water. For added strength, sandbags are sometimes placed over dirt embankments.

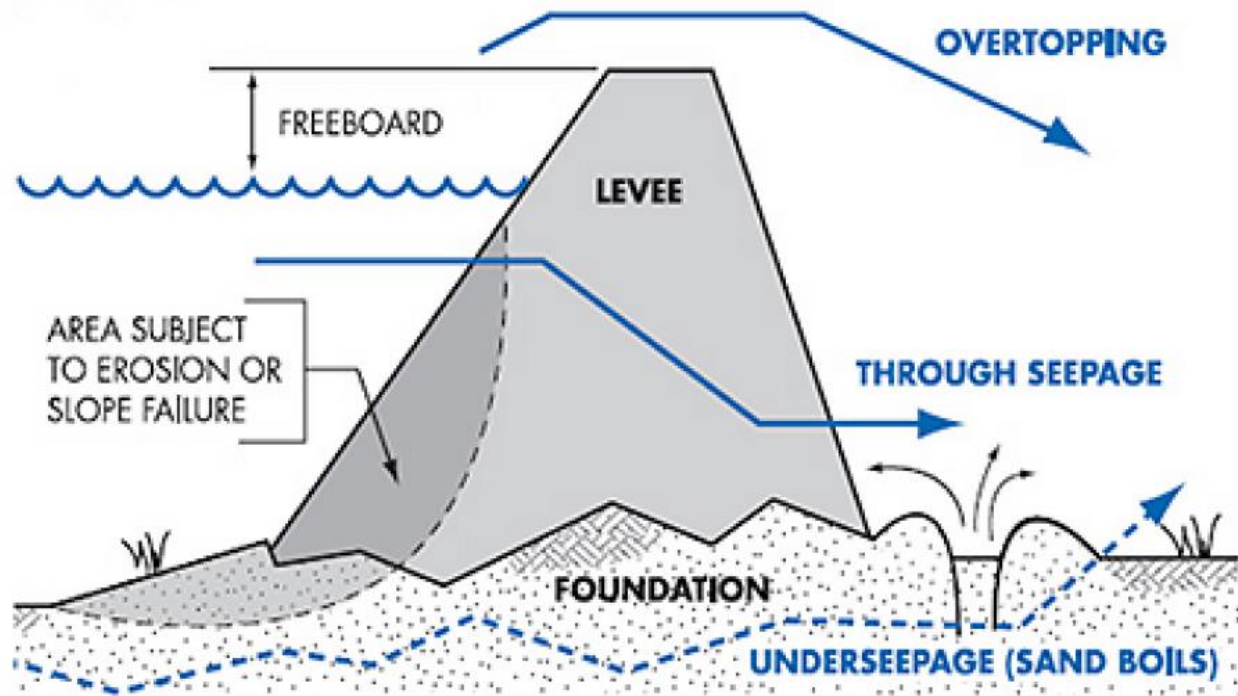
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. Levees reduce, not eliminate, the risk to individuals and structures located behind them.

A levee system failure or overtopping can create severe flooding and high water velocities. It's important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Under-seepage refers to water flowing under the levee through the levee foundation materials, often emanating from the bottom of the landside slope and ground surface and extending landward from the landside toe of the levee. Through-seepage refers to water flowing through the levee prism directly, often emanating from the landside slope of the levee. Both conditions can lead to failure by several mechanisms, including excessive water pressures causing foundation heave and slope instabilities, slow progressing internal erosion, and piping leading to levee slumping. These are both common in the levee systems in the County.

Rodents burrowing into and compromising the levee system is a significant issue in the Planning Area. Erosion can also lead to levee failure. Figure 4-43 depicts the causes of levee failure.

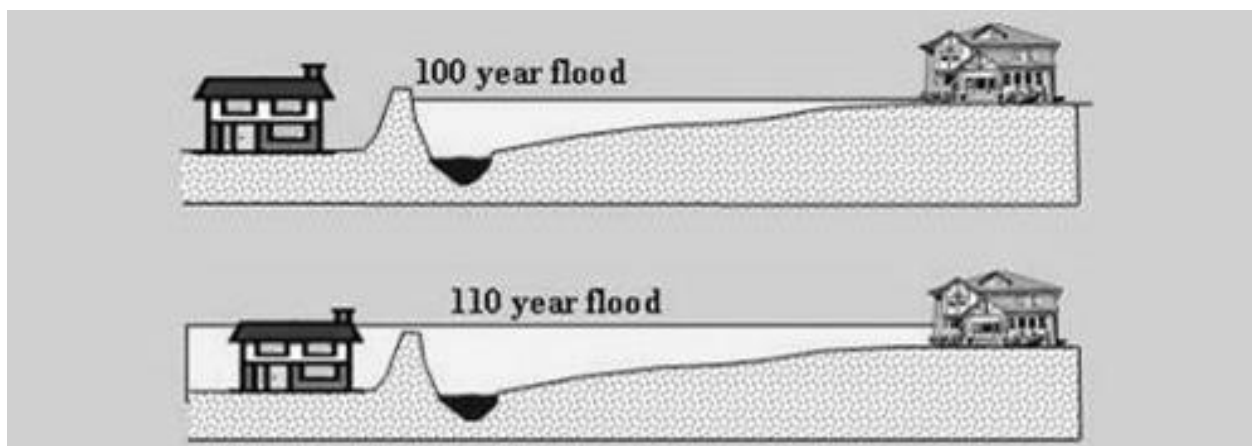
Figure 4-43 Potential Causes of Levee Failure



Source: USACE

Overtopping failure occurs when the flood water level rises above the crest of a levee. As shown in Figure 4-44, overtopping of levees can cause greater damage than a traditional flood due to the often lower topography behind the levee.

Figure 4-44 Flooding from Levee Overtopping



Source: Levees in History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.

In addition, the HMPC noted that deferred maintenance has been the same problem over the years and has been the main problem as to why the levees have frequent failures.

## Madera County Levees

The 2008 FIS noted that it was determined that:

*Levees exist in portions of Madera County that provide the community with some protection from flooding. However, the levees on the Chowchilla Canal/East Side Bypass, and portions of Ash and Berenda Sloughs, the Fresno and San Joaquin Rivers, Buttonwillow Drain, and Columbia Canal may not protect the community from rare events such as the 1-percent annual-chance flood. The criteria used to evaluate protection from the 1-percent annual-chance (1) adequate design, including freeboard, (2) structural stability, and (3) proper operation and maintenance. The levees on Ash and Berenda Sloughs and the Fresno River were designed and constructed by the USACE to provide protection from the 2-percent annual-chance and are maintained by the Madera County Flood Control and Water Conservation District. The levees on Chowchilla Canal/East Side Bypass were constructed by the California Reclamation Board and are maintained by the Lower San Joaquin Levee District. The design level of protection is unknown. No design, construction, or maintenance information was available for the other levees in question.*

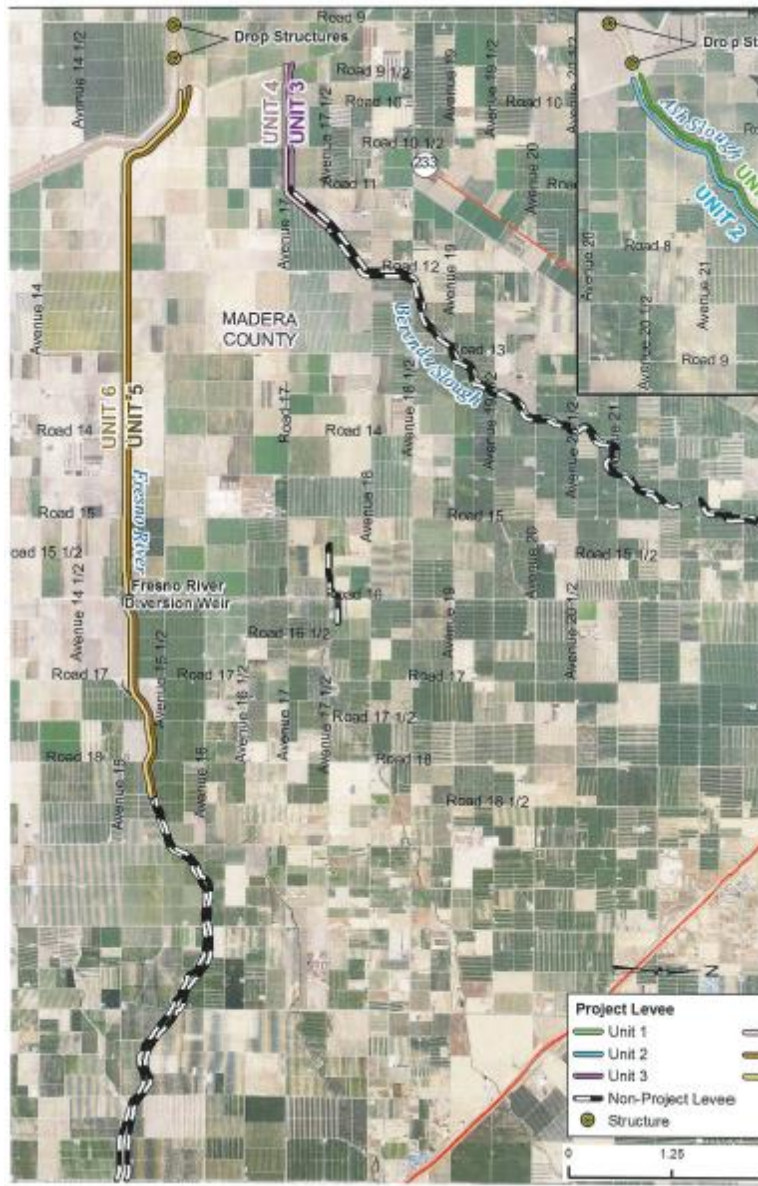
The Public Works Department of the County noted that •Project Levees were levees built in the 70s by the Army Corps of Engineers (USACE) and turned over to the County through agreements. The County therefore became the Local Maintenance Agency (LMA) for these project levees. See Figure 4-45

- Unit 1 Ash Slough
- Unit 2 Ash Slough
- Unit 3 Berenda Slough
- Unit 4 Berenda Slough
- Unit 5 Fresno River
- Unit 6 Fresno River
- Non-project Levees are those levees not included in Units 1-6.

Basically the County is the responsible jurisdictions for the maintenance and operation (O/M) of these facilities from the dams down to the Bypass, which include channel, levee, structures. For the most part approximately 90% of the levees are adjacent to agriculture. There really isn't much residential or commercial development occurring in our near our facilities. The County does want to become project certified again. PL84-99 the rehabilitation program would where the county would start the process also through USACE.



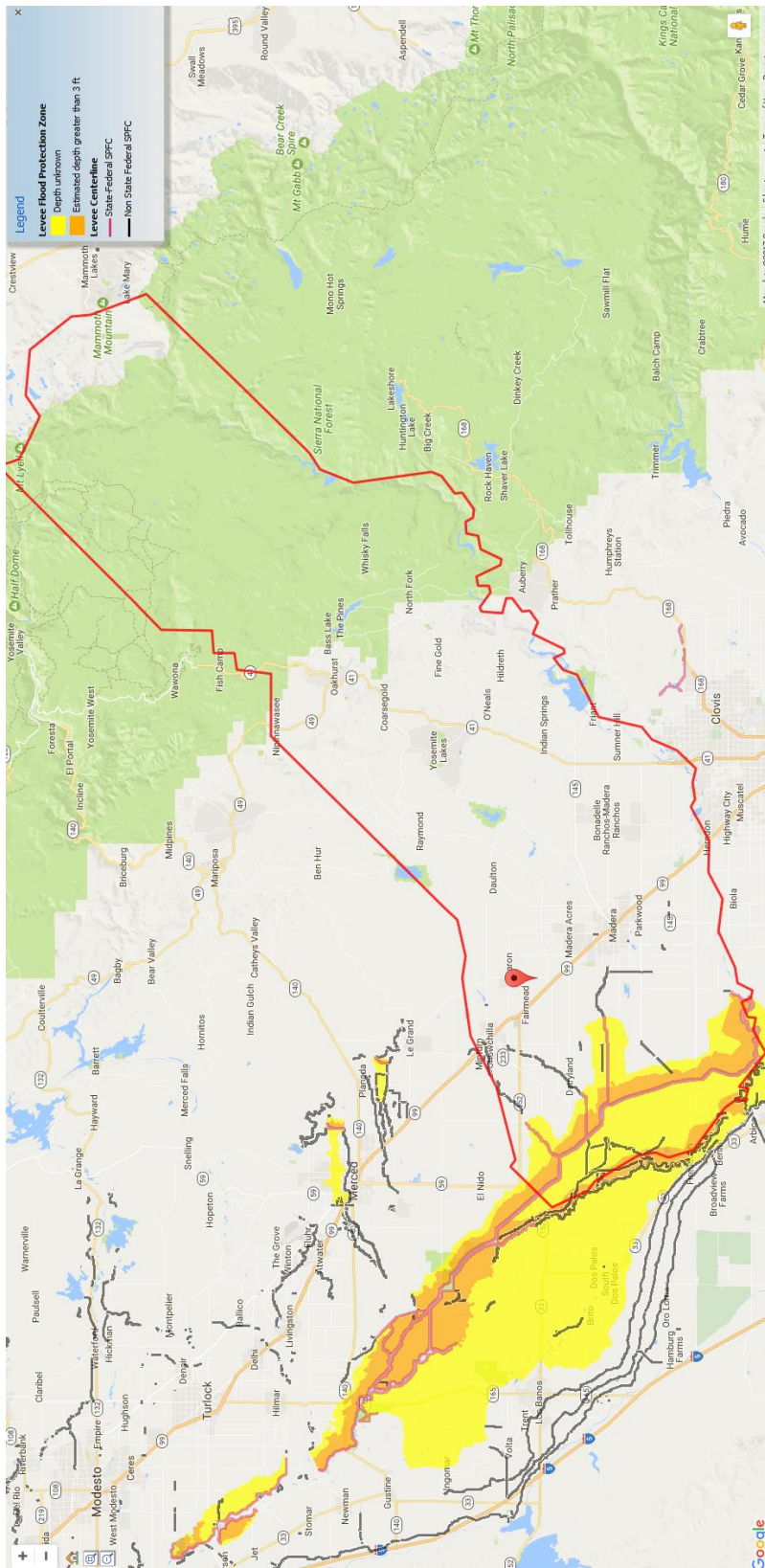
Figure 4-45 Madera County – Levee Status



Source: Madera County Public Works

The Levee Flood Protection Zone (LFPZ) maps were developed by the State of California Department of Water Resources as required by Water Code Section 9130 to increase awareness of flood risks associated with State-Federal levees. Levee Flood Protection Zone maps estimate the maximum area that may be flooded if a State-Federal levee fails with flows at maximum capacity that may reasonably be conveyed. These maps specifically focus on flood risks associated with State-Federal levees. Lands within the Levee Flood Protection Zone may also be subject to flooding due to other factors including, but not limited to, levee failure at flows less than design capacity, overtopping of a levee, drainage problems, or other types of flooding from sources on the land side of the levee. Lands not mapped within a Levee Flood Protection Zone may also be subject to flood risk. Levees in Madera County are shown in Figure 4-46.

Figure 4-46 Madera County – Levee Flood Protection Zones



Source: California Department of Water Resources. Yellow = depth unknown, orange = estimated depth greater than 3 ft.

## *Past Occurrences*

### Disaster Declaration History

There have been no state or federal disaster declarations in Madera County related to levee failure, according to Table 4-3.

### NCDC Events

The NCDC shows no events of levee failure in Madera County.

### Hazard Mitigation Planning Team Events

The Planning Team noted the following:

- Fresno River levee boils info. from the Flood Event of 2010-2011
  - ✓ Flood event damaged mainly the Fresno River (near the bypass – see Figure 4-47). At least 7 sites were identified to have seepage (boils). Several entities helped out and built temporary boil sack rings in all areas which alleviated the damages at least temporarily. In 2014, the County obtained a \$2.5 mill grant to repair these critical sites. This grant was under Proposition 1E.

*Figure 4-47 2011 Fresno River Levee Boils*



Source: Madera County Public Works

- In January 2017 Berenda had a few breaks. All breaks were due to the excess flows traveling down from the uncontrolled waters. The main break was at Avenue 18 and Road 18. Please see Figure 4-48. Madera Irrigation District helped out so much to maintain stability of the banks providing lots of hard

pan material. Cottonwood Creek also had several breaks please see attached. The cause was the same, uncontrolled released flows from the dams. All breaks were between Road 23 and Rd 24 ½

*Figure 4-48 2017 Levee Erosion*



Source: Madera County Public Works

### *Likelihood of Future Occurrence*

**Occasional**– Due to the numbers, ages and types of levees in Madera County, future levee failures are currently considered occasional.

## Climate Change and Levee Failure

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

### 4.2.18. Volcano

#### *Hazard/Problem Description*

The California State Hazard Mitigation Plan identifies volcanoes as one of the hazards that can adversely impact the State. However, there have been few losses in California from volcanic eruptions. Of the approximately 20 volcanoes in the State, only a few are active and pose a threat. Of these, Long Valley Caldera and Ubehebe Craters are the closest to Madera County. The Long Valley area is considered to be an active volcanic region of California and includes features such as the Mono-Inyo Craters, Long Valley Caldera, and numerous active and potential faults. Figure 4-49 shows volcanoes in or near California and the location of the Long Valley area relative to the Madera County Planning Area.

Figure 4-49 Active Volcanoes in California and in the Madera County Area

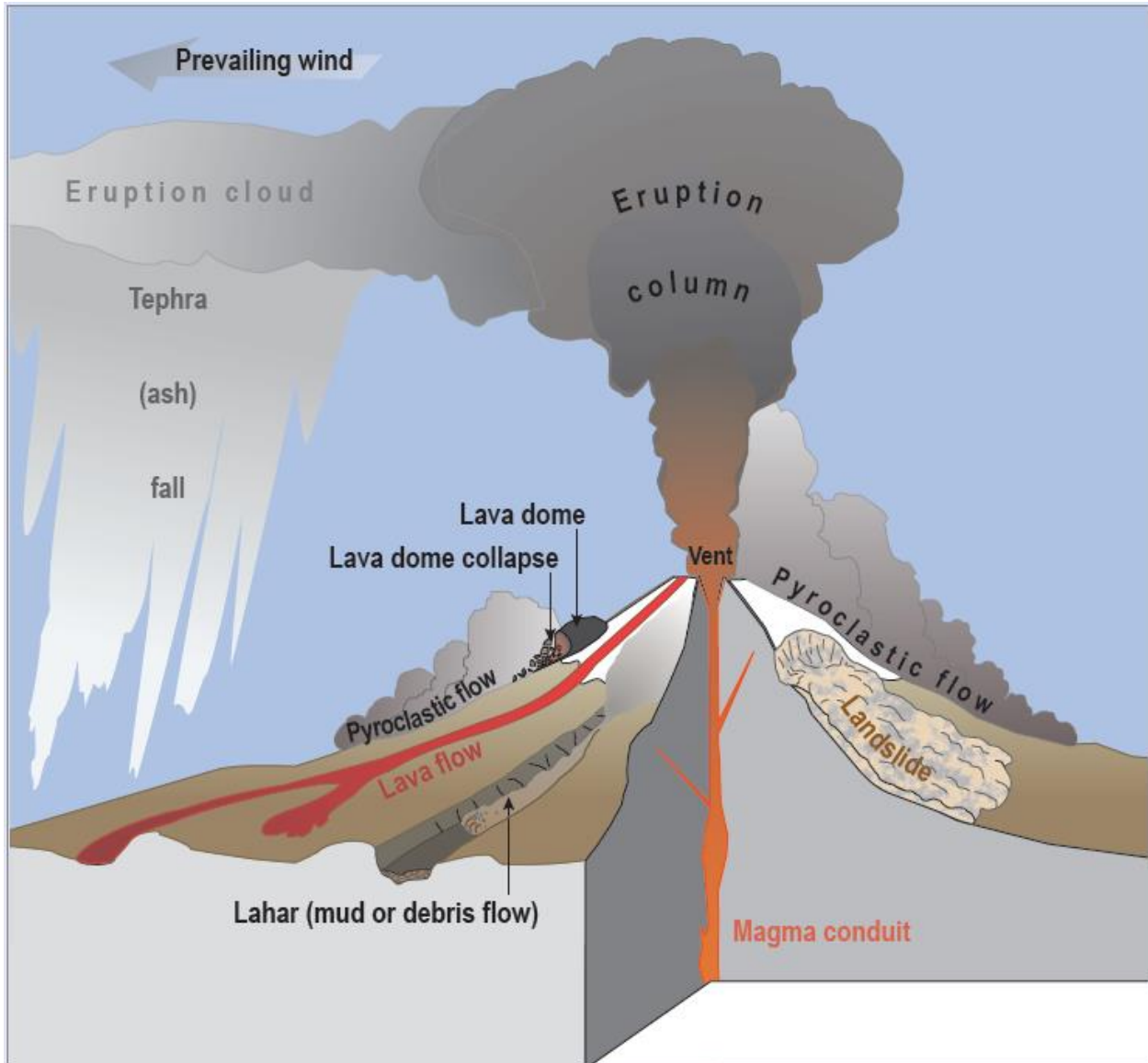


Source: 2013 State of California Hazard Mitigation Plan

As shown in Figure 4-50, active volcanoes pose a variety of natural hazards. Explosive eruptions blast lava fragments and gas into the air with tremendous force. The finest particles (ash) billow upward, forming an eruption column that can attain stratospheric heights in minutes. Simultaneously, searing volcanic gas laden with ash and coarse chunks of lava may sweep down the flanks of the volcano as a pyroclastic flow. Ash in the eruption cloud, carried by the prevailing winds, is an aviation hazard and may remain suspended for

hundreds of miles before settling to the ground as ash fall. During less energetic effusive eruptions, hot, fluid lava may issue from the volcano as lava flows that can cover many miles in a single day. Alternatively, a sluggish plug of cooler, partially solidified lava may push up at the vent during an effusive eruption, creating a lava dome. A growing lava dome may become so steep that it collapses, violently releasing pyroclastic flows potentially as hazardous as those produced during explosive eruptions.

*Figure 4-50 Volcanoes and Associated Hazards*

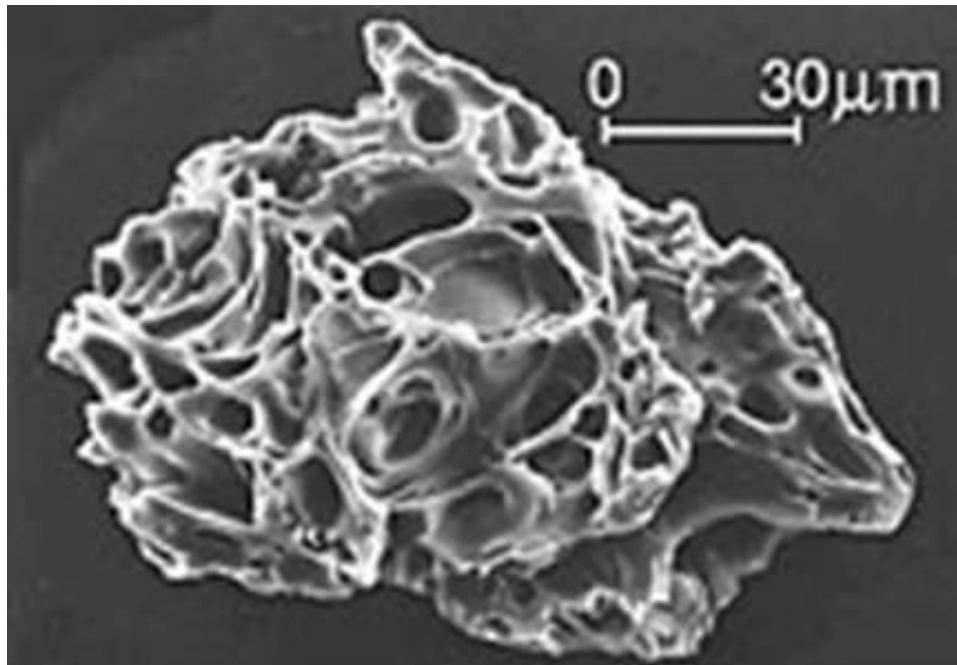


Source: USGS Publication 2014-3120

During and after an explosive or effusive eruption, loose volcanic debris on the flanks of the volcano can be mobilized by heavy rainfall or melting snow and ice, forming powerful floods of mud and rock (lahars) resembling rivers of wet concrete. These can rush down valleys and stream channels as one of the most destructive types of volcano hazards.

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. The USGS notes specific characteristics of volcanic ash. Volcanic ash is composed of small jagged pieces of rocks, minerals, and volcanic glass the size of sand and silt, as shown in Figure 4-51. Very small ash particles can be less than 0.001 millimeters across. Volcanic ash is not the product of combustion, like the soft fluffy material created by burning wood, leaves, or paper. Volcanic ash is hard, does not dissolve in water, is extremely abrasive and mildly corrosive, and conducts electricity when wet.

*Figure 4-51 Ash Particle from 1980 Mt. St Helens Eruption Magnified 200 Times*

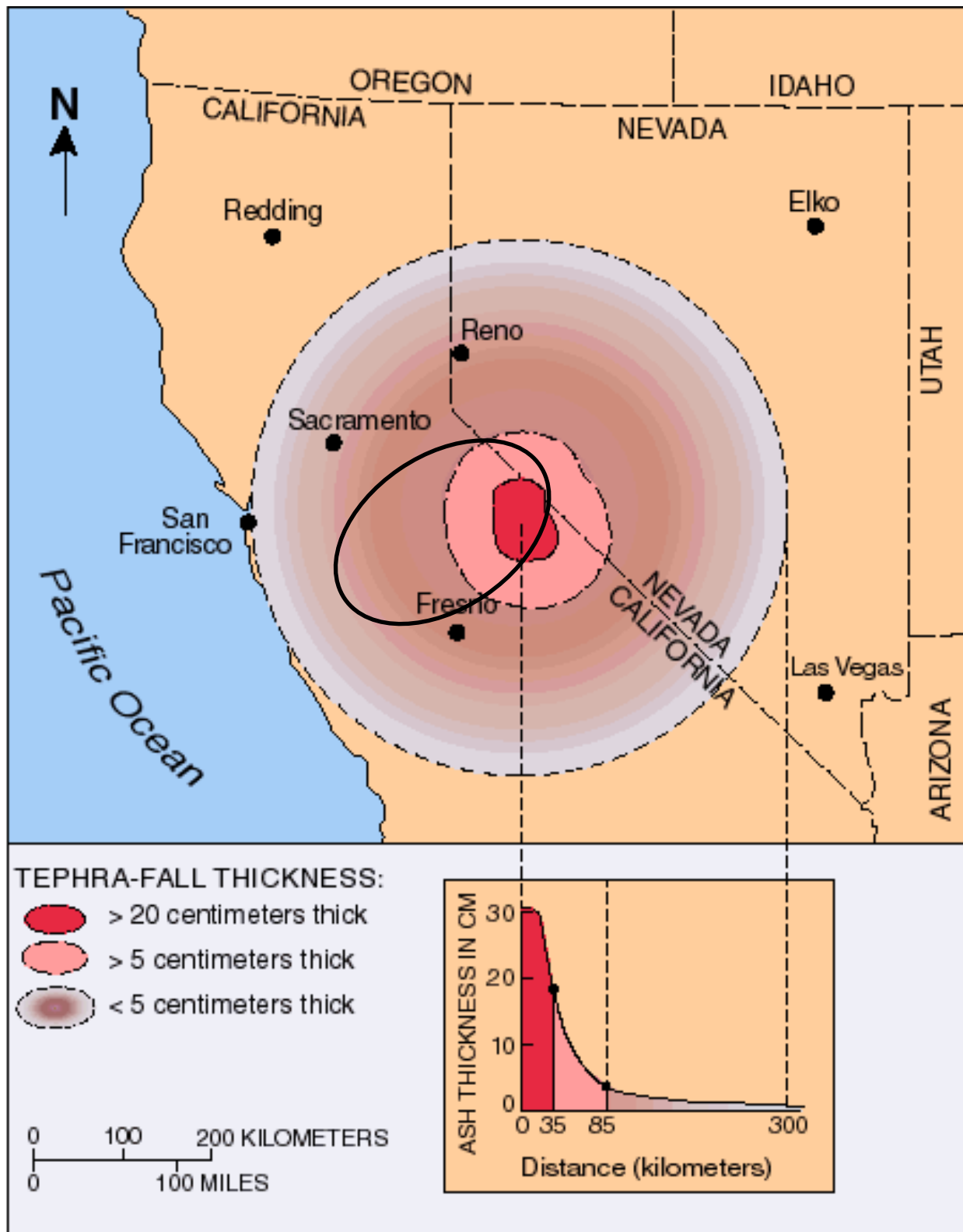


Source: US Geological Survey: Volcanic Ash: Effect & Mitigation Strategies. <http://volcanoes.usgs.gov/ash/properties.html>.

Volcanic ash is formed during explosive volcanic eruptions. Explosive eruptions occur when gases dissolved in molten rock (magma) expand and escape violently into the air, and also when water is heated by magma and abruptly flashes into steam. The force of the escaping gas violently shatters solid rocks. Expanding gas also shreds magma and blasts it into the air, where it solidifies into fragments of volcanic rock and glass. Once in the air, wind can blow the tiny ash particles tens to thousands of miles away from the volcano. Figure 4-52 is a volcanic hazard's ash dispersion map for the Long Valley Caldera, which could possibly affect Madera County.



Figure 4-52 Volcanic Hazards Ash Dispersion Map for the Long Valley Caldera



Source: US Geological Survey

The average grain-size of rock fragments and volcanic ash erupted from an exploding volcanic vent varies greatly among different eruptions and during a single explosive eruption that lasts hours to days. Heavier, large-sized rock fragments typically fall back to the ground on or close to the volcano and progressively smaller and lighter fragments are blown farther from the volcano by wind. Volcanic ash, the smallest particles (2 mm in diameter or smaller), can travel hundreds to thousands of kilometers downwind from a volcano depending on wind speed, volume of ash erupted, and height of the eruption column.

The size of ash particles that fall to the ground generally decreases exponentially with increasing distance from a volcano. Also, the range in grain size of volcanic ash typically diminishes downwind from a volcano (becoming progressively smaller). At specific locations, however, the distribution of ash particle sizes can vary widely. Based on Figure 4-52, the USGS estimated that ash between 2" and 8" could fall in areas of Madera County.

### *Past Occurrences*

#### Disaster Declarations

There have been no state or federal disaster declarations in Madera County related to volcano, as shown in Table 4-3.

#### NCDC Events

The NCDC does not track volcanic activity.

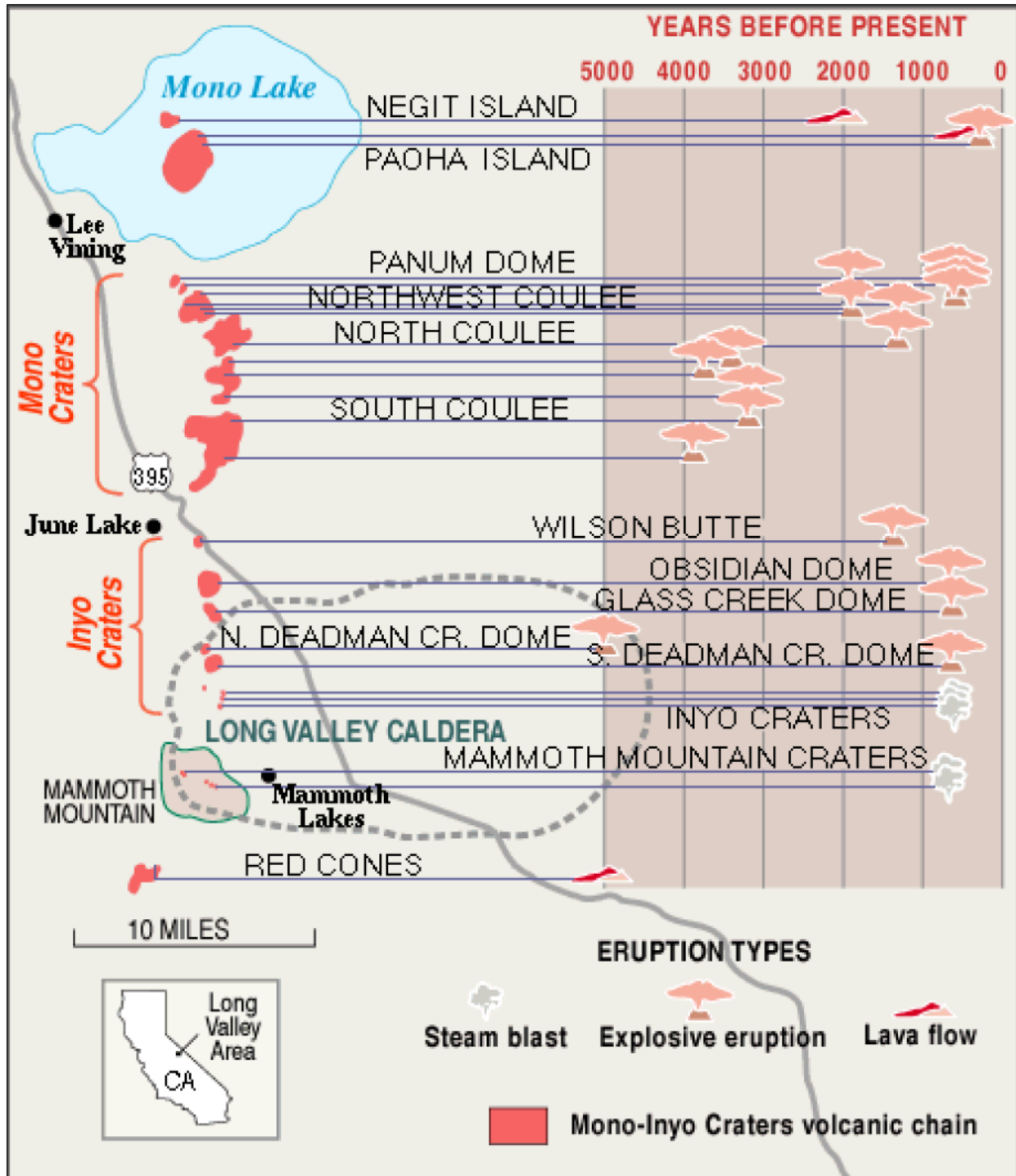
#### Hazard Mitigation Planning Team Events

The HMPC noted no volcanic events.

#### USGS Events

During the past 1,000 years, there have been at least 12 volcanic eruptions in the Long Valley area. This activity is likely to continue long into the future. The Long Valley Caldera and Mono-Inyo Craters volcanic chain has a long history of geologic activity that includes both earthquakes and volcanic eruptions. Volcanoes in the Mono-Inyo Craters volcanic chain have erupted often over the past 40,000 years. As shown in Figure 4-53, over the past 5,000 years, small to moderate eruptions have occurred at various sites along the Mono-Inyo Craters volcanic chain at intervals ranging from 250 to 700 years.

Figure 4-53 Volcanic Activity in the Mono-Inyo Craters Volcano Chain in the Past 5,000 Years



Source: U.S. Geological Survey

### Likelihood of Future Occurrences

**Unlikely**—According to the U.S. Geological Survey, the pattern of volcanic activity over the past 5,000 years suggests that the next eruption in the Long Valley area will most likely happen somewhere along the

Mono-Inyo volcanic chain. However, the probability of such an eruption occurring in any given year is less than 1 percent. The next eruption will most likely be small and similar to previous eruptions along the Mono-Inyo volcanic chain during the past 5,000 years (see Figure 4-53 above). According to the State Multi-Hazard Mitigation Plan, only Medicine Lake, Mount Shasta, Lassen Peak, and the Long Valley Caldera are considered active and pose a threat of future activity. However, due to the location of the Planning Area relative to the active volcanoes, the State Plan does consider Madera County to be vulnerable to eruption and/or ash from these volcanoes.

#### 4.2.19. Wildfire

##### *Hazard/Problem Description*

California is recognized as one of the most fire-prone and consequently fire-adapted landscapes in the world. The combination of complex terrain, Mediterranean climate, and productive natural plant communities, along with ample natural and aboriginal ignition sources, has created conditions for extensive wildfires. Wildland fire is an ongoing concern for the Madera County Planning Area. Generally, the fire season extends from early spring through late fall of each year during the hotter, dryer months. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, an accumulation of vegetation, and high winds.

Potential losses from wildfire include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Economic losses could also result. Smoke and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

##### **Wildland Urban Interface**

Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. While wildfire risk is predominantly associated with wildland urban interface (WUI) areas, significant wildfires can also occur in heavily populated areas. The WUI is a general term that applies to development adjacent to landscapes that support wildland fire. The WUI defines the community development into the foothills and mountainous areas of California. The WUI describes those communities that are mixed in with grass, brush and timbered covered lands (wildland). These are areas where wildland fire once burned only vegetation but now burns homes as well. The WUI for Madera County consists of communities at risk (shown in Table 4-90 in Section 4.2.18) as well as the area around the communities that pose a fire threat.

There are two types of WUI environments. The first is the true urban interface where development abruptly meets wildland. The second WUI environment is referred to as the wildland urban intermix. Wildland urban intermix communities are rural, low density communities where homes are intermixed in wildland areas. Wildland urban intermix communities are difficult to defend because they are sprawling communities over a large geographical area with wild fuels throughout. This profile makes access, structure protection, and fire control difficult as fire can freely run through the community.

WUI fires are generally the most damaging. Even relatively small acreage fires may result in disastrous damages. WUI fires occur where the natural forested landscape and urban-built environment meet or intermix. The damages are primarily reported as damage to infrastructure, built environment, loss of socio-economic values and injuries to people.

The pattern of increased damages is directly related to increased urban spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. WUI fires can occur where there is a distinct boundary between the built and natural areas or where development or infrastructure has encroached or is intermixed in the natural area. WUI fires may include fires that occur in remote areas that have critical infrastructure easements through them, including electrical transmission towers, railroads, water reservoirs, communications relay sites or other infrastructure assets. Human impact on wildland areas has made it much more difficult to protect life and property during a wildland fire. This home construction has created a new fuel load within the wildland and shifted firefighting tactics to life safety and structure protection.

### Madera County Wildfires

Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. The CWPP noted that where there is human access to wildland areas, such as the Sierra Nevada and foothills areas, the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Generally, there are four major factors that sustain wildfires and allow for predictions of a given area's potential to burn. These factors include fuel, topography, weather, and human actions.

- **Fuel** – Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also to be considered as a fuel source are manmade structures, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control. As a result of effective fire suppression since the 1930s, vegetation throughout the county has continued to grow and accumulate, and hazardous fuels have increased. As such, certain areas in and surrounding Madera County are extremely vulnerable to fires as a result of dense vegetation combined with a growing number of structures being built near and within rural lands. These high fuel hazards, coupled with a greater potential for ignitions, increases the susceptibility of the County to a catastrophic wildfire. The 2008 CWPP noted that fuel types begin with annual grasses in the lower elevations and at about 1,000' elevation change to oak-woodlands. At about 2,000' elevation the brush fields start intermixing with the oak-woodlands and brush becomes the more prominent natural vegetation as you approach 3,000' elevation. From 3,000' to 4,500', brush and timber become mixed. Above 4,500', the predominant fuel is mixed conifer timber. Fuel loading varies from about 2 tons per acre in grass to over 100 tons per acre in timber fuels.
- **Topography** – An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes. The 2008 CWPP noted that the County consists of elevations ranging from 350 feet above sea level at the western end of the Madera Canal to 13,157 feet at the crest of the Sierra Nevada Mountains. Major river drainages and their tributaries traverse the county and sharply divide

terrain in foothill and mountainous portions of the county into valleys with steep canyon walls. Slopes are greater than 100% over a large portion of the area and slopes of 35% to 50% are common over the remainder. The rivers drain to the gently rolling lower foothills until they reach the flat valley floor.

- **Weather** – Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will ignite more readily and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread and the more intense it will be. Winds can be significant at times in Madera County. Santa Ana winds in Madera County are especially conducive to hot, dry conditions, which can lead to “red flag” days indicating extreme fire danger. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning also ignites wildfires, often in difficult to reach terrain for firefighters. The 2008 CWPP noted that the valley and the lower foothill temperatures average close to 100 degrees in the daytime and 62 degrees at night in July with the humidity averaging between 17 to 22%. The temperature lowers and the humidity slightly increases as the elevation increases. At 4,000 feet, average summer daytime temperatures are in the mid 90’s with the humidity averaging between 25 to 35%. Temperatures at night can cool off to a comfortable mid 50’s and humidity ranging from 50 to 80%. Rainfall is generally non-existent from May until mid October except for an occasional thunderstorm. During the fire season the diurnal surface winds are up canyon by day and down canyon by night. Prevailing upper level winds are out of the west to northwest. These winds are more intense and when they surface at the higher elevations can have a negative impact on fire behavior. The most dangerous winds for firefighters are associated with thunderstorms. Winds within the vicinity of a storm cell are extremely gusty, erratic and unpredictable.
- **Human Actions** – Most wildfires are ignited by human action, the result of direct acts of arson, carelessness, or accidents. Many fires originate in populated areas along roads and around homes, and are often the result of arson or careless acts such as the disposal of cigarettes, use of equipment or debris burning. Recreation areas that are located in high fire hazard areas also result in increased human activity that can increase the potential for wildfires to occur.

Factors contributing to the wildfire risk in Madera County include:

- Overstocked forests, severely overgrown vegetation, and lack of defensible space around structures;
- Excessive vegetation along roadsides and hanging over roads, fire engine access, and evacuation routes;
- Drought and overstocked forests with increased beetle infestation or kill in weakened and stressed trees;
- Narrow and often one-lane and/or dead-end roads complicating evacuation and emergency response as well as the many subdivisions that have only one means of ingress/egress;
- A large percentage of the residential properties located in Eastern Madera County are parcels of one acre or larger and require a driveway to access the house. Many of these homes are built away from a roadway and require driveways that extend several hundred feet or longer.
- Inadequate or missing street signs on private roads and house address signs;
- Nature and frequency of lightning ignitions; and
- Increasing population density leading to more ignitions.

Historically, Madera County’s ecosystems have been kept healthy and in balance by a variety of natural disturbances, including fire, insects, pathogens, wind throw, floods, weather variations, landslides, avalanches and earthquakes. Over the last few centuries, this balance has been affected by human

introduced disturbances of fire exclusion/suppression, livestock grazing, roads and development, logging, and introduced plants, animals and pathogens. Lightning and human-caused fire ignitions occur frequently in the area.

Due to changes in ecosystem disturbance patterns, fire behavior may now deviate considerably from the historic fire conditions. These changes may benefit some species, but they put others at risk. More importantly, altered fire regimes potentially destabilize ecosystems and landscapes, thus creating conditions that may promote unprecedented catastrophic disturbance events. In turn, they may seriously reduce ecosystem resiliency, the ability to return to prior levels of productivity.

Consequently, wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may actually be beneficial to the landscape. Century old policies of fire exclusion and aggressive suppression have given way to better understanding of the importance fire plays in the natural cycle of certain forest types.

### *Past Occurrences*

#### Disaster Declaration History

A search of FEMA and Cal OES disaster declarations turned up multiple events. State and federal disaster declarations from wildfire can be found in Table 4-41.

*Table 4-41 Madera County Wildfire Disaster Declaration History 1950 to 2017*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	4	1961, 2005, 2014 (two times)	1	1965

Source: Cal OES, FEMA

#### NCDC Events

The NCDC has tracked wildfire events in the County dating back to 1993. The 97 events in Madera County are shown in Table 4-42. Events with specific damages, injuries, or deaths in Madera County are included below the table.

*Table 4-42 NCDC Wildfire Events in Madera County 1993 to 12/31/2016*

Date	Event	Injuries (direct)	Deaths (direct)	Property Damage	Crop Damage	Injuries (indirect)	Deaths (indirect)
8/20/2001	Wildfire	0	0	\$4,100,000	\$0	0	0
9/25/2001	Wildfire	0	0	\$144,000	\$0	0	0
10/1/2001	Wildfire	0	0	\$0	\$0	0	0
11/27/2002	Wildfire	0	0	\$22,000	\$0	0	0
7/8/2003	Wildfire	0	0	\$680,000	\$0	0	0
9/3/2003	Wildfire	0	0	\$64,000	\$0	0	0

Date	Event	Injuries (direct)	Deaths (direct)	Property Damage	Crop Damage	Injuries (indirect)	Deaths (indirect)
10/1/2003	Wildfire	0	0	\$68,000	\$0	0	0
6/16/2004	Wildfire	0	0	\$0	\$0	0	0
6/27/2004	Wildfire	0	0	\$0	\$0	0	0
8/1/2004	Wildfire	0	0	\$0	\$0	0	0
8/6/2004	Wildfire	0	0	\$0	\$0	0	0
8/14/2004	Wildfire	0	0	\$0	\$0	0	0
9/3/2004	Wildfire	0	0	\$250,000	\$0	0	0
9/8/2004	Wildfire	0	0	\$0	\$0	0	0
9/11/2004	Wildfire	0	0	\$0	\$0	0	0
9/12/2004	Wildfire	0	0	\$0	\$0	0	0
7/22/2005	Wildfire	0	0	\$0	\$0	0	0
7/25/2005	Wildfire	0	0	\$0	\$0	0	0
8/1/2005	Wildfire	0	0	\$0	\$0	0	0
8/14/2005	Wildfire	0	0	\$0	\$0	0	0
8/21/2005	Wildfire	0	0	\$0	\$0	0	0
9/1/2005	Wildfire	0	0	\$0	\$0	0	0
9/1/2005	Wildfire	0	0	\$0	\$0	0	0
9/20/2005	Wildfire	0	0	\$0	\$0	0	0
10/1/2005	Wildfire	0	0	\$0	\$0	0	0
6/4/2006	Wildfire	0	0	\$0	\$0	0	0
7/19/2006	Wildfire	0	0	\$0	\$0	0	0
7/20/2006	Wildfire	0	0	\$0	\$0	0	0
7/21/2006	Wildfire	0	0	\$0	\$0	0	0
7/21/2006	Wildfire	0	0	\$0	\$0	0	0
7/22/2006	Wildfire	0	0	\$0	\$0	0	0
7/23/2006	Wildfire	0	0	\$0	\$0	0	0
8/1/2006	Wildfire	0	0	\$0	\$0	0	0
8/1/2006	Wildfire	0	0	\$0	\$0	0	0
8/1/2006	Wildfire	0	0	\$0	\$0	0	0
8/1/2006	Wildfire	0	0	\$0	\$0	0	0
8/21/2006	Wildfire	0	0	\$0	\$0	0	0
9/15/2006	Wildfire	0	0	\$0	\$0	0	0
8/10/2007	Wildfire	0	0	\$0	\$0	0	0
11/1/2007	Wildfire	0	0	\$0	\$0	0	0
6/11/2008	Wildfire	0	0	\$0	\$0	0	0
6/21/2008	Wildfire	0	0	\$0	\$0	0	0
6/21/2008	Wildfire	0	0	\$0	\$0	0	0
6/21/2008	Wildfire	0	0	\$0	\$0	0	0



Date	Event	Injuries (direct)	Deaths (direct)	Property Damage	Crop Damage	Injuries (indirect)	Deaths (indirect)
7/1/2008	Wildfire	0	0	\$0	\$0	0	0
7/1/2008	Wildfire	0	0	\$0	\$0	0	0
7/19/2008	Wildfire	0	0	\$0	\$0	0	0
7/25/2008	Wildfire	0	0	\$25,000,000	\$0	0	0
8/1/2008	Wildfire	0	0	\$0	\$0	0	0
9/1/2008	Wildfire	0	0	\$0	\$0	0	0
9/11/2008	Wildfire	0	0	\$0	\$0	0	0
6/1/2009	Wildfire	0	0	\$0	\$0	0	0
6/7/2009	Wildfire	0	0	\$0	\$0	0	0
9/1/2009	Wildfire	0	0	\$0	\$0	0	0
8/1/2010	Wildfire	0	0	\$0	\$0	0	0
8/7/2010	Wildfire	0	0	\$0	\$0	0	0
9/1/2010	Wildfire	0	0	\$0	\$0	0	0
9/1/2010	Wildfire	0	0	\$0	\$0	0	0
9/1/2010	Wildfire	0	0	\$0	\$0	0	0
9/1/2010	Wildfire	0	0	\$0	\$0	0	0
8/1/2011	Wildfire	0	0	\$0	\$0	0	0
8/25/2011	Wildfire	0	0	\$0	\$0	0	0
9/13/2011	Wildfire	0	0	\$0	\$0	0	0
6/12/2012	Wildfire	0	0	\$0	\$0	0	0
8/1/2012	Wildfire	0	0	\$0	\$0	0	0
6/16/2013	Wildfire	0	0	\$0	\$0	0	0
8/1/2013	Wildfire	0	0	\$0	\$0	0	0
8/23/2013	Wildfire	0	0	\$0	\$0	0	0
9/1/2013	Wildfire	0	0	\$15,000,000	\$0	0	0
5/26/2014	Wildfire	0	0	\$1,000,000	\$0	0	0
6/1/2014	Wildfire	0	0	\$1,000,000	\$0	0	0
7/16/2014	Wildfire	0	0	\$0	\$0	0	0
7/26/2014	Wildfire	0	0	\$0	\$0	0	0
7/26/2014	Wildfire	0	0	\$0	\$0	0	0
7/28/2014	Wildfire	0	0	\$0	\$0	0	0
7/28/2014	Wildfire	0	0	\$0	\$0	0	0
8/1/2014	Wildfire	0	0	\$0	\$0	0	0
8/1/2014	Wildfire	0	0	\$0	\$0	0	0
8/1/2014	Wildfire	0	0	\$0	\$0	0	0
8/1/2014	Wildfire	0	0	\$0	\$0	0	0
8/1/2014	Wildfire	0	0	\$0	\$0	0	0
8/18/2014	Wildfire	0	0	\$0	\$0	0	0

Date	Event	Injuries (direct)	Deaths (direct)	Property Damage	Crop Damage	Injuries (indirect)	Deaths (indirect)
9/5/2014	Wildfire	0	0	\$0	\$0	3	0
9/7/2014	Wildfire	0	0	\$0	\$0	0	0
9/14/2014	Wildfire	0	0	\$0	\$0	4	0
10/7/2014	Wildfire	0	0	\$0	\$0	0	1
6/18/2015	Wildfire	0	0	\$0	\$0	0	0
6/18/2015	Wildfire	0	0	\$0	\$0	0	0
7/25/2015	Wildfire	0	0	\$0	\$0	0	0
7/25/2015	Wildfire	0	0	\$0	\$0	0	0
8/1/2015	Wildfire	0	0	\$0	\$0	0	0
8/1/2015	Wildfire	0	0	\$0	\$0	0	0
8/1/2015	Wildfire	0	0	\$0	\$0	0	0
9/1/2015	Wildfire	0	0	\$0	\$0	0	0
9/7/2015	Wildfire	0	0	\$0	\$0	0	0
7/30/2016	Wildfire	0	0	\$0	\$0	0	0
8/1/2016	Wildfire	0	0	\$0	\$0	0	0
<b>Totals</b>		<b>0</b>	<b>0</b>	<b>\$47,238,000</b>	<b>\$0</b>	<b>7</b>	<b>1</b>

Source: NCDRC

\*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

- **August 20 to 28, 2001** – The North Fork Fire was ignited by a rail-splitter accidentally and burned 4132 acres southeast of Bass Lake. There were two primary structures lost but no fatalities or injuries. In total, \$4.1 million in damages.
- **September 25 to 30, 2001** – The Silver Fire was initially sparked due to lightning on the 25th but was allowed to continue as a resource burn well into October (notification to the NWS on 10/28/01). Total size of 186 acres with no structures lost nor injuries at a cost of \$144,392.
- **July 3 to 8, 2003** – The North Fork Fire was fought by California Division of Forestry and burned 360 acres. The cause was human but no fatalities or structures were lost. In total, there were \$680,000 in damages.
- **September 14 to 22, 2014** – The Courtney fire was located 3 miles East of Oakhurst in Madera County and burned toward the community of Bass Lake. The fire began on September 14, 2014 and burned 320 acres before being contained on September 22, 2014. The cause of the fire was under investigation, but is believed to be human caused. The fire resulted in evacuations of several hundred residents and visitors for several days. There were 30 residences, 19 outbuildings, 13 vehicles, and 4 recreational vehicles destroyed as well as 4 residences, 3 outbuildings and 2 vehicles damaged. Cost of containment was \$4.4 million.

## CAL FIRE Events

CAL FIRE, USDA Forest Service Region 5, Bureau of Land Management (BLM), the National Park Service (NPS), Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878 (though the first recorded incident for the County was in 1917). For the National Park Service, Bureau of Land Management,

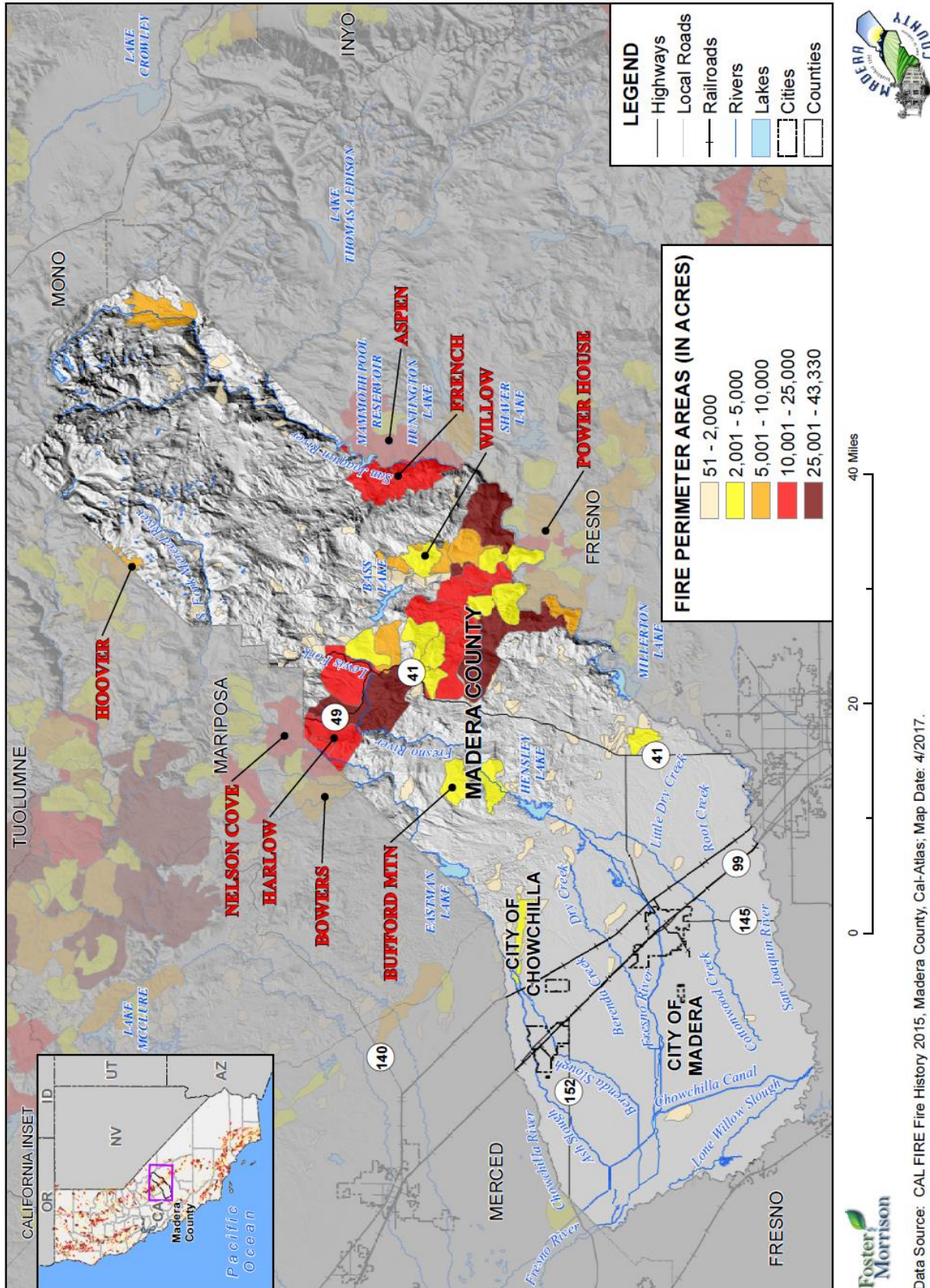
and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. CAL FIRE recognizes the various federal, state, and local agencies that have contributed to this dataset, including USDA Forest Service Region 5, BLM, National Park Service, and numerous local agencies.

Fires may be missing altogether or have missing or incorrect attribute data. Some fires may be missing because historical records were lost or damaged, fires were too small for the minimum cutoffs, documentation was inadequate, or fire perimeters have not yet been incorporated into the database. Also, agencies are at different stages of participation. For these reasons, the data should not be used for statistical or analytical purposes.

The data provides a reasonable view of the spatial distribution of past large fires in California. Using GIS, fire perimeters that intersect Madera County were extracted and are listed in summary in Table 4-43, and in detail in Table E-1 in Appendix E. There are 212 fires recorded in this database for Madera County. Each of them was tracked by CAL FIRE. Table E-1 lists each fire's date, cause, name, total acreage burned, and acreage burned in Madera County.

Figure 4-54 shows fire history for the County, colored by the size of the acreage burned. This map contains fires from 1950 to 2015, while the detailed tables of wildfire shown in Appendix E contain fires from 1950 to 2015.

Figure 4-54 Madera County Wildfire History



Data Source: CAL FIRE Fire History 2015, Madera County, Cal-Atlas; Map Date: 4/2017.

*Table 4-43 Madera County – Wildfire History Summary by Cause 1950-2015*

Jurisdiction / Cause of Fire	Fire Count	Fire Area (in Acres)
<b>City of Chowchilla</b>		
City of Chowchilla Total	0	0
<b>City of Madera</b>		
City of Madera Total	0	0
<b>Unincorporated County</b>		
Arson	3	13,224
Campfire	3	14,036
Debris	4	926
Equipment Use	9	17,092
Escaped Prescribed Burn	3	5,914
Lightning	36	48,513
Miscellaneous	25	57,283
Playing With Fire	1	5,701
Powerline	1	922
Smoking	1	475
Unknown / Unidentified	123	278,973
Vehicle	3	3,131
<b>Unincorporated County Total</b>	<b>212</b>	<b>446,190</b>

Source: CAL FIRE

### Hazard Mitigation Planning Team/CWPP Events

The HMPC and Madera County CWPP noted that fire has played a significant historical role in defining the current vegetative strata in Madera County. The following provides details on notable fires within the County.

**Harlow Fire.** The residents living in the foothills and mountains of Eastern Madera County unfortunately are no strangers to being exposed to wildland fire. Even though the population in 1961 was a fraction of what it is today, people are constantly reminded of the devastating results of the Harlow Fire that started in Mariposa County and burned through all of Nipinnawasee, Ahwahnee and a good portion of the Oakhurst basin. In just three days, July 10th thru July 12th, the fire burned 41,200 acres of grass, brush and timber, destroyed 106 structures and claimed the lives of two people who were trapped while driving through the flames. More recently, residents of Eastern Madera County experienced the reality of the consequences of residing in a wildland fire environment.

**North Fork Fire.** The North Fork fire started between the communities of North Fork and Bass Lake at approximately 12:25 pm on August 20th, 2001. The fire resulted in the loss of two homes and burned 4,132 acres of brush and timber. Many people suffered property damage and endured the inconvenience of evacuation, road closures, poor air quality and the disruption of routine living for several days.

**Quartz Mountain Fire.** The Quartz Mountain Fire started in August of 2005. The fire occurred on Quartz Mountain in the area of Indian Lakes Estates, burned several hundred acres of grass and heavy brush, threatened numerous structures and caused the evacuation of numerous families. The fire started in the late morning and burned through the hot part of the day but because of an aggressive initial attack, fuel reduction projects, and “defensible space” provided by homeowners the fire caused minimal damage. Although small on a scale of large and damaging fires, it still brought home to the residents of a community in Eastern Madera County the fear that an uncontrolled wildland fire can create.

**2013 Aspen Fire and 2014 French Fire.** Both fires were with in the Sierra National Forest but both had impacts to the North Fork Community due to smoke.

**Junction and Courtney Fires, 2014.** The 2016 Madera-Mariposa-Merced Unit Fire plan noted more recent large fires. The March 21<sup>st</sup>, 2014 snow storm damaged a significant number of trees in the Oakhurst and surrounding areas. The damage primarily affected the large oak trees that were not able to accommodate 14" of snowfall in a few, short hours. Nearly 100% of the properties in the Oakhurst Basin, Ahwahnee and Nipinnawasee communities lost trees in this storm. This storm and the wind events of November 30<sup>th</sup> 2014 and December 3<sup>rd</sup> 2014 resulted in a significant ‘blow down’ of oak and large pine trees and are a continuing cause for concern. With the exception of Oakhurst which has smaller parcels and neighborhoods and around structures and small parcels in the outlying areas most of the dead and down trees caused by these storms in the open wildland has not been removed. This dead and down along with the worst drought in recent history triggered the most destructive fire season in Eastern Madera County since the Harlow Fire in 1961. 35 residences and three commercial structures were destroyed on the Junction and Courtney Fires. Reports from Firefighters on the Junction and Courtney fires clearly showed the dry fuels, and dead and down vegetation, contributed to the long-range spotting and overall control issues on both fires. Many residents were evacuated from their homes while the fire was being fought.

The **2015 Willow Fire** caused evacuation of a small residential community of 400 homes. No damage to the community came about but evacuations were in place for about three days.

Other notable recent fires related to the drought were the 2015 Corrine Fire (912 acres burned) and the 2014 Junction Fire (620 acres burned).

### *Likelihood of Future Occurrence*

**Highly Likely** — From May to October of each year, Madera County faces a serious wildland fire threat. Fires will continue to occur on an annual basis in the Madera County Planning Area. The threat of wildfire and potential losses are constantly increasing as human development and population increase and the wildland urban interface areas expand. Due to its high fuel load and long, dry summers, most of Madera County continues to be at risk from wildfire.

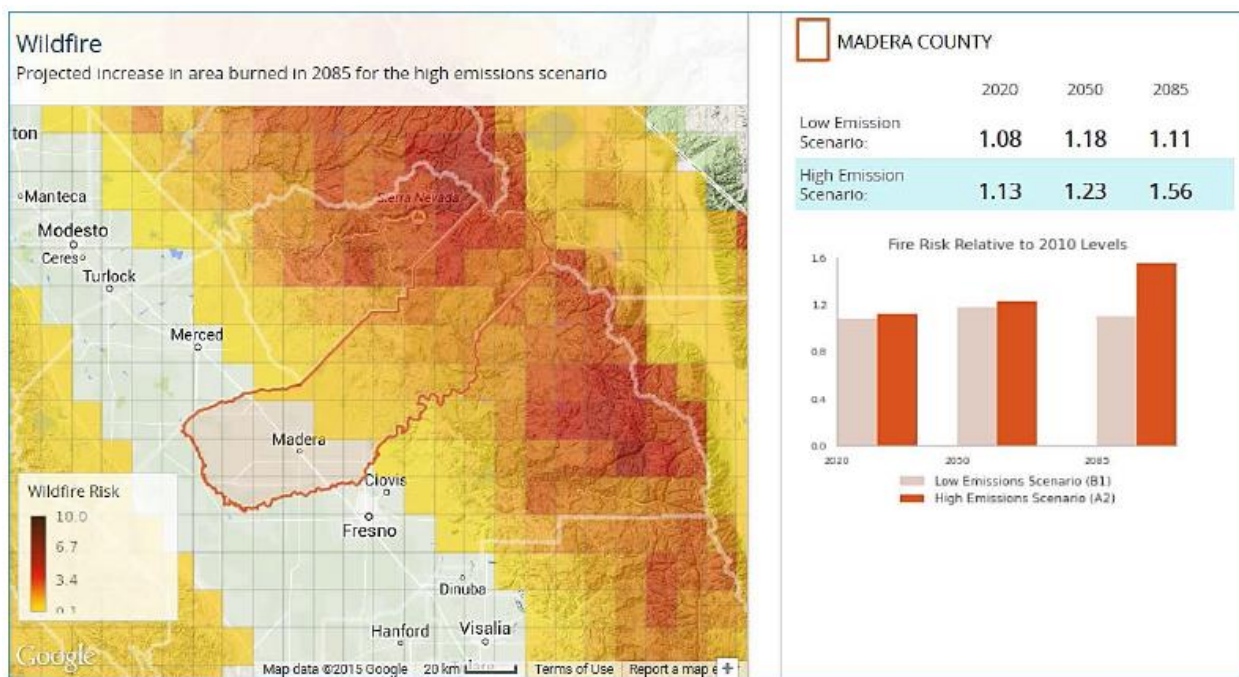
### *Climate Change and Wildfire*

Warmer temperatures can exacerbate drought conditions. Drought often kills plants, which serve as fuel for wildfires. Warmer temperatures could increase the number of wildfires and pest outbreaks, such as the western pine beetle. Cal Adapt noted that for Madera County periodic natural fire is an important ecosystem disturbance. Uncontrolled wildfires, however, can be extremely damaging to communities and ecosystems.

Fire can promote vegetation and wildlife diversity, release nutrients into the soil, and eliminate heavy accumulation of underbrush that can fuel catastrophic fires.

Figure 4-55 displays the projected increase or decrease in potential area burned based on projections of the Coupled Global Climate Model (version 3) for the high carbon emissions scenario in 2085. The bar graphs to the right of the map in Figure 4-55 illustrate the projected time trend over the 21st century for both the high and low emissions scenarios. Please note that these data are modeled solely on climate projections and do not take landscape and fuel sources into account. The projections of acreage burned are expressed in terms of the relative increase or decrease (greater or less than 1) acres. The 2010 baseline reflects historic data from 1980-1989 and trends through 2010.

*Figure 4-55 Madera County – Climate Change and Future Wildfire Areas Burned*



Source: Cal-Adapt

#### 4.2.20. Natural Hazards Summary

Table 4-44 summarizes the results of the hazard identification and hazard profiles for the Madera County Planning Area based on available hazard data and input from the HMPC. For each hazard profiled in Section 4.2, this table includes the likelihood of future occurrence and whether the hazard is considered a priority hazard for the Madera County Planning Area.

*Table 4-44 Hazard Identification/Profile Summary and Determination of Priority Hazard: Madera County Planning Area*

Hazard	Likelihood of Future Occurrence	Priority Hazard
Ag Hazards: Severe Weather/Insect Pests	Highly Likely	Y

Hazard	Likelihood of Future Occurrence	Priority Hazard
Climate Change	Likely	Y
Dam Failure	Occasional	Y
Drought and Water Shortage	Likely/Occasional	Y
Earthquake	Occasional	Y
Flood: 100/200/500-year	Occasional/Unlikely	Y
Flood: Localized/Stormwater	Highly Likely	Y
Hazardous Materials Transportation	Likely	Y
Landslides, Rockfalls, and Debris Flows	Highly Likely	N
Levee Failure	Occasional	Y
Severe Weather: Extreme Cold and Freeze	Likely	Y
Severe Weather: Extreme Heat	Highly Likely	Y
Severe Weather: Fog	Highly Likely	N
Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)	Highly Likely	Y
Severe Weather: Wind and Tornado	Likely	Y
Severe Weather: Winter Storms/Snow	Highly Likely	Y
Volcano	Unlikely	N
Wildfire (smoke, tree mortality)	Highly Likely	Y



## 4.3 Vulnerability Assessment

**Requirement §201.6(c)(2)(ii) and §201.7(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Requirement §201.6(c)(2)(ii)(A) and §201.7(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

**Requirement §201.6(c)(2)(ii)(B) and §201.7(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

**Requirement §201.6(c)(2)(ii)(C) and §201.7(c)(2)(ii)(C):** [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

**Requirement §201.7(c)(2)(ii)(D):** Cultural and sacred sites that significant, even if they cannot be valued in monetary terms. (see Annex C for this information)

With Madera County’s hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that each hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses. This section focuses on the risks to the County as a whole. Data, as available, from the individual participating jurisdictions was also evaluated and is integrated here and in the jurisdictional annexes, and noted where the risk differs for a particular jurisdiction within the Planning Area.

This vulnerability assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

### *Data Sources*

Data sources used to support this assessment included the following:

- CAL FIRE GIS datasets
- USFS GIS datasets
- County staff
- ArkStorm at Tahoe - Stakeholder Perspectives on Vulnerabilities and Preparedness for an Extreme Storm Event in the Greater Lake Tahoe, Reno and Carson City Region. 2014.
- California Adaptation Planning Guide
- Cal-Adapt
- CAL FIRE GIS datasets
- CalTrans, Truck Networks on California State Highways. 2015.

- California Department of Finance, E-1 Report
- California Department of Finance, E-4 Report
- California Department of Finance, P-1 Report
- California Department of Fish and Wildlife’s Natural Diversity Database
- California Department of Food and Agriculture
- California Department of Water Resources Best Available Maps
- California Department of Water Resources Division of Safety of Dams
- California Native Plant Society
- California Natural Diversity Database
- California Office of Historic Preservation
- Existing plans and studies
- FEMA’s HAZUS-MH 2.2 GIS-based inventory data
- FEMA Digital Flood Insurance Rate Map.
- FEMA Madera County Flood Insurance Study.
- Kenward, Alyson PhD, Adams-Smith, Dennis, and Raja, Urooj. Wildfires and Air Pollution – The Hidden Health Hazards of Climate Change. Climate Central. 2013.
- Liu, J.C., Mickley, L.J., Sulprizio, M.P. et al. Climatic Change. 138: 655. doi:10.1007/s10584-016-1762-6. 2016.
- Madera County Building Department
- Madera County GIS data
- Madera County General Plan
- Madera County General Plan Environmental Impact Report
- National Drought Mitigation Center – Drought Impact Reporter
- National Park Service – Historic American Buildings Survey and Historic American Engineering Record
- Personal interviews with planning team members and staff from the County and participating jurisdictions
- Public Health Alliance of Southern California
- Statewide GIS datasets from other agencies such as Cal OES, FEMA, USGS, CGS, Cal Atlas, and others
- US Census Bureau 2010 Household Population Estimates
- US Fish and Wildlife Service
- US Fish and Wildlife Service’s National Wetlands Inventory maps
- Written descriptions of inventory and risks provided by Madera County
- Personal interviews and discussions with planning team members and staff from the County and participating jurisdictions

#### **4.3.1. Madera County Vulnerability and Assets at Risk**

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

- Total values at risk;
- Critical facility inventory;

- Cultural, historical, and natural resources; and
- Growth and development trends.

### *Total Values at Risk*

#### **Parcel Inventory and Assessed Values**

This analysis captures the values associated with assessed assets located within Madera County. The April 2017 GIS parcel layer and the Madera County Assessor data, obtained from the Madera County Assessor's Office was used for as the basis of this analysis. This data provided by the County represents best available data.

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

#### **Methodology**

Madera County's April 2017 Assessor Data and the County's GIS parcel data were used as the basis for the inventory of assessed values for both improved and unimproved parcels within the County. This data provides the land and improved values assessed for each parcel, along with key information such as property use. Other GIS data, such as jurisdictional boundaries, roads, streams, and area features, was also obtained from Madera County, and supplemented by Cal Atlas as necessary, to support countywide mapping and analysis of assets at risk. City and County boundary limits and Spheres of Influence (SOI) data from Madera County were used to identify and attribute those parcels located within the city boundaries and those within the cities' SOI. Parcels within the City's SOI are considered to be part of unincorporated Madera County and were included in the general analysis for the County. Areas falling within the SOIs for the cities were also used for evaluating potential areas for future development within each City.

The Madera County GIS parcel data contained 58,292 parcels, including the areas of the City of Chowchilla, City of Madera, and the unincorporated areas of Madera County. As previously described, due to data limitations, North Fork Rancheria parcels are included within the unincorporated County area within this Base Plan document.

#### *Data Limitations & Notations*

Although based on best available data, the resulting information should only be used as an initial guide to overall values in the County. In the event of a disaster, structures and other infrastructure improvements are at the greatest risk of damage. Depending on the type of hazard and resulting damages, the land itself may not suffer a significant loss. For that reason, the values of structures and other infrastructure improvements are of greatest concern. As such, it is critical to note specific limitations to the assessed values data within the County, created by Proposition 13 and the Williamson Act. Proposition 13 declared property taxes were to be assessed their 1975 value and restricted annual increases of the tax to an inflation factor, not to exceed 2% per year. A reassessment of the property tax can only be made when the property

ownership changes or there is construction done. The Williamson Act further skews the assessed value of properties falling under this exemption. The Williamson Act is a California law that provides relief of property tax to owners of farmland and open-space land in exchange for a ten-year agreement that the land will not be developed or otherwise converted to another use. As a result of these California laws, overall property value information is low and likely does not reflect current market or true potential loss values for properties within the County.

The 2017 GIS and Assessor data was obtained to perform the spatial analysis. The initial GIS parcel data contained 58,296 records. The data contained 4 duplicated records, that were therefore excluded from the analysis dataset. The duplicate parcels largely consisted of split-parcel/timeshare ownership properties that were bundled under a common assessor parcel number (ASMT). The primary ASMT record in each bundle remained in the analysis dataset, and although the duplicate parcels were excluded, it should be noted that these records did not contain assessor values. In total, 58,292 records were utilized for the analysis.

### *Property Use Categories*

Madera County Assessor Use Codes provide detailed descriptive information about how each property is generally used, such as residential, commercial, or industrial. The Use Codes were categorized into the following property use categories found within the Madera County Assessor data:

- Agricultural - Ag-Industrial/Commercial/Manufacturing, Farmland Security Zone, Recreational, Timber
- Commercial
- Government
- Industrial – Industrial, Mining/Quarrying
- Institutional
- Residential
- Utilities – Utilities, Water, Roads
- Unknown – No use codes, unclassifiable

Once Use Codes were grouped into categories, the number of total and improved parcels and land and improved values were inventoried for the County and jurisdictions by property use.

### *Estimated Content Replacement Values*

Madera County’s assigned property use categories were used to develop estimated content replacement values (CRVs) that are potentially at loss from hazards. FEMA’s standard CRV factors were utilized to develop more accurate loss estimates for all mapped hazard analyses. FEMA’s CRV factors estimate value as a percent of improved structure value by property use. Table 4-45 shows the breakdown of the different property uses in Madera and their estimated CRV factors.

*Table 4-45 Madera County Planning Area – Content Replacement Factors by Property Use*

Madera County Property Use Categories	Hazus Property Use Categories	Hazus Content Replacement Values
Agricultural	Agricultural	100%
Commercial	Commercial	100%

Madera County Property Use Categories	Hazus Property Use Categories	Hazus Content Replacement Values
Government	Government	100%
Industrial	Industrial	150%
Institutional	Institutional	100%
Residential	Residential	50%
Utilities	Utilities	100%
Unknown	Unknown	100%

Source: Hazus

## Madera County Values at Risk Results

### *Values at Risk without Contents*

Values associated with land, and improved structure values were identified and summed in order to determine total assessed values at risk in unincorporated Madera County, which includes the North Fork Rancheria, and the jurisdictions of the City of Chowchilla and City of Madera. Together, the land value and improved structure value make up the majority of assessed values associated with each identified parcel or asset. Improved parcel counts were based on the assumption that a parcel was improved if a structure value was present. Information on other values such as personal property values were not readily available for inclusion in this effort. Table 4-46 shows the total values or exposure for the entire Madera County Planning Area, by jurisdiction. Table 4-47 shows the total values for the Planning Area by property use. The values for unincorporated Madera County are broken out by property use type and are provided in Table 4-48. More information on assets at risk for each jurisdiction can be found in their respective annexes.

*Table 4-46 Madera County Planning Area – Total Values at Risk by Jurisdiction*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
City of Chowchilla	4,980	3,760	\$219,707,198	\$517,313,639	\$737,020,837
City of Madera	16,051	14,132	\$745,275,552	\$1,989,396,095	\$2,734,671,647
Unincorporated County	37,261	28,111	\$3,328,212,727	\$6,017,149,104	\$9,345,361,831
<b>Total</b>	<b>58,292</b>	<b>46,003</b>	<b>\$4,293,195,477</b>	<b>\$8,523,858,838</b>	<b>\$12,817,054,315</b>

Source: Madera County April 2017 Parcel/Assessor's Data

*Table 4-47 Madera County Planning Area – Total Values at Risk by Property Use*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Agricultural	8,518	5,951	\$1,606,307,677	\$2,044,443,026	\$3,650,750,703
Commercial	2,418	1,646	\$372,843,662	\$1,321,966,374	\$1,694,810,036
Government	1,134	25	\$32,645,521	\$3,920,168	\$36,565,689

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Industrial	519	271	\$74,803,274	\$308,030,058	\$382,833,332
Institutional	301	181	\$22,678,878	\$70,883,263	\$93,562,141
Residential	43,869	37,798	\$2,159,518,151	\$4,750,924,602	\$6,910,442,753
Utilities	950	71	\$3,039,694	\$6,519,426	\$9,559,120
Unknown	583	60	\$21,358,620	\$17,171,921	\$38,530,541
<b>Total</b>	<b>58,292</b>	<b>46,003</b>	<b>\$4,293,195,477</b>	<b>\$8,523,858,838</b>	<b>\$12,817,054,315</b>

Source: Madera County April 2017 Parcel/Assessor's Data

*Table 4-48 Unincorporated Madera County – Total Values at Risk by Property Use*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Agricultural	8,304	5,898	\$1,569,400,284	\$2,040,229,419	\$3,609,629,703
Commercial	1,118	719	\$186,034,753	\$871,078,645	\$1,057,113,398
Government	943	15	\$20,369,680	\$2,398,754	\$22,768,434
Industrial	246	139	\$38,919,005	\$161,970,427	\$200,889,432
Institutional	164	91	\$18,553,195	\$42,144,833	\$60,698,028
Residential	25,572	21,132	\$1,477,242,823	\$2,881,751,476	\$4,358,994,299
Utilities	421	66	\$2,557,188	\$6,208,719	\$8,765,907
Unknown	493	51	\$15,135,799	\$11,366,831	\$26,502,630
<b>Total</b>	<b>37,261</b>	<b>28,111</b>	<b>\$3,328,212,727</b>	<b>\$6,017,149,104</b>	<b>\$9,345,361,831</b>

Source: Madera County April 2017 Parcel/Assessor's Data

### *Values at Risk with Contents*

Table 4-49 shows the total values of the Madera County Planning Area as shown in Table 4-47, but with estimated content replacement values (CRVs) included (using CRV multipliers from Table 4-45). This table is important as potential losses to the County include structure contents. In addition, loss estimates contained in the hazard vulnerability sections of this Chapter will use calculations based on the total values, including CRVs.

*Table 4-49 Madera County Planning Area – Total Values at Risk by Property Use with Content Replacement Values*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	8,518	5,951	\$1,606,307,677	\$2,044,443,026	\$2,044,443,026	\$5,695,193,729
Commercial	2,418	1,646	\$372,843,662	\$1,321,966,374	\$1,321,966,374	\$3,016,776,410
Government	1,134	25	\$32,645,521	\$3,920,168	\$3,920,168	\$40,485,857
Industrial	519	271	\$74,803,274	\$308,030,058	\$462,045,087	\$844,878,419

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Institutional	301	181	\$22,678,878	\$70,883,263	\$70,883,263	\$164,445,404
Residential	43,869	37,798	\$2,159,518,151	\$4,750,924,602	\$2,375,462,301	\$9,285,905,054
Utilities	950	71	\$3,039,694	\$6,519,426	\$6,519,426	\$16,078,546
Unknown	583	60	\$21,358,620	\$17,171,921	\$17,171,921	\$55,702,462
<b>Total</b>	<b>58,292</b>	<b>46,003</b>	<b>\$4,293,195,477</b>	<b>\$8,523,858,838</b>	<b>\$6,302,411,566</b>	<b>\$19,119,465,881</b>

Source: Madera County April 2017 Parcel/Assessor's Data

Table 4-50 shows the total values of the unincorporated County as shown in Table 4-48, also with estimated CRVs included.

*Table 4-50 Unincorporated Madera County – Total Values at Risk by Property Use with Content Replacement Values*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	8,304	5,898	\$1,569,400,284	\$2,040,229,419	\$2,040,229,419	\$5,649,859,122
Commercial	1,118	719	\$186,034,753	\$871,078,645	\$871,078,645	\$1,928,192,043
Government	943	15	\$20,369,680	\$2,398,754	\$2,398,754	\$25,167,188
Industrial	246	139	\$38,919,005	\$161,970,427	\$242,955,641	\$443,845,073
Institutional	164	91	\$18,553,195	\$42,144,833	\$42,144,833	\$102,842,861
Residential	25,572	21,132	\$1,477,242,823	\$2,881,751,476	\$1,440,875,738	\$5,799,870,037
Utilities	421	66	\$2,557,188	\$6,208,719	\$6,208,719	\$14,974,626
Unknown	493	51	\$15,135,799	\$11,366,831	\$11,366,831	\$37,869,461
<b>Total</b>	<b>37,261</b>	<b>28,111</b>	<b>\$3,328,212,727</b>	<b>\$6,017,149,104</b>	<b>\$4,657,258,580</b>	<b>\$14,002,620,411</b>

Source: Madera County April 2017 Parcel/Assessor's Data

### *Critical Facility Inventory*

For purposes of this plan, a critical facility is defined as:

*Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities: (2) At-risk Populations Facilities, (3) Hazardous Materials Facilities.

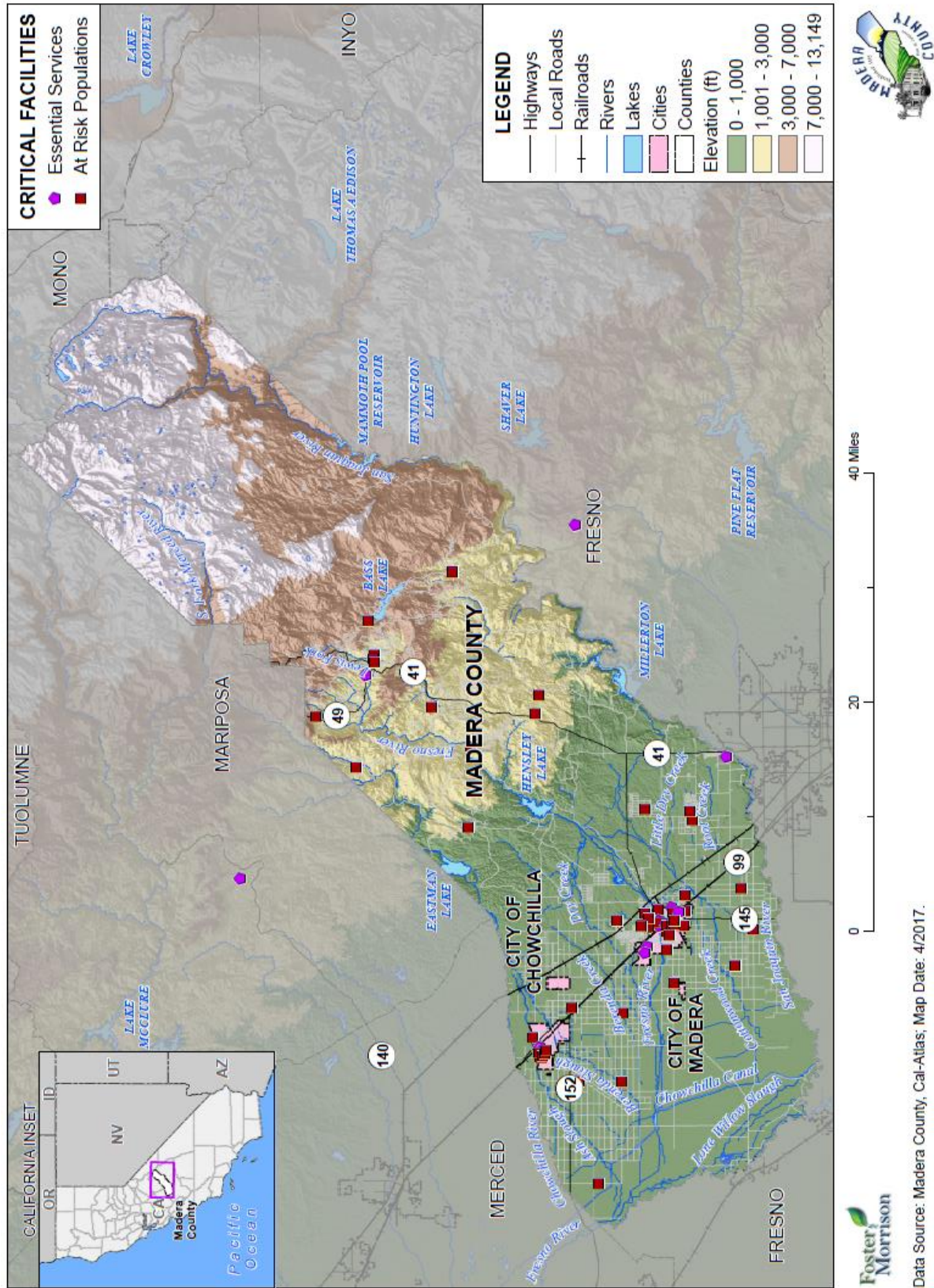
- **Essential Services Facilities** include, without limitation, public safety, emergency response, emergency medical, designated emergency shelters, communications, public utility plant facilities and equipment, and government operations. Sub-Categories:

- ✓ Public Safety - Police stations, fire and rescue stations, emergency operations centers
- ✓ Emergency Response - Emergency vehicle and equipment storage and essential governmental work centers for continuity of government operations.
- ✓ Emergency Medical - Hospitals, emergency care, urgent care, ambulance services.
- ✓ Designated Emergency Shelters.
- ✓ Communications - Main hubs for telephone, main broadcasting equipment for television systems, radio and other emergency warning systems.
- ✓ Public Utility Plant Facilities - including equipment for treatment, generation, storage, pumping and distribution (hubs for water, wastewater, power and gas).
- ✓ Essential Government Operations - Public records, courts, jails, building permitting and inspection services, government administration and management, maintenance and equipment centers, and public health.
- ✓ Transportation Lifeline Systems - Airports, helipads, and critical highways, roads, bridges and other transportation infrastructure (Note: Critical highways, roads, etc. will be determined during any hazard-specific evacuation planning and are not identified in this plan).
- **At Risk Population Facilities** include, without limitation, pre-schools, public and private primary and secondary schools, before and after school care centers with 12 or more students, daycare centers with 12 or more children, group homes, and assisted living residential or congregate care facilities with 12 or more residents.
- **Hazardous Materials Facilities** include, without limitation, any facility that could, if adversely impacted, release of hazardous material(s) in sufficient amounts during a hazard event that would create harm to people, the environment and property.

A fully detailed list of all critical facilities in the Planning Area can be found in Appendix F. A summary of critical facilities in the County can be found in Figure 4-56 and Table 4-51. Note, this critical facility GIS layer was based on an existing mapped inventory of critical facilities that represents best available data. It is the County's intent to build upon this initial inventory list. As such, this list is a work in progress and may not reflect all critical facilities within the Madera County Planning Area.



Figure 4-56 Madera County Planning Area – Critical Facility Inventory



*Table 4-51 Madera County Planning Area – Critical Facility Inventory*

Critical Facility Type	Critical Facility Count
<b>Essential Services</b>	
Airport and Radio Tower	1
Central Switching Station / Communications	1
City Hall Admin Critical Infrastructure	1
Community Services / Engineering and Infrastructure Services / IT Communications	1
Critical Communications	1
Emergency Dispatch Center	1
Fire Command Center	1
Fire Station	1
Medical Center	2
Police Dispatch Communication Center	1
Public Safety Facility / 911 PSAP	1
Rural Emergency Operations	1
<b>Essential Services Total</b>	<b>13</b>
<b>At Risk Populations</b>	
Convalescent Hospital	2
School	50
<b>At Risk Populations Total</b>	<b>52</b>
<b>Madera County Planning Area Grand Total</b>	
	<b>65</b>
<b>Adjacent Counties</b>	
Essential Services	
Fire Command Center / Dispatch Center	1
Telecommunications Infrastructure	1
Essential Services Total	2
<b>Adjacent Counties Grand Total</b>	<b>2</b>
<b>Madera County Planning Area and Adjacent Counties Grand Total</b>	
Essential Services	15
At Risk Populations	52
<b>Grand Total</b>	<b>67</b>

Source: Madera County GIS

### *Cultural, Historical, and Natural Resources*

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

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

## Cultural and Historical Resources

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

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

Historical resources included in the programs above are identified in Table 4-52.

*Table 4-52 Madera County Historical Resources*

Resource Name (Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City
Charles Miller / Stationmaster's House (P296)				X	4/29/2008	–
Fresno Flats Townsite (P845)				X	5/14/2002	Oakhurst
Jessie B. Ross Cabin (P751)				X	8/8/1991	North Fork
Jessie Ross Cabin (P752)				X	8/8/1991	Sierra
Laramore House (P716)				X	6/12/1989	Oakhurst
Little Church on the Hill and Oakhill Cemetery (P797)				X	5/31/1994	Oakhurst
Madera County Courthouse (N108)	X				9/3/1971	Madera
Madera Sugar Pine Logging Railroad Grade (P353)				X	11/19/1974	Oakhurst
Picayune Schoolhouse (C13)			X		8/3/2001	Coarsegold
Robertson Boulevard, State Highway 233 (P724)				X	11/20/1989	Chowchilla
Shay Locomotive #3315 (P352)				X	11/19/1974	Oakhurst
Taylor Log House (P837)				X	5/31/2000	Oakhurst

Source: California Department of Parks and Recreation Office of Historic Preservation, <http://ohp.parks.ca.gov/>

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

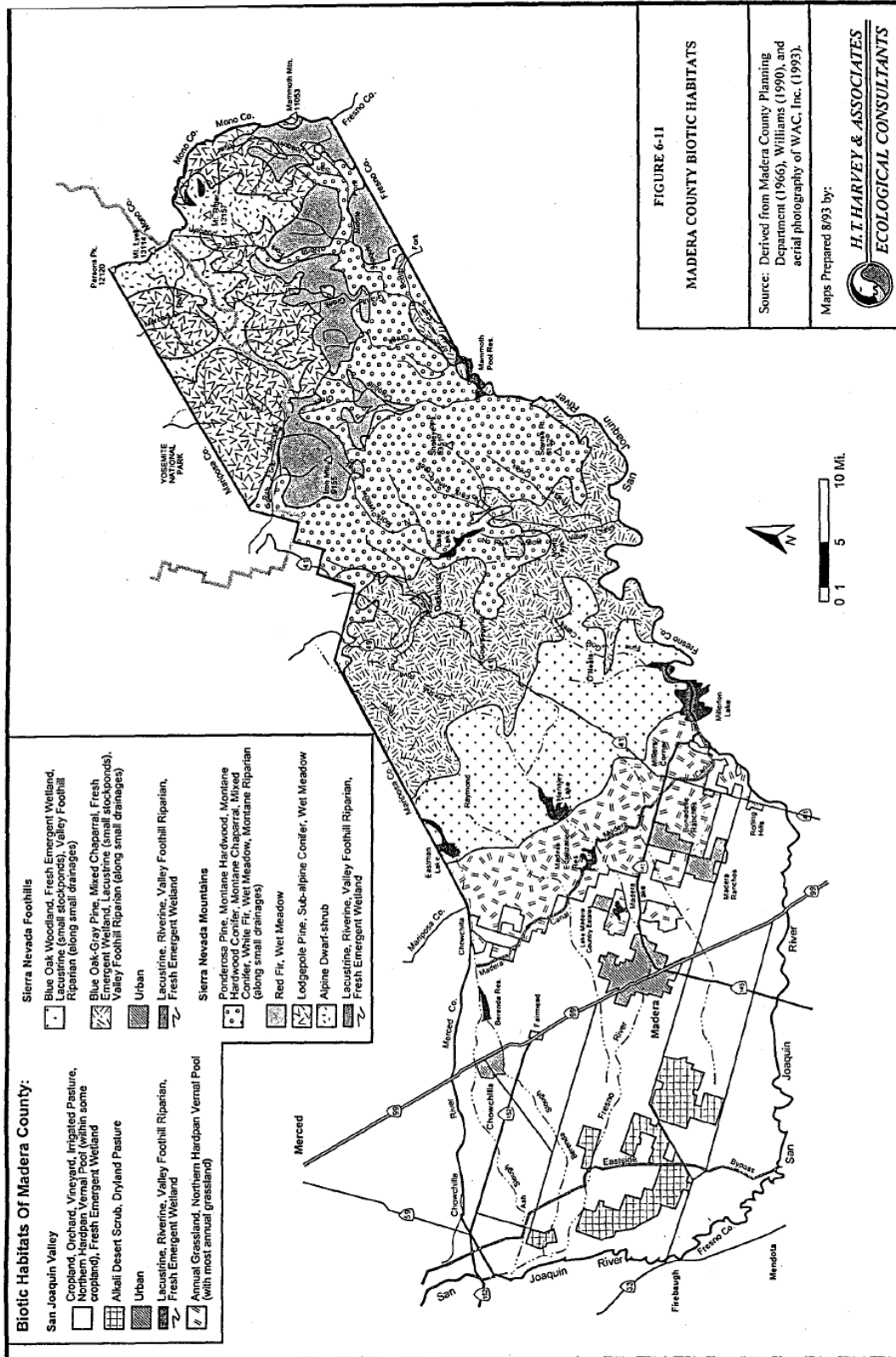
## Natural Resources

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

The General Plan Background Report noted that Madera County can be divided into three sections. Roughly one-third of the County lies within the San Joaquin Valley. In Madera County, this valley extends from the San Joaquin River in the west to the Sierra foothills in the east. The central third of the county lies within the foothills of the Sierra Nevada. Daulton, the Madera Equalization Reservoir, and the intersection of Highways 41 and 145 are all located at the toe of the western foothills. Ahwahnee, Oakhurst and North Fork are all located just west of the transition from foothill to the more montane terrain of the Sierra Nevada.

The eastern third of the county is rugged mountainous terrain extending to the crest of the Sierra. This section describes the biotic habitats described in the General Plan Background Report that are located in Madera County, which can be seen on Figure 4-57.

Figure 4-57 Madera County Biotic Habitats



Source: Madera County General Plan Background Report

## San Joaquin Valley Habitats

The biotic habitats of the San Joaquin Valley have been substantially modified by agriculture, urban development, and the diversion of water from natural drainages, particularly the three large rivers. Native habitats may still be found in scattered locations. Remnant riparian forests and woodlands may still be found along portions of the San Joaquin and Fresno Rivers. Narrow, and frequently discontinuous stands of riparian scrub may still be found along some seasonal drainages. Native scrub and alkali grassland are still associated with some alkaline soils just east of the San Joaquin River. Croplands, orchard-vineyards, pastures, and urban and suburban centers have, however, replaced most native habitats. Even so, western Madera County continues to provide important habitat for resident and migratory wildlife species. Wildlife adapted to grasslands must now make do with suitable croplands. Migratory wildlife still use remaining riparian habitats as avenues for movement through the County. Riparian woodlands and annual grasslands still provide wintering, breeding, and foraging habitat for terrestrial vertebrates, including several listed as threatened or endangered.

- **Cropland** – Leveled agricultural fields and ancillary facilities (e.g., roads, residences, corporation yards) occupy much of the western third of Madera County. In addition to cultivated crops, weedy non-native annual and biennial plants are favored by the yearly disturbance associated with ploughing, discing, harrowing, and harvesting. Common agricultural practices do not favor California's native flora.
- **Orchard – Vineyard** – Orchards and vineyards occupied approximately 157,000 acres of the county in 1992. Common crops included almonds, pistachios, nectarines, figs, and table, wine and raisin grapes. Most orchards and vineyards are kept disced during the growing season, providing little opportunity for the development of an herbaceous understory.
- **Pasture** – Many of the acres of the County's agricultural lands were used for pasture. Some pastures are flood, irrigated and support a mix of perennial grasses and forbs suitable for livestock. Pastures provide many of the same values for terrestrial vertebrates as annual grassland (see discussion below).
- **Annual Grassland** – Annual grasslands occur along the eastern edge of the San Joaquin Valley between the Madera Canal and a line formed by Eastman, Hensley and Millerton Lakes. This grassland continues into the Sierra foothills, forming the understory of blue oak and blue oak-digger pine woodland. A scattering of grassland habitats still remains immediately west of the Madera Canal, but most of this habitat has been converted to croplands, vineyards, orchards, and residential subdivisions. Non-native annual grasses favored by livestock grazing provide most of the vegetative cover in annual grasslands.
- **Northern Hardpan Vernal Pool** – Northern hardpan vernal pools are confined to soils with a defined iron-silica hardpan or claypan layer one to two feet below the soil surface. Vernal pools provide habitat for a flora uniquely adapted to them. Although some aquatic plants occur in them, most vascular plants are emergent or reach maturity at the very margins of gradually receding pools. The phenology (blooming period) of some vernal pool plants is such that bands or concentric rings of different blooming species may be visible around the pools in April and May.
- **Valley Foothill Riparian** – Riparian habitats are associated with the bed, banks, and floodplains of rivers and creeks. The proximity of surface and subsurface water favors the growth of mesic vegetation (vegetation adapted to moist soils or a high water table) not found in drier upland areas. A variety of trees and shrubs provide multiple vegetation layers with an overstory of cottonwoods, oaks and sycamores, and an understory of willow thickets and other shrubs. Lianas of native grape vine often grow into the highest canopy layers. The best riparian habitat now occurs along the San Joaquin River

in scattered locations below Friant Dam downstream to Firebaugh. Open stands of large valley oaks) and California sycamores occur on the river's floodplain. With the exception of a one-mile stretch immediately below Buchanan Dam, riparian vegetation is very sparse or absent along the former bed of the Chowchilla River. Riparian vegetation below the dam consists primarily of Fremont's cottonwoods and red and sandbar willows. Dense riparian woodland can be found immediately below Hensley Lake on the Fresno River. Fremont's cottonwoods, red willows, sandbar willows, and goodding's willows are species typically found within the river's bed and banks. Trees of the upper bank are largely restricted to valley oaks. Much of the former flood plain of the Fresno River still supports an open woodland of valley oaks and Fremont's cottonwoods, with red willows well established in low-flow meander channels.

- **Alkali Desert Scrub** – Also known as chenopod scrub, or alkali sink scrub, alkali desert scrub is a native habitat confined to western Madera County, primarily north of Avenue 7 between the San Joaquin River and Road 21. The alkaline soils and seasonally perched water on a shallow claypan severely limit the plants that can survive here.
- **Urban** – Urban habitats of Madera County are, for the purposes of this analysis, towns and subdivisions where native habitats have been substantially modified by homes and businesses. Such areas include towns such as Chowchilla and Madera. They also include subdivisions of relatively small lots such as Bonadelle Ranchos, Madera Ranchos, and Valley Lake Ranchos. Undeveloped lots in these subdivisions still support other habitats such as annual grassland and vernal pools.
- **Lacustrine** – Lakes, in the form of reservoirs, are a minor habitat in the San Joaquin Valley portion of Madera County. Berenda Reservoir, Madera Lake, and various small farm or stock ponds provide year-round to seasonal open water habitat. Lacustrine habitats function in a similar manner to riverine habitats in providing habitat for wildlife (see below).
- **Riverine** – The aquatic habitat associated with rivers is now confined to the San Joaquin River between Friant Dam and the Madera and Merced County line. Downstream of Firebaugh, flows in the river are greatly reduced. The river is fringed by a narrow band of riparian habitat and discontinuous stands of emergent vegetation. The San Joaquin River is home to many fish including native species. Riverine habitat is important to reptiles and amphibians occurring in adjacent riparian habitats. The San Joaquin River provides habitat for several birds. Mammals from surrounding areas utilize riverine habitat as a source of drinking water.

### Sierra Nevada Foothill Habitats

The foothills of the Sierra Nevada comprise gentle rolling to rugged terrain between the elevations of 400 to 3,000 feet. Native foothill habitats have been modified by grazing and low density residential development, but, with the possible exception of riparian habitats, their structure and floristic elements remain much the same as a half century ago. Foothill habitats are used by resident native wildlife for breeding and foraging. They provide important wintering habitat for deer and various predators which summer at higher elevations. Riparian corridors, although degraded by grazing, fragmented by development, or dewatered for residential and golf course irrigation, continue to serve as important movement corridors for migratory species. Foothill habitats are, therefore, important connecting links between the San Joaquin Valley and the Sierra.

- **Blue Oak Woodland** – The low foothills of the Sierra Nevada support an open woodland of blue oaks (*Quercus douglasii*). This woodland is found between the elevations of 400 and 1,500 feet. Wildlife



use of blue oak woodland habitats is, in many ways, similar to that of annual grassland. Oak trees, however, provide cover, breeding and foraging habitat for a number of additional species.

- **Blue Oak-Digger Pine** – An association of blue oaks and digger pines occurs upslope of the blue oak woodland at elevations ranging from 1,500 to nearly 3,000 feet NGVD. At the lower elevations, this association includes patchy to occasionally dense stands of blue oaks, digger pines, interior live oaks, and California buckeye. Above 2,000 feet, blue oaks may be replaced by valley oaks. In the Oakhurst Basin, valley oaks of three to four feet in diameter are not uncommon.
- **Mixed Chaparral** – Mixed chaparral is an association of various shrub species adapted to hot dry slopes at 2,000 to 3,000 feet in elevation. Typical of these shrubs are thick leathery evergreen leaves. This is a fire adapted community. Mature stands of mixed chaparral, with considerable dead wood and flammable vegetation, are very susceptible to explosively-hot, fast-moving fires. Many chaparral species have the ability to resprout from burned stumps. Extensive stands of this habitat are intermixed with blue oak-digger pine habitat in the Oakhurst Basin and south of Bass Lake, Thornberry Mountain, and Ward Mountain (near Fine Gold) on south-facing slopes.
- **Valley Foothill Riparian** – Narrow but often lush corridors of riparian trees are associated with foothill rivers and creeks. Riparian associations are found along the channels of the San Joaquin, Chowchilla, and Fresno Rivers, Coarsegold Creek, Fine Gold Creek, Miami Creek, Willow Creek, and their tributaries. The width and overall quality of these riparian corridors varies considerably. Many creek channels, such as Coarsegold Creek upstream from the town of Coarsegold, are narrow and deeply incised such that only a narrow band of riparian trees could become established on the channel banks. At greater distances from the Creek, oaks and pines are located on steep slopes too far from the water that riparian trees require. Yet Fine Gold Creek, in places, provides a broad floodplain 200 to 300 feet across, on which a dense riparian forest has become established.
- **Lacustrine** – Eastman, Hensley, and Millerton Lakes are large reservoirs located in the lower foothills on the Chowchilla, Fresno, and San Joaquin Rivers respectively. Other impoundments include Kerckhoff and Redinger Lakes, small recreational lakes created in Yosemite Lakes Park and Indian Lakes Estates, and innumerable small stock ponds throughout the foothills. Though these reservoirs are all man-made, they support several important wildlife resources.
- **Riverine** – Three rivers descend from the Sierra Nevada through the foothills of Madera County. The Chowchilla and Fresno Rivers provide seasonal riverine habitat upstream of Eastman and Hensley Lakes. These rivers are reduced to negligible flows during the late summer, especially during drought years. The San Joaquin River upstream of Millerton, Kerckhoff, and Redinger Lakes drains a much larger watershed than the previous two rivers. This watershed, which encompasses the highest peaks of the Sierra Nevada, collects considerable snow during the winter. The San Joaquin River therefore sustains significant flows throughout the summer. The wildlife use of foothill riverine habitats is similar to riverine habitats on the valley floor, though many of the introduced warm-water fish species may be absent.
- **Fresh Emergent Wetland** – Fresh emergent wetlands of the foothills are much like those of the San Joaquin Valley. Emergent vegetation in the form of cattails and creeping spikerush may be found on the margins of many small farm ponds and small recreational lakes. Wildlife species using these wetlands are similar to those using the emergent wetlands of the San Joaquin Valley.
- **Urban** – Urban habitats are confined to Oakhurst, North Fork, and Coarsegold. Very small areas of urban development may be found in Raymond, O'Neals, and various small subdivisions such as Goldside.

## Sierra Nevada Mountain Habitat

The Sierra Nevada is a patchwork of biotic habitats. For example, the area depicted as mixed conifer is really a mosaic of habitats including ponderosa pine, montane hardwood, montane hardwood-conifer, white fir, Sierran mixed conifer, montane chaparral, lacustrine, and riverine. The spatial relationships of these habitats has much to do with elevation, aspect (e.g., north-facing, south-facing slopes), logging, and fire history. Habitats of the Sierra are the least altered by agricultural and residential development of all the biotic habitats of Madera County. Yet, the fragmentation of movement corridors in the San Joaquin Valley and Sierra foothills, the loss of foothill wintering habitat from residential development, the damming of rivers and streams, and, potentially, the high levels of air pollution, all have adverse effects on the fish and wildlife resources of the Sierra Nevada.

- **Ponderosa Pine** – Ponderosa pine forest occurs in Madera County from 3,000 feet to 5,000 feet in elevation, or somewhat higher on favored south-facing slopes. Good examples of this habitat can be seen in the vicinity of Bass Lake, north-facing slopes of Thornberry Mountain, and the upper watershed of Little Fine Gold Creek near Teaford Meadows. In areas of frequent low-intensity forest fires, this habitat is characterized by open stands of mature ponderosa pines. In Madera County, this habitat is more frequently made up of relatively dense stands of second growth trees.
- **Montane Hardwood** – Steep-sided and rocky south-facing slopes at elevations ranging from 3,500 to 6,000 feet in elevation often support extensive stands of canyon live oak, and, at somewhat higher elevations, California black oak. One of the best examples of montane hardwood may be seen on Lewis Creek along the short trail to Corlieu Falls, where canyon live oaks provide a nearly closed canopy on a steep east-facing slope. Small stands of California black oaks may be seen in the vicinity of Sierra Sky Ranch, Mudge Ranch, and along the Beasore and Mammoth Roads.
- **Montane Hardwood Conifer** – This habitat is a closed canopy forest of the same species listed under "montane hardwood". It occurs at elevations ranging from 3,500 feet to 6,000 feet in elevation. It is differentiated from the montane hardwood by the mix of conifers (ponderosa pine, incense cedar, sugar pine, and white fir), which provide at least one-third of the canopy, to hardwoods (California black oaks and canyon live oaks) which also provide at least one-third of the canopy. This habitat is evident on the north side of Goat Mountain above Bass Lake, along portions of Highway 41 between Yosemite Forks and Fish Camp, and on both the Beasore and Mammoth Roads.
- **Montane Chaparral** – Montane chaparral, like mixed chaparral of lower elevations, is dominated by shrubs of 1 to 10 feet in height. This plant association may occur on rocky south-facing slopes unsuited to the establishment of trees, or in a variety of other habitats recently disturbed by fire or logging. Montane chaparral can form a nearly impenetrable layer of shrubby vegetation that makes it ideal cover for many species of wildlife.
- **Mixed Conifer** – Mixed conifer is a structurally diverse (many canopy layers), sometimes dense closed canopy forest which, in Madera County, occurs at elevations ranging from 4,000 feet to 6,000 feet. Overstory species are generally confined to conifers like ponderosa pine, sugar pine, incense cedar, and white fir, but scattered California black oaks are not uncommon. In open mixed conifer forest understory species may include Pacific dogwood, mountain misery, deer brush, snow bush, and chinquapin. This habitat is evident in various locations on Highway 41 between Cedar Valley and Fish Camp, along the Beasore Road, the Sky Ranch Road, and others above 4,000 feet in elevation. The structural diversity of this habitat favors a diversity of wildlife, particularly birds.
- **White Fir** – White fir forest occurs within the mixed conifer forest, frequently on north-facing slopes between 5,000 and 7,000 feet in elevation. White firs are the dominant, and in some cases only, tree

species. White firs readily regenerate in their own shade, so dense thickets of young white firs are often intermixed with mature trees where fire has been excluded for many years. Wildlife use of white fir habitats in Madera County is generally similar to that described for mixed conifer above.

- **Red Fir** – The distribution of red fir forest in Madera County is limited to elevations of 7,000 to 9,000 feet. Red fir forest may be observed along the Beasore Road between the Chilkoot Lake Road and Beasore Meadows and along much of the Scenic Road from Muglers Meadow to McCreary Meadow. As with white fir, wildlife use of this habitat is expected to be similar to that described for mixed conifer.
- **Lodgepole Pine** – In Madera County, Lodgepole pine forest is associated with meadow and creek margins, or high rocky terrain above the red fir forest. The distribution of this habitat is generally confined to elevations of 7,000 to more than 9,000 feet. Examples of this habitat may be seen along Chiquita and Granite Creeks and in Clover Meadow. Lodgepole pine forests, because of lower structural diversity, are generally lower in number of animal species than other forest types.
- **Subalpine Conifer** – Subalpine conifer, the wooded habitat of some of the highest elevations of eastern Madera County (9,500 to 11,000 feet), is an open woodland occurring in thin rocky soils. This habitat is associated with the main crest of the Sierra, the Ritter Range, the Clark Range, and the high peaks on the eastern boundary of Yosemite National Park. The subalpine conifer habitat, probably because of its harsher climatic conditions and the sparseness of the vegetation, is generally low in wildlife diversity.
- **Alpine Dwarf-shrub** – Alpine dwarf-shrub occurs above 10,000 feet in elevation. In Madera County, this habitat can be found above the subalpine conifer habitat described above. Like Subalpine conifer habitats, alpine dwarf-shrub has a harsh climate, short growing season, and sparse vegetation.
- **Wet Meadow** – Wet meadows occur in eastern Madera County between 4,000 and 10,000 feet in elevation. Trees are generally absent from these meadows. Wet meadows of Madera County can readily be observed along Willow Creek (Soquel and Texas Flat campgrounds), and along the Beasore Road at Beasore Meadow, Muglers Meadow, Jackass Meadow, and Clover Meadow. Meadows and meadow edges support a number of wildlife species. Many insects breed in this moist habitat.
- **Montane Riparian** – Most montane creeks and rivers support a narrow band of riparian trees and shrubs; This narrow band widens along slower moving creeks lacking a deeply incised channel (a condition observed in broad meadows). Though riparian areas are generally narrower in the montane portions of the county than at lower elevations, they still are important movement and migration corridors for mule deer and other wildlife.
- **Riverine** – The aquatic habitat of the many perennial creeks of Madera County may be considered riverine. Mostly, seasonal high water associated with melting snow, has sufficient velocity to transport gravels, cobbles, and, in some cases, boulders, which severely scour channel beds. Therefore, montane stream beds are usually devoid of vegetation.
- **Lacustrine** – A considerable number of lakes can be found at the higher elevations of eastern Madera County. Glacial in origin, these lakes are frozen and covered with snow during the winter and spring. Many are quite small, although the largest, such as Thousand Island and Garnet, each occupy several hundred acres. All natural lakes in Madera County are found above 7,000 feet in elevation. Numerous reservoirs, the largest of which are Bass Lake and Mammoth Pool, are located at lower elevations and usually do not freeze in the winter. Mountain lakes are important sources of water for many wildlife species.

## Special Status Species

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

The California Natural Diversity Database, a program that inventories the status and locations of rare plants and animals in California, was queried to create an inventory of special status species in Madera County. Table 4-53 lists the name, federal status, state status, California Department of Fish and Wildlife status, and the California Rare Plant rank of species in Madera County.

*Table 4-53 Special Status Species in Madera County*

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
<b>Animals - Amphibians</b>					
<i>Ambystoma californiense</i>	California tiger salamander	Threatened	Threatened	WL	-
<i>Anaxyrus canorus</i>	Yosemite toad	Threatened	None	SSC	-
<i>Hydromantes platycephalus</i>	Mount Lyell salamander	None	None	WL	-
<i>Rana boylei</i>	foothill yellow-legged frog	None	None	SSC	-
<i>Rana draytonii</i>	California red-legged frog	Threatened	None	SSC	-
<i>Rana sierrae</i>	Sierra Nevada yellow-legged frog	Endangered	Threatened	WL	-
<i>Spea hammondi</i>	western spadefoot	None	None	SSC	-
<b>Animals - Birds</b>					
<i>Aquila chrysaetos</i>	golden eagle	None	None	FP ; WL	-
<i>Buteo swainsoni</i>	Swainson's hawk	None	Threatened	-	-
<i>Elanus leucurus</i>	white-tailed kite	None	None	FP	-
<i>Haliaeetus leucocephalus</i>	bald eagle	Delisted	Endangered	FP	-
<i>Pandion haliaetus</i>	osprey	None	None	WL	-
<i>Eremophila alpestris actia</i>	California horned lark	None	None	WL	-
<i>Ardea alba</i>	great egret	None	None	-	-
<i>Ardea herodias</i>	great blue heron	None	None	-	-
<i>Charadrius montanus</i>	mountain plover	None	None	SSC	-
<i>Coccyzus americanus occidentalis</i>	western yellow-billed cuckoo	Threatened	Endangered	-	-
<i>Spizella breweri</i>	Brewer's sparrow	None	None	-	-
<i>Falco columbarius</i>	merlin	None	None	WL	-

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
<i>Falco mexicanus</i>	prairie falcon	None	None	WL	-
<i>Riparia riparia</i>	bank swallow	None	Threatened	-	-
<i>Agelaius tricolor</i>	tricolored blackbird	None	Candidate Endangered	SSC	-
<i>Xanthocephalus xanthocephalus</i>	yellow-headed blackbird	None	None	SSC	-
<i>Setophaga petechia</i>	yellow warbler	None	None	SSC	-
<i>Phalacrocorax auritus</i>	double-crested cormorant	None	None	WL	-
<i>Picoides arcticus</i>	black-backed woodpecker	None	None	-	-
<i>Sphyrapicus ruber</i>	red-breasted sapsucker	None	None	-	-
<i>Numenius americanus</i>	long-billed curlew	None	None	WL	-
<i>Athene cunicularia</i>	burrowing owl	None	None	SSC	-
<i>Psiloscoops flammeolus</i>	flamulated owl	None	None	-	-
<i>Strix nebulosa</i>	great gray owl	None	Endangered	-	-
<i>Contopus cooperi</i>	olive-sided flycatcher	None	None	SSC	-
<i>Empidonax traillii</i>	willow flycatcher	None	Endangered	-	-
<b>Animals - Crustaceans</b>					
<i>Calasellus longus</i>	An isopod	None	None	-	-
<i>Branchinecta lynchi</i>	vernal pool fairy shrimp	Threatened	None	-	-
<i>Branchinecta mesovallensis</i>	midvalley fairy shrimp	None	None	-	-
<i>Linderiella occidentalis</i>	California linderiella	None	None	-	-
<i>Lepidurus packardi</i>	vernal pool tadpole shrimp	Endangered	None	-	-
<b>Animals - Fish</b>					
<i>Mylopharodon conocephalus</i>	hardhead	None	None	SSC	-
<i>Oncorhynchus clarkii henshawi</i>	Lahontan cutthroat trout	Threatened	None	-	-
<i>Oncorhynchus clarkii seleniris</i>	Paiute cutthroat trout	Threatened	None	-	-
<i>Oncorhynchus mykiss irideus</i>	steelhead - Central Valley DPS	Threatened	None	-	-
<b>Animals - Insects</b>					
<i>Andrena macswaini</i>	An andrenid bee	None	None	-	-
<i>Bombus crotchii</i>	Crotch bumble bee	None	None	-	-
<i>Bombus occidentalis</i>	western bumble bee	None	None	-	-
<i>Efferia antiochi</i>	Antioch efferian robberfly	None	None	-	-
<i>Desmocerus californicus dimorphus</i>	valley elderberry longhorn beetle	Threatened	None	-	-
<i>Hydroporus leechi</i>	Leech's skyline diving beetle	None	None	-	-
<i>Lytta moesta</i>	moestan blister beetle	None	None	-	-
<i>Lytta molesta</i>	molestan blister beetle	None	None	-	-
<i>Tetrix sierrana</i>	Sierra pygmy grasshopper	None	None	-	-

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
<i>Neotremma genella</i>	golden-horned caddisfly	None	None	-	-
<b>Animals - Mammals</b>					
<i>Aplodontia rufa californica</i>	Sierra Nevada mountain beaver	None	None	SSC	-
<i>Vulpes macrotis mutica</i>	San Joaquin kit fox	Endangered	Threatened	-	-
<i>Vulpes vulpes necator</i>	Sierra Nevada red fox	Candidate	Threatened	-	-
<i>Erethizon dorsatum</i>	North American porcupine	None	None	-	-
<i>Dipodomys beermanni dixonii</i>	Merced kangaroo rat	None	None	-	-
<i>Dipodomys nitratoides exilis</i>	Fresno kangaroo rat	Endangered	Endangered	-	-
<i>Perognathus inornatus</i>	San Joaquin Pocket Mouse	None	None	-	-
<i>Eumops perotis californicus</i>	western mastiff bat	None	None	SSC	-
<i>Gulo gulo</i>	California wolverine	Proposed Threatened	Threatened	FP	-
<i>Martes caurina sierrae</i>	Sierra marten	None	None	-	-
<i>Pekania pennanti</i>	fisher - West Coast DPS	Proposed Threatened	Candidate Threatened	SSC	-
<i>Taxidea taxus</i>	American badger	None	None	SSC	-
<i>Ochotona princeps schisticeps</i>	gray-headed pika	None	None	-	-
<i>Antrozous pallidus</i>	pallid bat	None	None	SSC	-
<i>Euderma maculatum</i>	spotted bat	None	None	SSC	-
<i>Lasiomycteris noctivagans</i>	silver-haired bat	None	None	-	-
<i>Lasiurus cinereus</i>	hoary bat	None	None	-	-
<i>Myotis evotis</i>	long-eared myotis	None	None	-	-
<i>Myotis volans</i>	long-legged myotis	None	None	-	-
<i>Myotis yumanensis</i>	Yuma myotis	None	None	-	-
<b>Animals - Mollusks</b>					
<i>Margaritifera falcata</i>	western pearlshell	None	None	-	-
<b>Animals - Reptiles</b>					
<i>Anniella pulchra pulchra</i>	silvery legless lizard	None	None	SSC	-
<i>Gambelia sila</i>	blunt-nosed leopard lizard	Endangered	Endangered	FP	-
<i>Emys marmorata</i>	western pond turtle	None	None	SSC	-
<i>Thamnophis gigas</i>	giant gartersnake	Threatened	Threatened	-	-
<i>Phrynosoma blainvillii</i>	coast horned lizard	None	None	SSC	-
<b>Community - Aquatic</b>					
-	Central Valley Drainage Hardhead/Squawfish Stream	None	None	-	-

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
–	Central Valley Drainage Rainbow Trout/Cyprinid Stream	None	None	-	-
–	Central Valley Drainage Resident Rainbow Trout Stream	None	None	-	-
<b>Community - Terrestrial</b>					
–	Big Tree Forest	None	None	-	-
–	Great Valley Mixed Riparian Forest	None	None	-	-
–	Northern Claypan Vernal Pool	None	None	-	-
–	Northern Hardpan Vernal Pool	None	None	-	-
–	Valley Sacaton Grassland	None	None	-	-
–	Valley Sink Scrub	None	None	-	-
<b>Plants - Bryophytes</b>					
<i>Bruchia bolanderi</i>	Bolander's bruchia	None	None	-	4.2
<i>Bryum chryseum</i>	brassy bryum	None	None	-	4.3
<i>Plagiobryoides vinosula</i>	wine-colored tufa moss	None	None	-	4.2
<i>Fissidens apbelotaxifolius</i>	brook pocket moss	None	None	-	2B.2
<i>Meesia longiseta</i>	long seta hump moss	None	None	-	2B.3
<i>Meesia triquetra</i>	three-ranked hump moss	None	None	-	4.2
<i>Didymodon californicus</i>	California beard-moss	None	None	-	4.2
<b>Plants - Lichens</b>					
<i>Peltigera gowardii</i>	western waterfan lichen	None	None	-	4.2
<b>Plants - Vascular</b>					
<i>Sagittaria sanfordii</i>	Sanford's arrowhead	None	None	-	1B.2
<i>Allium abramsii</i>	Abrams' onion	None	None	-	1B.2
<i>Eryngium spinosepalum</i>	spiny-sepaled button-celery	None	None	-	1B.2
<i>Calycadenia hooveri</i>	Hoover's calycadenia	None	None	-	1B.3
<i>Eriophyllum lanatum</i> var. <i>obovatum</i>	southern Sierra woolly sunflower	None	None	-	4.3
<i>Eriophyllum nubigenum</i>	Yosemite woolly sunflower	None	None	-	1B.3
<i>Hulsea brevifolia</i>	short-leaved hulsea	None	None	-	1B.2
<i>Jensia yosemitana</i>	Yosemite tarplant	None	None	-	3.2
<i>Layia munzii</i>	Munz's tidy-tips	None	None	-	1B.2
<i>Pseudobabia babiifolia</i>	Hartweg's golden sunburst	Endangered	Endangered	-	1B.1
<i>Wyethia elata</i>	Hall's wyethia	None	None	-	4.3

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
<i>Cryptantha glomeriflora</i>	clustered-flower cryptantha	None	None	-	4.3
<i>Cryptantha hooveri</i>	Hoover's cryptantha	None	None	-	1A
<i>Boechea tularensis</i>	Tulare rockcress	None	None	-	1B.3
<i>Sabulina stricta</i>	bog sandwort	None	None	-	2B.3
<i>Atriplex cordulata</i> var. <i>cordulata</i>	heartscale	None	None	-	1B.2
<i>Atriplex minuscula</i>	lesser saltscale	None	None	-	1B.1
<i>Atriplex persistens</i>	vernal pool smallscale	None	None	-	1B.2
<i>Atriplex subtilis</i>	subtle orache	None	None	-	1B.2
<i>Carex congdonii</i>	Congdon's sedge	None	None	-	4.3
<i>Carex geyeri</i>	Geyer's sedge	None	None	-	4.2
<i>Eriophorum gracile</i>	slender cottongrass	None	None	-	4.3
<i>Lupinus citrinus</i> var. <i>citrinus</i>	orange lupine	None	None	-	1B.2
<i>Lupinus gracilentus</i>	slender lupine	None	None	-	1B.3
<i>Trifolium bolanderi</i>	Bolander's clover	None	None	-	1B.2
<i>Carpenteria californica</i>	tree-anemone	None	Threatened	-	1B.2
<i>Erythronium pluriflorum</i>	Shuteye Peak fawn lily	None	None	-	1B.3
<i>Pityopus californicus</i>	California pinefoot	None	None	-	4.2
<i>Calyptidium pulchellum</i>	Mariposa pussypaws	Threatened	None	-	1B.1
<i>Claytonia megarhiza</i>	fell-fields claytonia	None	None	-	2B.3
<i>Claytonia parviflora</i> ssp. <i>grandiflora</i>	streambank spring beauty	None	None	-	4.2
<i>Levisia disepala</i>	Yosemite lewisia	None	None	-	1B.2
<i>Camissonia sierrae</i> ssp. <i>alticola</i>	Mono Hot Springs evening-primrose	None	None	-	1B.2
<i>Camissonia sierrae</i> ssp. <i>sierrae</i>	Yosemite evening-primrose	None	None	-	4.3
<i>Clarkia australis</i>	Small's southern clarkia	None	None	-	1B.2
<i>Clarkia rostrata</i>	beaked clarkia	None	None	-	1B.3
<i>Epilobium howellii</i>	subalpine fireweed	None	None	-	4.3
<i>Botrychium paradoxum</i>	paradox moonwort	None	None	-	2B.1
<i>Cypripedium montanum</i>	mountain lady's-slipper	None	None	-	4.2
<i>Piperia colemanii</i>	Coleman's rein orchid	None	None	-	4.3
<i>Platanthera yosemitensis</i>	Yosemite bog orchid	None	None	-	1B.2
<i>Castilleja campestris</i> var. <i>succulenta</i>	succulent owl's-clover	Threatened	Endangered	-	1B.2
<i>Chloropyron palmatum</i>	palmate-bracted salty bird's-beak	Endangered	Endangered	-	1B.1
<i>Cordylanthus rigidus</i> ssp. <i>brevibracteatus</i>	short-bracted bird's-beak	None	None	-	4.3



Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
<i>Erythranthe gracilipes</i>	slender-stalked monkeyflower	None	None	-	1B.2
<i>Erythranthe laciniata</i>	cut-leaved monkeyflower	None	None	-	4.3
<i>Gratiola heterosepala</i>	Boggs Lake hedge-hyssop	None	Endangered	-	1B.2
<i>Agrostis humilis</i>	mountain bent grass	None	None	-	2B.3
<i>Orcuttia inaequalis</i>	San Joaquin Valley Orcutt grass	Threatened	Endangered	-	1B.1
<i>Orcuttia pilosa</i>	hairy Orcutt grass	Endangered	Endangered	-	1B.1
<i>Puccinellia simplex</i>	California alkali grass	None	None	-	1B.2
<i>Tuctoria greenei</i>	Greene's tuctoria	Endangered	Rare	-	1B.1
<i>Collomia rawsoniana</i>	Rawson's flaming trumpet	None	None	-	1B.2
<i>Leptosiphon serrulatus</i>	Madera leptosiphon	None	None	-	1B.2
<i>Navarretia nigelliformis</i> ssp. <i>radians</i>	shining navarretia	None	None	-	1B.2
<i>Eriogonum prattenianum</i> var. <i>avium</i>	Kettle Dome buckwheat	None	None	-	4.2
<i>Goodmania luteola</i>	golden goodmania	None	None	-	4.2
<i>Potamogeton epihydrus</i>	Nuttall's ribbon-leaved pondweed	None	None	-	2B.2
<i>Potamogeton robbinsii</i>	Robbins' pondweed	None	None	-	2B.3
<i>Delphinium hansenii</i> ssp. <i>evanianum</i>	Ewan's larkspur	None	None	-	4.2
<i>Delphinium recurvatum</i>	recurved larkspur	None	None	-	1B.2
<i>Ceanothus fresnensis</i>	Fresno ceanothus	None	None	-	4.3
<i>Ivesia unguiculata</i>	Yosemite ivesia	None	None	-	4.2
<i>Mitellastrum caulescens</i>	leafy-stemmed mitrewort	None	None	-	4.2
<i>Viola pinetorum</i> var. <i>grisea</i>	grey-leaved violet	None	None	-	1B.3

Sources: California Natural Diversity Database BIOS Viewer Tool

**Federal Status**

Endangered: The classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Threatened: The classification provided to an animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Proposed Endangered: The classification provided to an animal or plant that is proposed for federal listing as Endangered in the Federal Register under Section 4 of the Endangered Species Act.

Proposed Threatened: The classification provided to an animal or plant that is proposed for federal listing as Threatened in the Federal Register under Section 4 of the Endangered Species Act.

Candidate: The classification provided to an animal or plant that has been studied by the United States Fish and Wildlife Service, and the Service has concluded that it should be proposed for addition to the Federal Endangered and Threatened species list.

None: The plant or animal has no federal status.

Delisted: The plant or animal was previously listed as Endangered or Threatened, but is no longer listed on the Federal Endangered and Threatened species list.

**CDFW Status**

FP: Fully Protected: This classification was the State of California's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction.

SSC: Species of Special Concern: To this end, the Department has designated certain vertebrate species as "Species of Special Concern" because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of designating species as "Species of Special Concern" is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long-term viability.

WL: Watch List: Species that were previously designated as "Species of Special Concern" but no longer merit that status, or which do not yet meet SSC criteria, but for which there is concern and a need for additional information to clarify status.

#### **CA Rare Plant Rank**

1A: Plants presumed extinct in California and rare/extinct elsewhere

1B.1: Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California

1B.2: Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California

1B.3: Plants rare, threatened, or endangered in California and elsewhere; not very threatened in California

2A: Plants presumed extirpated in California, but more common elsewhere

2B.1: Plants rare, threatened, or endangered in California, but more common elsewhere; seriously threatened in California

2B.2: Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in California

2B.3: Plants rare, threatened, or endangered in California, but more common elsewhere; not very threatened in California

3.1: Plants about which we need more information; seriously threatened in California

3.2: Plants about which we need more information; fairly threatened in California

3.3: Plants about which we need more information; not very threatened in California

4.1: Plants of limited distribution; seriously threatened in California

4.2: Plants of limited distribution; fairly threatened in California

4.3: Plants of limited distribution; not very threatened in California

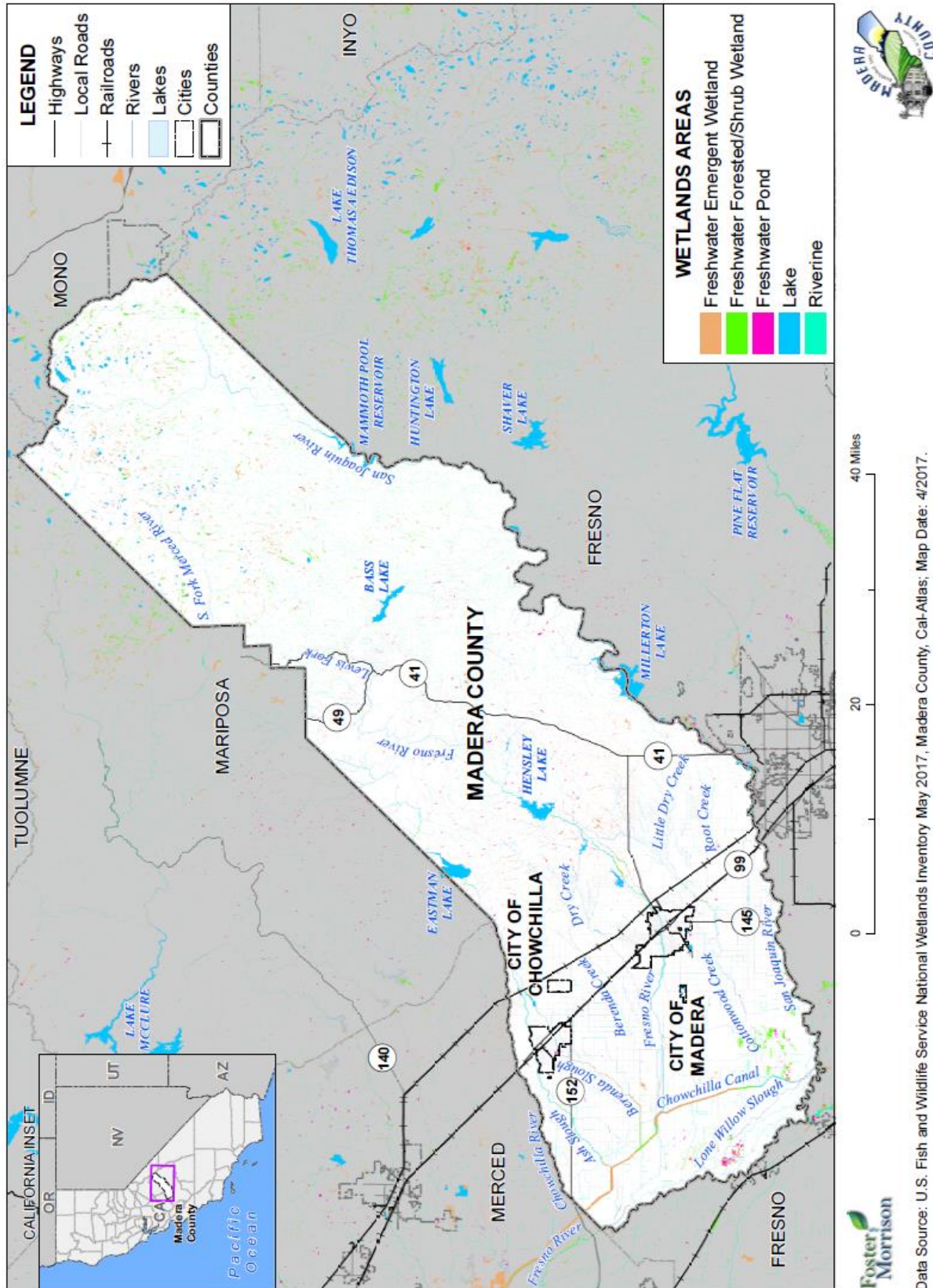
## **Wetlands**

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

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

Wetlands in the County are shown in Figure 4-58.

Figure 4-58 Madera County Planning Area – Wetlands



Data Source: U.S. Fish and Wildlife Service National Wetlands Inventory May 2017, Madera County, Cal-Atlas; Map Date: 4/2017.

## Natural and Beneficial Functions

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

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

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

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

## Farmlands

### Williamson Act

The Williamson Act (WA) and Farm Land Security Zone (FSZ) give property owners, that choose to participate in the programs, the opportunity to have a restricted tax basis in exchange for agreeing not to develop their properties to uses other than agricultural. Contract terms are 10 years for WA or 20 years for FSZ and renew annually, unless the owner or County files a Notice of Nonrenewal. Calculations are run yearly and participants are taxed on the lower of their restricted value or their Prop 13 value. In the case of FSZ parcels there is an additional 35% taken off of the enrolled land and growing values. For the 2016 fiscal year 4,153 parcels encompassing 528,530 acres were under contract. Parcels taxed on a restricted basis were assessed at a value of \$731,958,791 with an underlying Prop 13 value of \$1,692,360,764. This savings of \$960,401,973 in assessed value by the programs participants would equate to an understatement of value, if the assumption was made that the Tax Roll equaled the Prop 13 values. The difference between the restricted and Prop 13 values fluctuates from year to year based on factors such as cap rates, land rents and commodity market conditions. The County has 552,564 acres under Williamson Act Contract as of 2013.

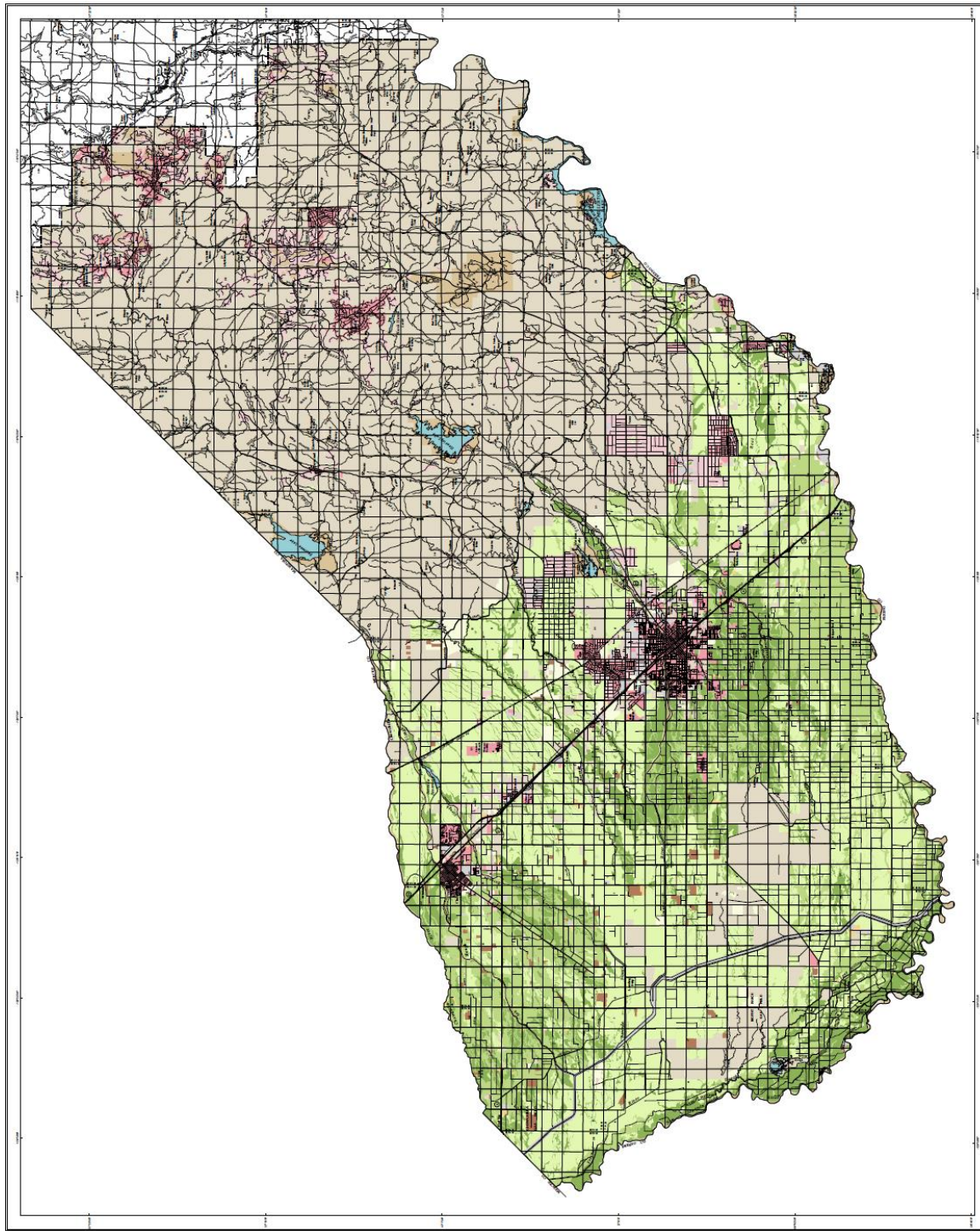
## State Inventory of Important Farmland

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

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

The 2014 maps were the most recent versions. These lands are shown in Figure 4-59.

Figure 4-59 Madera County – Map of Important Farmlands 2014



- PRIME FARMLAND**

PRIME FARMLAND HAS THE BEST COMBINATION OF PHYSICAL AND CHEMICAL FEATURES ABLE TO SUSTAIN LONG-TERM AGRICULTURAL PRODUCTION. THIS LAND HAS THE SOIL QUALITY, GROWING SEASON, AND MOISTURE SUPPLY NEEDED TO PRODUCE SUSTAINED HIGH YIELDS. LAND MUST HAVE BEEN USED FOR IRREGATED AGRICULTURAL PRODUCTION AT SOME TIME DURING THE FOUR YEARS PRIOR TO THE MAPPING DATE.
- UNIQUE FARMLAND**

UNIQUE FARMLAND CONSISTS OF LESSEER QUALITY SOILS USED FOR THE PRODUCTION OF THE WETTER GRAIN AND OTHER CROPS. THIS LAND IS USUALLY IRRIGATED, BUT MAY INCLUDE NONIRRIGATED ORCHARDS OR VINEYARDS AS FOUND IN SOME CLIMATES. SORES IN CALIFORNIA. LAND MUST HAVE BEEN CROPPED AT SOME TIME DURING THE FOUR YEARS PRIOR TO THE MAPPING DATE.
- GRAZING LAND**

GRAZING LAND IS LAND ON WHICH THE EXISTING VEGETATION IS SUITED TO THE GRAZING OF LIVESTOCK.
- FARMLAND OF STATEWIDE IMPORTANCE**

FARMLAND OF STATEWIDE IMPORTANCE IS SIMILAR TO PRIME FARMLAND BUT WITH MINOR SHORTCOMINGS, SUCH AS GREATER SLOPES OR LESS ABILITY TO STORE SOIL MOISTURE. LAND MUST HAVE BEEN USED FOR IRRIGATED AGRICULTURAL PRODUCTION AT SOME TIME DURING THE FOUR YEARS PRIOR TO THE MAPPING DATE.
- FARMLAND OF LOCAL IMPORTANCE**

FARMLANDS THAT HAVE PHYSICAL CHARACTERISTICS THAT WOULD QUALIFY FOR PRIME OR STATEWIDE IMPORTANCE FOR THE LACK OF IRRIGATION WATER. FARMLANDS THAT PRODUCE CROPS THAT ARE NOT LISTED UNDER UNIQUE LANDS BUT ARE IMPORTANT TO THE ECONOMY OF THE COUNTY ARE: CHRISTMAS TREES, SUGAR CORN, MELON, AND CABBAGES, POULTRY HOUSES AND PRODUCE, SHIPPED OR PLANTED NATURE ONLY BANGALANDS, AND BRIGATED PASTURES BY IT IN THEIR PRESENCE OR FROM IF SOILS ARE LISTED AS SUCH OTHERWISE AS LOCAL.

ALSO, LANDS THAT ARE LEGISLATED TO BE USED ONLY FOR AGRICULTURAL (FARMLANDS PURPOSES), SUCH AS WILLAMSON ACT LAND IN WESTERN NEVADA COUNTY.
- URBAN AND BUILT-UP LAND**

URBAN AND BUILT-UP LAND IS OCCUPIED BY STRUCTURES WITH A BUILDING DENSITY OF AT LEAST 1 UNIT TO 1.5 ACRES, OR APPROXIMATELY 6 STRUCTURES TO A 10-ACRE PARCEL. COMMON EXAMPLES INCLUDE RESIDENTIAL, INDUSTRIAL, COMMERCIAL, INSTITUTIONAL FACILITIES, CEMETERIES, AIRPORTS, GOLF COURSES, SANITARY LANDFILLS, SEWAGE TREATMENT, AND WATER CONTROL STRUCTURES.

Source: State of California Department of Conservation

## *Growth and Development Trends*

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability. Information from the Madera County General Plan 2016-2024 Housing Element, the California Department of Finance, and the US Census Bureau form the basis of this discussion.

More specific information on growth and development for each participating jurisdiction can be found in the jurisdictional annexes.

### **Current Status and Past Development**

The estimated population of Madera County for January 1, 2017 was 156,492, representing an almost seven-fold increase from just over 23,000 people in 1940. Table 4-54 and Table 4-55 illustrate the pace of population growth in Madera County dating back to 1940 along with more recent population trends for each jurisdiction. The data on population and housing growth shows that Madera County saw tremendous growth during the end of the 20<sup>th</sup> century. That growth continued between 2000 and 2010, and the County has seen additional population gains since 2010. Much of the population growth in the County since 2000 has been in the incorporated jurisdictions.

*Table 4-54 Madera County Population Growth 1940-2017*

Year	Population	Change	Percent Increase
1940	23,314	–	–
1950	36,964	13,650	58.5%
1960	40,468	3,504	9.5%
1970	41,519	1,051	2.6%
1980	63,316	21,797	52.0%
1990	88,090	24,774	39.6%
2000	123,109	35,019	39.8%
2010	150,865	27,756	22.5%
2017	156,492	5,627	3.7%

Sources: Madera County Housing Element Background Report, California Department of Finance, US Census Bureau

*Table 4-55 Population Growth for Jurisdictions in Madera County, 2000-2017*

Area	2000	2010	2017	% Change 2000 to 2017
Chowchilla	11,127	18,720	18,840	69.3%
Madera	43,207	61,416	66,082	52.9%
Unincorporated County	68,775	70,729	71,570	4.1%

Sources: Madera County Housing Element Background Report, California Department of Finance E-1, US Census Bureau

## Special Populations

The HMPC noted that the Wildwood Trailer Park near California Highway 41 and the San Joaquin River is an economically depressed area that is at risk to flooding.

The 2017 Climate Change and Health Profile Report noted that there are other special populations in the County.

*In 2010, the age-adjusted death rate in Madera County was higher than the state average. Disparities in death rates among race/ethnicity groups highlight how certain populations disproportionately experience health impacts. Within the county, the highest death rate occurred among Whites and the lowest death rate occurred among African-Americans. In 2012, nearly 49% of adults (47,829) reported one or more chronic health conditions including heart disease, diabetes, asthma, severe mental stress or high blood pressure. In 2012, 16% of adults reported having been diagnosed with asthma. In 2012, approximately 34% of adults were obese (statewide average was 25%).*

*In 2012, nearly 12% of residents aged 5 years and older had a mental or physical disability (statewide average was 10%). In 2005-2010, there was an annual average of 36 heat-related emergency room visits and an age-adjusted rate of 24 emergency room visits per 100,000 persons (the statewide age-adjusted rate was 10 emergency room visits per 100,000 persons).*

*Among climate-vulnerable groups in 2010 were 11,983 children under the age of 5 years and 17,262 adults aged 65 years and older. In 2010, there were approximately 8,624 people living in nursing homes, dormitories, and other group quarters where institutional authorities would need to provide transportation in the event of emergencies.*

*Social and demographic factors and inequities affect individual and community vulnerability to the health impacts of climate change. In 2010, 10% of households (4,204) did not have a household member 14 years or older who spoke English proficiently (called linguistically isolated; statewide average was 10%).*

Additionally, the Planning Team noted that due to Madera County being a largely agricultural based county, there is a large segment of the population that is Spanish speaking only. The County recognized the fact they are a special population since they only speak Spanish. The County makes efforts to reach this special population by doing messaging in Spanish language as well.

## Cal DWR Special Population Mapping

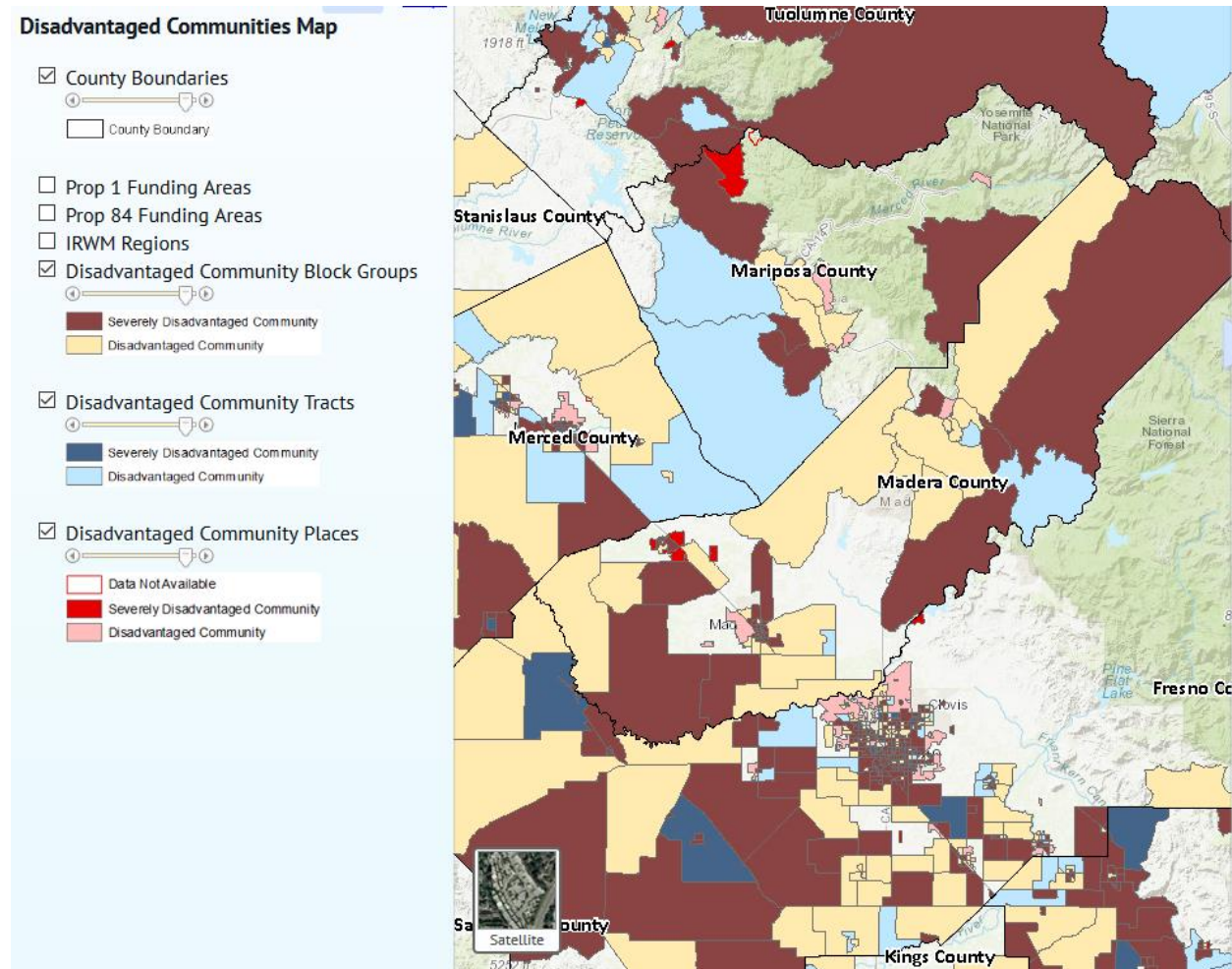
The Department of Water Resources (DWR) has developed a web-based application to assist local agencies and other interested parties in evaluating disadvantaged community (DAC) status throughout the State, using the definition provided by Proposition 84 IRWM Guidelines (2015). The DAC Mapping Tool is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

- Census Place
- Census Tract
- Census Block Group



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

*Figure 4-60 Madera County – Disadvantaged Communities*



Source: Cal DWR

### Development since 2011 Plan

As shown in Table 4-54, the Madera County Planning Area has grown by approximately 4.1% between 2010 and January 1, 2017.

The Madera County Building Department and Planning Department tracked total building permits issued since 2011 for unincorporated Madera County. A summary of all development is shown in Table 4-56. These are tracked by hazard area and by property use type, and area shown in Table 4-57. Madera County does track development in wildfire areas; however, the County does not track development in flood or other areas. All development in the wildfired hazard area was completed in accordance with all current and

applicable development codes and standards and should be adequately protected. Thus, with the exception of more people living in the area potentially exposed to natural hazards, this growth should not cause a significant change in vulnerability of the Madera County Planning Area to identified priority hazards.

*Table 4-56 Unincorporated Madera County Development since 2011 Summary*

Property Use	2011	2012	2013	2014	2015
Residential	17	31	56	45	55
Commercial	91	136	99	101	94
Industrial	1	4	10	3	3
Other	218	235	248	207	217
<b>Total</b>	<b>327</b>	<b>406</b>	<b>413</b>	<b>356</b>	<b>369</b>

Source: Madera County Building Department

*Table 4-57 Unincorporated Madera County Development in Hazard Zones since 2011*

Property Use	1 % Annual Chance Flood	Wildfire Very High	Other
Residential	–	84	–
Commercial	–	16	–
Industrial	–	–	–
Other	–	–	–
<b>Total</b>	–	<b>100</b>	–

Source: Madera County Building Department

## Future Development

As indicated in the previous section, Madera County had been steadily growing from 1940 to 2017. Long term forecasts by the California Department of Finance project population growth in Madera County continuing through the 2060. Table 4-58 shows the population projections for the County as a whole through 2060.

*Table 4-58 Population Projections for Madera County Planning Area, 2010-2060*

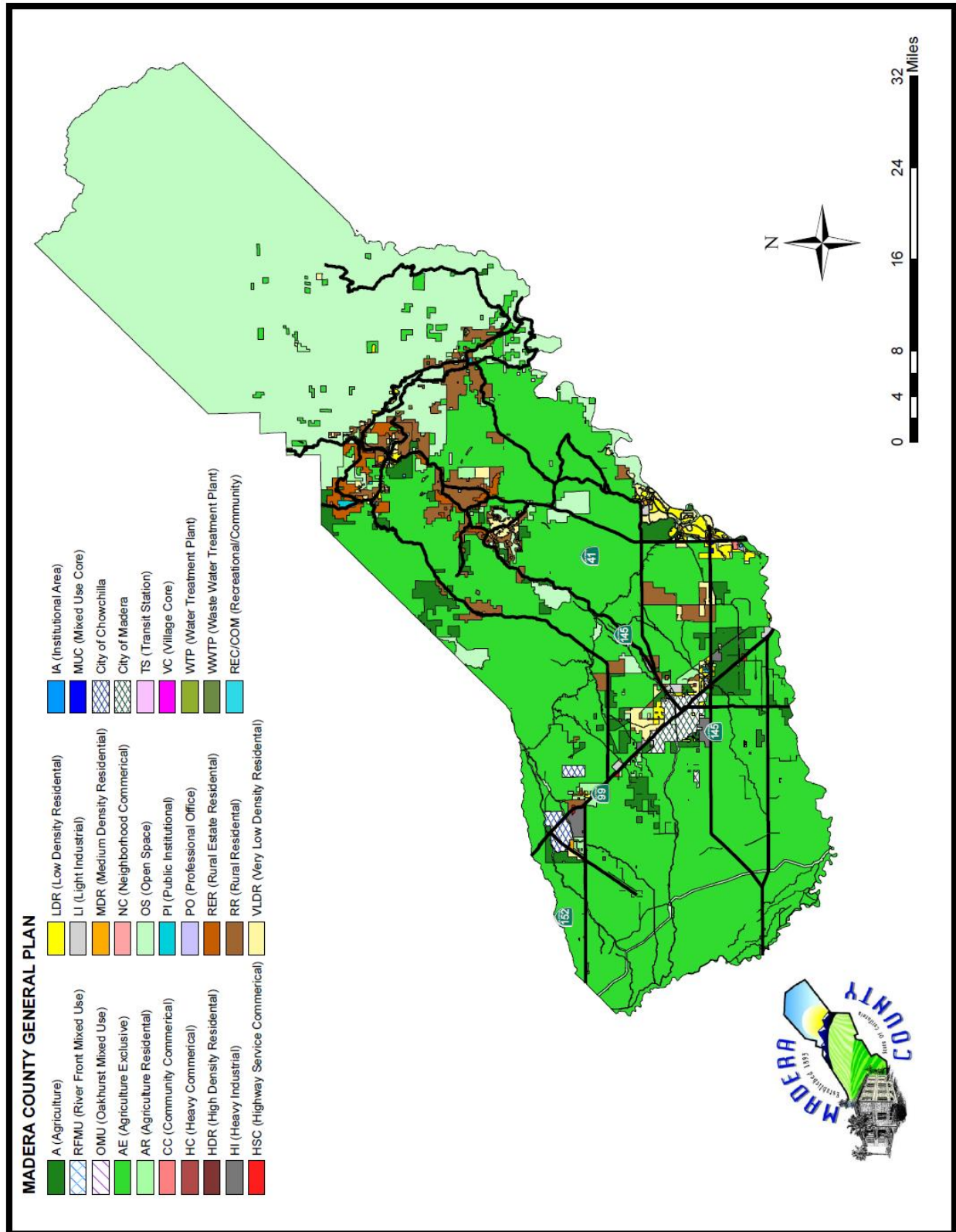
County	2020	2025	2030	2035	2040	2045	2050	2055	2060
Madera	162,814	174,156	186,761	199,556	212,229	224,744	237,116	249,271	262,065

Source: California Department of Finance, P-1 Report

## Land Use/Zoning

The future use of land in the County is fundamental to attaining the vision of a balanced, self-sustaining community. A land use pattern which balances growth between rural and urban areas, as well as providing a balance between housing, employment, natural resources, and services in the County is a key element in maintaining the quality of life and unique character of the County. Descriptions of allowed uses for each classification are detailed in the Madera County General Plan Land Use Element. Figure 4-61 is sourced from this section.

Figure 4-61 Madera County General Plan Land Use



Source: Madera County General Plan

## Future Development Analysis

Unincorporated Madera County has four planned development areas:

- Gunner Ranch West/VCH
- North Fork Village
- Tesoro Viejo
- Village of Gateway (Riverstone)

A description of each of these planned developments is detailed below.

### *Gunner Ranch West*

The Gunner Ranch project is located in an unincorporated area of southern Madera County, along State Highway 41 and adjacent to the San Joaquin River which also serves as the Fresno County/Madera County boundary. The approximately 1,135 acre site is bounded on the north by Avenues 9 and 10, on the east by Highway 41, on the south by Avenues 8 and 8½, on the southeast by the San Joaquin River, and on the west by Roads 39½ and 40.

### *North Fork Village*

The project site consists of open space comprised of rolling hills, Cottonwood Creek, exposed rock formations, and oak trees. The project site includes twenty-eight (28) Madera County Assessors Parcels, of which twenty-three (23) are owned by Friant Development Corporation (totaling 2,084.32 acres) and five (5) are owned by others (totaling 149.27 acres) (Exhibit 5.9-1). The project proposes to develop portions of the following Sections (with Township and Range), all in Mount Diablo Base Meridian:

- Section 5 and 6 of T11S, R21E
- Section 1 of T11S, R20E
- Sections 21, 27, 28, 31, 32, and 33 of T10S, R21E

### *Tesoro Viejo*

Tesoro Viejo, a 1,500-acre community in southeastern Madera County, north of Fresno, California. The community will have from 3,800 to 5,200 dwelling units, with individual neighborhoods having a range of densities from townhomes and small lot courts to larger lot single family homes and rural clustered homes. The design encourages walking and bicycling within the neighborhoods and to community services and amenities. A mixed-use community core incorporates high density residential, community retail, and office uses, and will be the primary retail and employment center for southeast Madera County.

The project includes approximately 2.5 to 3.5 million square feet of commercial and business park/industrial space, consisting of both light industrial and highway service or large format commercial along the future planned Highway 41, as well as the potential for office/ Research & Development flex uses in closer proximity to the community core. A smaller mixed-use neighborhood center is planned in the eastern portion of the site to provide services to local neighborhoods and the community village, outside of

the project, to the north. Two elementary schools and other public institutional uses such as a library and churches are being planned to anchor several neighborhood centers throughout the rest of the community.

### *Village of Gateway*

The Gateway Village site is approximately 2,062 acres, is generally bordered on the south by Avenue 10, on the east by Rolling Hills Estates and Highway 41, on the north by a boundary that ranges up to one mile north of Avenue 12, and by Road 40 on the west. The site lies approximately midway between downtown Madera and downtown Fresno - about 11 miles distance. The current land use is predominately Agriculture. It is serviced by Highway 41 and Avenues 10 and 12. The site is generally flat with the exception of some gentle undulation to the topography caused by Root Creek and its tributary system, which flows through the site from the northeast to the southwest.

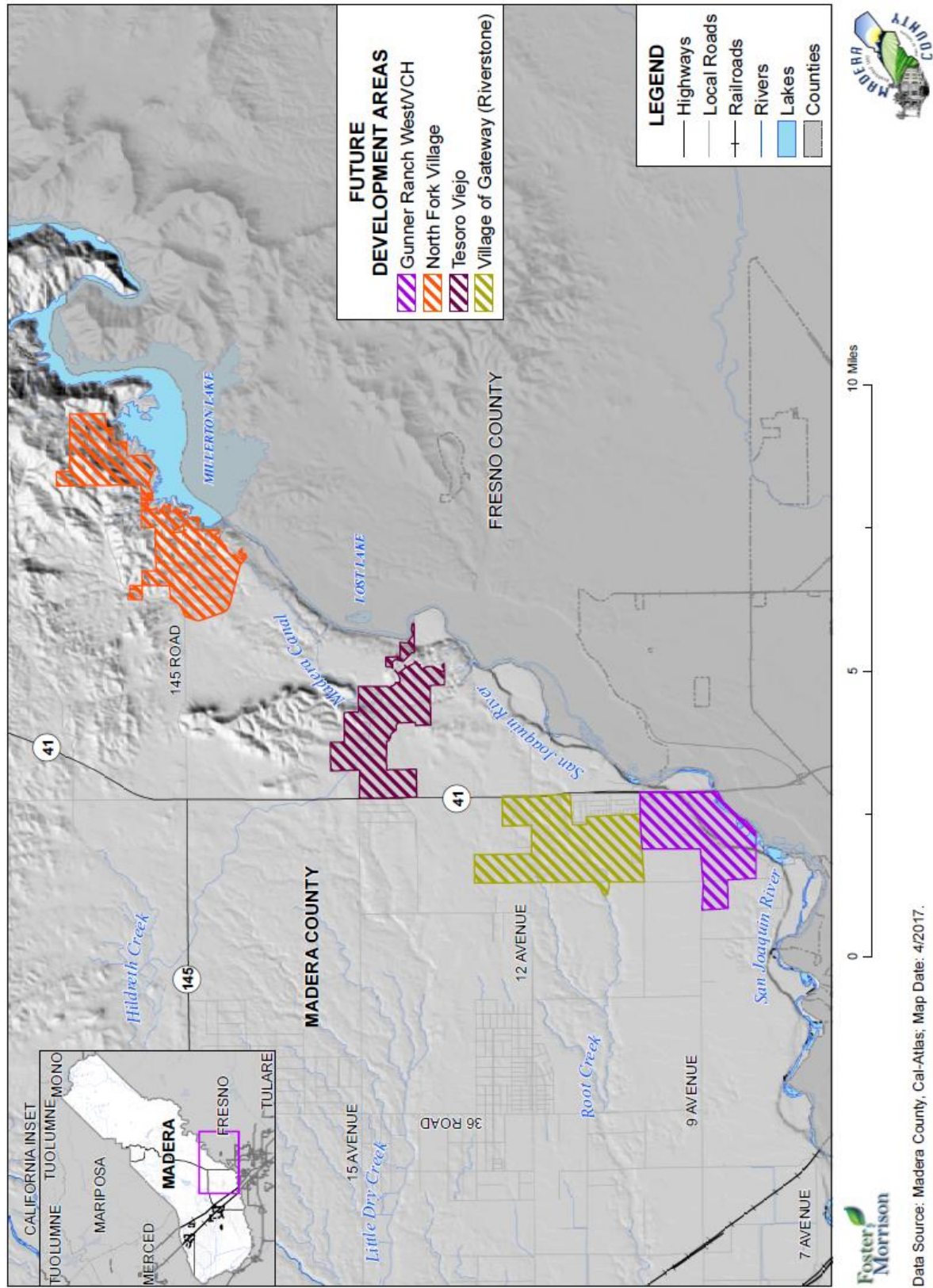
### **Methodology**

Unincorporated Madera County has identified four future planned development areas. GIS was used to determine the locations, number of parcels, and acres associated with each future development area. Later in this vulnerability assessment, GIS is also used to develop hazard overlays on these future development areas to determine possible impacts or development constraints associated with mapped hazards that include dam failure, flooding, hazardous materials, and wildfires incidences within the County.

Madera County provided these four planned development areas in GIS. These areas were overlaid on the County Assessor's and parcel data to determine parcels and acreages for each identified area. Summary tables for these unincorporated Madera County future development areas are presented below.

The future development areas in the County are shown on Figure 4-62. Table 4-59 shows the areas which the County has identified for future growth and development and includes information regarding the type of development.

Figure 4-62 Madera County Future Development Areas



*Table 4-59 Unincorporated Madera County Future Development Areas*

Future Development Areas	Parcels	Acres
Gunner Ranch West/VCH	38	1,589
North Fork Village	31	2,369
Tesoro Viejo	169	1,699
Village of Gateway (Riverstone)	294	2,009
<b>Grand Total</b>	<b>532</b>	<b>7,666</b>

Source: Madera County GIS

### 4.3.2. Madera County Vulnerability to Specific Hazards

The Disaster Mitigation Act regulations require that the HMPC evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies, where data permits, the Madera County Planning Area’s vulnerability to each of the hazards identified as a priority hazard in Section 4.2.20 Natural Hazards Summary. Where specific hazards vary across the Madera County Planning Area, additional information can be found in the jurisdictional annexes. Based on information developed for the hazard profiles, the priority hazards evaluated further as part of this vulnerability assessment include:

- Ag Hazards: Severe Weather/Insect Pests
- Climate Change
- Dam Failure
- Drought and Water Shortage
- Earthquake
- Flood: 100/200/500–year
- Flood: Localized/Stormwater
- Hazardous Materials Transportation
- Landslides, Rockfalls, and Debris Flows
- Levee Failure
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)
- Severe Weather: Wind and Tornado
- Severe Weather: Winter Storms/Snow
- Wildfire (smoke, tree mortality)

Landslide, fog, and volcano were determined not to be priority hazards during the initial prioritization process based on information obtained during development of the hazard profiles.

An estimate of the vulnerability of the Madera County Planning Area and unincorporated County to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

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

The HMPC identified five hazards in the Planning Area for which specific geographical hazard areas have been defined and for which sufficient data exists to support a quantifiable vulnerability analysis. These six hazards are dam failure, earthquake, flood, hazardous materials, and wildfire. Because these hazards have discrete hazard risk areas, their risk varies by jurisdiction. The vulnerability of the dam failure, flood (100/500-year), hazardous materials transportation, and wildfire hazards were analyzed using GIS and County parcel and assessor data. The HMPC used FEMA’s loss estimation software, HAZUS-MH, to analyze the County’s vulnerability to earthquakes.

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

- General hazard-related impacts, including impacts to life, safety, and health
- Values at risk (i.e., types, numbers, and value of land and improvements)
- Identification of population at risk
- Identification of critical facilities at risk
- Identification of cultural, historical, and natural resources at risk
- Overall community impact
- Future development/development trends within the identified hazard area

For hazardous materials, the HMPC identified:

- General hazard-related impacts, including impacts to life, safety, and health and overall community impacts
- Identification of population at risk
- Identification of critical facilities at risk

The HMPC used FEMA’s loss estimation software, HAZUS-MH, to analyze the County’s vulnerability to earthquakes.



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

- Agricultural Hazards
- Climate Change
- Drought and Water Shortage
- Flood: Localized/Stormwater
- Levee Failure
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rain and Storms
- Severe Weather: Winds and Tornadoes
- Severe Weather: Winter Storm and Snow

The vulnerability sections below are presented alphabetically.

### 4.3.3. Agricultural Hazards Vulnerability Assessment

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Medium

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

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

- Drought's most severe effects on agriculture include water quality and quantity issues. Other impacts include decreased crop yields, impact to feed and forage, and altered plant populations.
- Earthquakes can strike without warning and cause dramatic changes to the landscape of an area that can have devastating impacts on agricultural production and the environment. These impacts could include loss of harvest or livestock and destruction of irrigation systems and other agricultural infrastructure.
- Extreme cold may result in loss of livestock, increased deicing, downed power lines, and increased use of generators. Deicing can impact agriculture by damaging local ecosystems and contaminating water bodies. Downed power lines cause people to run generators more often, which can release harmful air pollutants.

- Hot weather and extreme heat can worsen ozone levels and air quality as well as leading to drought conditions. Excessive heat and prolonged dry or drought conditions can impact agriculture by creating worker safety issues for farm field workers, severely damaging crops, and reducing availability of water and food supply for livestock.
- Wildfires can spread quickly and devastate thousands of acres of land, which may include agricultural lands. This devastation could lead to large losses in crops, forestry, livestock, and agricultural infrastructure.
- Flooding causes many impacts to agricultural production, including water contamination, damage to crops, loss of livestock, increased susceptibility of livestock to disease, flooded farm machinery, and environmental damage to and from agricultural chemicals.
- Landslides and debris flow occur in all 50 states and commonly occur in connection with other major natural disasters such as earthquakes, volcanoes, wildfires, and floods. Some of the threats from landslides and debris flow include rapidly moving water and debris that can cause trauma; broken electrical, water, gas, and sewage lines; and disrupted roadways and railways. This can lead to agricultural impacts including contamination of water, change in vegetation, and harvest and livestock losses.
- Tornadoes can appear without much warning and have the potential to devastate an area very quickly. This devastation can impact agriculture by contaminating water and destroying crops, livestock, and other farm property.

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

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

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

### *Future Development*

Future development in the County is not likely to have an impact on agricultural hazards in Madera County, except to the extent that agricultural lands are taken out of production as new development occurs reducing available land for agricultural uses, including those related to farming, timber production and grazing.

#### 4.3.4. Climate Change Vulnerability Assessment

**Likelihood of Future Occurrence**—Likely  
**Vulnerability**—Medium

The California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change.

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

#### Madera County Climate Change Impacts

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

- Temperature increases
- Decreased precipitation
- Reduced agricultural productivity
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increase wildfire

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

**Ecosystems and Biodiversity.** Exacerbated by new development in the region, climate change can cause habitats to shift, creating conditions that stress ecosystems and endemic species. Timber practices, also compounded by climate change, has resulted in forests with trees of similar age, lacking snags and underbrush, further reducing the diversity of the habitat. The Sierra's aquatic and riparian systems are one of the most altered habitats in the region through past development and water diversion activities. Continued changes in hydrologic flow regimes and increased temperatures will further stress these systems regional habitats supporting many special-status species.

**Snowpack and Flooding.** Climate-related decrease in snowpack can have significant consequences on the areas that depend on this water. In addition, a decrease in snowpack can increase impacts from flooding,

landslide, and loss of economic base related to a drop in tourism. Recreation and tourism are likely to suffer due to lower water levels in waterways and reservoirs and declining snowpack. This can result in impacts to hotels, restaurants, and second home development. Increases in flood events can further stress the region and increase flood related impacts and damages.

**Agriculture.** Agriculture will also be impacted due to reduced or altered precipitation. Water supply (for irrigation) can alleviate some of the other climate stresses (altered temperature or precipitation) or, in the case of reduced water supply, exacerbate them. The challenge of climate change is that water supply is projected to be reduced and water that is available will be more costly for users. Employees of water-reliant industries such as agriculture may become more economically vulnerable because of unstable working conditions.

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

**Public Health, Socioeconomic, and Equity Impact.** The foothills of the North Central Valley Region show higher ozone levels and increased temperatures causing vulnerable populations to be at greater risk to these issues. In addition to the elderly population found in this region, people who work and play outdoors are also vulnerable. Farm employment or lodging and food services are among the top five employment sectors in several of the counties in this region. Agricultural workers and employees in the tourist industry are more susceptible to heat events. Regardless of their occupation, the poor are less likely to have the adaptive capacity to prevent and address impacts for reasons stated above. Madera County is considered a “high poverty” county. Households eligible for energy utility financial assistance programs are an indicator of potential impacts. These households may be more at risk of not using cooling appliances, such as air conditioning, due to associated energy costs. At 55%, Madera County has a moderately high proportion of populations eligible for energy assistance.

### *Future Development*

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

Other future development considerations, noted by Cal Adapt, include:

**Climate change, coupled with shifting demographics and market conditions, could impact both the location of desired developments and the nature of development.** Demand may increase for smaller

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

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

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

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

Including dual or multi-purpose facilities and amenities as part of all new development provides not just desirable community amenities but critical infrastructure for climate resiliency.

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

**Climate change will affect Utilities.** California is already experiencing impacts from climate change such as an increased number of wildfires, sea level rise and severe drought. Utility efforts to deal with these impacts range from emergency and risk management protocols to new standards for infrastructure design and new resource management techniques. Utilities are just beginning to build additional resilience and redundancy into their infrastructure investments from a climate adaptation perspective, but have been doing so from an overall safety and reliability perspective for decades. Significant efforts are also being made in those areas that overlap with climate change mitigation such as diversification of resources, specifically the addition of more renewables to the portfolio mix, as well as implementation of demand response efforts to curb peak demand. Efforts are also under way to upgrade the distribution grid infrastructure, which should add significant resilience to the grid as well. Next, they will issue a guidance document that expands upon the vulnerability assessments phase and includes plans for resilience solutions including cost/benefit analysis methodologies. The outcomes of this work will help to inform next steps on how infrastructure, the grid and other related operations will be modified to address climate change. New development will have to adapt and incorporate these new approaches as they evolve. Existing and new development will be affected from impacts that includes not only diminished capacity from all of the utility assets from generation to transmission and distribution, but also the cost consequences resulting from prevention, replacement, outage, and energy loss. These have the potential for greatly impacting not just residential development but commercial and industrial and all utility users.

**Addressing Urban Heat Islands and Heat Events.** New development will contribute to urban heat island (UHI) impacts and will need to incorporate urban greening methods into all aspects of development; interior and exterior of buildings, surrounding environment and beyond. New development will need to reduce its impacts to the overall UHI impacts affecting the county and surrounding region. On-going and expanding heat wave awareness and assistance will also affect new development. During heat waves in Madera County, a heat alert is issued and news organizations are provided with tips on how vulnerable people can protect themselves. Programs used by health departments to engage with thousands of block captains to check on elderly and other vulnerable residents, along with public cooling places extending their hours, or local businesses welcoming residents into their businesses for purposes of staying cool are examples of programs and services that will be necessary. Other programs to consider that could further involve hospitals and clinics are operating a “heatline” with nurses or other healthcare professionals ready to assist callers with heat-related health problems. In addition, continued funding for weatherization, reduced utility

rates and similar programs that offers assistance to elderly, low-income residents to install roof insulation, solar, trees and cool surfaces to save energy and lower indoor temperatures.

### 4.3.5. Dam Failure Vulnerability Assessment

**Likelihood of Future Occurrence**—Jurisdictional Dams – Unlikely; Non-jurisdictional Dams - Occasional

**Vulnerability**—High

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

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

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Based on the risk assessment, it is apparent that a major dam failure could have a devastating impact on the Planning Area. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect crops and livestock as well as lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies.

Flooding as a result of dam failure can occur as a result of manmade or natural causes. Such causes include improper siting, structural design flaws, erosion of the face or foundation, earthquakes, massive landslides, and rapidly rising flood waters. Inundation as a result of dam failure would most likely be the result of an earthquake. There are populated areas within the inundation zone of several of these dams; others have public property (such as roads) located down creek. However, the area of Madera County in which these dams exist is not located within an historical seismic zone.

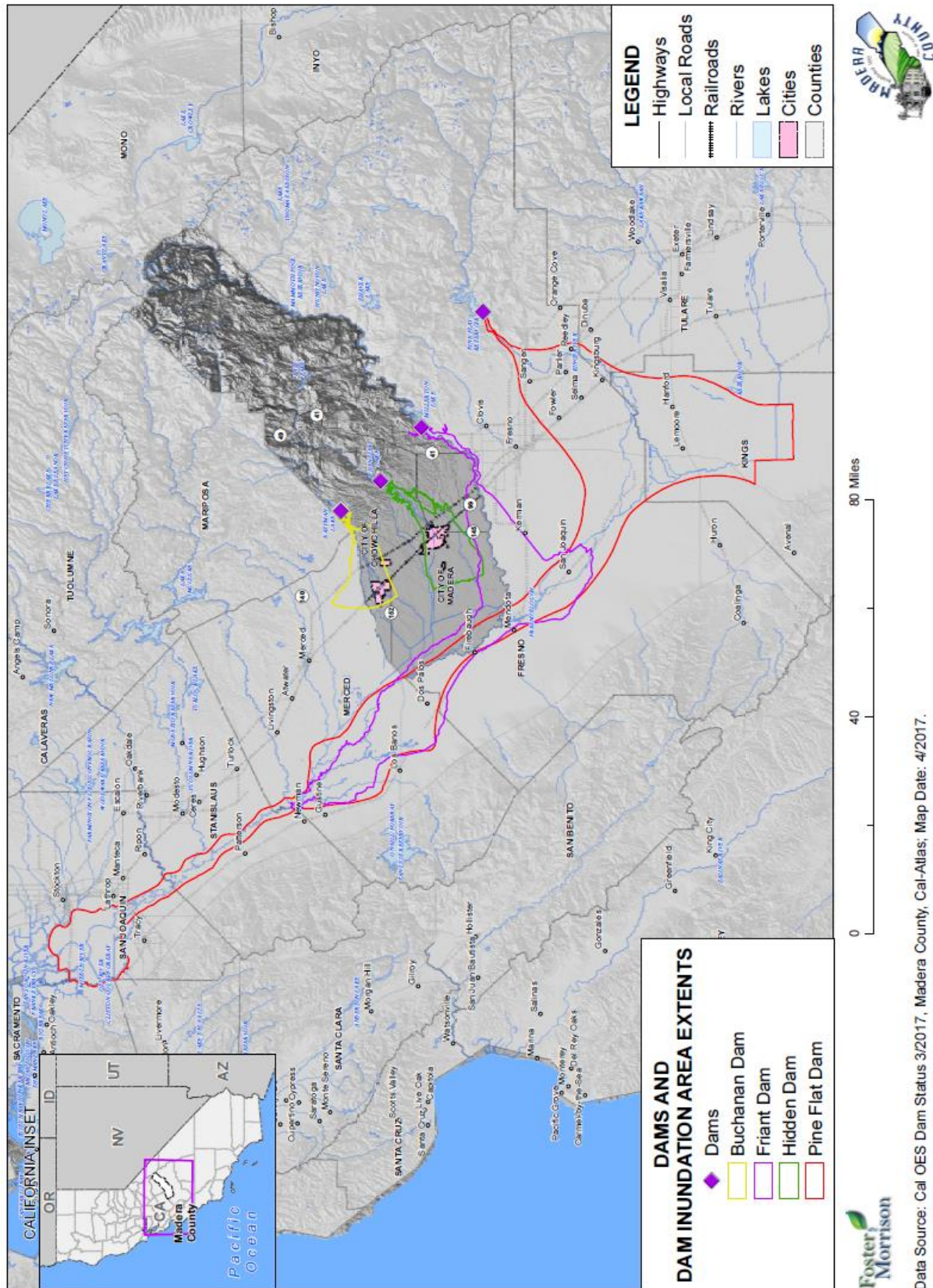
#### *Values at Risk*

Dam inundation areas, as obtained from Cal OES, were used as the basis of this dam inundation analysis. Figure 4-63 shows the dam inundation areas of dams of concern for the County. Those dams are the Buchanan Dam, Friant Dam, Hidden Dam, and Pine Flat Dam. Failure of the Buchanan Dam would flood an area of 104 square miles that includes the City of Chowchilla and a portion of Merced County. Failure of the Hidden Dam would flood the City of Madera and a surrounding area of 132 square miles entirely within the County of Madera. Failure of the Friant Dam would flood an area of 736 square miles in Fresno, Madera, and Merced Counties; the portion of Madera County that would flood is along the southern and western borders of the County. Failure of the Pine Flat Dam would cause the greatest area of flooding; this dam would flood an area of 1,818 square miles extending from the dam location in Fresno County south to the Central Valley in Kings County, and as far north as Stockton in San Joaquin County. However, only a small portion of western Madera County would be flooded in this case. The depth of flooding due to the

failure of a dam is unknown. However, as shown above, the dams with potential to flood the largest area in Madera County in case of dam failure are two dams located in the County: the Buchanan and Hidden Dams.



Figure 4-63 Madera County Planning Area – Dam Inundation Areas



## Methodology and Results

Madera County's April 2017 Assessor Data and the County's GIS parcel data, obtained from Madera County, were used for the county inventory of parcels and values. GIS was used to create a centroid, or point representing the center of the parcel polygon. The dam inundation areas, obtained from Cal OES, were then overlaid on the parcel layer. For the purposes of this analysis, if the dam inundation layer intersected a parcel centroid, the entire parcel was considered to be in the dam inundation area. The parcels were segregated and analyzed in this fashion for the Madera County Planning Area. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessors database and the GIS parcel layer.

Table 4-60 contains the dam inundation analysis results for the entire Madera County Planning Area. This includes unincorporated Madera County and the incorporated jurisdictions. These tables show the property use type, number of parcels, and values at risk (including contents) to dam failure for the entire Madera County Planning Area.

*Table 4-60 Madera County Planning Area – Values and Parcels in All Dam Inundation Zones by Property Use*

Jurisdiction / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>City of Chowchilla</b>						
Agricultural	159	32	\$21,234,594	\$2,838,232	\$2,838,232	\$26,911,058
Commercial	289	171	\$37,032,351	\$70,599,111	\$70,599,111	\$178,230,573
Government	49	2	\$2,235,844	\$128,278	\$128,278	\$2,492,400
Industrial	35	24	\$6,847,747	\$40,455,124	\$60,682,686	\$107,985,557
Institutional	53	27	\$777,254	\$5,298,665	\$5,298,665	\$11,374,584
Residential	4,079	3,501	\$149,032,667	\$397,792,211	\$198,896,106	\$745,720,984
Utilities	296	1	\$34,943	\$5,655	\$5,655	\$46,253
Unknown	17	1	\$300,883	\$10,000	\$10,000	\$320,883
<b>City of Chowchilla Total</b>	<b>4,977</b>	<b>3,759</b>	<b>\$217,496,283</b>	<b>\$517,127,276</b>	<b>\$338,458,733</b>	<b>\$1,073,082,292</b>
<b>City of Madera</b>						
Agricultural	46	16	\$14,486,265	\$1,340,410	\$1,340,410	\$17,167,085
Commercial	987	749	\$133,523,625	\$371,140,624	\$371,140,624	\$875,804,873
Government	139	6	\$7,877,015	\$525,003	\$525,003	\$8,927,021
Industrial	220	97	\$26,690,127	\$85,417,445	\$128,126,168	\$240,233,740
Institutional	84	63	\$3,348,429	\$23,439,765	\$23,439,765	\$50,227,959
Residential	14,216	13,164	\$533,063,090	\$1,471,261,426	\$735,630,713	\$2,739,955,229
Utilities	232	4	\$447,562	\$305,052	\$305,052	\$1,057,666
Unknown	72	8	\$5,921,937	\$5,795,090	\$5,795,090	\$17,512,117

Jurisdiction / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>City of Madera Total</b>	<b>15,996</b>	<b>14,107</b>	<b>\$725,358,050</b>	<b>\$1,959,224,815</b>	<b>\$1,266,302,825</b>	<b>\$3,950,885,690</b>
<b>Unincorporated County</b>						
Agricultural	2,248	1,961	\$557,502,758	\$847,417,330	\$847,417,330	\$2,252,337,418
Commercial	152	98	\$24,212,254	\$22,692,675	\$22,692,675	\$69,597,604
Government	119	6	\$15,340,766	\$761,269	\$761,269	\$16,863,304
Industrial	45	32	\$23,368,935	\$101,850,280	\$152,775,420	\$277,994,635
Institutional	35	21	\$910,366	\$2,776,784	\$2,776,784	\$6,463,934
Residential	3,209	2,783	\$116,268,275	\$265,278,962	\$132,639,481	\$514,186,718
Utilities	61	8	\$802,487	\$184,568	\$184,568	\$1,171,623
Unknown	109	25	\$11,685,389	\$7,946,601	\$7,946,601	\$27,578,591
<b>Unincorporated County Total</b>	<b>5,978</b>	<b>4,934</b>	<b>\$750,091,230</b>	<b>\$1,248,908,469</b>	<b>\$1,167,194,128</b>	<b>\$3,166,193,827</b>
<b>Grand Total</b>						
<b>Grand Total</b>	<b>26,951</b>	<b>22,800</b>	<b>\$1,692,945,563</b>	<b>\$3,725,260,560</b>	<b>\$2,771,955,685</b>	<b>\$8,190,161,808</b>

Source: Cal OES, Madera County April 2017 Parcel/ Assessor's Data

Table 4-61 contains the dam inundation analysis results for the entire Madera County Planning Area broken out by dam inundation area and by jurisdiction. This table shows the property use type, number of parcels, and values at risk (including contents) to dam failure by each individual dam for the Madera County Planning Area.

*Table 4-61 Madera County Planning Area – Values and Parcels in Each Dam Inundation Zones by Property Use*

Dam Inundation/ Jurisdiction / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Buchanan Dam</b>						
<b>City of Chowchilla</b>						
Agricultural	159	32	\$21,234,594	\$2,838,232	\$2,838,232	\$26,911,058
Commercial	289	171	\$37,032,351	\$70,599,111	\$70,599,111	\$178,230,573
Government	49	2	\$2,235,844	\$128,278	\$128,278	\$2,492,400
Industrial	35	24	\$6,847,747	\$40,455,124	\$60,682,686	\$107,985,557
Institutional	53	27	\$777,254	\$5,298,665	\$5,298,665	\$11,374,584
Residential	4,079	3,501	\$149,032,667	\$397,792,211	\$198,896,106	\$745,720,984
Utilities	296	1	\$34,943	\$5,655	\$5,655	\$46,253
Unknown	17	1	\$300,883	\$10,000	\$10,000	\$320,883

Dam Inundation/ Jurisdiction / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>City of Chowchilla Total</b>	<b>4,977</b>	<b>3,759</b>	<b>\$217,496,283</b>	<b>\$517,127,276</b>	<b>\$338,458,733</b>	<b>\$1,073,082,292</b>
<b>Unincorporated County</b>						
Agricultural	447	337	\$88,635,662	\$118,530,749	\$118,530,749	\$325,697,160
Commercial	15	13	\$1,431,189	\$1,435,742	\$1,435,742	\$4,302,673
Government	15	1	\$32,201	\$23,826	\$23,826	\$79,853
Industrial	-	-	\$0	\$0	\$0	\$0
Institutional	1	1	\$35,000	\$81,000	\$81,000	\$197,000
Residential	206	178	\$14,346,179	\$25,920,268	\$12,960,134	\$53,226,581
Utilities	1	-	\$0	\$0	\$0	\$0
Unknown	17	1	\$223,682	\$144,905	\$144,905	\$513,492
<b>Unincorporated County Total</b>	<b>702</b>	<b>531</b>	<b>\$104,703,913</b>	<b>\$146,136,490</b>	<b>\$133,176,356</b>	<b>\$384,016,759</b>
<b>Buchanan Dam Total</b>	<b>5,679</b>	<b>4,290</b>	<b>\$322,200,196</b>	<b>\$663,263,766</b>	<b>\$471,635,089</b>	<b>\$1,457,099,051</b>
<b>Friant Dam Inundation</b>						
<b>Unincorporated County</b>						
Agricultural	834	749	\$267,119,113	\$457,018,898	\$457,018,898	\$1,181,156,909
Commercial	37	15	\$6,606,830	\$3,773,186	\$3,773,186	\$14,153,202
Government	52	3	\$10,155,092	\$33,341	\$33,341	\$10,221,774
Industrial	2	2	\$662,985	\$1,720,467	\$2,580,701	\$4,964,153
Institutional	5	1	\$28,019	\$84,506	\$84,506	\$197,031
Residential	217	191	\$7,691,492	\$15,133,105	\$7,566,553	\$30,391,150
Utilities	36	7	\$754,311	\$179,392	\$179,392	\$1,113,095
Unknown	32	12	\$6,701,193	\$4,892,928	\$4,892,928	\$16,487,049
<b>Unincorporated County Total</b>	<b>1,215</b>	<b>980</b>	<b>\$299,719,035</b>	<b>\$482,835,823</b>	<b>\$476,129,504</b>	<b>\$1,258,684,362</b>
<b>Friant Dam Total</b>	<b>1,215</b>	<b>980</b>	<b>\$299,719,035</b>	<b>\$482,835,823</b>	<b>\$476,129,504</b>	<b>\$1,258,684,362</b>
<b>Hidden Dam Inundation</b>						
<b>City of Madera</b>						
Agricultural	46	16	\$14,486,265	\$1,340,410	\$1,340,410	\$17,167,085
Commercial	987	749	\$133,523,625	\$371,140,624	\$371,140,624	\$875,804,873
Government	139	6	\$7,877,015	\$525,003	\$525,003	\$8,927,021
Industrial	220	97	\$26,690,127	\$85,417,445	\$128,126,168	\$240,233,740
Institutional	84	63	\$3,348,429	\$23,439,765	\$23,439,765	\$50,227,959

Dam Inundation/ Jurisdiction / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Residential	14,216	13,164	\$533,063,090	\$1,471,261,426	\$735,630,713	\$2,739,955,229
Utilities	232	4	\$447,562	\$305,052	\$305,052	\$1,057,666
Unknown	72	8	\$5,921,937	\$5,795,090	\$5,795,090	\$17,512,117
<b>City of Madera Total</b>	<b>15,996</b>	<b>14,107</b>	<b>\$725,358,050</b>	<b>\$1,959,224,815</b>	<b>\$1,266,302,825</b>	<b>\$3,950,885,690</b>
<b>Unincorporated County</b>						
Agricultural	981	889	\$206,296,455	\$284,450,851	\$284,450,851	\$775,198,157
Commercial	100	70	\$16,174,235	\$17,483,747	\$17,483,747	\$51,141,729
Government	52	2	\$5,153,473	\$704,102	\$704,102	\$6,561,677
Industrial	43	30	\$22,705,950	\$100,129,813	\$150,194,720	\$273,030,483
Institutional	29	19	\$847,347	\$2,611,278	\$2,611,278	\$6,069,903
Residential	2,786	2,414	\$94,230,604	\$224,225,589	\$112,112,795	\$430,568,988
Utilities	24	1	\$48,176	\$5,176	\$5,176	\$58,528
Unknown	60	12	\$4,760,514	\$2,908,768	\$2,908,768	\$10,578,050
<b>Unincorporated County Total</b>	<b>4,075</b>	<b>3,437</b>	<b>\$350,216,754</b>	<b>\$632,519,324</b>	<b>\$570,471,436</b>	<b>\$1,553,207,514</b>
<b>Hidden Dam Total</b>	<b>20,071</b>	<b>17,544</b>	<b>\$1,075,574,804</b>	<b>\$2,591,744,139</b>	<b>\$1,836,774,261</b>	<b>\$5,504,093,204</b>
<b>Pine Flat Dam Inundation</b>						
<b>Unincorporated County</b>						
Agricultural	141	114	\$61,846,280	\$72,420,136	\$72,420,136	\$206,686,552
Commercial	2	1	\$67,536	\$122,621	\$122,621	\$312,778
Government	9	0	\$34,824	\$0	\$0	\$34,824
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	2	1	\$27,312	\$84,506	\$84,506	\$196,324
Residential	107	102	\$3,503,523	\$8,721,839	\$4,360,920	\$16,586,282
Utilities	24	3	\$459,582	\$99,020	\$99,020	\$657,622
Unknown	5	5	\$715,901	\$153,524	\$153,524	\$1,022,949
<b>Unincorporated County Total</b>	<b>290</b>	<b>226</b>	<b>\$66,654,958</b>	<b>\$81,601,646</b>	<b>\$77,240,727</b>	<b>\$225,497,331</b>
<b>Pine Flat Dam Total</b>	<b>290</b>	<b>226</b>	<b>\$66,654,958</b>	<b>\$81,601,646</b>	<b>\$77,240,727</b>	<b>\$225,497,331</b>

Source: Cal OES, Madera County April 2017 Parcel/Assessor's Data

### *Flooded Acres*

Also of interest is the land area affected by the various dam inundation zones. The following is an analysis of flooded acres in the Madera County Planning Area broken out by jurisdiction and by property use.

## Methodology

A parcel boundary analysis was performed to obtain total acres and flooded acres by dam inundation zone for each parcel. GIS was used to calculate acres flooded by FEMA flood zones and property use categories. The Madera County parcel layer and Cal OES dam inundation areas were intersected. The resulting data tables with flooded acreages were then imported into a database and linked back to the original parcels, including total acres by parcel number. Once this was completed, each parcel contained acreage values for flooded acre by zone type within the parcel. In the tables below, the dam inundation zones are summarized and then split out by jurisdiction and by dam.

## Limitations

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

## Flooded Acres Analysis Results

The end result of the flooded acres analysis is an inventory of the improved and unimproved acres subject to dam failure within the County. The following tables represent a detailed and summary analysis of total acres for each FEMA DFIRM flood zone. Table 4-62 gives summary information for the Planning Area by jurisdiction. This table includes all dam inundation zones in the respective jurisdictions. Table 4-63 gives detail on the dam inundation flooded acres in the Planning Area by dam.

*Table 4-62 Madera County Planning Area – Flooded Acres by Jurisdiction Summary*

Jurisdiction	Total Flooded Acres	Improved Flooded Acres
City of Chowchilla	5,958	2,974
City of Madera	7,932	4,279
Unincorporated County	206,250	180,407
<b>Madera County Planning Area</b>	<b>220,140</b>	<b>187,660</b>

Source: Cal OES, Madera County April 2017 Parcel/Assessor's Data

*Table 4-63 Madera County Planning Area – Flooded Acres by Jurisdiction and Dam Inundation Area*

Dam Inundation Area	Total Flooded Acres	Improved Flooded Acres
<b>City of Chowchilla</b>		
Buchanan Dam	5,958	2,974
<b>Total</b>	<b>5,958</b>	<b>2,974</b>
<b>City of Madera</b>		
Hidden Dam	7,932	4,279
<b>Total</b>	<b>7,932</b>	<b>4,279</b>

Dam Inundation Area	Total Flooded Acres	Improved Flooded Acres
<b>Unincorporated County</b>		
Buchanan Dam	35,787	28,458
Friant Dam	74,835	68,315
Friant Dam, Hidden Dam	1,667	1,659
Friant Dam, Pine Flat Dam	22,705	19,935
Hidden Dam	71,256	62,040
<b>Total</b>	<b>206,250</b>	<b>180,407</b>
<b>Grand Total</b>		
<b>Grand Total</b>	<b>220,140</b>	<b>187,660</b>

Source: Cal OES, Madera County April 2017 Parcel/Assessor's Data

### *Population at Risk*

A separate analysis was performed to determine population in dam inundation zones. Using GIS, the dam inundation area dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a inundation zone were counted and multiplied by the Census Bureau average household size for each jurisdiction; results were tabulated by jurisdiction and flood zone (see Table 4-64). According to this analysis, for the entire Planning Area, there is a population of 70,197 in dam inundation areas. For the unincorporated County, there is a population of 9,128 in the dam inundation areas.

*Table 4-64 Madera County Planning Area – Total Population at Risk to Dam Inundation Flooding*

Jurisdiction	Improved Residential Parcels	Population*
City of Chowchilla	3,501	10,783
City of Madera	13,164	50,286
Unincorporated County	2,783	9,128
<b>Total</b>	<b>19,448</b>	<b>70,197</b>

Source: Cal OES; US Census Bureau 2010 Estimates, Madera County April 2017 Parcel/Assessor's Data

\* Census Bureau 2010 average household sizes are: Chowchilla – 3.08, Madera – 3.82, Unincorporated – 3.28

It is unlikely that all dams that could affect Madera County would fail at the same time. Table 4-65 shows the populations at risk to dam failure flooding for each dam. According to this, there is 11,367 residents in the Buchanan Dam inundation area, 626 residents in the Friant Dam inundation area, 58,204 residents in the Hidden Dam inundation area, and 335 residents in the Pine Flat Dam inundation area.

*Table 4-65 Madera County Planning Area – Population at Risk to Each Dam Inundation Flooding*

Jurisdiction	Improved Residential Parcels	Population*
<b>Buchanan Dam</b>		
City of Chowchilla	3,501	10,783

Unincorporated County	178	584
<b>Buchanan Dam Total</b>	<b>3,679</b>	<b>11,367</b>
<b>Friant Dam</b>		
Unincorporated County	191	626
<b>Friant Dam Total</b>	<b>191</b>	<b>626</b>
<b>Hidden Dam</b>		
City of Madera	13,164	50,286
Unincorporated County	2,414	7,918
<b>Hidden Dam Total</b>	<b>15,578</b>	<b>58,204</b>
<b>Pine Flat Dam</b>		
Unincorporated County	102	335
<b>Total</b>	<b>102</b>	<b>335</b>

Source: Cal OES; US Census Bureau 2010 Estimates, Madera County April 2017 Parcel/Assessor's Data

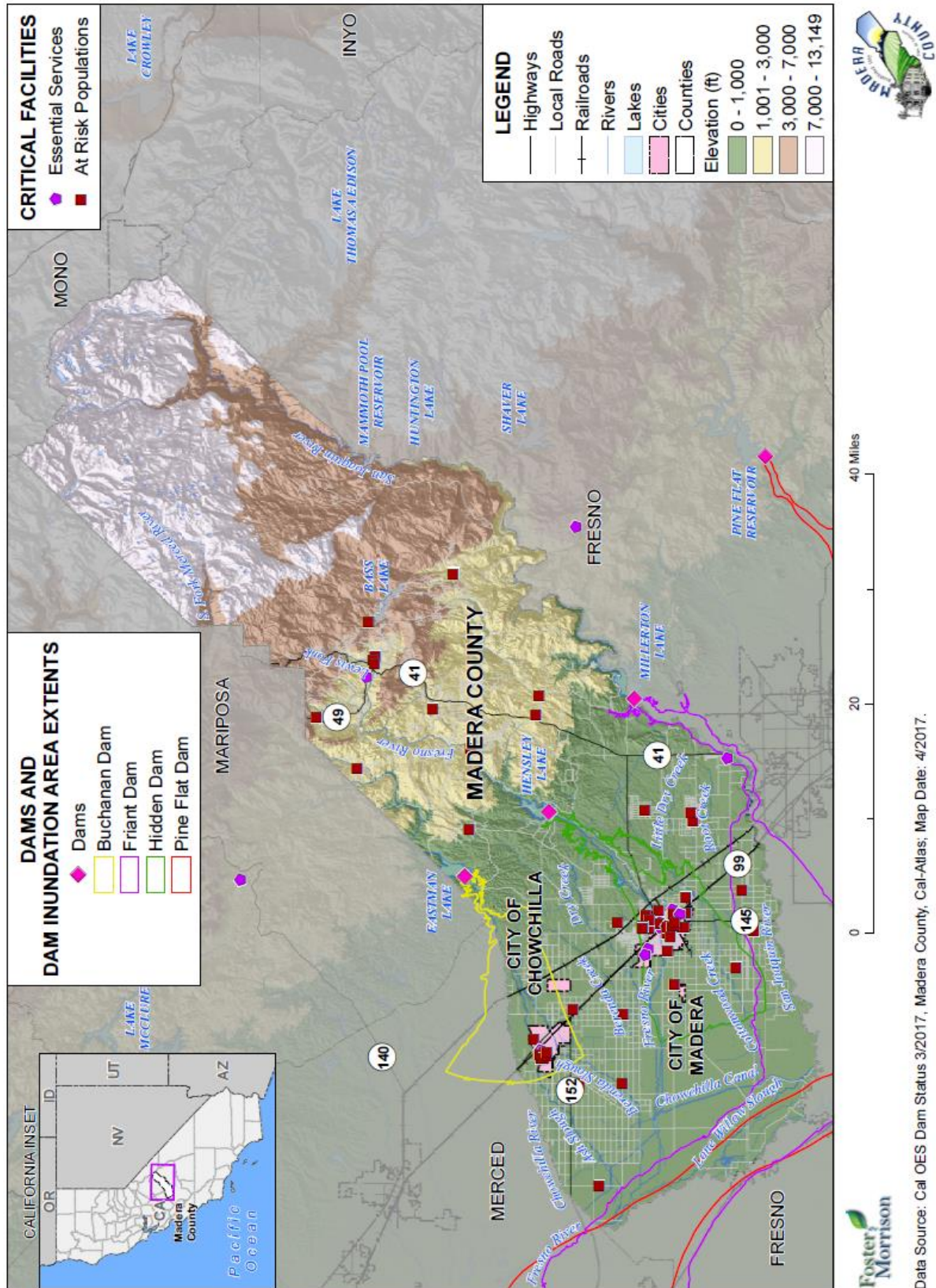
\* Census Bureau 2010 average household sizes are: Chowchilla – 3.08, Madera – 3.82, Unincorporated – 3.28

### *Critical Facilities at Risk*

A separate analysis was performed on the critical facility inventory in Madera County and all jurisdictions to determine critical facilities in the dam inundation zones. Using GIS, the dam inundation zones were overlaid on the critical facility GIS layer. Figure 4-64 shows critical facilities, as well as the dam inundation zones by dam. Table 4-66 details critical facilities by facility type and count for each jurisdiction by dam. Details of critical facility definition, type, name and address and jurisdiction in dam inundation zones are listed in Appendix F.



Figure 4-64 Madera County Planning Area – Critical Facilities in Dam Inundation Zones



*Table 4-66 Madera County Planning Area – Critical Facilities in Dam Inundation Zones*

Critical Facility Category / Dam Inundation Source	Critical Facility Type	Critical Facility Count
<b>City of Chowchilla</b>		
<b>Buchanan Dam</b>		
Essential Services	Central Switching Station / Communications	1
	Fire Station	1
	Public Safety Facility / 911 PSAP	1
	<b>Total</b>	<b>3</b>
At Risk Populations	Convalescent Hospital	2
	School	5
	<b>Total</b>	<b>7</b>
<b>City of Chowchilla Total</b>		<b>10</b>
<b>City of Madera</b>		
<b>Hidden Dam</b>		
Essential Services	Airport and Radio Tower	1
	City Hall Admin Critical Infrastructure	1
	Community Services / Engineering and Infrastructure Services / IT Communications	1
	Critical Communications	1
	Emergency Dispatch Center	1
	Fire Command Center	1
	Medical Center	1
	Police Dispatch Communication Center	1
<b>Total</b>	<b>8</b>	
At Risk Populations	School	15
	<b>Total</b>	<b>15</b>
<b>City of Madera Total</b>		<b>23</b>
<b>Unincorporated County</b>		
<b>Friant Dam</b>		
At Risk Populations	School	2
	<b>Total</b>	<b>2</b>
<b>Hidden Dam</b>		
At Risk Populations	School	6
	<b>Total</b>	<b>6</b>
<b>Madera County Planning Area Total</b>		<b>8</b>

Source: Madera County GIS

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

The Madera County Planning Area has significant historical, cultural, and natural resources located throughout the County as previously described. Risk analysis of these resources was not possible due to data limitations. However, any facility or resource located in a dam inundation zone is potentially at risk from dam failure and inundation.

## *Overall Community Impact*

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

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

## *Future Development*

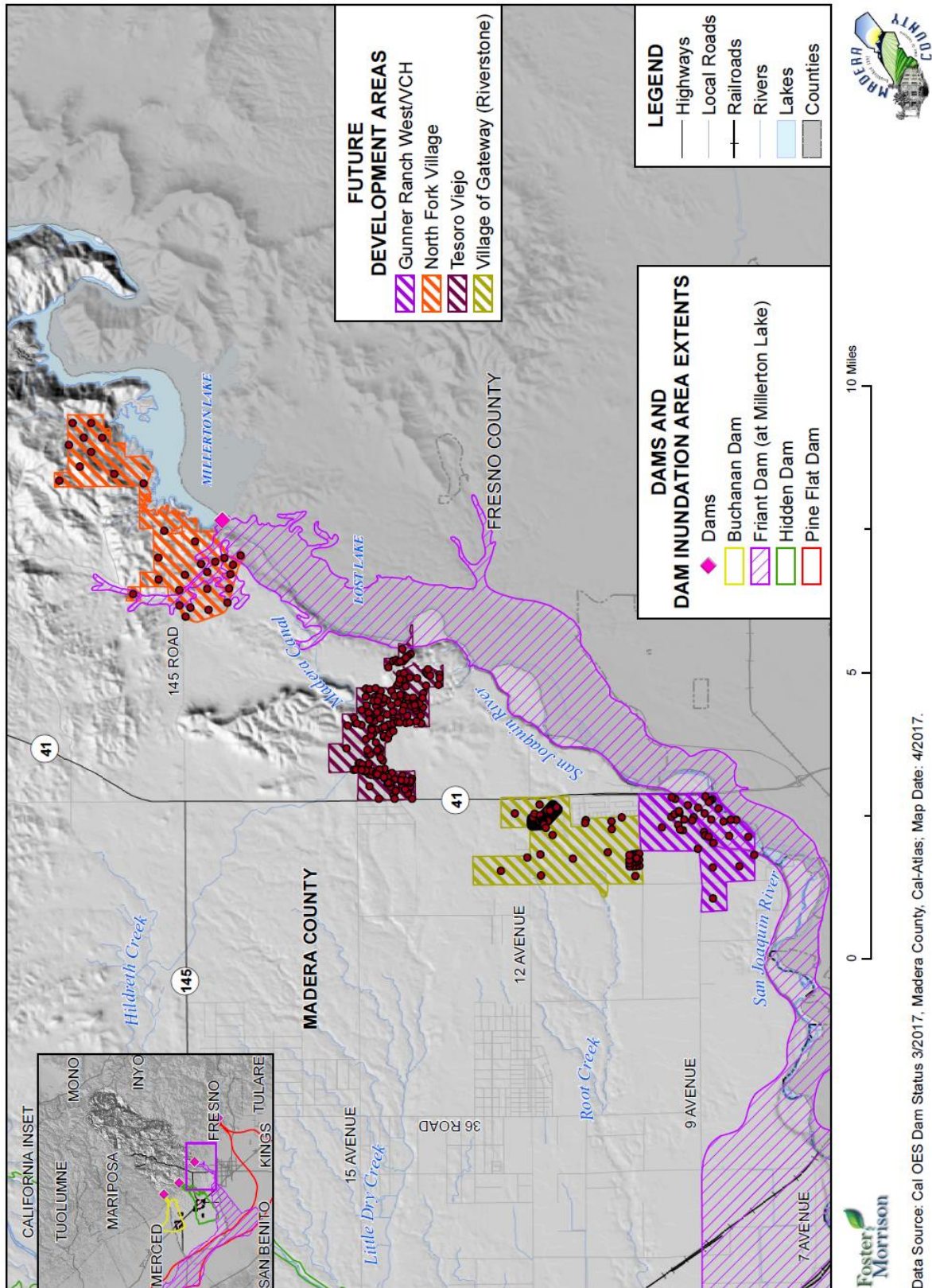
Although new growth and development corridors would fall in the area flooded by a dam failure, given the limited potential of total dam failure and the large area that a dam failure would affect, development in the dam inundation area will continue to occur.

## **GIS Analysis**

Madera County's GIS parcel layer was used as the basis for the countywide inventory of parcels and acres values. In this analysis, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point containing the assessor's data. In addition, Madera County provided a GIS spatial file identifying the four future development areas for which the analysis was to be performed. Utilizing the future development spatial layer, the parcel centroid data was intersected to determine the parcel counts and approximate acreage totals within each development. Dam inundation data from Cal OES was used for this analysis.

Table 4-98 shows the breakdown of the future development parcel counts in dam inundation zones Madera County and their acreages. Future development in the County in dam inundation areas is shown on Figure 4-81.

Figure 4-65 Unincorporated Madera County – Future Development and Dam Inundation Zones



*Table 4-67 Unincorporated Madera County – Future Development and Dam Inundation Zones*

Future Development Areas	Parcels	Acres	Dam(s) Inundation Area
Gunner Ranch West/VCH	16	576	Friant Dam
North Fork Village	6	121	Friant Dam
Tesoro Viejo	0	0	–
Village of Gateway (Riverstone)	0	0	–
<b>Grand Total</b>	<b>22</b>	<b>697</b>	

Source: Cal OES; Madera County GIS

### 4.3.6. Drought and Water Shortage Vulnerability Assessment

**Likelihood of Future Occurrence**—Drought – Likely; Water Shortage – Occasional  
**Vulnerability**—Medium

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

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

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The Drought Impact Reporter from the NDMC is a useful reference tool that compiles reported drought impacts nationwide. Table 4-68 show drought impacts for the Madera County Planning Area from 1850 to May 2017. The data represented is skewed, with the majority of these impacts from records within the past ten years.

*Table 4-68 Madera County Drought Impacts*

Category	Number of Impacts
Agriculture	84
Business and Industry	23
Energy	6
Fire	23
Plants & Wildlife	40

Category	Number of Impacts
Relief, Response, and Restrictions	103
Society and Public Health	81
Tourism and Recreation	16
Water Supply and Quality	113
<b>Total</b>	<b>489</b>

Source: National Drought Mitigation Center

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

It is difficult to quantitatively assess drought impacts to Madera County because not many county-specific studies have been conducted. Some factors to consider include: the impacts of fallowed agricultural land, habitat loss and associated effects on wildlife, and the drawdown of the groundwater table. The most direct and likely most difficult drought impact to quantify is to local economies, especially agricultural economies. The State has conducted some empirical studies on the economic effects of fallowed lands with regard to water purchased by the State’s Water Bank; but these studies do not quantitatively address the situation in Madera County. It can be assumed, however, that the loss of production in one sector of the economy would affect other sectors. This is especially true of agriculture in Madera County, which is highly vulnerable to drought conditions.

The drawdown of the groundwater table is one factor that has been recognized to occur during repeated dry years. Lowering of groundwater levels results in the need to deepen wells, which subsequently lead to increased pumping costs. These costs are a major consideration for residents relying on domestic wells and agricultural producers that irrigate with groundwater and/or use it for frost protection. Land subsidence can also occur when the groundwater table is depleted.

### *Tree Mortality (Drought and Bark Beetles)*

One of the specific vulnerabilities of drought in Madera County is the increased risk to trees from beetle kill. Drought weakens trees and makes them more susceptible to insect infestation. Bark beetles mine the inner bark (the phloem-cambial region) on twigs, branches, or trunks of trees and shrubs. This activity often starts a flow of tree sap in conifers, but sometimes even in hardwoods like elm and walnut. The sap flow (pitch tube) is accompanied by the sawdustlike frass created by the beetles. Frass accumulates in bark crevices or may drop and be visible on the ground or in spider webs. Small emergence holes in the bark are a good indication that bark beetles were present. Removal of the bark with the emergence holes often reveals dead and degraded inner bark and sometimes new adult beetles that have not yet emerged. Bark beetles frequently attack trees weakened by drought, disease, injuries, or other factors that may stress the tree. Bark beetles can contribute to the decline and eventual death of trees; however only a few aggressive beetle species are known to be the sole cause of tree mortality (see Figure 4-66).

*Figure 4-66 Monterey Pine Killed by Engraver Beetles*



Source: University of California

In addition to attacking larger limbs, some species such as cedar and cypress bark beetles feed by mining twigs up to 6 inches back from the end of the branch, resulting in dead tips. These discolored shoots hanging on the tree are often referred to as “flagging” or “flags.” (see Figure 4-67) Adult elm bark beetles feed on the inner bark of twigs before laying eggs. If an adult has emerged from cut logs or a portion of a tree that is infected by Dutch elm disease, the beetle’s body will be contaminated with fungal spores. When the adult beetle feeds on twigs, the beetle infects healthy elms with the fungi that cause Dutch elm disease. Elms showing yellowing or wilting branches in spring may be infected with Dutch elm disease.

*Figure 4-67 Flag Tips from Cypress Bark Beetle Feeding*



Source: University of California

More information regarding tree mortality is discussed in the wildfire vulnerability in Section 4.3.15.

### *Future Development*

According to the HMPC, Madera County has access to large quantities of water through surface water as well as groundwater. However, population growth in the County will add additional pressure to water companies during periods of drought and water shortage. Water companies will need to continue to plan for and add infrastructure capacity for population growth.

### **4.3.7. Earthquake Vulnerability Assessment**

**Likelihood of Future Occurrence—Occasional**

**Vulnerability—High**

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



Ground shaking is the primary earthquake hazard. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicentral location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15 percent of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

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

Common impacts from earthquakes include damage to infrastructure and buildings (e.g., crumbling of unreinforced masonry, failure of architectural facades, rupturing of underground utilities, and road closures). Earthquakes also frequently trigger secondary hazards, such as dam failures, landslides and rock falls, explosions, and fires that can become disasters themselves.

### *Estimating Potential Losses*

Earthquake losses will vary across the Madera County Planning Area depending on the source and magnitude of the event. To further evaluate potential losses associated with earthquake activity in the Planning Area, a HAZUS-MH probabilistic earthquake scenario was run for the 2017 LHMP Update.

### **2017 Earthquake Scenario**

HAZUS-MH 2.2 was utilized to model earthquake losses for the County. Specifically, the probable magnitude used for Madera County utilized a 7.0 magnitude earthquake, based on data from the Madera County General Plan. Level 1 analyses were run, meaning that only the default data was used and not supplemented with local building inventory or hazard data. There are certain data limitations when using the default data, so the results should be interpreted accordingly; this is a planning level analysis.

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

The results of the probabilistic scenario are captured in Table 4-69. Key losses included the following:

- Total economic loss estimated for the earthquake was \$1.128 billion, which includes building losses and lifeline losses based on the HAZUS-MH inventory.
- Building-related losses, including direct building losses and business interruption losses, totaled \$1.007 billion.
- Over 20 percent of the buildings in the County were at least moderately damaged. 432 buildings were completely destroyed.
- Over 59 percent of the building- and income-related losses were residential structures.
- 16 percent of the estimated losses were related to business interruptions.
- The mid-day earthquake caused the most casualties: 23
- 15 percent of the households experienced a loss of potable water the first day after the earthquake.

*Table 4-69 Madera HAZUS-MH Earthquake Loss Estimation 2,500-Year Scenario Results*

Type of Impact	Impacts to County	
Total Buildings Damaged (based on 47,000 buildings)	Slight: 15,593 Moderate: 7,526 Extensive: 1,639 Complete: 432	
Building and Income Related Losses	\$1.007 billion 59 percent of damage related to residential structures 11 percent of loss due to business interruption	
Total Economic Losses (Includes building, income and lifeline losses)	\$1.128 billion	
Casualties (Based on 2 a.m. time of occurrence)	Without requiring hospitalization: 183 Requiring hospitalization: 30 Life threatening: 2 Fatalities: 4	
Casualties (Based on 2 p.m. time of occurrence)	Without requiring hospitalization: 355 Requiring hospitalization: 3 Life threatening: 12 Fatalities: 23	
Casualties (Based on 5 p.m. time of occurrence)	Without requiring hospitalization: 229 Requiring hospitalization: 53 Life threatening: 14 Fatalities: 14	
Damage to Transportation Systems	4 bridges with moderate damage	
Damage to Essential Facilities	No facilities with at least moderate damage	
Damage to Utility Systems	1 wastewater facility with moderate damage 3 electrical power facilities with moderate damage 5 communications facilities with moderate damage 242 potable water line breaks 173 waste water line breaks 50 natural gas line breaks	
Households without Power/Water Service (Based on 43,317 total households)	Power loss, Day 1: 960 Power loss, Day 3: 510 Power loss, Day 7: 168 Power loss, Day 30: 26 Power loss, Day 90: 2	Water loss, Day 1: 6,663 Water loss, Day 3: 3,987 Water loss, Day 7: 355 Water loss, Day 30: 0 Water loss, Day 90: 0
Displaced Households	465	

Type of Impact	Impacts to County
Shelter Requirements	528 people
Debris Generation	0.21 million tons

Source: HAZUS-MH 2.2

### *Future Development*

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

#### **4.3.8. Flood: 1% and 0.2% Annual Chance Vulnerability Assessment**

**Likelihood of Future Occurrence**—1% – Occasional; 0.2% – Unlikely

**Vulnerability**—Medium

Flooding is a significant problem in Madera County. Historically, the Madera County Planning Area has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

Historically, much of the growth in the County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Flooding is the most likely natural hazard to occur in the County, although many physical and management systems are in place to limit risks of flooding or damage when it periodically occurs. Western Madera County has a location and topography that is naturally subject to flooding. Before levees and other flood protection infrastructure were constructed, water would seasonally cover the western areas of the county. The San Joaquin River forms most of the southern and western borders of the county. In addition, several other river corridors flow from the Sierra Nevada foothills across the County from east to west (e.g., Fresno River and Chowchilla River). Flood hazards in Madera County can result from intense rain and snowmelt and/or failure of flood control facilities, such as dams, levees, or drainage channels.

### **Flood Hazard Assessment**

This risk assessment for the Madera County LHMP Update assessed the flood hazard specific to Madera County. This included an evaluation of multiple flood hazards including the Special Flood Hazard Area (SFHA) shown on the DFIRM; Repetitive Loss (RL) Areas; localized, stormwater flooding areas; other areas that have flooded in the past, but not identified on the DFIRM; other areas of shallow flooding

identified through other studies and sources; levee failure flooding; dam failure flooding; and mudflow flooding especially in significant post-burn areas. This comprehensive flood risk assessment included an assessment of less-frequent flood hazards, areas likely to be flooded, and flood problems that are likely to get worse in the future as a result of changes in floodplain development and demographics, development in the watershed, and climate change or sea level rise. Existing studies, maps, historical data, and federal, state, and local community expertise and knowledge contributed to this current flood assessment for Madera County. An evaluation of the success of completed and ongoing flood control projects and associated maintenance aspects contributed to this flood hazard assessment and the resulting flood mitigation strategy for the Madera County Planning Area. This flood risk assessment for this LHMP Update includes an assessment of future flooding conditions based on historic development in the floodplains and proposed future development as further described throughout this plan. The flood vulnerability assessment that follows focuses on the flood hazard based on the updated FEMA DFIRMs.

### *Flood Analysis*

Unincorporated Madera County and its incorporated jurisdictions have mapped FEMA flood hazard areas. GIS was used to determine the possible impacts of flooding within the County and how the risk varies across the Planning Area. Two different analyses were performed to assess the flood risk in the County to the 1% annual chance and 0.2% annual chance flood events:

- Values at Risk and Flood Loss Estimates
- Flooded Acres

For each of these analyses, results are provided in this Base Plan for two different areas: 1) Madera County Planning Area and 2) unincorporated Madera County, which includes North Fork Rancheria. Information specific to the two incorporated communities are included in their respective annexes to this plan.

### **FEMA DFIRMs**

Madera County has a FEMA effective DFIRM dated September 6, 2008, with digital LOMR updates dated May 19, 2014, which was obtained from the National Flood Hazard Layer to perform the flood analysis.

Each of the DFIRM flood zones that begins with the letter ‘A’ depict the Special Flood Hazard Area, or the 1% annual chance flood event (commonly referred to as the 100-year flood). Table 4-70 explains the difference between DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the Planning Area, and shows which flood zones are present in each jurisdiction. The effective DFIRM maps for the Madera County Planning Area are shown on Figure 4-68.

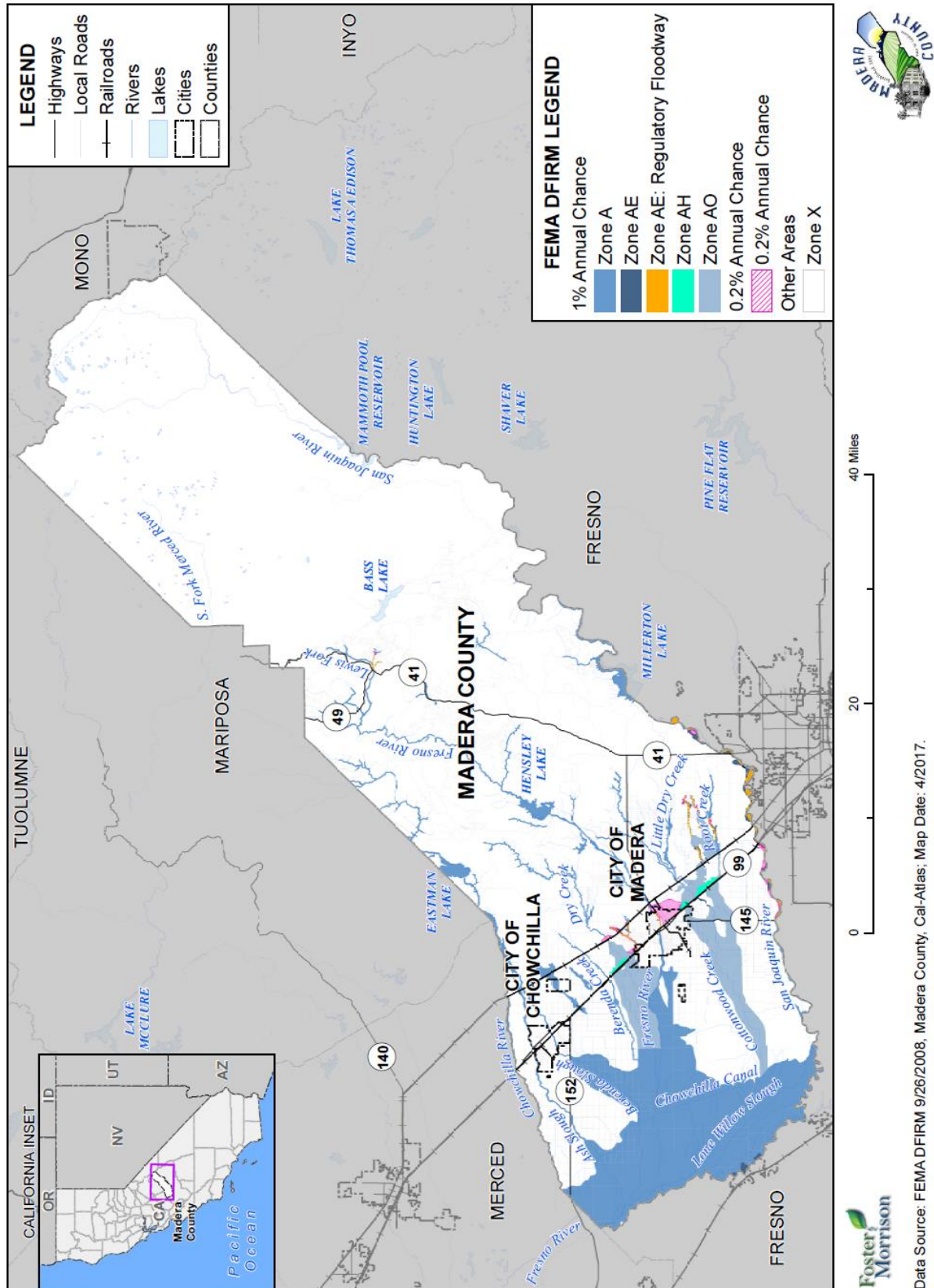
*Table 4-70 Madera County Planning Area – DFIRM Flood Hazard Zones*

Flood Zone	Description	Flood Zone Present in City of Chowchilla	Flood Zone Present in City of Madera	Flood Zone Present in Madera County	Flood Zone Present in Madera County Planning Area
A	100-year Flood: No base flood elevations provided	X	X	X	X
AE	100-year Flood: Base flood elevations provided		X	X	X
AE Floodway	100-year Flood: Regulatory floodway; Base flood elevations provided		X	X	X
AH	100-year Flood: Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet.		X	X	X
AO	100-year Flood: River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet.		X	X	X
Shaded X	500-year Flood: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood		X	X	X
X (unshaded)	No flood hazard	X	X	X	X
D	Unmapped Areas			X	X

Source: FEMA

\*In Madera County, the floodway is defined as the channel of any water course and adjacent lands that must be reserved in order to discharge the base flood without increasing the water surface elevation more than one foot.

Figure 4-68 Madera County Planning Area – DFIRM Flood Zones



## Values at Risk and Flood Loss Estimates Analysis

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

### Methodology

Methodologies for values at risk and flood loss estimates are detailed below.

#### *Values at Risk*

Madera County's September 6, 2008 FIRM, modified by the May 19, 2014 LOMR updates, as obtained from the National Flood Hazard Layer was used as the basis of this flood analysis. Madera County's April 2017 Assessor Data and the County's GIS parcel data, obtained from Madera County, were used for the county inventory of parcels and values.

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

#### *Flood Loss Estimates*

Using the data generated during the values at risk analysis, a flood loss estimate provides additional information as to what is potentially at risk to a 1% and 0.2% annual chance flood events. Unlike the values at risk which provide actual assessed values for parcels located within each FEMA flood zone, the flood loss estimate applies estimates of what may actually be at loss to a given flood event. The loss estimate for flood is based on the total of improved values obtained from the values at risk analysis and adds estimated contents values and a damage factor.

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

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

Once the potential value of affected parcels was calculated, a damage factor was applied to obtain loss estimates by flood zone. When a flood occurs, seldom does the event cause total loss of an area or building. Potential losses from flooding are related to a variety of factors including flood depth, flood velocity, building type, and construction. The percent of damage is primarily related to the flood depth. FEMA's flood benefit/cost module uses a simplified approach to model flood damage based on building type and flood depth. The values at risk in the flood analysis tables were refined by applying an average damage estimation of 20% of the total building value. The 20% damage estimate utilized FEMA's Flood Building Loss Table based on an assumed average flood depth of 2 feet.

### Values at Risk and Flood Loss Estimates Results

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

#### Madera County Planning Area

Table 4-71 and Table 4-72 contain flood analysis results for the entire Madera County Planning Area. This includes unincorporated Madera County and the incorporated jurisdictions. These tables show the number of parcels and values at risk to the 1% and 0.2% annual chance event for the entire Madera County Planning Area. Table 4-71 shows the value of improved parcels by jurisdiction. Table 4-72 shows the improved parcels by property use category in each flood zone for the entire Planning Area.

*Table 4-71 Madera County Planning Area – Count and Improved Value of Parcels in 1% and 0.2% Annual Chance Flood Zones by Jurisdiction*

Jurisdiction	1 % Annual Chance Flood Zone			0.2% Annual Chance Flood Zone**		
	Total Parcel Count	Improved Parcel Count*	Total Improved Value	Total Parcel Count	Improved Parcel Count*	Total Improved Value
Chowchilla	23	15	\$2,213,121	0	0	\$0
Madera	491	438	\$53,198,896	2,825	2,157	\$237,866,595
Unincorporated County	3,822	3,033	\$929,867,818	426	372	\$39,312,774
<b>Total</b>	<b>4,336</b>	<b>3,486</b>	<b>\$985,279,835</b>	<b>3,251</b>	<b>2,529</b>	<b>\$277,179,369</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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



*Table 4-72 Madera County Planning Area – Count and Improved Value by Property Use and Detailed DFIRM Flood Zones, with Content Replacement Values*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Zone A (1% Annual Chance Flood)</b>						
Agricultural	918	772	\$306,741,369	\$531,169,097	\$531,169,097	\$1,369,079,563
Commercial	25	13	\$3,318,553	\$4,230,298	\$4,230,298	\$11,779,149
Government	140	3	\$647,763	\$1,437,674	\$1,437,674	\$3,523,111
Industrial	2	1	\$10,353	\$29,658	\$44,487	\$84,498
Institutional	5	1	\$28,946	\$84,506	\$84,506	\$197,958
Residential	485	386	\$24,135,034	\$46,130,536	\$23,065,268	\$93,330,838
Utilities	38	8	\$1,107,057	\$177,899	\$177,899	\$1,462,855
Unknown	47	9	\$5,268,749	\$3,158,147	\$3,158,147	\$11,585,043
<b>Zone A Total</b>	<b>1,660</b>	<b>1,193</b>	<b>\$341,257,824</b>	<b>\$586,417,815</b>	<b>\$563,367,376</b>	<b>\$1,491,043,015</b>
<b>Zone AE (1% Annual Chance Flood)</b>						
Agricultural	36	22	\$7,547,261	\$6,764,156	\$6,764,156	\$21,075,573
Commercial	10	5	\$7,431,266	\$1,521,069	\$1,521,069	\$10,473,404
Government	7	2	\$3,137,241	\$32,504	\$32,504	\$3,202,249
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	2	1	\$7,376	\$10,344	\$10,344	\$28,064
Residential	289	263	\$11,877,532	\$38,954,706	\$19,477,353	\$70,309,591
Utilities	8	2	\$58,378	\$239,280	\$239,280	\$536,938
Unknown	1	1	\$47,201	\$116,125	\$116,125	\$279,451
<b>Zone AE Total</b>	<b>353</b>	<b>296</b>	<b>\$30,106,255</b>	<b>\$47,638,184</b>	<b>\$28,160,831</b>	<b>\$105,905,270</b>
<b>Zone AE Floodway (1% Annual Chance Flood)</b>						
Agricultural	18	12	\$2,068,150	\$1,093,972	\$1,093,972	\$4,256,094
Commercial	8	7	\$575,664	\$1,226,109	\$1,226,109	\$3,027,882
Government	10	1	\$7,017,851	\$837	\$837	\$7,019,525
Industrial	-	-	\$0	\$0	\$0	\$0
Institutional	-	-	\$0	\$0	\$0	\$0
Residential	183	147	\$8,697,379	\$20,465,933	\$10,232,967	\$39,396,279
Utilities	3	-	\$1,251	\$0	\$0	\$1,251
Unknown	4	-	\$4,994	\$0	\$0	\$4,994
<b>Zone AE Floodway Total</b>	<b>226</b>	<b>167</b>	<b>\$18,365,289</b>	<b>\$22,786,851</b>	<b>\$12,553,885</b>	<b>\$53,706,025</b>
<b>Zone AH (1% Annual Chance Flood)</b>						
Agricultural	22	21	\$5,861,321	\$3,407,483	\$3,407,483	\$12,676,287
Commercial	11	5	\$1,453,345	\$559,226	\$559,226	\$2,571,797

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Government	2	-	\$0	\$0	\$0	\$0
Industrial	1	1	\$1,818,629	\$12,295,501	\$18,443,252	\$32,557,382
Institutional	-	-	\$0	\$0	\$0	\$0
Residential	151	140	\$6,668,823	\$16,404,480	\$8,202,240	\$31,275,543
Utilities	1	-	\$1	\$0	\$0	\$1
Unknown	4	2	\$216,176	\$182,818	\$182,818	\$581,812
<b>Zone AH Total</b>	<b>192</b>	<b>169</b>	<b>\$16,018,295</b>	<b>\$32,849,508</b>	<b>\$30,795,019</b>	<b>\$79,662,822</b>
<b>Zone AO (1% Annual Chance Flood)</b>						
Agricultural	557	537	\$132,121,883	\$171,542,704	\$171,542,704	\$475,207,291
Commercial	128	33	\$14,594,490	\$16,388,049	\$16,388,049	\$47,370,588
Government	13	1	\$184,109	\$9,543	\$9,543	\$203,195
Industrial	32	30	\$2,845,893	\$7,405,603	\$11,108,405	\$21,359,901
Institutional	12	7	\$757,977	\$1,309,276	\$1,309,276	\$3,376,529
Residential	1,131	1,052	\$37,364,087	\$98,632,781	\$49,316,391	\$185,313,259
Utilities	18	-	\$17,399	\$0	\$0	\$17,399
Unknown	14	1	\$162,951	\$299,521	\$299,521	\$761,993
<b>Zone AO Total</b>	<b>1,905</b>	<b>1,661</b>	<b>\$188,048,789</b>	<b>\$295,587,477</b>	<b>\$249,973,888</b>	<b>\$733,610,154</b>
<b>1 % Annual Chance Grand Total</b>	<b>4,336</b>	<b>3,486</b>	<b>\$593,796,452</b>	<b>\$985,279,835</b>	<b>\$884,850,998</b>	<b>\$2,463,927,285</b>
<b>Zone X (shaded) (0.2% Annual Chance **)</b>						
Agricultural	63	48	\$7,116,465	\$7,816,288	\$7,816,288	\$22,749,041
Commercial	271	208	\$19,388,556	\$55,464,229	\$55,464,229	\$130,317,014
Government	38	4	\$4,628,286	\$780,580	\$780,580	\$6,189,446
Industrial	24	6	\$552,949	\$217,303	\$325,955	\$1,096,207
Institutional	25	20	\$640,580	\$3,438,102	\$3,438,102	\$7,516,784
Residential	2,762	2,239	\$78,585,309	\$208,295,629	\$104,147,815	\$391,028,753
Utilities	44	1	\$57,406	\$162,846	\$162,846	\$383,098
Unknown	24	3	\$126,440	\$1,004,392	\$1,004,392	\$2,135,224
<b>0.2% Annual Chance Total</b>	<b>3,251</b>	<b>2,529</b>	<b>\$111,095,991</b>	<b>\$277,179,369</b>	<b>\$173,140,206</b>	<b>\$561,415,566</b>
<b>Zone D – Unmapped</b>						
Agricultural	240	100	\$14,639,972	\$10,352,176	\$10,352,176	\$35,344,324
Commercial	159	131	\$18,191,360	\$24,239,605	\$24,239,605	\$66,670,570
Government	581	3	\$706,401	\$195,161	\$195,161	\$1,096,723
Industrial	52	41	\$1,625,686	\$2,236,710	\$3,355,065	\$7,217,461

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Institutional	23	11	\$2,167,347	\$4,924,970	\$4,924,970	\$12,017,287
Residential	3,551	2,948	\$345,623,626	\$398,382,211	\$199,191,106	\$943,196,943
Utilities	60	5	\$520,781	\$24,884	\$24,884	\$570,549
Unknown	71	4	\$456,402	\$693,378	\$693,378	\$1,843,158
<b>Zone D Total</b>	<b>4,737</b>	<b>3,243</b>	<b>\$383,931,575</b>	<b>\$441,049,095</b>	<b>\$242,976,345</b>	<b>\$1,067,957,015</b>
<b>Zone X – Unshaded (No Mapped Flood Hazard)</b>						
Agricultural	6,664	4,439	\$1,130,211,256	\$1,312,297,150	\$1,312,297,150	\$3,754,805,556
Commercial	1,806	1,244	\$307,890,428	\$1,218,337,789	\$1,218,337,789	\$2,744,566,006
Government	343	11	\$16,323,870	\$1,463,869	\$1,463,869	\$19,251,608
Industrial	408	192	\$67,949,764	\$285,845,283	\$428,767,925	\$782,562,972
Institutional	234	141	\$19,076,652	\$61,116,065	\$61,116,065	\$141,308,782
Residential	35,317	30,623	\$1,646,566,361	\$3,923,658,326	\$1,961,829,163	\$7,532,053,850
Utilities	778	55	\$1,277,421	\$5,914,517	\$5,914,517	\$13,106,455
Unknown	418	40	\$15,075,707	\$11,717,540	\$11,717,540	\$38,510,787
<b>Zone X (unshaded) Total</b>	<b>45,968</b>	<b>36,745</b>	<b>\$3,204,371,459</b>	<b>\$6,820,350,539</b>	<b>\$5,001,444,018</b>	<b>\$15,026,166,016</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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

Table 4-73 shows potential losses summarized by the 1% and 0.2% annual chance flood event with loss estimate and loss ratios for the Planning Area. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all parcels located in the Planning Area) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator that a community may have more difficulties recovering from a flood. The County should keep in mind that the loss ratio could increase with additional development in the 1% and 0.2% annual chance floodplain, unless development is elevated in accordance with the local floodplain management ordinance.

*Table 4-73 Madera County Planning Area – Flood Loss Estimates*

Flood Zone/ Property Use	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance	4,336	3,486	\$985,279,835	\$884,850,998	\$1,870,130,833	\$374,026,167	1.01%
0.2% Annual Chance**	3,251	2,529	\$277,179,369	\$173,140,206	\$450,319,575	\$90,063,915	0.70%
<b>Grand Total</b>	<b>7,587</b>	<b>6,015</b>	<b>\$1,262,459,204</b>	<b>\$1,057,991,204</b>	<b>\$2,320,450,408</b>	<b>\$464,090,082</b>	<b>1.71%</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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

According to the information in Table 4-71 through Table 4-73, the Madera County Planning Area has 3,486 improved parcels and roughly \$1.9 billion of structure and contents value in the 1% annual chance floodplain. There are 2,529 improved parcels and roughly \$450 million of structure and contents value in the 0.2% annual chance flood event. A loss ratio of 1.71% indicates that while the County does have assets at risk, those asset values do not indicate a disproportionate number of assets in the FEMA regulated floodplains.

### Unincorporated Madera County

Table 4-74 and Table 4-75 contain information for unincorporated Madera County only. Table 4-74 shows the number of improved parcels and associated structure and other improved assets at risk to the each of the FEMA flood zones using the DFIRM data in the unincorporated areas and Table 4-75 shows potential losses summarized by 1% and 0.2% annual chance flood events with loss estimates and loss ratios.

*Table 4-74 Unincorporated Madera County– Count and Improved Value by Property Use and Detailed Flood Zone with Contents Replacement Values*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Zone A (1% Annual Chance Flood)</b>						
Agricultural	912	772	\$306,727,785	\$531,169,097	\$531,169,097	\$1,369,065,979
Commercial	18	9	\$2,691,184	\$2,889,645	\$2,889,645	\$8,470,474
Government	136	3	\$569,962	\$1,437,674	\$1,437,674	\$3,445,310
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	4	1	\$27,312	\$84,506	\$84,506	\$196,324
Residential	421	332	\$21,669,740	\$38,796,938	\$19,398,469	\$79,865,147
Utilities	36	8	\$1,107,057	\$177,899	\$177,899	\$1,462,855
Unknown	46	9	\$5,268,749	\$3,158,147	\$3,158,147	\$11,585,043
<b>Zone A Total</b>	<b>1,573</b>	<b>1,134</b>	<b>\$338,061,789</b>	<b>\$577,713,906</b>	<b>\$558,315,437</b>	<b>\$1,474,091,132</b>
<b>Zone AE (1% Annual Chance Flood)</b>						
Agricultural	36	22	\$7,547,261	\$6,764,156	\$6,764,156	\$21,075,573
Commercial	9	5	\$1,314,680	\$1,521,069	\$1,521,069	\$4,356,818
Government	7	2	\$3,137,241	\$32,504	\$32,504	\$3,202,249
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	2	1	\$7,376	\$10,344	\$10,344	\$28,064
Residential	286	260	\$11,800,764	\$38,824,646	\$19,412,323	\$70,037,733
Utilities	8	2	\$58,378	\$239,280	\$239,280	\$536,938

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	1	1	\$47,201	\$116,125	\$116,125	\$279,451
<b>Zone AE Total</b>	<b>349</b>	<b>293</b>	<b>\$23,912,901</b>	<b>\$47,508,124</b>	<b>\$28,095,801</b>	<b>\$99,516,826</b>
<b>Zone AE Floodway (1% Annual Chance Flood)</b>						
Agricultural	18	12	\$2,068,150	\$1,093,972	\$1,093,972	\$4,256,094
Commercial	7	7	\$510,398	\$1,226,109	\$1,226,109	\$2,962,616
Government	8	1	\$7,017,851	\$837	\$837	\$7,019,525
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	178	145	\$8,636,923	\$20,302,586	\$10,151,293	\$39,090,802
Utilities	3	0	\$1,251	\$0	\$0	\$1,251
Unknown	2	0	\$4,523	\$0	\$0	\$4,523
<b>Zone AE Floodway Total</b>	<b>216</b>	<b>165</b>	<b>\$18,239,096</b>	<b>\$22,623,504</b>	<b>\$12,472,211</b>	<b>\$53,334,811</b>
<b>Zone AH (1% Annual Chance Flood)</b>						
Agricultural	22	21	\$5,861,321	\$3,407,483	\$3,407,483	\$12,676,287
Commercial	11	5	\$1,453,345	\$559,226	\$559,226	\$2,571,797
Government	2	0	\$0	\$0	\$0	\$0
Industrial	1	1	\$1,818,629	\$12,295,501	\$18,443,252	\$32,557,382
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	56	49	\$1,820,814	\$3,952,849	\$1,976,425	\$7,750,088
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	4	2	\$216,176	\$182,818	\$182,818	\$581,812
<b>Zone AH Total</b>	<b>96</b>	<b>78</b>	<b>\$11,170,285</b>	<b>\$20,397,877</b>	<b>\$24,569,203</b>	<b>\$56,137,365</b>
<b>Zone AO (1% Annual Chance Flood)</b>						
Agricultural	549	529	\$126,896,647	\$171,173,538	\$171,173,538	\$469,243,723
Commercial	128	33	\$14,594,490	\$16,388,049	\$16,388,049	\$47,370,588
Government	12	0	\$13,990	\$0	\$0	\$13,990
Industrial	32	30	\$2,845,893	\$7,405,603	\$11,108,405	\$21,359,901
Institutional	11	6	\$613,507	\$1,295,129	\$1,295,129	\$3,203,765
Residential	831	764	\$24,225,510	\$65,062,567	\$32,531,284	\$121,819,361
Utilities	11	0	\$17,348	\$0	\$0	\$17,348
Unknown	14	1	\$162,951	\$299,521	\$299,521	\$761,993
<b>Zone AO Total</b>	<b>1,588</b>	<b>1,363</b>	<b>\$169,370,336</b>	<b>\$261,624,407</b>	<b>\$232,795,925</b>	<b>\$663,790,668</b>

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>1 % Annual Chance Grand Total</b>	<b>3,822</b>	<b>3,033</b>	<b>\$560,754,407</b>	<b>\$929,867,818</b>	<b>\$856,248,577</b>	<b>\$2,346,870,802</b>
<b>Zone X (0.2% Annual Chance **)</b>						
Agricultural	58	45	\$6,603,263	\$7,558,250	\$7,558,250	\$21,719,763
Commercial	9	6	\$942,273	\$460,873	\$460,873	\$1,864,019
Government	6	2	\$4,129,731	\$704,102	\$704,102	\$5,537,935
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	2	1	\$6,637	\$26,712	\$26,712	\$60,061
Residential	346	317	\$12,337,355	\$30,557,924	\$15,278,962	\$58,174,241
Utilities	1	0	\$0	\$0	\$0	\$0
Unknown	4	1	\$3,045	\$4,913	\$4,913	\$12,871
<b>Zone X (shaded) Total</b>	<b>426</b>	<b>372</b>	<b>\$24,022,304</b>	<b>\$39,312,774</b>	<b>\$24,033,812</b>	<b>\$87,368,890</b>
<b>Zone D – Unmapped</b>						
Agricultural	240	100	\$14,639,972	\$10,352,176	\$10,352,176	\$35,344,324
Commercial	159	131	\$18,191,360	\$24,239,605	\$24,239,605	\$66,670,570
Government	581	3	\$706,401	\$195,161	\$195,161	\$1,096,723
Industrial	52	41	\$1,625,686	\$2,236,710	\$3,355,065	\$7,217,461
Institutional	23	11	\$2,167,347	\$4,924,970	\$4,924,970	\$12,017,287
Residential	3,551	2,948	\$345,623,626	\$398,382,211	\$199,191,106	\$943,196,943
Utilities	60	5	\$520,781	\$24,884	\$24,884	\$570,549
Unknown	71	4	\$456,402	\$693,378	\$693,378	\$1,843,158
<b>Zone D (unmapped) Total</b>	<b>4,737</b>	<b>3,243</b>	<b>\$383,931,575</b>	<b>\$441,049,095</b>	<b>\$242,976,345</b>	<b>\$1,067,957,015</b>
<b>Zone X – Unshaded (No Mapped Flood Hazard)</b>						
Agricultural	6,469	4,397	\$1,099,055,885	\$1,308,710,747	\$1,308,710,747	\$3,716,477,379
Commercial	777	523	\$146,337,023	\$823,794,069	\$823,794,069	\$1,793,925,161
Government	191	4	\$4,794,504	\$28,476	\$28,476	\$4,851,456
Industrial	161	67	\$32,628,797	\$140,032,613	\$210,048,920	\$382,710,330
Institutional	122	71	\$15,731,016	\$35,803,172	\$35,803,172	\$87,337,360
Residential	19,903	16,317	\$1,051,128,091	\$2,285,871,755	\$1,142,935,878	\$4,479,935,724
Utilities	302	51	\$852,373	\$5,766,656	\$5,766,656	\$12,385,685
Unknown	351	33	\$8,976,752	\$6,911,929	\$6,911,929	\$22,800,610

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Zone X (unshaded) Total</b>	<b>28,276</b>	<b>21,463</b>	<b>\$2,359,504,441</b>	<b>\$4,606,919,417</b>	<b>\$3,533,999,846</b>	<b>\$10,500,423,704</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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

*Table 4-75 Unincorporated Madera County – Flood Loss Estimates*

Flood Zone/ Property Use	Total Parcel Count	Improved Parcel Count*	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance	3,822	3,033	\$929,867,818	\$856,248,577	\$1,786,116,395	\$357,223,279	1.23%
0.2% Annual Chance**	426	372	\$39,312,774	\$24,033,812	\$63,346,586	\$12,669,317	0.14%
<b>Grand Total</b>	<b>4,248</b>	<b>3,405</b>	<b>\$969,180,592</b>	<b>\$880,282,389</b>	<b>\$1,849,462,981</b>	<b>\$369,892,596</b>	<b>1.37%</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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

According to Table 4-74 and Table 4-75, unincorporated Madera County has 3,033 improved parcels and roughly \$1.8 billion of structure and contents value in the 1% annual chance floodplain. The unincorporated County has 372 improved parcels and roughly \$63.3 million in structure and contents values in the 0.2% annual chance floodplain. These values can be refined a step further. Applying the 20 percent damage factor as previously described, there is a 1% chance in any given year of a flood event causing roughly \$357 million in damage in the unincorporated areas of Madera County. Applying the same factor, there is a 0.2% chance of a flood event causing \$12.7 million in damage to the unincorporated County. A loss ratio of 1.37% indicates that while the unincorporated County has assets at risk in the floodplain, flood losses would be limited compared to the total built environment and the community would likely be able to recover adequately.

### Flooded Acres Analysis

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the Madera County Planning Area broken out by jurisdiction and by property use.

### Methodology

A parcel boundary analysis was performed to obtain total acres and flooded acres by flood zone for each parcel. GIS was used to calculate acres flooded by FEMA flood zones and property use categories. The Madera County parcel layer and FEMA DFIRM were intersected, and each segment divided by the

intersection of flood zone and parcels was calculated for acres. This process was conducted for 1% and 0.2% annual chance flood areas, with each segment being defined by zone type (A, AE, AE Floodway, 0.2% Annual Chance, D, and X) and acres. The resulting data tables with flooded acreages were then imported into a database and linked back to the original parcels, including total acres by parcel number. Once this was completed, each parcel contained acreage values for flooded acre by zone type within the parcel. In the tables below, the 1% and 0.2% annual chance flood zones are summarized and then split out by property use, their total flooded acres, total improved acres, and percent of improved acres that are flooded.

**Limitations**

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

**Flooded Acres Analysis Results**

The end result of the flooded acres analysis is an inventory of the improved and unimproved acres subject to flooding within the County. Results are presented here first for the Madera County Planning Area and secondly for unincorporated County, which includes North Fork Rancheria. Results for the incorporated jurisdictions are presented in their annexes to the plan.

**Madera County Planning Area**

The following tables represent a detailed and summary analysis of total acres for each FEMA DFIRM flood zone. Table 4-76 gives summary information for the Planning Area by jurisdiction. Table 4-77 gives detail on the flooded acres in the Planning Area by property use. Table 4-78 gives a summary for the entire Planning Area by 1% and 0.2% annual chance, and shows what percentage of the County Planning Area falls in each flood zone.

*Table 4-76 Madera County Planning Area – Flooded Acres by Jurisdiction Summary*

Flood Zone	Total Flooded Acres	Improved Flooded Acres
<b>City of Chowchilla</b>		
1% Annual Chance Flood Hazard	69	15
0.2% Annual Chance Flood Hazard*	0	0
<b>City of Madera</b>		
1% Annual Chance Flood Hazard	729	473
0.2% Annual Chance Flood Hazard*	876	461
<b>Unincorporated County</b>		
1% Annual Chance Flood Hazard	179,592	154,926
0.2% Annual Chance Flood Hazard*	1,592	1,190

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data



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

**Table 4-77 Madera County Planning Area – Flooded Acres by Property Use and Detailed Flood Zone**

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
<b>1% Annual Chance Flood Hazard</b>		
<b>Zone AE Floodway</b>		
Agricultural	679	532
Commercial	27	27
Government	459	144
Industrial	0	0
Institutional	0	0
Residential	239	166
Utilities	3	0
Unknown	27	0
<b>Zone AE Floodway Total</b>	<b>1,434</b>	<b>869</b>
<b>Zone AE</b>		
Agricultural	2,026	1,520
Commercial	205	3
Government	249	54
Industrial	0	0
Institutional	81	0
Residential	274	252
Utilities	81	5
Unknown	1	1
<b>Zone AE Total</b>	<b>2,917</b>	<b>1,836</b>
<b>Zone A</b>		
Agricultural	125,231	113,746
Commercial	89	51
Government	9,251	130
Industrial	11	4
Institutional	6	0
Residential	1,079	781
Utilities	646	202
Unknown	3,529	2,861
<b>Zone A Total</b>	<b>139,842</b>	<b>117,777</b>
<b>Zone AH</b>		
Agricultural	901	873

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
Commercial	48	17
Government	2	-
Industrial	179	179
Institutional	-	-
Residential	98	66
Utilities	0	-
Unknown	6	3
<b>Zone AH Total</b>	<b>1,234</b>	<b>1,138</b>
<b>Zone AO</b>		
Agricultural	32,815	32,570
Commercial	1,051	410
Government	102	7
Industrial	102	91
Institutional	167	135
Residential	645	580
Utilities	40	-
Unknown	41	2
<b>Zone AO Total</b>	<b>34,962</b>	<b>33,795</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>180,390</b>	<b>155,414</b>
<b>Zone X-shaded (0.2% Annual Chance)*</b>		
Agricultural	1,074	821
Commercial	184	80
Government	181	67
Industrial	9	4
Institutional	9	7
Residential	933	667
Utilities	63	0
Unknown	15	5
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>2,468</b>	<b>1,651</b>
<b>Zone D (unmapped)</b>		
Agricultural	13,656	5,475
Commercial	315	272
Government	391,277	121
Industrial	265	5
Institutional	757	492
Residential	10,724	5,589

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
Utilities	1,329	3
Unknown	101,646	21
<b>Zone D (unmapped) Total</b>	<b>519,969</b>	<b>11,978</b>
<b>Zone X -unshaded (No Mapped Flood Hazard)</b>		
Agricultural	558,461	327,541
Commercial	5,459	3,202
Government	15,118	1,386
Industrial	3,338	2,249
Institutional	1,859	806
Residential	60,881	47,172
Utilities	1,140	28
Unknown	5,917	1,859
<b>Zone X (unshaded) Total</b>	<b>652,175</b>	<b>384,242</b>
<b>Grand Total</b>		
	<b>1,355,001</b>	<b>553,285</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

*Table 4-78 Madera County Planning Area – Flooded Acres Summary*

Flood Zone	Total Flooded Acres	Improved Flooded Acres	% of Improved Flooded Acres
1% Annual Chance Flood Hazard	180,390	155,414	28.1%
0.2% Annual Chance Flood Hazard*	2,468	1,651	0.3%
Other Areas (Zone D and X)	1,172,143	396,220	71.6%
<b>Total</b>	<b>1,355,001</b>	<b>553,285</b>	<b>100.0%</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

### *Unincorporated Madera County*

Table 4-79 gives detailed information by property use for the unincorporated County. This information is available for each jurisdiction in their respective annexes. Table 4-80 gives a summary for the entire Planning Area by 1% and 0.2% annual chance, and shows what percentage of the unincorporated County falls in each flood zone

*Table 4-79 Unincorporated Madera County – Flooded Acres by Property Use and Detailed Flood Zone*

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
<b>1% Annual Chance Flood Hazard</b>		
<b>Zone AE Floodway</b>		
Agricultural	679	532
Commercial	27	27
Government	452	144
Industrial	0	0
Institutional	0	0
Residential	232	166
Utilities	3	0
Unknown	15	0
<b>Zone AE Floodway Total</b>	<b>1,408</b>	<b>869</b>
<b>Zone AE</b>		
Agricultural	2,026	1,520
Commercial	107	3
Government	249	54
Industrial	-	-
Institutional	81	0
Residential	274	252
Utilities	81	5
Unknown	1	1
<b>Zone AE Total</b>	<b>2,819</b>	<b>1,835</b>
<b>Zone A</b>		
Agricultural	125,168	113,746
Commercial	79	44
Government	9,196	130
Industrial	0	0
Institutional	6	0
Residential	1,035	765
Utilities	644	202
Unknown	3,528	2,861
<b>Zone A Total</b>	<b>139,657</b>	<b>117,749</b>
<b>Zone AH</b>		
Agricultural	901	873
Commercial	48	17
Government	2	-

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
Industrial	179	179
Institutional	0	0
Residential	79	55
Utilities	0	0
Unknown	6	3
<b>Zone AH Total</b>	<b>1,215</b>	<b>1,127</b>
<b>Zone AO</b>		
Agricultural	32,428	32,184
Commercial	1,051	410
Government	95	-
Industrial	102	91
Institutional	153	121
Residential	601	539
Utilities	22	0
Unknown	41	2
<b>Zone AO Total</b>	<b>34,493</b>	<b>33,346</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>179,592</b>	<b>154,926</b>
<b>Zone X – shaded (0.2% Annual Chance*)</b>		
Agricultural	1,034	807
Commercial	78	13
Government	123	66
Industrial	0	0
Institutional	1	1
Residential	355	304
Utilities	0	0
Unknown	1	0
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>1,592</b>	<b>1,190</b>
<b>Zone D (unmapped)</b>		
Agricultural	13,656	5,475
Commercial	315	272
Government	391,277	121
Industrial	265	5
Institutional	757	492
Residential	10,724	5,589
Utilities	1,329	3
Unknown	101,646	21

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
<b>Zone D (unmapped) Total</b>	<b>519,969</b>	<b>11,978</b>
<b>Zone X -unshaded (No Mapped Flood Hazard)</b>		
Agricultural	555,954	326,325
Commercial	3,772	2,393
Government	12,005	16
Industrial	2,239	1,539
Institutional	1,639	698
Residential	56,499	44,038
Utilities	599	25
Unknown	5,693	1,831
<b>Zone X (unshaded) Total</b>	<b>638,400</b>	<b>376,864</b>
<b>Grand Total</b>		
	<b>1,339,553</b>	<b>544,958</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

*Table 4-80 Unincorporated Madera County – Flooded Acres Summary*

Flood Zone	Total Flooded Acres	Improved Flooded Acres	% of Improved Flooded Acres
1% Annual Chance Flood Hazard	179,592	154,926	28.4%
0.2% Annual Chance Flood Hazard*	1,592	1,190	0.2%
Other Areas (Zone D and X)	1,158,369	388,842	71.4%
<b>Total</b>	<b>1,339,553</b>	<b>544,958</b>	<b>100.0%</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

## Insurance Coverage, Claims Paid, and Repetitive Losses

Unincorporated Madera County joined the NFIP on August 4, 1987. The County does not participate in the CRS program, but may consider joining. NFIP insurance data indicates that as of September 19, 2016, there were 910 policies in force in the unincorporated County, resulting in \$177,276,400. of insurance in force and \$830,562 in annual premiums paid. Of these, 769 are for residential properties and 131 are nonresidential. 776 of these are in A zones; 2 are in D zones, and 132 policies are for parcels in the B, C, & X zones.

There have been 20 closed paid losses totaling \$189,951.78; 8 of these were for residential properties and 12 were for nonresidential. Of these 20 paid losses, 9 were parcels in A zones, 6 parcels were in B, C, & X zones, and 6 were in unknown zones. Of the 20 claims, 13 claims were associated with pre-FIRM structures, 2 with post-FIRM structures, and 5 were unknown. There have been no substantial damage

claims since 1978. There has also been 2 repetitive loss (RL) property in the unincorporated County. The losses occurred pre-FIRM in A zones, with payments totaling \$138,759.40. There is 1 severe repetitive loss (SRL) property in the unincorporated County.

Based on this analysis of insurance coverage, unincorporated Madera County has assets at risk to the 100-year and greater floods. Of the 3,033 improved parcels within the 100-year floodplain, only 776 (or 25.6 percent) of those parcels maintain flood insurance. This can be seen on Table 4-81 along with insurance policies for the two unincorporated communities that comprise the Planning Area. Flood insurance details specific to the incorporated communities are included in their jurisdictional annexes.

**Table 4-81 Madera County Planning Area – Percentages of Policy Holders to Parcels in the 1% Annual Chance Floodplain**

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain)*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Chowchilla**	15	0	0%
City of Madera	438	5	1.1%
Unincorporated County	3,033	776	25.6%
<b>Total</b>	<b>3,486</b>	<b>781</b>	<b>22.4%</b>

Source: FEMA 9/26/2008 DFIRM; 8/19/2016 NFIP Data

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

\*\*The City of Chowchilla does not participate in the NFIP

### **Population at Risk**

A separate analysis was performed to determine population in flood zones. Using GIS, the DFIRM Flood dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the Census Bureau average household size for each jurisdiction; results were tabulated by jurisdiction and flood zone (see Table 4-82). According to this analysis, for the entire Planning Area, there is a population of 6,750 in the 1% annual chance floodplain, and another 8,382 in the 0.2% annual chance floodplain. For the unincorporated County there is a population of 5,084 in the 1% annual chance flood event, and another 1,040 in the 0.2% annual chance flood event.

*Table 4-82 Madera County Planning Area – Population at Risk to Flooding*

Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels*	Population**	Improved Residential Parcels*	Population**
City of Chowchilla	10	31	0	0
City of Madera	428	1,635	1,922	7,342
Unincorporated County	1,550	5,084	317	1,040
<b>Total</b>	<b>1,988</b>	<b>6,750</b>	<b>2,239</b>	<b>8,382</b>

Source: FEMA 9/26/2008 DFIRM; US Census Bureau 2010 Estimates, Madera County April 2017 Parcel/Assessor's Data

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

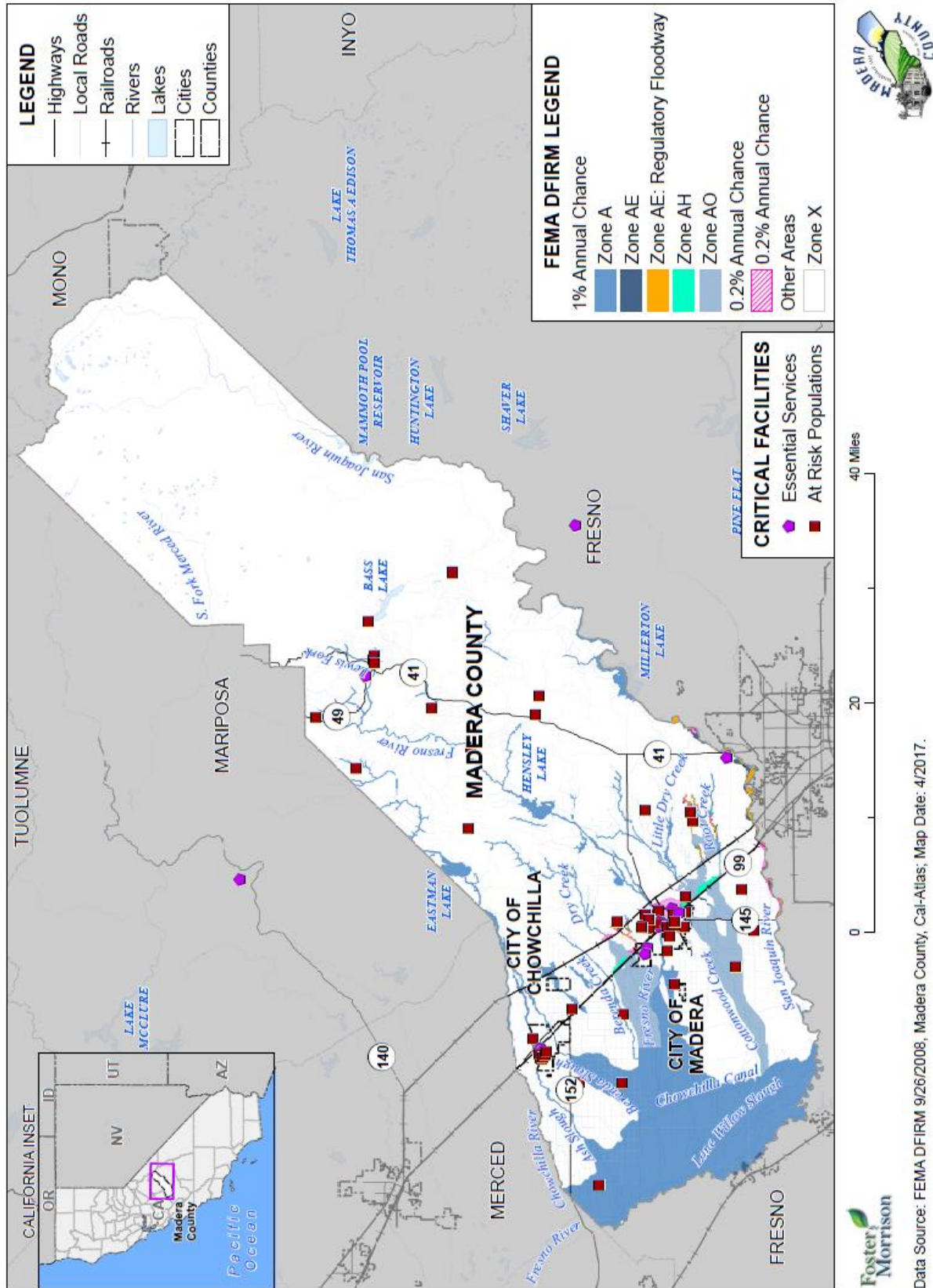
\*\* Census Bureau 2010 average household sizes are: Chowchilla – 3.08, Madera – 3.82, Unincorporated County – 3.28

### *Critical Facilities at Risk*

A separate analysis was performed on the critical facility inventory in Madera County and all jurisdictions to determine critical facilities in the 1% and 0.2 annual chance floodplains. Using GIS, the DFIRM flood zones were overlayed on the critical facility GIS layer. Figure 4-69 shows critical facilities, as well as the DFIRM flood zones. Table 4-83 details critical facilities by facility type and count for the Planning Area. Table 4-85 details critical facilities by facility type for the unincorporated County. Details of critical facility definition, type, name and address and jurisdiction by flood zone are listed in Appendix F. Note that the critical facilities in adjacent counties were not part of this analysis due to lack of data.



Figure 4-69 Madera County Planning Area – Critical Facilities in DFIRM Flood Zones



*Table 4-83 Madera County Planning Area – Critical Facilities in DFIRM Flood Zones*

Critical Facility Category / Flood Zone	Critical Facility Type	Critical Facility Count
<b>1% Annual Chance Flood Hazard</b>		
<b>Zone A</b>		
At Risk Populations	School	3
<b>Zone A Total</b>		<b>3</b>
<b>Zone AO</b>		
At Risk Populations	School	3
<b>Zone AO Total</b>		<b>3</b>
<b>1% Annual Chance Flood Hazard Total</b>		<b>6</b>
<b>0.2% Annual Chance Flood Hazard</b>		
Essential Services	Fire Command Center	1
At Risk Populations	School	2
<b>0.2% Annual Chance Flood Hazard Total</b>		<b>3</b>

Source: Madera County GIS

*Table 4-84 Unincorporated Madera County – Critical Facilities in DFIRM Flood Zones*

Critical Facility Category / Flood Zone	Critical Facility Type	Critical Facility Count
<b>1% Annual Chance Flood Hazard</b>		
<b>Zone A</b>		
At Risk Populations	School	3
<b>Zone A Total</b>		<b>3</b>
<b>Zone AO</b>		
At Risk Populations	School	2
<b>Zone AO Total</b>		<b>2</b>
<b>1% Annual Chance Flood Hazard Total</b>		<b>5</b>
<b>0.2% Annual Chance Flood Hazard</b>		
–	–	0
<b>0.2% Annual Chance Flood Hazard Total</b>		<b>0</b>

Source: Madera County GIS

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

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

protecting these areas and associated functions are a vital component of sound floodplain management practices for the Madera County Planning Area.

### *Overall Community Impact*

Floods and their impacts vary by location and severity of any given flood event and will likely only affect certain areas of the County Planning Area during specific times. Based on the risk assessment, it is evident that floods will continue to have potentially devastating economic impacts to certain areas of the County. However, many of the floods in the County are minor, localized flood events that are more of a nuisance than a disaster. Impacts that are not always quantified, but can be anticipated in large future events, include:

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

In addition, the HMPC desired to emphasize the fact that the floods occurring in our facilities may not be a large impact to the community, but small impacts accumulate. The County received over 100 flood service requests in the spring of 2017. The accumulation of these minor floods led to significant events that resulted in the County running out of all its sources. The Flood Operation Center in Sacramento was called a few times for assistance.

### *Future Development and Future Flood Conditions*

This section provides an analysis of the flood hazard and proposed future development within the County based on FEMA DFIRMs and also discusses considerations in evaluating future flooding conditions.

#### **Future Development: General Regulatory Considerations**

Communities that participate in the NFIP adopt regulations and codes that govern development in Special Flood Hazard Areas, and enforce those requirements through their local floodplain management ordinances generally through the issuance of permits. Madera County's floodplain management ordinance provides standards for development, subdivision of land, construction of buildings, and improvements and repairs to buildings that meet the minimum requirements of the NFIP.

The International Residential Code (IRC) and International Building Code (IBC), by reference to ASCE 24, include requirements that govern the design and construction of buildings and structures in flood hazard areas. FEMA has determined that the flood provisions of the I-Codes are consistent with the requirements of the NFIP (the I-Code requirements shown either meet or exceed NFIP requirements). ASCE 24, a design

standard developed by the American Society of Civil Engineers, expands on the minimum NFIP requirements with more specificity, additional requirements, and some limitations.

With the adoption of the 2015 International Code, communities will be moving towards a more stringent approach to regulatory floodplain management, beyond the minimum requirements of the NFIP. The adoption and enforcement of disaster-resistant building codes is a core community action to promote effective mitigation. When communities ensure that new buildings and infrastructure are designed and constructed in accordance with national building codes and construction standards, they significantly increase local resilience now and in the future. With continued advancements in building codes, local ordinances should be reviewed and updated to meet and exceed standards as practicable to protect new development from future flood events and to further promote disaster resiliency.

One of the most effective ways to reduce vulnerability to potential flood damage is through careful land use planning that fully considers applicable flood management information and practices. Master planning will also be necessary to assure that open channel flood flow conveyances serving the smaller internal streams and drainage areas are adequately prepared to accommodate the flows. Preservation and maintenance of natural and riparian areas should also be an ongoing priority to realize the flood control benefits of the natural and beneficial functions of these areas. Also, to be considered in reducing flooding in areas of existing and future development is to promote implementation of stormwater program elements and erosion and sediment controls, including the clearing of vegetation from natural and man-made drains that are critical to flood protection. Both native and invasive species can clog drains, and reduce flows of floodwaters, which slow that natural drainage process and can exacerbate flooding.

### **Future Development: State Regulatory Considerations**

Senate Bills (SB) 5 and 17 and Assembly Bills (AB) 5, 70, 156, and 162 (Legislation) were signed into law in 2007 to address flood problems, direct use of bond funds, and support local land-use planning. As part of this Legislation, DWR was required to develop a Central Valley Flood Protection Plan (CVFPP). The CVFPP was adopted in 2012 and will be updated every 5 years. In 2012, SB1278 and AB1965 were enacted, revising provisions related to planning and zoning for flood protection.

In accordance with this legislation, communities will be required to make findings related to an urban level of flood protection as stipulated in California Government Code Sections 65865.5, 65962, and 66474.5, using criteria consistent with, or developed by DWR after July 2016. DWR has developed draft criteria, Urban Level of Flood Protection (ULOP) (November 2013).

The ULOP requires a minimum urban level of 0.5% (200)-year flood protection before a community can issue a building permit or approve a parcel map. This requirement affects areas in the Sacramento-San Joaquin Valley where flood depths are anticipated to exceed three feet and are in a watershed greater than 10 square miles for the 0.5% (200)-year flood event. If a ULOP plan is in place to reach 0.5% (200)-year flood protection and adequate progress is shown annually, then these requirements can be delayed until 2025.

The Legislation also requires DWR to propose updated requirements to the California Building Standards Code for adoption and approval by the California Building Standards Commission. These requirements

apply to construction in the Sacramento and San Joaquin valleys, where flood levels are anticipated to exceed three feet for a 0.5% (200)-year flood event.

The California DWR BAM/Flood Awareness Maps, detailed previously in this plan, were developed to provide communities with an additional tool in understanding potential flood hazards currently not mapped as a regulated floodplain. These preliminary maps include the 1% (100)-, 0.5% (200)- and 0.2% (500)-year floodplains to provide information on the true risk of flooding to allow communities to make informed floodplain management and property use decisions. These advisory maps are intended to help communities begin implementing activities to meet SB 5 requirements calling for a minimum of 0.5% (200)-year protection for new development in urban and urbanizing area.

Madera County and incorporated communities will continue to evaluate the applicability and incorporation of these requirements to their communities as part of their floodplain management programs.

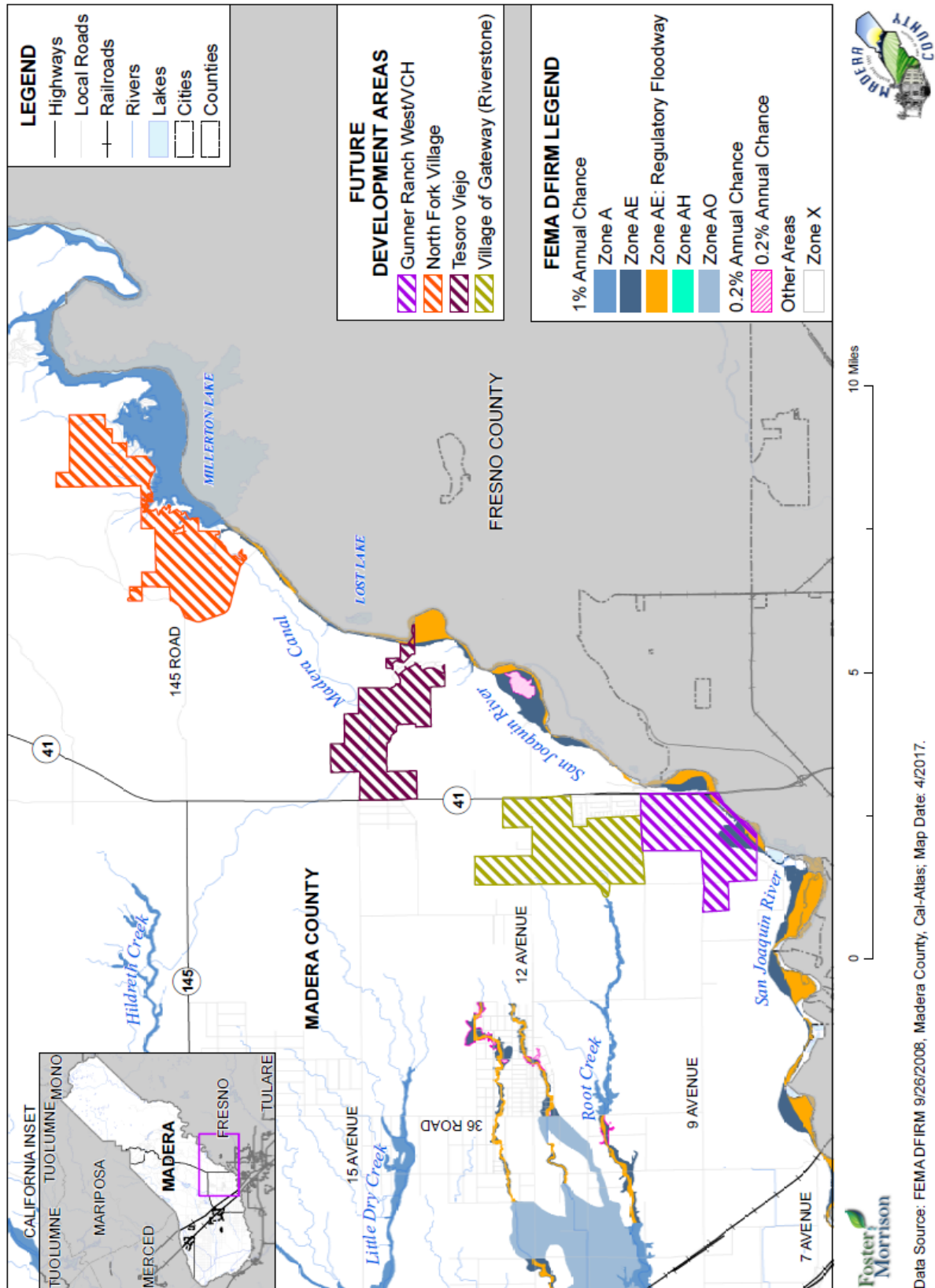
### Future Development: DFIRM Analysis

Madera County's GIS parcel layer was used as the basis for the countywide inventory of parcels and acres values. In this analysis, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point containing the assessor's data. In addition, Madera County provided a GIS spatial file identifying the 4 future development areas for which the analysis was to be performed. Utilizing the future development spatial layer, the parcel centroid data was intersected to determine the parcel counts within each development. The following hazards data was collected to perform the additional analysis:

- Flood Hazard Data: Madera County has a 9/6/2008 effective FEMA DFIRM, with May 9, 2014 LOMR, as obtained from the NFHL, was utilized to perform the flood analysis.
- In some cases, there are future development areas in multiple flood zones, such as Zone A, Zone AE, the 2% Annual Chance Zone, or Zone X. GIS was used to intersect the DFIRM flood data with the development areas. For the purposes of this analysis, the development polygon that intersected any flood zones was assigned the flood zones for the entire development polygon. The development areas were segregated and analyzed in this fashion for unincorporated Madera County.

The model assumes that Madera County's GIS parcel layer can be intersected by each future development area to determine the parcel counts and approximate acreage totals. Table 4-85 shows the breakdown of the future development parcel counts in unincorporated Madera County and their acreages. Future development in the unincorporated County is shown on Figure 4-70.

Figure 4-70 Unincorporated Madera County – Future Development and Flood Zones



*Table 4-85 Unincorporated Madera County – Future Development and Flood Zones*

Future Development Areas	Parcels	Acres	Flood Zones
Gunner Ranch West/VCH	38	1,589	1% Annual Chance Flood - Zone AE, Zone AE Floodway; Other Areas - Zone X (unshaded)*
North Fork Village	31	2,369	Other Areas - Zone X (unshaded)*
Tesoro Viejo	169	1,699	Other Areas - Zone X (unshaded)*
Village of Gateway (Riverstone)	294	2,009	Other Areas - Zone X (unshaded)*
<b>Grand Total</b>	<b>532</b>	<b>7,666</b>	

Source: FEMA 9/26/2008 DFIRM; Madera County GIS

\*Zone X (unshaded) is the area outside the mapped flood hazard zone.

### Future Flood Conditions: The Effects of Climate Change

The effects of climate change on future flood conditions should also be considered. While the risk and associated short and long-term impacts of climate change are uncertain, experts in this field tend to agree that among the most significant impacts include those resulting from increased heat and precipitation events that cause increased frequency and magnitude of flooding. Changes associated with climate change and flooding could be significant given the higher elevations in the County where winter snow could turn to more significant rain events. Increases in damaging flood events will cause greater property damage, public health and safety concerns displacement, and loss of life. In addition, an increase in the magnitude and severity of flood events can lead to potential contamination of potable water and contamination of food crops given the agricultural industry in the County. Displacement of residents can include both temporary and long-term displacement, increase in insurance rates or restriction of coverage in vulnerable areas.

Madera County will continue to study the risk and vulnerability associated with future flood conditions, both in terms of future growth areas and other considerations such as climate change, as they evaluate and implement their flood mitigation and adaptation strategy for the Madera County Planning Area.

### Future Flood Conditions: ARkStorm Scenario

Also to be considered in evaluating potential “worst case” future flood conditions, is the ARkStorm Scenario. Although much attention in California’s focuses on the “Big One” as a high magnitude earthquake, there is the risk of another significant event in California – a massive, statewide winter storm. The last such storms occurred in the 19th century, outside the memory of current emergency managers, officials, and communities. However, massive storms are a recurring feature of the state, the source of rare but inevitable disasters. The USGS Multi Hazards Demonstration Project’s (MHDP) developed a product called ARkStorm, which addressed massive U.S. West Coast storms analogous to those that devastated California in 1861-1862. Over the last decade, scientists have determined that the largest storms in California are the product of phenomena called Atmospheric Rivers, and so the MHDP storm scenario is called the ARkStorm, for Atmospheric River 1000 (a measure of the storm’s size).

Scientific studies of offshore deposits in northern and southern California indicate that storms of this magnitude and larger have occurred about as often as large earthquakes on the southern San Andreas Fault. Such storms are projected to become more frequent and intense as a result of climate change. This scientific

effort resulted in a plausible flood hazard scenario to be used as a planning and preparation tool by hazard mitigation and emergency response agencies.

For the ARkStorm Scenario, experts designed a large, scientifically realistic meteorological event followed by an examination of the secondary hazards (e.g., landslides and flooding), physical damages to the intense winter storms of 1861-62 that left California's Central Valley impassible. Storms far larger than the ARkStorm, dubbed megastorms, have also hit California at least six times in the last two millennia.

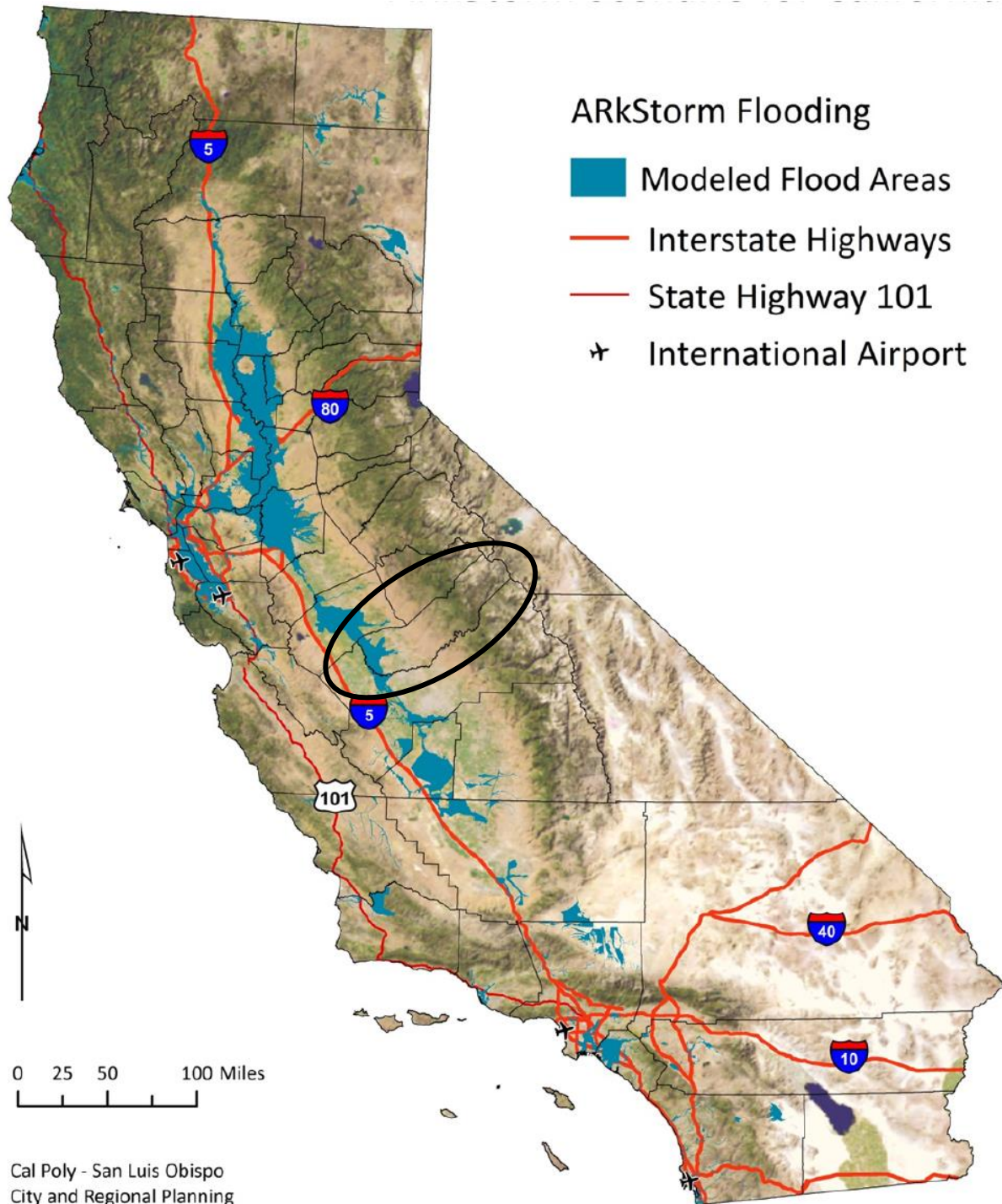
The ARkStorm produces precipitation in many places exceeding levels experienced on average every 500 to 1,000 years. Extensive flooding in many cases overwhelms the state's flood protection system, which is at best designed to resist 100- to 200-year runoffs (many flood protection systems in the state were designed for smaller runoff events). The Central Valley experiences widespread flooding. Serious flooding also occurs in Orange County, Los Angeles County, San Diego, the San Francisco Bay Area, and other coastal communities. In some places, winds reach hurricane speeds, as high as 125 miles per hour. Hundreds of landslides occur, damaging roads, highways, and homes. Property damage exceeds \$300 billion, most of it from flooding. Agricultural losses and other costs to repair lifelines, dewater flooded islands, and repair damage from landslides brings the total direct property loss to nearly \$400 billion, of which only \$20 to \$30 billion would be recoverable through public and commercial insurance. Power, water, sewer, and other lifelines experience damage that takes weeks or months to restore. Flooding evacuation could involve over one million residents in the inland region and Delta counties.

A storm of ARkStorm's magnitude has important implications: 1) it raises serious questions about the ability of existing national, state, and local disaster policy to handle an event of this magnitude; 2) it emphasizes the choice between paying now to mitigate, or paying a lot more later to recover; 3) innovative financing solutions are likely to be needed to avoid fiscal crisis and adequately fund response and recovery costs; 4) responders and government managers at all levels could be encouraged to conduct self-assessments and devise table-top exercises to exercise their ability to address a similar event; 5) the scenario can be a reference point for application of FEMA and Cal OES guidance connecting federal, state, and local natural hazards mapping and mitigation planning under the NFIP and Disaster Mitigation Act of 2000; and 6) common messages to educate the public about the risk of such an extreme event could be developed and consistently communicated to facilitate policy formulation and transformation.

Figure 4-71 depicts an ARkStorm modeled scenario showing the potential for flooding primarily in the Central Valley as the result of a large storm. In Madera County, the modeled scenario suggests the County would see inundation in the western portions of the County.



Figure 4-71 Projected ARkStorm Flooding in California



Cal Poly - San Luis Obispo  
City and Regional Planning  
June 2013

Source: USGS ArkStorm

### 4.3.9. Flood: Localized Stormwater Flooding Vulnerability Assessment

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Medium

Historically, the Planning Area has been at risk to flooding primarily during the winter and spring months when stream systems in the County swell with heavy rainfall. Localized flooding also occurs throughout the Planning Area at various times throughout the year with several areas of primary concern unique to each City. Madera County tracks localized flooding areas as shown in Table 4-38 in Section 4.2.13.

#### *Future Development*

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

Much of the growth in Madera County is occurring through expansion of the urban areas, causing a significant increase in peak flow and stormwater runoff. Such growth will consume previously undeveloped acres, and the impacts may overwhelm existing drainage and flood control facilities.

The potential for flooding may increase as stormwater is channeled due to land development. Such changes can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the floodplain.

The HMPC noted that the Madera County Public Works Department is making sure new and future development will not divert any storm runoff to the facilities. We are making sure that developments contain/retain and mitigate for storm water through catch basins. The County, unlike the cities, does not have a master plan and therefore every new development must retain their runoff. All designs must meet and withstand the 100-year storms.

### 4.3.10. Hazardous Materials Transport Vulnerability Assessment

**Likelihood of Future Occurrence**—Likely

**Vulnerability**—Medium

It is often quite difficult to quantify the potential losses from human-caused hazards. While the facilities themselves have a tangible dollar value, loss from a human-caused hazard often inflicts an even greater toll on a community, both economically and emotionally. The impact to identified assets will vary from event to event and depend on the type, location, and nature of a specific hazardous material incident. The County has specific concerns with hazardous materials transport:

- Increased loading and unloading of transport vehicles at the Ethanol Plant.

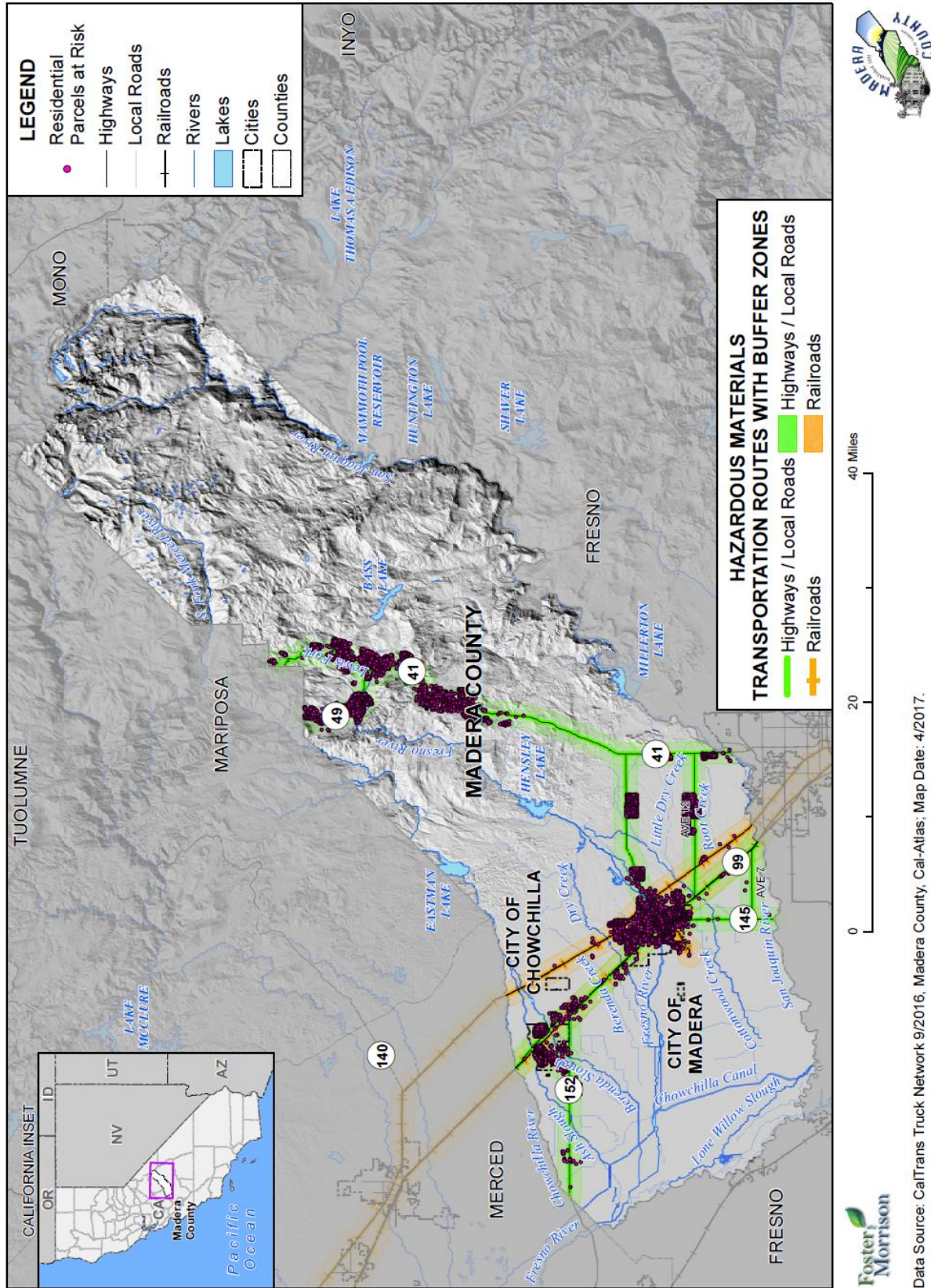
- Increase transport vehicles from the Ethanol plant.
- Increase of crude oil on railroad lines through populated areas of the City and County.

Given the difficulty in quantifying the losses associated with technological hazards, this section focuses on analyzing key Planning Area assets relative to the hazardous materials transportation corridors identified above in Section 4.2.15. Figure 4-72 shows the hazardous materials transportation corridors (for roadways and rail) in Madera County as well as the one mile buffer zone (on each side of the corridor for a two mile total buffer) used this analysis as detailed further in the methodology below.

### *Methodology: Buffer Zone*

An analysis of the potential vulnerability of the Planning Area to a transportation-related hazardous materials release was conducted using GIS within identified transportation corridors. Transportation corridors included roadways and railroads. While the County has underground pipelines also associated with the transportation of hazardous materials, mapping of these areas was unavailable. To evaluate the areas most vulnerable, a one mile buffer was applied to both sides of Highways 41, 49, 99, 145, and 152, as well as the Union Pacific and BNSF Railroads. The result is a two-mile buffer zone around each transportation corridor that is used for this analysis. The buffer distance was based on guidelines in the U.S. Department of Transportation’s Emergency Response Guidebook that suggest distances useful to protect people from vapors resulting from spills involving dangerous goods considered toxic if inhaled. The recommended buffer distance referred to in the guide as the “protective action distance” is the area surrounding the incident in which people are at risk of harmful exposure. For purposes of this plan, a buffer distance of one mile was used on either side of the transportation corridor. Actual buffer distances will vary depending on the nature and quantity of the release, whether the release occurred during the night or daytime, and prevailing weather conditions.

Figure 4-72 Madera County Planning Area – Hazardous Materials Routes and Buffer Zone



### *Values at Risk*

During a hazardous materials transportation spill, it is generally the people that are at risk to the effects of the spill. During a spill, buildings, property, and their values are at a lesser risk, thus this analysis is not included.

### *Population at Risk*

To determine the populations at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS to determine the residential population that resides within the two-mile buffer zone of the highway, railroad, and pipeline corridors. Using GIS, the buffered corridor was overlaid on the improved residential parcel data and results tabulated for the Planning Area, unincorporated County, and incorporated jurisdictions as found in Table 4-86. Those parcel centroids that intersect the buffered corridor were counted and multiplied by the 2010 Census Bureau average household factors for Madera County communities. According to this analysis, there is a total population of 78,237 in the buffered corridor. There are 30,038 people in the buffered corridor in the unincorporated County.

*Table 4-86 Madera County Planning Area – Jurisdictional Populations at Risk in Hazardous Materials Buffer Zones*

Jurisdiction	Residential Parcels	Population
City of Chowchilla	3,429	10,561
City of Madera	9,853	37,638
Unincorporated County	9,158	30,038
<b>Total</b>	<b>22,440</b>	<b>78,237</b>

Source: Cal Trans, Madera County GIS, US Census Bureau

\* Census Bureau 2010 average household sizes are: Chowchilla – 3.08, Madera – 3.82, Unincorporated County – 3.28

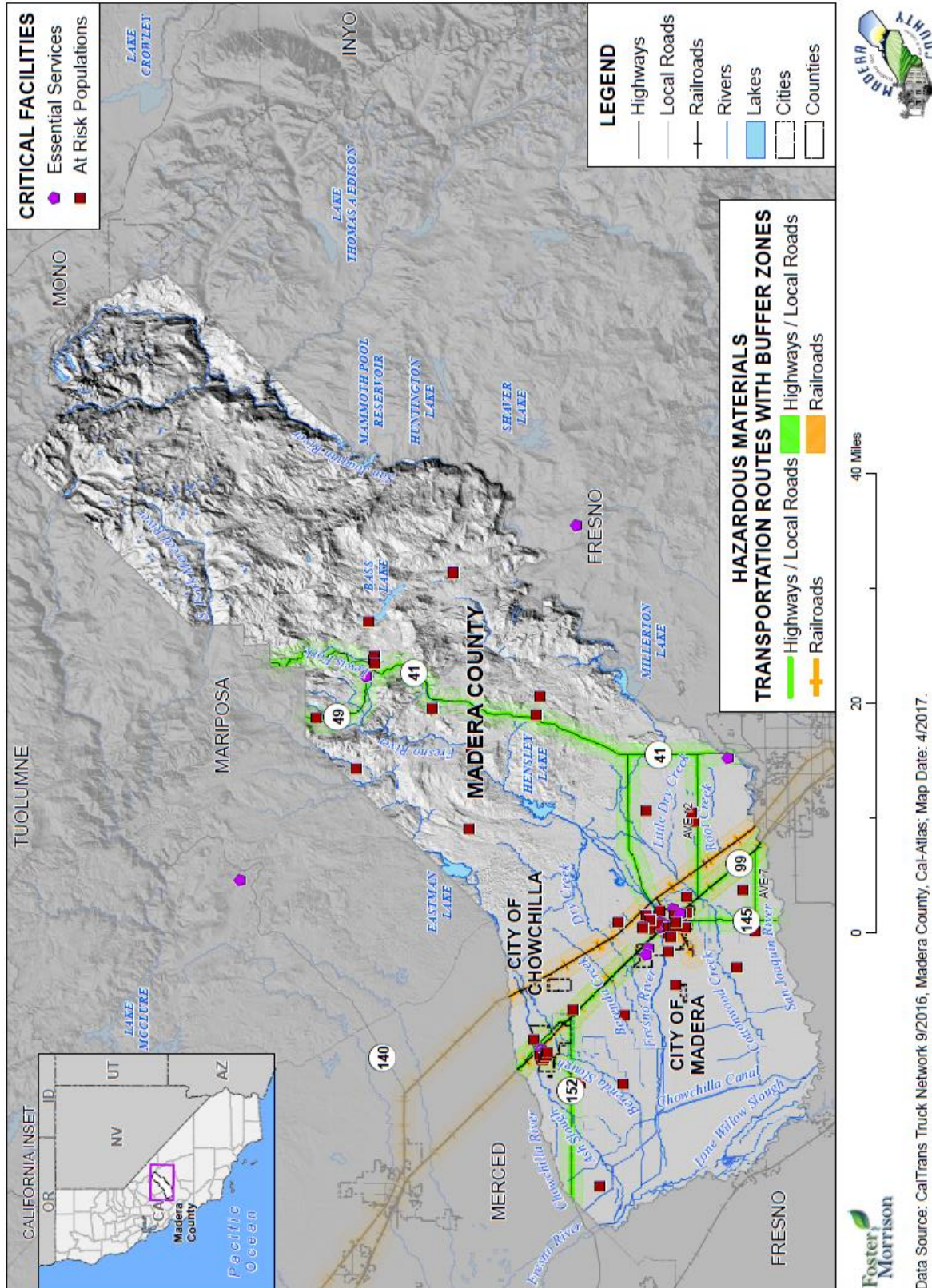
### *Historical, Cultural, and Natural Resources at Risk*

The Madera County Planning Area has significant cultural and natural resources located throughout the County as previously described. Vulnerability analysis of these resources was not possible due to data limitations.

### *Critical Facilities at Risk*

To determine the critical facilities at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS to determine the facilities located within the two-mile buffer zone of the highway and railroad corridors. Using GIS, the buffered corridor was overlaid on the Madera County critical facilities layer and results tabulated for the Planning Area, as shown on Figure 4-73 and detailed in Table 4-87. Table 4-88 shows only the critical facilities in the unincorporated County.

Figure 4-73 Madera County Planning Area – Critical Facilities in Hazardous Materials Buffer Zones



*Table 4-87 Madera County Planning Area – Critical Facilities in the Hazardous Materials Buffer Zones*

Transportation Routes /Critical Facility Category	Critical Facility Type	Critical Facility Count
<b>Avenue 7</b>		
At Risk Populations	School	1
<b>Avenue 7 Total</b>		<b>1</b>
<b>Avenue 12</b>		
At Risk Populations	School	3
<b>Avenue 12 Total</b>		<b>3</b>
<b>Highway 145</b>		
Essential Services	City Hall Admin Critical Infrastructure	1
	Community Services / Engineering and Infrastructure Services / IT Communications	1
	Critical Communications	1
	Medical Center	1
	Police Dispatch Communication Center	1
	<b>Total</b>	<b>5</b>
<b>At Risk Populations</b>	<b>School</b>	<b>13</b>
<b>Highway 145 Total</b>		<b>18</b>
<b>Highway 152</b>		
At Risk Populations	School	2
<b>Highway 152 Total</b>		<b>2</b>
<b>Highway 233</b>		
Essential Services	Central Switching Station / Communications	1
	Fire Station	1
	Public Safety Facility / 911 PSAP	1
	<b>Total</b>	<b>3</b>
At Risk Populations	Convalescent Hospital	2
	School	5
	<b>Total</b>	<b>7</b>
<b>Highway 233 Total</b>		<b>10</b>
<b>Highway 41</b>		
Essential Services	Medical Center	1
	Rural Emergency Operations	1

Transportation Routes /Critical Facility Category	Critical Facility Type	Critical Facility Count
	<b>Total</b>	<b>2</b>
At Risk Populations	School	5
	Total	5
<b>Highway 41 Total</b>		<b>7</b>
<b>Highway 49</b>		
At Risk Populations	School	2
<b>Highway 49 Total</b>		<b>2</b>
<b>Highway 99</b>		
Essential Services	Airport and Radio Tower	1
	Emergency Dispatch Center	1
	Fire Command Center	1
	<b>Total</b>	<b>3</b>
At Risk Populations	School	2
At Risk Populations Total	<b>Total</b>	<b>2</b>
<b>Highway 99 Total</b>		<b>5</b>
<b>BNSF Railway</b>		
Essential Services	Fire Command Center	1
	<b>Total</b>	<b>1</b>
At Risk Populations	School	3
	<b>Total</b>	<b>3</b>
<b>BNSF Railway Total</b>		<b>4</b>
<b>Union Pacific Railroad</b>		
Essential Services	Central Switching Station / Communications	1
	Fire Station	1
	Public Safety Facility / 911 PSAP	1
	Airport and Radio Tower	1
	City Hall Admin Critical Infrastructure	1
	Community Services / Engineering and Infrastructure Services / IT Communications	1
	Critical Communications	1
	Emergency Dispatch Center	1
	Medical Center	1
	Police Dispatch Communication Center	1
	<b>Total</b>	<b>10</b>



Transportation Routes /Critical Facility Category	Critical Facility Type	Critical Facility Count
At Risk Populations	Convalescent Hospital	2
	School	19
	<b>Total</b>	<b>21</b>
<b>Union Pacific Railroad Total</b>		<b>31</b>

Source: Madera County GIS

*Table 4-88 Unincorporated Madera County – Critical Facilities in the Hazardous Materials Buffer Zone*

Critical Facility Category	Critical Facility Type	Critical Facility Count
Essential Services	Medical Center	1
	Rural Emergency Operations	1
At Risk Populations	School	15
<b>Unincorporated County Total</b>		<b>17</b>

Source: Madera County GIS

### *Overall Community Impacts*

Impacts from hazardous materials vary by location and severity of any given event and will likely only affect certain areas of the County during specific times. Based on the risk assessment, it is evident that hazardous materials spills will continue to have potential economic impacts to certain areas of the County. However, many of the spill in the County are minor, localized events that are more of a nuisance than a disaster. Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;
- Commercial and residential structural and property damage;
- Disruption of and damage to public infrastructure and services;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community;
- Negative impact on commercial and residential property values; and
- Impact on the overall mental health of the community.

### *Future Development*

Development will continue to happen within hazardous materials transportation zones. Those who choose to develop in these areas should be made aware of the risks associated with living within close proximity to a hazardous materials transportation route.

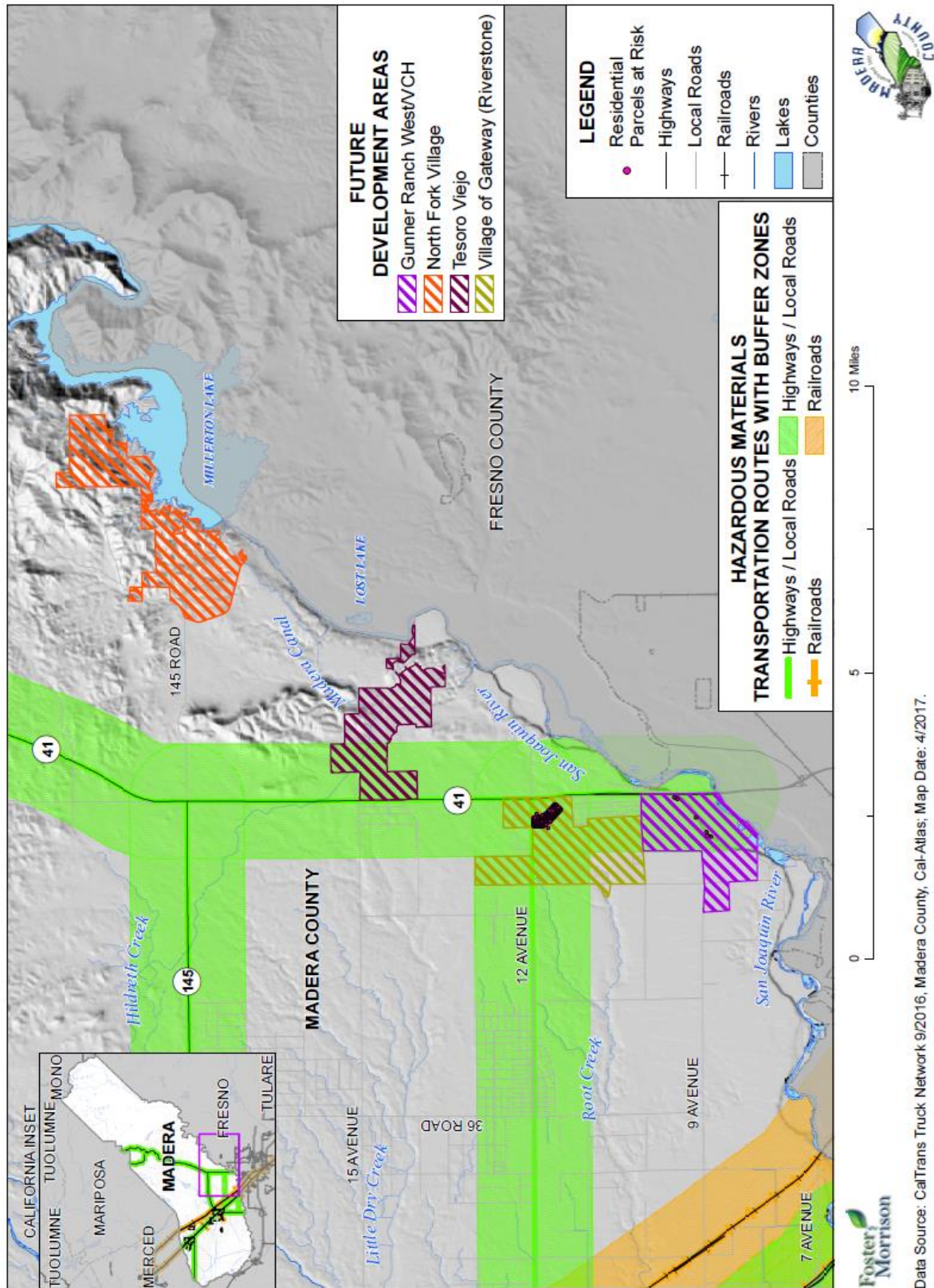
### *GIS Analysis*

To determine the future development areas falling within the buffer zones associated with a transportation-related hazardous materials release, an analysis was performed using GIS.. Madera County’s GIS parcel layer was used as the basis for the countywide inventory of parcels and acres values. In this analysis, the

parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point containing the assessor's data. In addition, Madera County provided a GIS spatial file identifying the 4 future development areas for which the analysis was to be performed. Utilizing the future development spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each future development area.

Table 4-89 shows the breakdown of the future development parcel counts in Madera County and their acreages in the hazardous materials buffer zone. Future development in the County is shown on Figure 4-74.

Figure 4-74 Unincorporated Madera County – Future Development and Hazardous Materials Buffer Zones



*Table 4-89 Unincorporated Madera County – Future Development and Hazardous Materials Buffer Zones*

Future Development Areas	Parcels	Acres	Hazardous Materials Transportation Routes
Gunner Ranch West/VCH	34	1,129	Avenue 41
North Fork Village	0	0	–
Tesoro Viejo	55	666	Avenue 41
Village of Gateway (Riverstone)	274	1,462	Avenue 12, Avenue 41
<b>Grand Total</b>	<b>363</b>	<b>3,258</b>	

Source: Cal Trans, Madera County GIS

### 4.3.11. Levee Failure Vulnerability Assessment

**Likelihood of Future Occurrence**—Occasional  
**Vulnerability**—Medium

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

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

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

There are numerous levee systems in Madera County. None of them are accredited by FEMA as providing protection against the 100-year flood. Due to this, no GIS analysis could be performed on leveed zones in the County. However, with both project and non-project levees present within the Planning Area, buildings and people living and working in areas protected by levees are vulnerable to the effects of failures.

Based on input from the HMPC, the following concerns were identified with respect to a potential failure of a levee within the County:

- Deferred maintenance has been the same problem over the years and has been the main problem as to why the levees have frequent failures.

## *Future Development*

Future development built in the levee zones is subject to being built to the standards in the Madera County Floodplain Ordinance.

### **4.3.12. Severe Weather: Extreme Cold and Freeze Vulnerability Assessment**

#### **Likelihood of Future Occurrence—Likely Vulnerability—Medium**

Extreme cold and freeze events happen in Madera County each year. Extreme cold often accompanies a winter storm or is left in its wake. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers leading to power outages. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures and ice can cause accidents and road closures and can cause significant damage to the agricultural industry. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Vulnerable populations to cold and freeze include:

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

Also of concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of extreme cold and freeze.

In addition to vulnerable populations, pets and livestock are at risk to freeze and cold. However, many residents of Madera County are self-sufficient and accustomed to rural living and the climate extremes that are part of the territory.

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

Other impacts to the County as a result of extreme cold and freeze include damage to infrastructure, frozen pipes, utility outages, road closures, traffic accidents, and interruption in business and school activities. Delays in emergency response services can be of significant concern.

## *Future Development*

Future development built to code should be able to withstand extreme cold and freeze. Pipes at risk of freezing should be mitigated by either burying or insulating them from freeze as new facilities are improved or added. Current County codes provide such provisions for new construction. Vulnerability to extreme cold will increase as the average age of the population in the County shifts. Greater numbers of future senior citizens will result from the large number of baby boomers in the Planning Area. However, as previously mentioned, many of the residents of Madera County are self-sufficient and accustomed to rural living.

### **4.3.13. Severe Weather: Extreme Heat Vulnerability Assessment**

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Medium

Extreme heat happens in Madera County each year. Limited data on temperature extreme impacts in the County was available during the development of this hazard's profile. Extreme heat normally does not impact structures as there may be a limited number of days where the temperatures stay high which gives the structure periodic relief between hot and cool temperature cycles. Areas prone to excessively high temperatures are identified normally on a nation-wide assessment scale, which doesn't allow detailed results on specific structures.

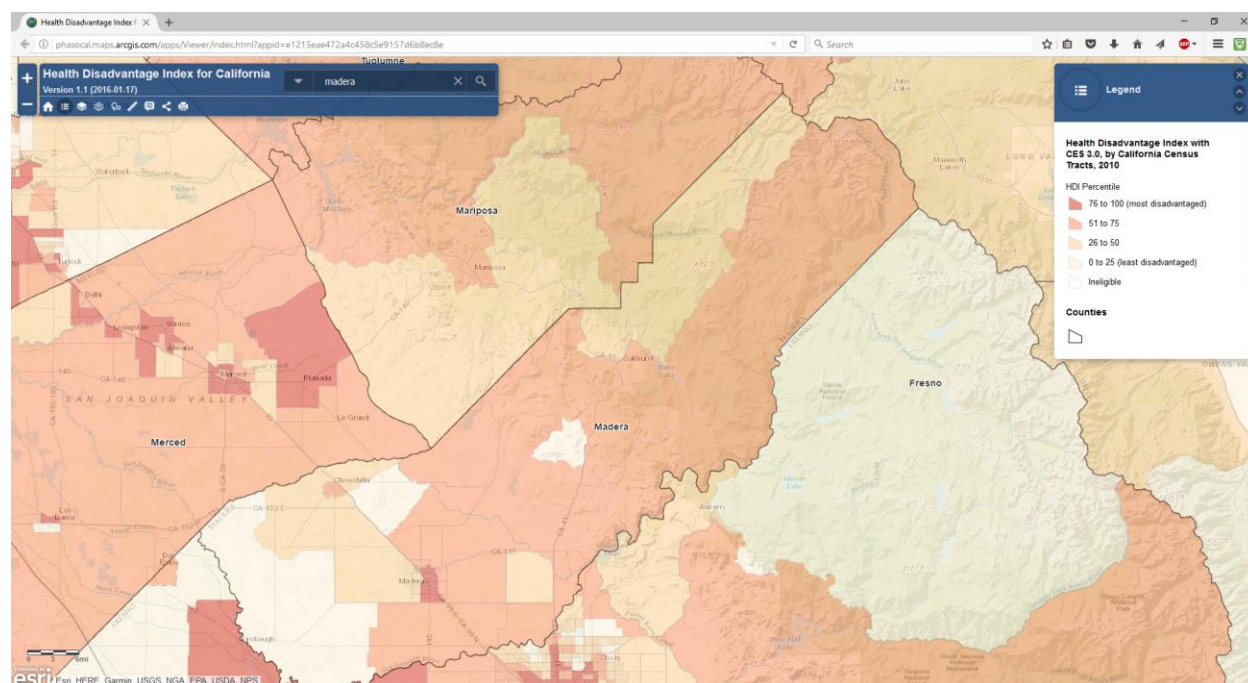
Recent research indicates that the impact of extreme temperatures, particularly on populations, has been historically under-represented. Extreme heat may overload demands for electricity to run air conditioners in homes and businesses during prolonged periods of exposure and presents health concerns to individuals outside in the temperatures. Extreme heat may also be a secondary effect of droughts, or may cause drought-like conditions in a temporary setting. For example, several weeks of extreme heat increases evapotranspiration and reduces moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist.

Vulnerable populations to extreme heat include:

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

The Public Health Alliance has developed a composite index to identify cumulative health disadvantage in California. Factors such as those bulleted above were combined to show what areas are at greater risk to hazards like extreme heat. This is shown on Figure 4-75.

*Figure 4-75 Health Disadvantage Index by California Census Tract*



Source: Public Health Alliance of Southern California

In addition to vulnerable populations, pets and livestock are at risk to extreme heat.

### *Future Development*

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

#### **4.3.14. Severe Weather: Heavy Rains and Storms Vulnerability Assessment**

**Likelihood of Future Occurrence—Highly Likely**

**Vulnerability—Medium**

According to historical hazard data, severe weather is an annual occurrence in Madera County. Heavy rains in the winter months fall as precipitation in the western County, while snowfall occurs at higher elevations (discussed in Section 4.3.16). Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and severe storms are the most frequent type of severe weather occurrences in the County. Wind and sometimes lightning accompany these storms and have caused damage in the past. However, actual damage associated with the primary effects of severe weather have been limited. It is the secondary hazards caused by weather, such as floods, fire, and agricultural losses that have had the greatest impact on the County. The risk and vulnerability associated with these secondary

hazards are discussed in other sections of this plan (Section 4.3.8 Flood: 100/500-year, Section 4.3.9 Flood: Localized Stormwater, and Section 4.3.4 Dam Failure).

### *Future Development*

New critical facilities should be built to withstand severe storm events, including hail damage, lightning, and thunderstorm winds. While minimal damages have occurred to critical facilities in the past due to lightning, hail, or high winds and tornadoes, there still remains future risk. With development occurring in the region, future losses to new development may occur.

#### **4.3.15. Severe Weather: Wind and Tornado**

**Likelihood of Future Occurrence—Likely**  
**Vulnerability—Medium**

The County is subject to potentially destructive straight-line winds as well as tornadoes. High winds are common throughout the area, and can happen during most times of the entire year. Straight line winds are primarily a public safety and economic concern. Windstorms and tornadoes can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered.

Future losses from straight line winds include:

- Erosion (soil loss)
- Dry land farming seed loss
- Windblown weeds
- Downed trees
- Power line impacts and economic losses from power outages
- Occasional building damage, primarily to roofs

While there has been some scattered record keeping describing the impacts of dust storms, there is little information to indicate that straight-line winds are little more than a nuisance that causes sporadic problems. For example, while winds can blow weeds that can create an additional expense for farmers, they often cause little long term damage and there is little justification for allocating resources to combat them. Though recordkeeping may be scattered, the HMPC noted that microbursts have caused problems in the County in the past. Damages to buildings, irrigation systems, and associated air quality issues from dust storms have all occurred in the past. During the recent drought, larger areas of dirt and dust became more susceptible to the effects of winds.

Campers, mobile homes, barns, and sheds and their occupants are particularly vulnerable as windstorm events in the region can be sufficient in magnitude to overturn these lighter structures. Livestock that may be contained in these structures may be injured or killed, causing economic harm to the rancher who owns both the structure and the livestock. Overhead power lines are vulnerable and account for the majority of historical damages. State highways can be vulnerable to high winds and dust storms, where high profile vehicles may be overturned by winds and lowered visibility can lead to multi-car accidents. Winds have caused downed trees that have fallen on homes and have blocked roadways.



## *Future Development*

Future development projects should consider windstorm hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Development trends in the County are not expected to increase vulnerability to the hazard.

### **4.3.16. Severe Weather: Winter Storms and Snow**

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Medium

Winter storms and snow events happen in Madera County each year. Heavy rains in the winter months fall as precipitation in the western County (discussed in Section 4.3.14), while snowfall occurs at higher elevations. Winter weather can occasionally be accompanied by high winds, which can cause downed trees and power lines, power outages, accidents, and road closures. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets to impacts of severe winter weather in the County. The ability for the County to continue to operate during periods of winter storm and snow is paramount. Vulnerable populations to winter storms and snow include:

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

However, many residents of Madera County are self-sufficient and accustomed to rural living and the climate extremes that are part of the territory. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of winter storm and heavy snows. The varying elevations in the County, in part, determine the extent to which a given area is affected by winter storms and snow.

Other impacts to the County as a result of winter snow storms include damage to infrastructure, frozen pipes, utility outages, road closures, traffic accidents, and interruption in business and school activities. Also of concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. Delays in emergency response services can be of significant concern. Further, there are economic impacts associated with areas prone to heavy snow. Although the eastern portion of the county is the most vulnerable to the effects of snow, snowfall occurring in the lower elevations can create significant issues, as residents working and living in those areas may not be as prepared for snowfall.

## *Future Development*

Future development built to code should be able to withstand snow loads from severe winter storms. Current County codes provide such provisions for new construction. Vulnerability to winter snow storms will

increase as the average age of the population in the County shifts. Greater numbers of future senior citizens will result from the large number of baby boomers in the Planning Area. However, as previously mentioned, many of the residents of Madera County are self-sufficient and accustomed to rural living.

#### 4.3.17. Wildfire Vulnerability Assessment

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Extremely High

Risk and vulnerability to the Madera County Planning Area from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. Even the more urbanized area of western Madera County is not immune from fire. During the May to October fire season, the dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the Planning Area, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

The wildfire hazard is the highest priority hazard in the County, and is the hazard with the greatest potential for catastrophic loss. Wildfires can cause short-term and long-term disruption to the County. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the County by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires may result in casualties and can destroy buildings and infrastructure.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. In some cases, the economic impact of this loss of services may be comparable to the economic impact of physical damages or, in some cases, even greater. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Fires can also cause major damage to power plants and power lines needed to distribute electricity to operate facilities.

#### *Madera County Communities at Risk to Wildfire*

The National Fire Plan is a cooperative, long-term effort between various government agency partners with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. For purposes of the National Fire Plan, the California Department of Forestry and Fire Protection (CAL FIRE) generated a list of California communities at risk for wildfire. The intent of this assessment was to evaluate the risk to a given area from fire escaping off federal lands. Three main factors were used to determine the wildfire threat in the wildland-urban interface areas of California: fuel hazards, probability of fire, and areas of suitable housing density that could create

wildland urban interface fire protection strategy situations. The preliminary criteria and methodology for evaluating wildfire risk to communities is published in the Federal Register, January 4, 2001. The National Fire Plan identifies 7 “Communities at Risk” in Madera County. These are shown in Table 4-90.

*Table 4-90 Madera County Communities at Risk to Wildfire*

Communities at Risk		
Ahwahnee	North Fork	Yosemite Lakes
Bass Lake	Oakhurst	
Cascadel Woods		

Source: CAL FIRE

### *Tree Mortality and Beetle Kill*

Drought can weaken trees, making them less resistant to bark beetles. These beetles attack trees weakened trees and can kill them. These trees then become fuel for wildfires. This is discussed in greater detail in Section 4.3.6.

On October 30, 2015, Governor Brown proclaimed a State of Emergency and included provisions to expedite the removal and disposal of dead and dying hazardous trees. As a result, costs related to identification, removal, and disposal of dead and dying trees caused from drought conditions may be eligible for California Disaster Assistance Act (CDAA) reimbursement.

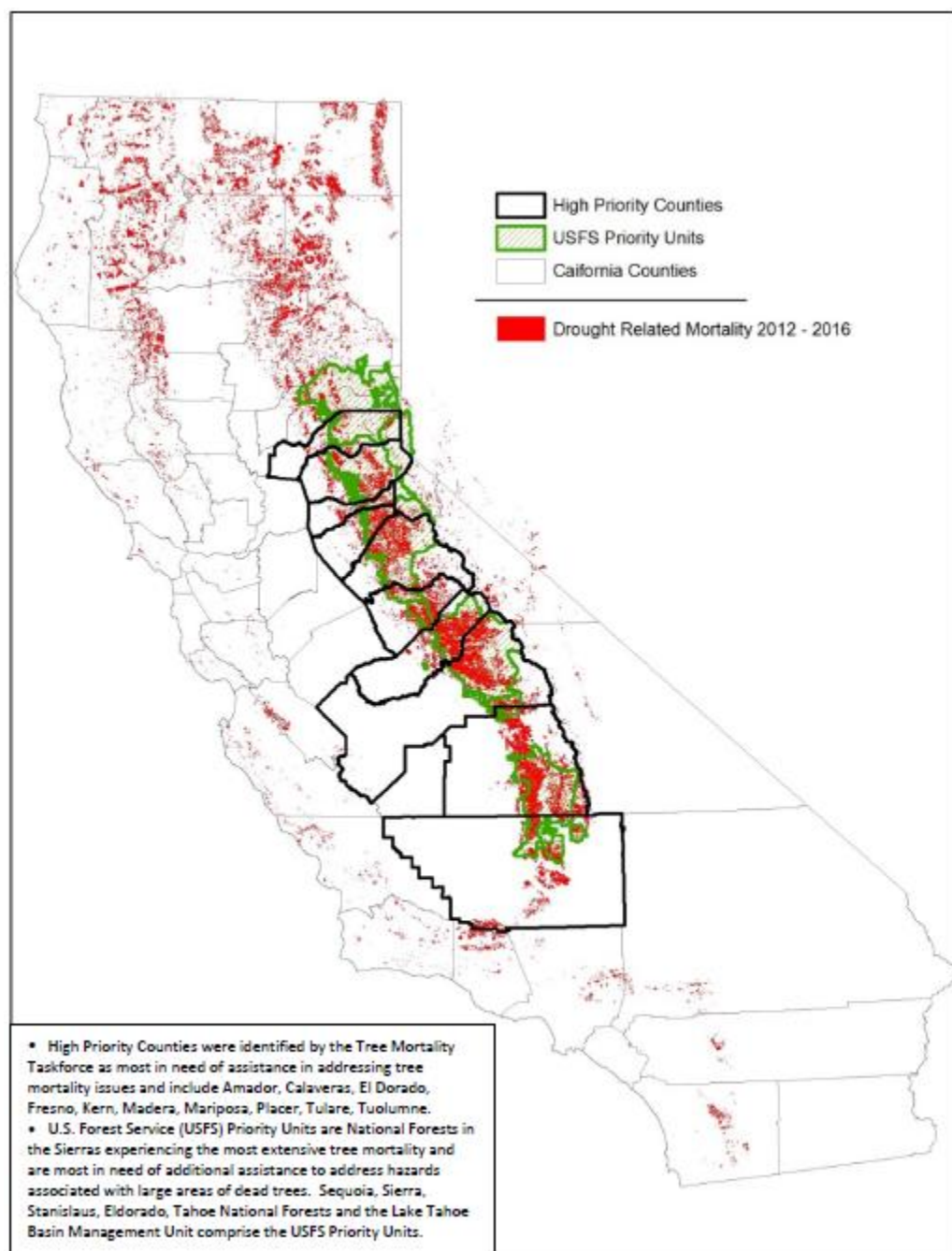
Between 2010 and late 2015, US Forest Service Aerial Detection Surveys found that 40 million trees had died across California – with nearly ¾ of that total succumbing to drought and insect mortality from September 2014 to October of 2015. Surveys completed during the 2016 season resulted in the detection of approximately 62 million additional trees. Many of these trees were in Madera or surround counties. As shown in Table 4-91, there are almost 11 million dead trees in Madera County. A map of areas affected is shown on Figure 4-76. It is estimated that 355,000 acres of dead trees exist in Madera County.

*Table 4-91 Madera County and Surrounding Areas – Dead Tree Counts 2010 to 2016*

County	Estimated Cumulative Number of Dead Trees High Priority Counties							
	Totals Rounded to the nearest 100							
	2010	2011	2012	2013	2014	2015	2016	All Years
Amador	7,000	2,000	600	2,000	17,000	79,000	682,000	789,600
Calaveras	8,000	2,000	2,000	4,000	144,000	237,000	1,875,000	2,272,000
El Dorado	53,000	19,000	5,000	11,000	47,000	200,000	1,359,000	1,694,000
Fresno	82,000	59,000	82,000	65,000	269,000	4,300,000	11,912,000	16,769,000
Kern	79,000	18,000	8,000	23,000	176,000	3,300,000	2,994,000	6,598,000
Madera	15,000	8,000	6,000	31,000	55,000	1,900,000	8,972,000	10,987,000
Mariposa	18,000	10,000	21,000	72,000	68,000	1,200,000	6,562,000	7,951,000
Placer	90,000	16,000	5,000	5,000	21,000	80,000	557,000	774,000
Tulare	234,000	46,000	57,000	67,000	272,000	6,800,000	12,957,000	20,433,000
Tuolumne	39,000	15,000	45,000	83,000	287,000	997,000	6,213,000	7,679,000
<b>Total</b>	<b>625,000</b>	<b>195,000</b>	<b>231,600</b>	<b>363,000</b>	<b>1,356,000</b>	<b>19,093,000</b>	<b>54,083,000</b>	<b>75,946,600</b>

Source: US Forest Service

Figure 4-76 Aerial Detection Survey Coverage – Tree Mortality



Source: US Forest Service

### *Wildfire (Smoke) and Air Quality*

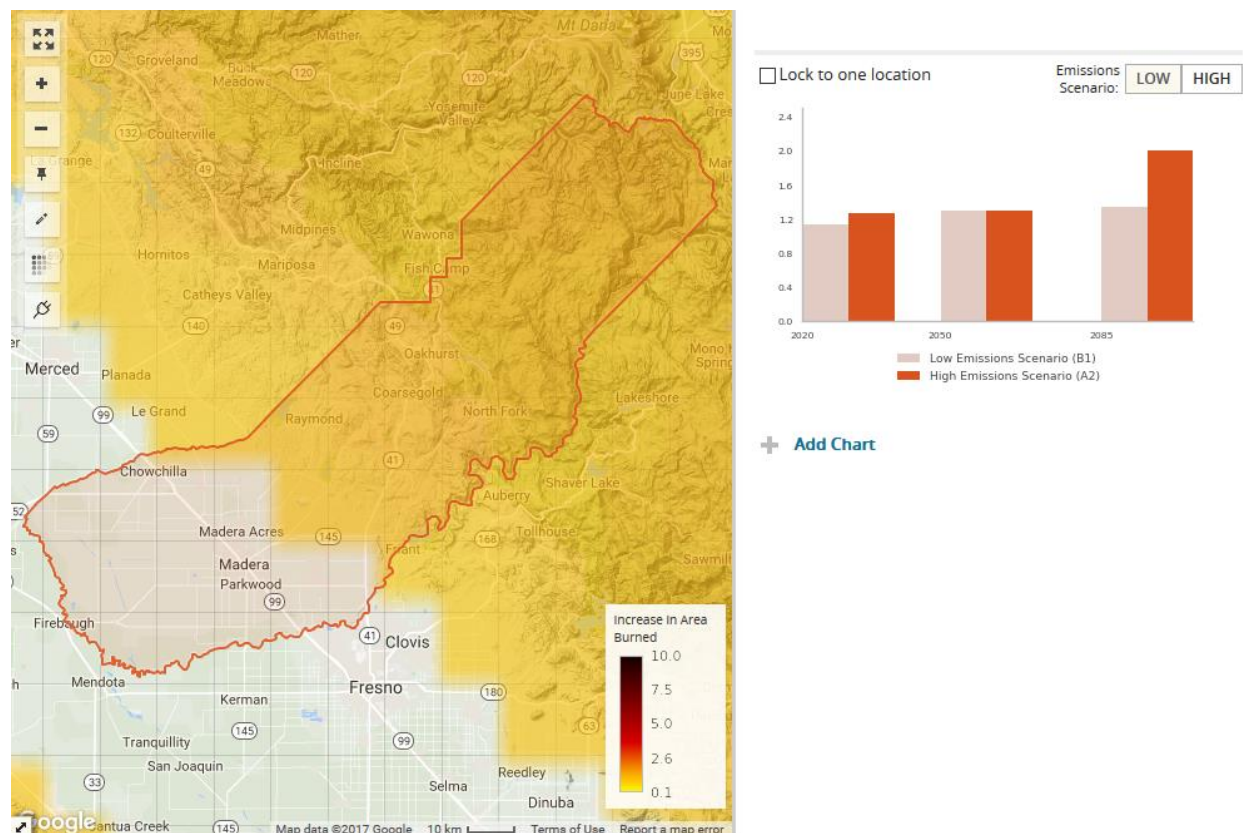
During many summer months in past years, Madera County residents have had to breathe wildfire smoke, from fires both within and outside of the County. Smoke from wildfires is made up of gas and particulate matter, which can be easily observed in the air. Wildfires have the potential to generate tremendous emissions, depending on the acreage burned, fuel loading, and fuel type. The length of time it takes for

these emissions to occur depends on the severity of the wildfire. In addition to causing elevated PM2.5 concentrations, wildfires also generate and transport ozone precursors. When wildfire emissions are combined with the Valley’s common summertime high temperatures and stagnant conditions, the potential for the production of peak ground level ozone is elevated. The summer of 2015 brought terrible wildfires along with severe smoke impacts to numerous locations in California. During the 2015 summer wildfire season, the San Joaquin Valley Air Pollution Control District issued eight health cautionary statements and press releases advising Valley residents to protect themselves from wildfire smoke. Staff also fielded 178 public calls and responded to 43 media inquiries regarding wildfire activity this year. Additionally, District staff worked closely with county health officials to communicate potential impacts to the public and actions to be taken to minimize exposure.

Air quality standards have been established to protect human health with the pollutant referred to as PM2.5 which consists of particles 2.5 microns or less in diameter. These smaller sizes of particles are responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract.

Cal-Adapt is an online tool put together by the California Energy Commission that downscales global climate models to the California level with projections for sea-level rise, drought, temperature increase, heat, and wildfire, from 2020 out to 2085. Figure 4-77 shows the 2020 wildfire projection for Madera County (while Figure 4-55 in Section 4.2.19 showed the 2085 projections). Air quality in these areas of the County would be lower due to wildfire if the scenario projected is accurate.

*Figure 4-77 2020 Wildfire Projections for Madera County*



Source: Cal-Adapt

## *Insurance in WUI Areas*

The HMPC noted that in the WUI areas, there has been increased difficulty in obtaining home insurance and the cost of insurance premiums. Madera County's ISO ratings are on the rise due to multiple factors. The County is seeing insurance rates rise approximately 30% in the WUI Areas due to the ISO Rating changes. This increases costs to those who live in the WUI. The County is taking action to mitigate the increased ISO Ratings. The County attempted a sales tax increase in 2017 but did not pass at the election. The County Board of Supervisors directed County Staff to look at other ideas to bring the ISO Rating down.

## *Wildfire Analysis*

Unincorporated Madera County and the incorporated communities have mapped CAL FIRE data which provides a variety of fire hazard information for California communities. Utilizing this data from CAL FIRE, GIS was used to determine the possible impacts of wildfire within Madera County and how the wildfire risk varies across the Planning Area. Two primary CAL FIRE datasets and associated analysis was used for this plan:

- Fire Responsibility Areas
- Fire Hazard Severity Zones

Each of the analyses that follow include a detailed methodology and the analysis results. For each of these analyses, results are provided in this Base Plan for two different areas: 1) Madera County Planning Area and 2) unincorporated Madera County, which includes North Fork Rancheria. Information specific to the incorporated communities are included in their respective annexes to this plan.

## **Fire Responsibility Area Analysis**

There are numerous wildland fire protection agencies that have responsibility within the county, including the US Forest Service (USFS), the Bureau of Land Management (BLM), and the CAL FIRE. There are also numerous fire departments and fire protection districts that serve local areas, many of whom have mutual aid agreements with each other as well as state and federal agencies for fire suppression and protection. Fire Responsibility areas are generally categorized by Federal Responsibility Areas (FRA), State Responsibility Areas (SRA) and Local Responsibility Areas (LRA). CAL FIRE has a legal responsibility to provide fire protection on all SRA lands, which are defined based on land ownership, population density and land use.

The CAL FIRE data, detailing Fire Responsibility Areas within the County Planning Area, was utilized to determine the locations, numbers, types, and values of land and structures falling within each Fire Responsibility Area. The following sections provide details on the methodology and results for this analysis.

## **Methodology**

CAL FIRE's State Responsibility Area layer was used in this analysis to show Madera County's values, inventory and population by FRA, SRA, and LRA. This dataset (SRA16\_2) represents SRA status as of

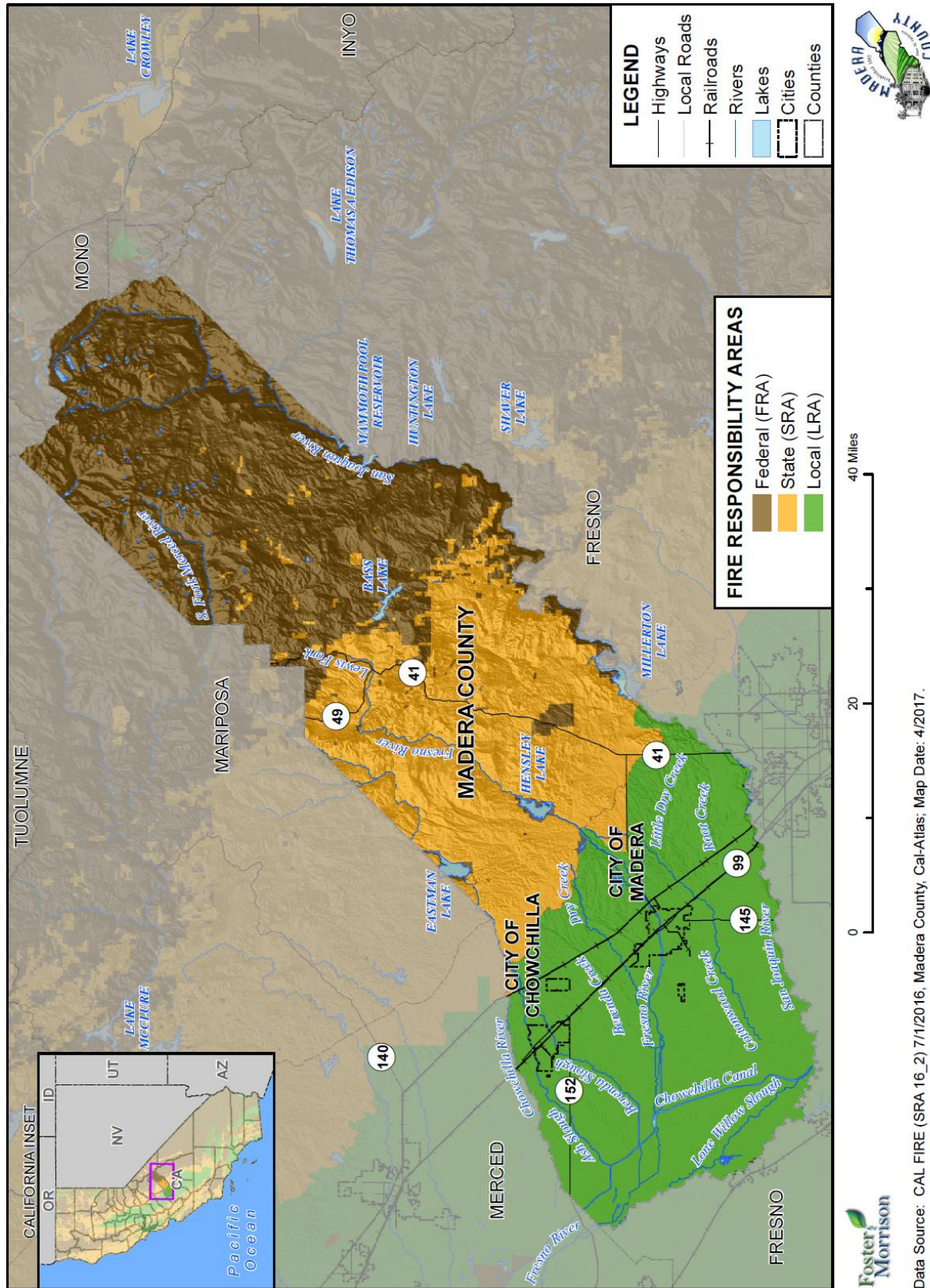
July 1, 2016. GIS analysis was performed using this dataset combined with the county parcel layer and April 2017 Assessor data.

The fire responsibility area layer was overlaid with the parcel data. Since it is possible for any given parcel to intersect with multiple fire responsibility areas, for purposes of this analysis, the parcel centroid was used to determine which fire responsibility area to assign to each parcel. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessor's database and the FIS parcel layer. Based on this approach, the fire responsibility areas for the Madera County Planning Area were determined and further broken out by jurisdiction and property use and included information on both land and improved values.

### **Fire Responsibility Area Analysis Results: Parcels and Values at Risk**

The FRA in the County encompasses a relatively small number of parcels although the area covers approximately 30% of the Madera County geographic area. The largest is the LRA, with almost 49 percent of the parcels in the unincorporated County falling in the LRA. The LRA falls within the local jurisdictions of Chowchilla and Madera. Locations of each responsibility area are shown in Figure 4-78. The FRA contains 740 parcels, of which only 17 are improved. The SRA contains 18,264 parcels, with nearly \$3.4 billion in total value. The LRA has 39,288 parcels with \$9.2 billion in total value. It should be noted that fire does not just affect structural values, fire can also affect land values. As such the Assessor's land values and all parcels were accounted for in this analysis to represent total county values at risk. However, it is highly unlikely the whole County will ever be on fire at once. The Fire Responsibility Areas for the entire Madera County Planning Area are illustrated in Figure 4-78, which summarizes total parcel counts, improved parcel counts land values, structure values, and total values by property use.

Figure 4-78 Madera County Planning Area Fire Responsibility Areas by FRA, SRA, LRA



Data Source: CAL FIRE (SRA 16\_2) 7/1/2016; Madera County, Cal-Atlas; Map Date: 4/2017.



*Table 4-92 Madera County Planning Area – Count and Values at Risk in Local, State, and Federal Responsibility Areas by Jurisdiction and Property Use with Contents Replacement Values*

Jurisdiction/Fire Responsibility Area / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Total Improved Value	Estimated Contents Value	Total Value
<b>City of Chowchilla</b>						
<b>Federal Responsibility Area</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>FRA Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>State Responsibility Area</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>SRA Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Local Responsibility Area</b>						
Agricultural	160	32	\$21,307,747	\$2,838,232	\$2,838,232	\$26,984,211
Commercial	289	171	\$37,032,351	\$70,599,111	\$70,599,111	\$178,230,573
Government	51	3	\$4,373,606	\$314,641	\$314,641	\$5,002,888
Industrial	35	24	\$6,847,747	\$40,455,124	\$60,682,686	\$107,985,557
Institutional	53	27	\$777,254	\$5,298,665	\$5,298,665	\$11,374,584
Residential	4,079	3,501	\$149,032,667	\$397,792,211	\$198,896,106	\$745,720,984
Utilities	296	1	\$34,943	\$5,655	\$5,655	\$46,253
Unknown	17	1	\$300,883	\$10,000	\$10,000	\$320,883
<b>LRA Total</b>	<b>4,980</b>	<b>3,760</b>	<b>\$219,707,198</b>	<b>\$517,313,639</b>	<b>\$338,645,096</b>	<b>\$1,075,665,933</b>
<b>City of Madera</b>						
<b>Federal Responsibility Area</b>						

Jurisdiction/Fire Responsibility Area / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Total Improved Value	Estimated Contents Value	Total Value
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>FRA Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>State Responsibility Area</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>SRA Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Local Responsibility Area</b>						
Agricultural	54	21	\$15,599,646	\$1,375,375	\$1,375,375	\$18,350,396
Commercial	1,011	756	\$149,776,558	\$380,288,618	\$380,288,618	\$910,353,794
Government	140	7	\$7,902,235	\$1,206,773	\$1,206,773	\$10,315,781
Industrial	238	108	\$29,036,522	\$105,604,507	\$158,406,761	\$293,047,790
Institutional	84	63	\$3,348,429	\$23,439,765	\$23,439,765	\$50,227,959
Residential	14,218	13,165	\$533,242,661	\$1,471,380,915	\$735,690,458	\$2,740,314,034
Utilities	233	4	\$447,563	\$305,052	\$305,052	\$1,057,667
Unknown	73	8	\$5,921,938	\$5,795,090	\$5,795,090	\$17,512,118
<b>LRA Total</b>	<b>16,051</b>	<b>14,132</b>	<b>\$745,275,552</b>	<b>\$1,989,396,095</b>	<b>\$1,306,507,891</b>	<b>\$4,041,179,538</b>
<b>Unincorporated County</b>						
<b>Federal Responsibility Area</b>						
Agricultural	14	1	\$902,247	\$11,907	\$11,907	\$926,061
Commercial	6	4	\$2,167,797	\$280,925,281	\$280,925,281	\$564,018,359
Government	645	0	\$521,417	\$0	\$0	\$521,417
Industrial	1	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0

Jurisdiction/Fire Responsibility Area / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Total Improved Value	Estimated Contents Value	Total Value
Residential	32	12	\$1,078,549	\$953,219	\$476,610	\$2,508,378
Utilities	2	0	\$15,590	\$0	\$0	\$15,590
Unknown	40	0	\$1,957	\$0	\$0	\$1,957
<b>FRA Total</b>	<b>740</b>	<b>17</b>	<b>\$4,687,557</b>	<b>\$281,890,407</b>	<b>\$281,413,798</b>	<b>\$567,991,762</b>
<b>State Responsibility Area</b>						
Agricultural	2,866	1,130	\$214,052,714	\$173,133,298	\$173,133,298	\$560,319,310
Commercial	618	454	\$107,076,027	\$177,791,886	\$177,791,886	\$462,659,799
Government	79	5	\$407,011	\$196,288	\$196,288	\$799,587
Industrial	79	60	\$6,324,238	\$9,668,690	\$14,503,035	\$30,495,963
Institutional	86	48	\$15,374,145	\$30,017,282	\$30,017,282	\$75,408,709
Residential	14,093	11,478	\$981,291,021	\$1,630,895,550	\$815,447,775	\$3,427,634,346
Utilities	328	54	\$1,309,349	\$5,553,054	\$5,553,054	\$12,415,457
Unknown	115	15	\$1,966,513	\$2,425,195	\$2,425,195	\$6,816,903
<b>SRA Total</b>	<b>18,264</b>	<b>13,244</b>	<b>\$1,327,801,018</b>	<b>\$2,029,681,243</b>	<b>\$1,219,067,813</b>	<b>\$4,576,550,074</b>
<b>Local Responsibility Area</b>						
Agricultural	5,424	4,767	\$1,354,445,323	\$1,867,084,214	\$1,867,084,214	\$5,088,613,751
Commercial	494	261	\$76,790,929	\$412,361,478	\$412,361,478	\$901,513,885
Government	219	10	\$19,441,252	\$2,202,466	\$2,202,466	\$23,846,184
Industrial	166	79	\$32,594,767	\$152,301,737	\$228,452,606	\$413,349,110
Institutional	78	43	\$3,179,050	\$12,127,551	\$12,127,551	\$27,434,152
Residential	11,447	9,642	\$494,873,253	\$1,249,902,707	\$624,951,354	\$2,369,727,314
Utilities	91	12	\$1,232,249	\$655,665	\$655,665	\$2,543,579
Unknown	338	36	\$13,167,329	\$8,941,636	\$8,941,636	\$31,050,601
<b>LRA Total</b>	<b>18,257</b>	<b>14,850</b>	<b>\$1,995,724,152</b>	<b>\$3,705,577,454</b>	<b>\$3,156,776,969</b>	<b>\$8,858,078,575</b>

Source: CAL FIRE, Madera County April 2017 Parcel/Assessor's Data

\*Land and structure values

## Fire Hazard Severity Zone Analysis

As part of the Fire and Resource Assessment Program (FRAP), CAL FIRE was mandated to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), then define the application of various mitigation strategies to reduce risk associated with wildland fires.

Fire hazard is a way to measure the physical fire behavior so that people can predict the damage a fire is likely to cause. Fire hazard measurement includes the speed at which a wildfire moves, the amount of heat the fire produces, and most importantly, the burning fire brands that the fire sends ahead of the flaming front.

The fire hazard model developed by CAL FIRE considers the wildland fuels. Fuel is that part of the natural vegetation that burns during the wildfire. The model also considers topography, especially the steepness of the slopes. Fires burn faster as they burn up-slope. Weather (temperature, humidity, and wind) has a significant influence on fire behavior. The model recognizes that some areas of California have more frequent and severe wildfires than other areas. Finally, the model considers the production of burning fire brands (embers) how far they move, and how receptive the landing site is to new fires.

In 2007, CAL FIRE updated its Fire Hazard Severity Zone (FHSZ) maps for the State of California to provide updated map zones, based on new data, science, and technology that will create more accurate zone designations such that mitigation strategies are implemented in areas where hazards warrant these investments. The zones will provide specific designation for application of defensible space and building standards consistent with known mechanisms of fire risk to people, property, and natural resources. The program is still ongoing with fire hazard severity zone maps being updated based on designated responsibility areas: FRA, SRA, and LRA.

The CAL FIRE data, detailing FHSZs within the County Planning Area, was utilized to determine the locations, numbers, types, and values of land and structures falling within each FHSZ. The following sections provide details on the methodology and results for this analysis.

## Methodology

As previously described, CAL FIRE mapped the SRA Fire Hazard Severity Zones (FHSZs), or areas of significant fire hazard, based on fuels, terrain, weather, and other relevant factors. Zones are designated with Very High, High, Moderate, Non-Wildland/Non-Urban and Urban Unzoned hazard classes. The combination of the Adopted SRA FHSZ (fhszs06\_3\_20) dated November 2007 and the “Draft” FHSZ (c20fhszl06\_1) dated September 2007 layer was used to get a complete coverage of Fire Hazards.

Analysis was performed using these two FHSZ datasets, and using GIS, the parcel layer was overlaid on the Adopted and Draft FHSZ layers. Since it is possible for any given parcel to intersect with multiple FHSZs for purposes of this analysis, the parcel centroid was used to determine which FHSZ to assign to each parcel. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessor’s database and the FIS parcel layer. Based on this approach, the FHSZs for the Madera County Planning Area were determined and further broken out by jurisdiction and property use and included information on both land and improved values.

## Fire Hazard Severity Zones Analysis Results: Values at Risk

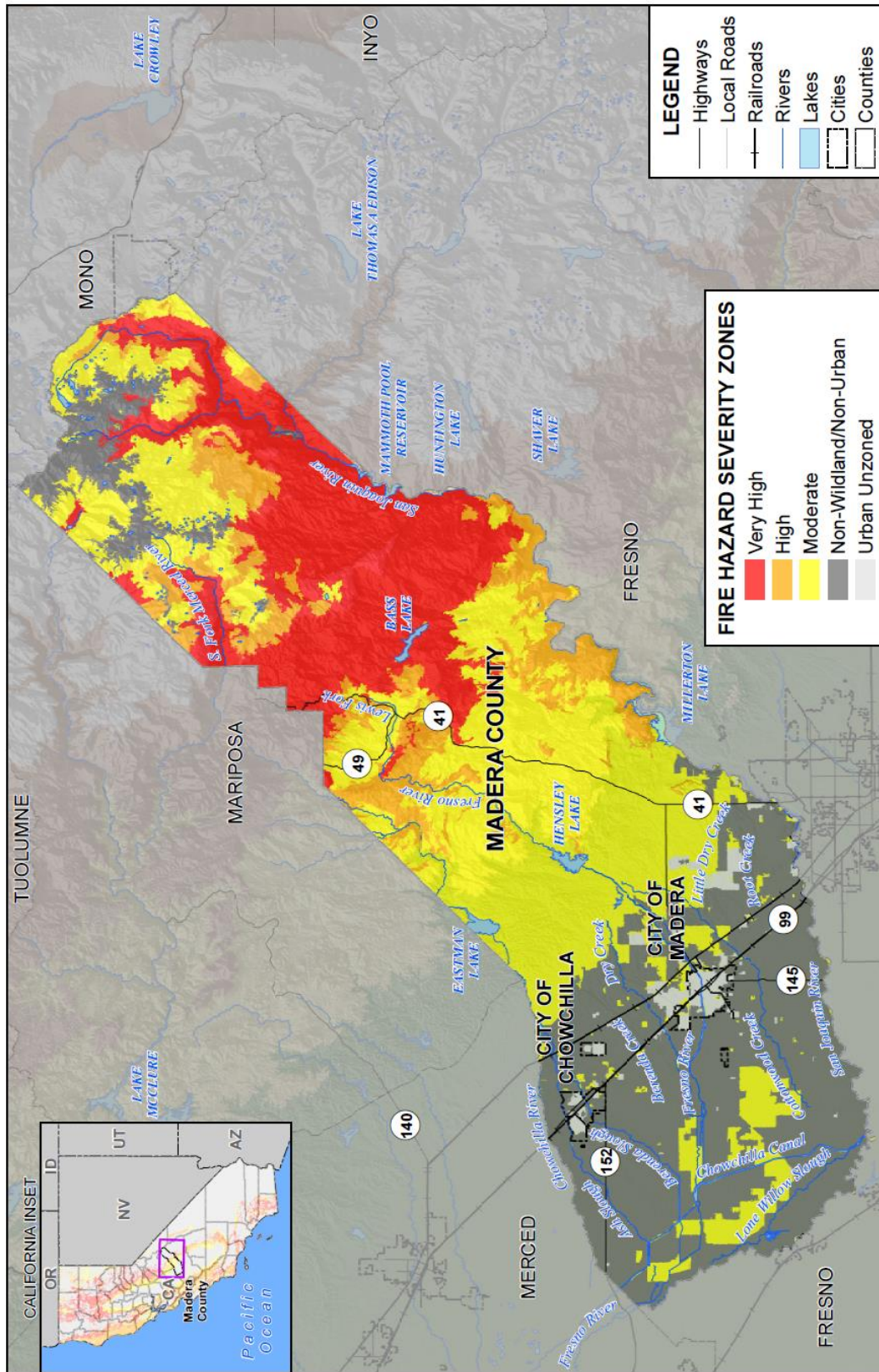
Results are presented in this section for the Madera County Planning Area and the unincorporated County. Detail tables for the two incorporated communities are included in their respective annexes to this plan. North Fork Rancheria data is included within the counts for the unincorporated County.

### *Madera County Planning Area*

The Fire Hazard Severity Zones are shown in Figure 4-79. Analysis results for the entire Madera County Planning Area are summarized in Table 4-93, which summarizes by jurisdiction total parcel counts, improved parcel counts, and their improved and land values and the estimated contents replacement values

based on the CRV factors detailed in Table 4-45, as well as the percentage of parcels affected by each fire hazard severity zone.

Figure 4-79 Madera County Planning Area – Fire Hazard Severity Zones



Foster Morrison

Data Source: CAL FIRE (Adopted SRA 11/2007 - fhsz06\_3\_20 and Draft 9/2007 - c20fhsz06\_1), Madera County, Cal-Atlas, Map Date: 4/2017.

*Table 4-93 Madera County Planning Area – Count and Value of Parcels in Fire Hazard Severity Zones by Jurisdiction with Content Replacement Values*

Fire Hazard Severity Zone / Jurisdiction	Total Parcel Count	Total Land Value	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value*
<b>Very High</b>						
City of Chowchilla	0	\$0	0	\$0	\$0	\$0
City of Madera	0	\$0	0	\$0	\$0	\$0
Unincorporated County	4,162	\$366,764,768	3,018	\$442,566,701	\$239,695,107	\$1,049,026,576
<b>Very High Total</b>	<b>4,162</b>	<b>\$366,764,768</b>	<b>3,018</b>	<b>\$442,566,701</b>	<b>\$239,695,107</b>	<b>\$1,049,026,576</b>
<b>High</b>						
City of Chowchilla	0	\$0	0	\$0	\$0	\$0
City of Madera	0	\$0	0	\$0	\$0	\$0
Unincorporated County	2,615	\$173,676,050	1,604	\$244,733,547	\$143,884,225	\$562,293,822
<b>High Total</b>	<b>2,615</b>	<b>\$173,676,050</b>	<b>1,604</b>	<b>\$244,733,547</b>	<b>\$143,884,225</b>	<b>\$562,293,822</b>
<b>Moderate</b>						
City of Chowchilla	38	\$1,776,624	32	\$3,997,678	\$2,057,674	\$7,831,976
City of Madera	656	\$32,274,927	537	\$80,288,708	\$51,027,959	\$163,591,594
Unincorporated County	15,312	\$1,010,711,125	10,729	\$1,949,525,589	\$1,327,237,058	\$4,287,473,772
<b>Moderate Total</b>	<b>16,006</b>	<b>\$1,044,762,676</b>	<b>11,298</b>	<b>\$2,033,811,975</b>	<b>\$1,380,322,690</b>	<b>\$4,458,897,341</b>
<b>Non-Wildland/Non-Urban</b>						
City of Chowchilla	1,062	\$68,536,287	436	\$93,596,807	\$57,313,611	\$219,446,705
City of Madera	2,180	\$125,855,690	1,672	\$244,487,953	\$137,911,906	\$508,255,549
Unincorporated County	6,905	\$1,396,108,173	5,450	\$1,967,141,241	\$1,915,958,720	\$5,279,208,134
<b>Non-Wildland/Non-Urban Total</b>	<b>10,147</b>	<b>\$1,590,500,150</b>	<b>7,558</b>	<b>\$2,305,226,001</b>	<b>\$2,111,184,237</b>	<b>\$6,006,910,388</b>
<b>Urban Unzoned</b>						
City of Chowchilla	3,880	\$149,394,287	3,292	\$419,719,154	\$279,273,811	\$848,387,252
City of Madera	13,215	\$587,144,935	11,923	\$1,664,619,434	\$1,117,568,027	\$3,369,332,396
Unincorporated County	8,267	\$380,952,611	7,310	\$1,413,182,026	\$1,030,483,471	\$2,824,618,108

Fire Hazard Severity Zone / Jurisdiction	Total Parcel Count	Total Land Value	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value*
Urban Unzoned Total	25,362	\$1,117,491,833	22,525	\$3,497,520,614	\$2,427,325,309	\$7,042,337,756
<b>Grand Total</b>	<b>58,292</b>	<b>\$4,293,195,477</b>	<b>46,003</b>	<b>\$8,523,858,838</b>	<b>\$6,302,411,566</b>	<b>\$19,119,465,881</b>

Source: CAL FIRE, Madera County April 2017 Parcel/Assessor's Data

### *Unincorporated Madera County*

Table 4-94 breaks out the details of FHSZ by property use for the unincorporated County, and includes the estimated contents replacement values based on the CRV factors detailed in Table 4-45 in Section 4.3.1. As shown in the table, the County has substantial values at risk. \$1.049 billion falls in the very high, \$562 million falls in the high, and \$4.287 billion falls in the moderate fire severity zone.

*Table 4-94 Unincorporated Madera County – Count and Value of Parcels by Property Use and Fire Hazard Severity Zone with Content Replacement Values*

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Total Land Value	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value
<b>Very High</b>						
Agricultural	129	\$9,939,182	34	\$4,031,059	\$4,031,059	\$18,001,300
Commercial	131	\$16,057,447	109	\$21,865,918	\$21,865,918	\$59,789,283
Government	417	\$409,644	1	\$112,115	\$112,115	\$633,874
Industrial	49	\$1,761,004	43	\$2,517,990	\$3,776,985	\$8,055,979
Institutional	14	\$2,300,900	7	\$4,408,872	\$4,408,872	\$11,118,644
Residential	3,342	\$335,140,040	2,809	\$408,261,179	\$204,130,590	\$947,531,809
Utilities	49	\$510,877	11	\$676,190	\$676,190	\$1,863,257
Unknown	31	\$645,674	4	\$693,378	\$693,378	\$2,032,430
<b>Very High Total</b>	<b>4,162</b>	<b>\$366,764,768</b>	<b>3,018</b>	<b>\$442,566,701</b>	<b>\$239,695,107</b>	<b>\$1,049,026,576</b>
<b>High</b>						
Agricultural	544	\$30,716,026	169	\$19,186,660	\$19,186,660	\$69,089,346
Commercial	98	\$16,240,503	75	\$20,410,739	\$20,410,739	\$57,061,981
Government	123	\$337,977	0	\$0	\$0	\$337,977
Industrial	3	\$80,180	1	\$113,420	\$170,130	\$363,730
Institutional	4	\$447,199	4	\$2,404,865	\$2,404,865	\$5,256,929
Residential	1,803	\$125,563,449	1,349	\$201,812,065	\$100,906,033	\$428,281,547
Utilities	18	\$40,900	4	\$656,970	\$656,970	\$1,354,840
Unknown	22	\$249,816	2	\$148,828	\$148,828	\$547,472



Fire Hazard Severity Zone / Property Use	Total Parcel Count	Total Land Value	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value
<b>High Total</b>	<b>2,615</b>	<b>\$173,676,050</b>	<b>1,604</b>	<b>\$244,733,547</b>	<b>\$143,884,225</b>	<b>\$562,293,822</b>
<b>Moderate</b>						
Agricultural	2,620	\$268,794,046	1,105	\$230,988,994	\$230,988,994	\$730,772,034
Commercial	452	\$86,372,337	300	\$424,869,312	\$424,869,312	\$936,110,961
Government	206	\$5,104,604	6	\$138,195	\$138,195	\$5,380,994
Industrial	100	\$6,851,121	25	\$8,828,999	\$13,243,499	\$28,923,619
Institutional	84	\$12,929,656	44	\$24,162,175	\$24,162,175	\$61,254,006
Residential	11,452	\$626,841,656	9,194	\$1,253,406,061	\$626,703,031	\$2,506,950,748
Utilities	265	\$892,550	41	\$4,252,137	\$4,252,137	\$9,396,824
Unknown	133	\$2,925,155	14	\$2,879,716	\$2,879,716	\$8,684,587
<b>Moderate Total</b>	<b>15,312</b>	<b>\$1,010,711,125</b>	<b>10,729</b>	<b>\$1,949,525,589</b>	<b>\$1,327,237,058</b>	<b>\$4,287,473,772</b>
<b>Non-Wildland/Non-Urban</b>						
Agricultural	4,938	\$1,251,596,990	4,529	\$1,774,837,527	\$1,774,837,527	\$4,801,272,044
Commercial	203	\$32,851,011	69	\$18,911,846	\$18,911,846	\$70,674,703
Government	166	\$11,533,178	6	\$734,596	\$734,596	\$13,002,370
Industrial	38	\$13,916,183	20	\$29,584,172	\$44,376,258	\$87,876,613
Institutional	28	\$1,615,560	15	\$3,668,683	\$3,668,683	\$8,952,926
Residential	1,196	\$73,043,989	779	\$131,949,215	\$65,974,608	\$270,967,812
Utilities	60	\$615,730	6	\$152,325	\$152,325	\$920,380
Unknown	276	\$10,935,532	26	\$7,302,877	\$7,302,877	\$25,541,286
<b>Non-Wildland/Non-Urban Total</b>	<b>6,905</b>	<b>\$1,396,108,173</b>	<b>5,450</b>	<b>\$1,967,141,241</b>	<b>\$1,915,958,720</b>	<b>\$5,279,208,134</b>
<b>Urban Unzoned</b>						
Agricultural	73	\$8,354,040	61	\$11,185,179	\$11,185,179	\$30,724,398
Commercial	234	\$34,513,455	166	\$385,020,830	\$385,020,830	\$804,555,115
Government	31	\$2,984,277	2	\$1,413,848	\$1,413,848	\$5,811,973
Industrial	56	\$16,310,517	50	\$120,925,846	\$181,388,769	\$318,625,132
Institutional	34	\$1,259,880	21	\$7,500,238	\$7,500,238	\$16,260,356
Residential	7,779	\$316,653,689	7,001	\$886,322,956	\$443,161,478	\$1,646,138,123
Utilities	29	\$497,131	4	\$471,097	\$471,097	\$1,439,325
Unknown	31	\$379,622	5	\$342,032	\$342,032	\$1,063,686
<b>Urban Unzoned Total</b>	<b>8,267</b>	<b>\$380,952,611</b>	<b>7,310</b>	<b>\$1,413,182,026</b>	<b>\$1,030,483,471</b>	<b>\$2,824,618,108</b>
<b>Grand Total</b>						
<b>Grand Total</b>	<b>37,261</b>	<b>\$3,328,212,727</b>	<b>28,111</b>	<b>\$6,017,149,104</b>	<b>\$4,657,258,580</b>	<b>\$14,002,620,411</b>

Source: CAL FIRE, Madera County April 2017 Parcel/Assessor's Data

**Population at Risk**

A separate analysis was performed to determine population in fire hazard severity zones. Using GIS, the CAL FIRE fire hazard severity zones datasets were overlaid on the improved residential parcel data. Those parcel centroids that intersect each fire severity zone were counted and multiplied by the Census Bureau average household size for each jurisdiction and the unincorporated County); results were tabulated by jurisdiction and fire severity zone (see Table 4-95). According to this analysis, there is a population of 43,795 in the moderate or higher fire hazard severity zone categories in the unincorporated County.

**Table 4-95 Madera County Planning Area – Population at Risk in Moderate or Higher Fire Hazard Severity Zone**

	City of Chowchilla		City of Madera		Unincorporated County	
	Imp. Res. Parcels	Population	Imp. Res. Parcels	Population	Imp. Res. Parcels	Population
Very High	0	0	0	0	2,809	9,214
High	0	0	0	0	1,349	4,425
Moderate	30	92	517	1,975	9,194	30,156
<b>Total</b>	<b>30</b>	<b>92</b>	<b>517</b>	<b>1,975</b>	<b>13,352</b>	<b>43,795</b>

Source: CAL FIRE, US Census Bureau, Madera County 2016/2017 Assessor/Parcel Data  
 \*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone  
 \*\* Census Bureau 2010 average household sizes are: Chowchilla – 3.08, Madera – 3.82, Unincorporated County – 3.28

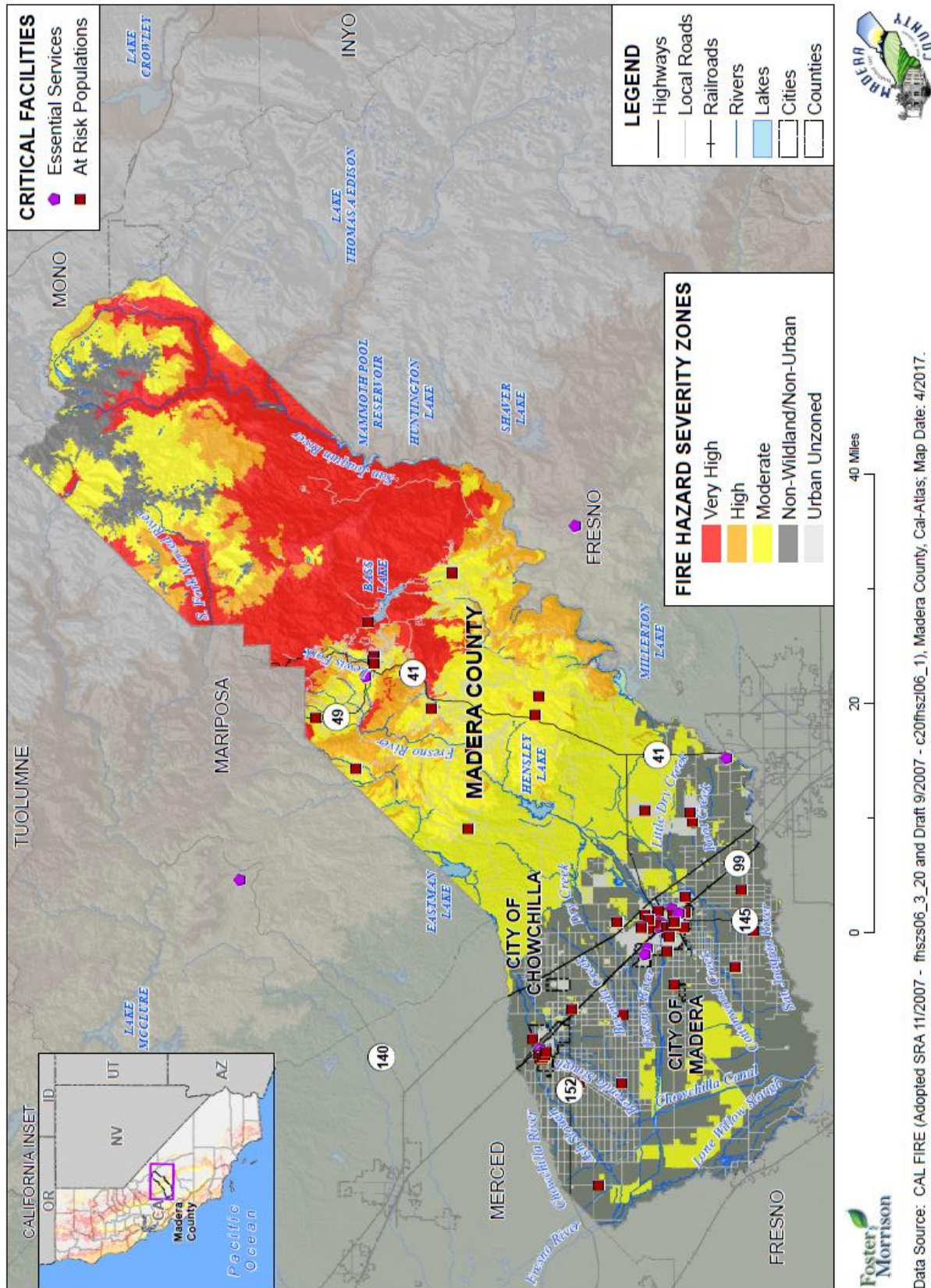
**Historical, Cultural, and Natural Resources at Risk**

Madera County has substantial historical, cultural and natural resources located throughout the County as previously described. In addition, there are other natural resources at risk when wildland-urban interface fires occur. One is the watershed and ecosystem losses that occur from wildland fires. This includes impacts to water supplies and water quality as well as air quality. Another is the aesthetic value of the area. Major fires that result in visible damage detract from that value. Other assets at risk include wildland recreation areas, wildlife and habitat areas, and rangeland resources. The loss to these natural resources can be significant.

**Critical Facilities at Risk**

Wildfire analysis was performed on the critical facility inventory in Madera County and all jurisdictions. GIS was used to determine whether the facility locations intersect a fire hazard severity zone provided by CAL FIRE, and if so, which zone it intersects. This is shown on Figure 4-80. There is 1 critical facility in the Planning Area in the very high fire, none in the high fire severity zone, and 18 facilities in the moderate fire severity zone, as shown in Table 4-96. There no critical facilities in the very high or high fire severity zone, and 18 facilities in the moderate fire severity zone, as shown in Table 4-97. Details of critical facility definition, type, name, address, and jurisdiction by fire severity zone are listed in Appendix F.

Figure 4-80 Madera County Planning Area – Critical Facilities in Fire Hazard Severity Zones



Data Source: CAL FIRE (Adopted SRA 11/2007 - fhsz06\_3\_20 and Draft 9/2007 - c20fhsz06\_1), Madera County, Cal-Atlas; Map Date: 4/2017.

*Table 4-96 Madera County Planning Area – Critical Facilities in Fire Hazard Severity Zones*

Critical Facility Category / Fire Hazard Severity Zone	Critical Facility Type	Critical Facility Count
<b>Moderate</b>		
Essential Services	Rural Emergency Operations	1
At Risk Populations	School	17
<b>Moderate Total</b>		<b>18</b>
<b>Non-Wildland/Non-Urban</b>		
At Risk Populations	School	13
Essential Services	Emergency Dispatch Center	1
<b>Non-Wildland/Non-Urban Total</b>		<b>14</b>
<b>Urban Unzoned</b>		
Essential Services	Airport and Radio Tower	1
	Central Switching Station / Communications	1
	City Hall Admin Critical Infrastructure	1
	Community Services / Engineering and Infrastructure Services / IT Communications	1
	Critical Communications	1
	Fire Command Center	1
	Fire Station	1
	Medical Center	2
	Police Dispatch Communication Center	1
	Public Safety Facility / 911 PSAP	1
	<b>Total</b>	<b>11</b>
At Risk Populations	Convalescent Hospital	2
	School	20
	<b>Total</b>	<b>22</b>
<b>Urban Unzoned Total</b>		<b>33</b>
<b>Adjacent Counties</b>		
<b>Very High</b>		
Essential Services	Telecommunications Infrastructure	1
<b>Very High Total</b>		<b>1</b>
<b>Moderate</b>		
Essential Services	Fire Command Center / Dispatch Center	1
<b>Moderate Total</b>		<b>1</b>

Critical Facility Category / Fire Hazard Severity Zone	Critical Facility Type	Critical Facility Count
<b>Adjacent Counties Total</b>		<b>2</b>

Source: Madera County GIS

*Table 4-97 Unincorporated Madera County – Critical Facilities in Fire Hazard Severity Zones*

Critical Facility Category / Fire Hazard Severity Zone	Critical Facility Type	Critical Facility Count
<b>Very High</b>		
At Risk Populations	School	1
<b>Very High Total</b>		<b>1</b>
<b>Moderate</b>		
Essential Services	Rural Emergency Operations	1
At Risk Populations	School	17
<b>Moderate Total</b>		<b>18</b>
<b>Non-Wildland/Non-Urban</b>		
At Risk Populations	School	9
<b>Non-Wildland/Non-Urban Total</b>		<b>9</b>
<b>Urban Unzoned</b>		
Essential Services	Medical Center	1
At Risk Populations	School	4
<b>Urban Unzoned Total</b>		<b>5</b>

Source: Madera County GIS

### *Overall Community Impact*

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

- Injury and loss of life;
- Commercial and residential structural and property damage;
- Decreased water quality in area watersheds;
- Increase in post-fire hazards such as flooding, sedimentation, and mudslides;
- Damage to natural resource habitats and other resources, such as timber and rangeland;
- Loss of water, power, roads, phones, and transportation, which could impact, strand, and/or impair mobility for emergency responders and/or area residents;
- Economic losses (jobs, sales, tax revenue) associated with loss of commercial structures;
- Negative impact on commercial and residential property values;
- Loss of churches, which could severely impact the social fabric of the community;
- Loss of schools, which could severely impact the entire school system and disrupt families and teachers, as temporary facilities and relocations would likely be needed; and
- Impact on the overall mental health of the community.

## *Future Development*

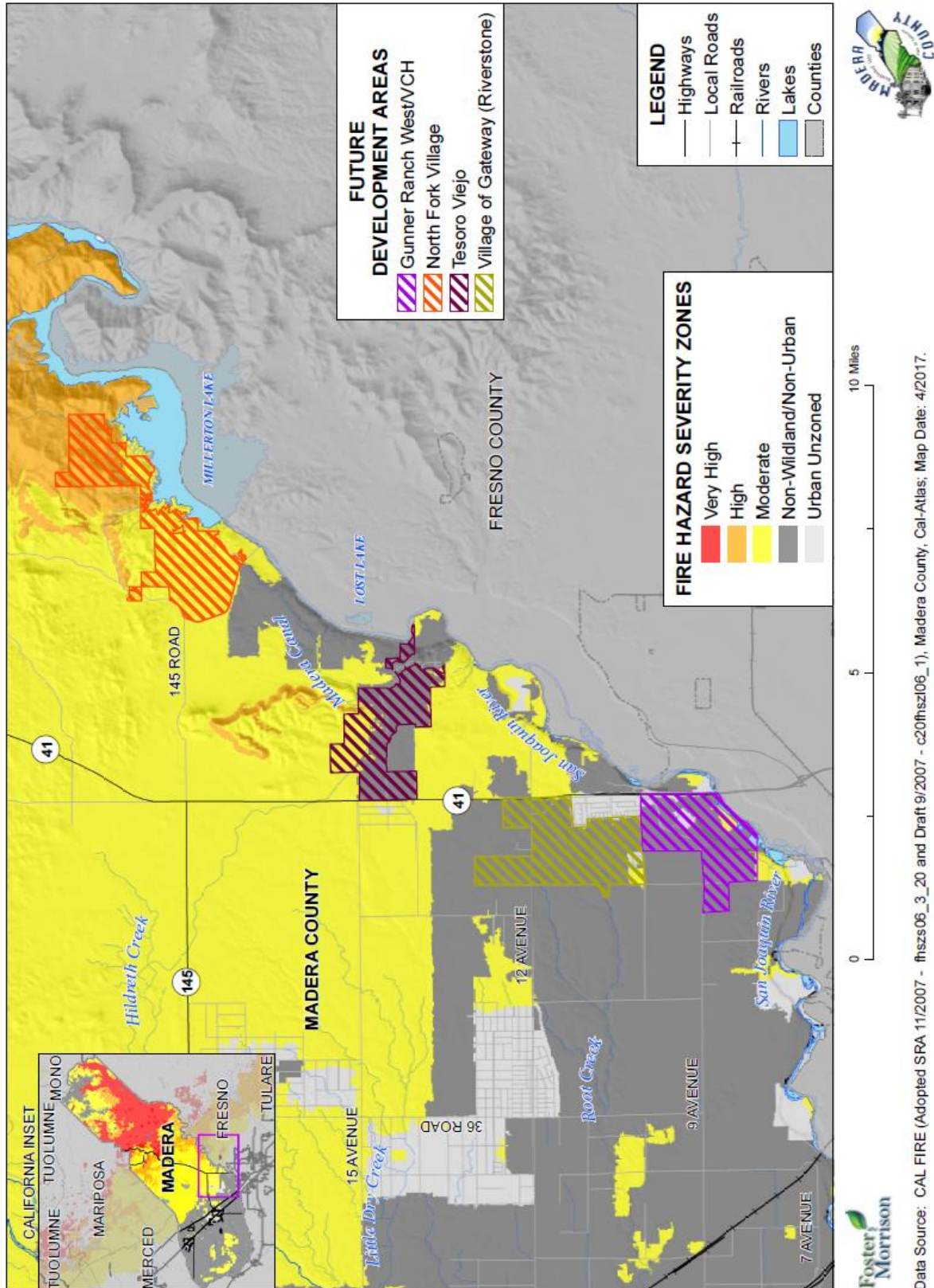
Population growth and development in Madera County has recently slowed. However, additional growth and development within the WUI and other fire prone areas of the County would place additional assets at risk to wildfire.

## **GIS Analysis**

Madera County's GIS parcel layer was used as the basis for the countywide inventory of parcels and acres values. In this analysis, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point containing the assessor's data. In addition, Madera County provided a GIS spatial file identifying the 4 future development areas for which the analysis was to be performed. Utilizing the future development spatial layer, the parcel centroid data was intersected to determine the parcel counts and approximate acreage totals within each development. CAL FIRE Fire Hazard Severity Zone data was used to perform the analysis.

Table 4-85 shows the breakdown of the future development parcel counts in Madera County and their acreages. Future development in the County by Fire Hazard Severity Zone is shown on Figure 4-70.

Figure 4-81 Unincorporated Madera County – Future Development and Fire Hazard Severity Zones



Data Source: CAL FIRE (Adopted SRA 11/2007 - fhsz06\_3\_20 and Draft 9/2007 - c20fhsz06\_1), Madera County, Cal-Atlas; Map Date: 4/2017.

*Table 4-98 Unincorporated Madera County – Future Development and Fire Hazard Severity Zones*

<b>Future Development Areas</b>	<b>Parcels</b>	<b>Acres</b>	<b>Fire Hazard Severity Zones</b>
Gunner Ranch West/VCH	38	1,589	Moderate, Non-Wildland/Non-Urban, Urban Unzoned
North Fork Village	31	2,369	High, Moderate
Tesoro Viejo	169	1,699	Moderate, Non-Wildland/Non-Urban
Village of Gateway (Riverstone)	294	2,009	Moderate, Non-Wildland/Non-Urban, Urban Unzoned
<b>Grand Total</b>	<b>532</b>	<b>7,666</b>	

Source: CAL FIRE; Madera County GIS



## 4.4 Capability Assessment

Thus far, the planning process has identified the natural hazards posing a threat to the Planning Area and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County’s net vulnerability to disasters, and more accurately focuses the goals, objectives, and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of matrixes. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This section presents the County’s mitigation capabilities and discusses select state and federal mitigation capabilities that are applicable to the County.

Similar to the HMPC’s effort to describe hazards, risks, and vulnerability of the County, this mitigation capability assessment describes the County’s existing capabilities, programs, and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This assessment is divided into four sections: regulatory mitigation capabilities are discussed in Section 4.4.1; administrative and technical mitigation capabilities are discussed in Section 4.4.2; fiscal mitigation capabilities are discussed in Section 4.4.3; and mitigation education, outreach, and partnerships are discussed in Section 4.4.4. A discussion of other mitigation efforts follows in Section 4.4.5.

### 4.4.1. Madera County’s Regulatory Mitigation Capabilities

Table 4-99 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, and indicates those that are in place in the County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

*Table 4-99 Madera County Regulatory Mitigation Capabilities*

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy?
		Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan	Y 1995	
Capital Improvements Plan	Y 2007	2017 Update is in progress.
Economic Development Plan		

Local Emergency Operations Plan	Y 2010	Needs to be updated.
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	In planning process
Engineering Studies for Streams	N	In planning process
Community Wildfire Protection Plan	Y 2008	Needs to be updated.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	2015 CAL FIRE Fire Plan
<b>Building Code, Permitting, and Inspections</b>	<b>Y/N</b>	<b>Are codes adequately enforced?</b>
Building Code	Y	Version/Year: 2016 California Building Code
Building Code Effectiveness Grading Schedule (BCEGS) Score		Score:
Fire department ISO rating:	Y	Rating: It fluctuates between 7 and 10 in the High Fire Areas
Site plan review requirements	Y	Site Plan and Elevations are reviewed by all departments
<b>Property Use Planning and Ordinances</b>	<b>Y/N</b>	<b>Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?</b>
Zoning ordinance	Yes	By designated specific areas for Industry it aid control and reduces hazards
Subdivision ordinance	Yes	The subdivision ordinance requires an CEQA environmental review
Floodplain ordinance	Y	Madera County utilizes the FEMA Floodplain maps and has adopted an ordinance.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	In process in 2017.
Flood insurance rate maps	Yes	
Elevation Certificates	Yes	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		

As indicated in the tables above, Madera County has several plans and programs that guide the County's mitigation of development of hazard-prone areas. Starting with the Madera County General Plan, which is the most comprehensive of the County's plans when it comes to mitigation, some of these are described in more detail below.

## *Madera County General Plan (1995)*

A general plan is a legal document, required by state law, that serves as a community's "constitution" for land use and development. The plan must be a comprehensive, long-term document, detailing proposals for the "physical development of the county or city, and of any land outside its boundaries which in the planning agency's judgment bears relation to its planning" (Government Code §65300 et seq.). Time horizons vary, but the typical general plan looks 10 to 20 years into the future. The law specifically requires that the general plan address seven topics or "elements." These are land use, circulation (transportation), housing, conservation, open space, noise, and safety. The plan must analyze issues of importance to the community, set forth policies in text and diagrams for conservation and development, and outline specific programs for implementing these policies.

Goals and policies related to mitigation from the General Plan are the following:

### Public Facilities and Services Element

<b>Goal 3.C</b>	<b>To ensure the availability of an adequate and safe water supply and the maintenance of high quality water in water bodies and aquifers used as sources of domestic and agricultural water supply.</b>
Policy 3.C.1.	The County shall approve new development only if an adequate water supply to serve such development is demonstrated.
Policy 3.C.2.	The County shall approve new development based on the following guidelines for water supply: <ul style="list-style-type: none"> <li>a. Urban and suburban development should rely on community water systems</li> <li>b. Rural communities should rely on community water systems. Individual wells may be permitted in cases where no community water system exists or can be extended to the property but development will be limited to densities which can be safely developed with wells.</li> <li>c. Agricultural areas should rely on public water systems where available, otherwise individual water wells are acceptable.</li> </ul>
Policy 3.C.3.	The County shall limit development in areas identified as having severe water table depression to uses that do not have high water usage or to uses served by a surface water supply.
Policy 3.C.4.	The County shall require that water supplies serving new development meet state water quality standards
Policy 3.C.5.	The County shall require that new development adjacent to bodies of water used as domestic water sources adequately mitigate potential water quality impacts on these water bodies.
Policy 3.C.6.	The County shall promote efficient water use and reduced water demand by: <ul style="list-style-type: none"> <li>a. Requiring water-conserving design and equipment in new construction;</li> <li>b. Encouraging water-conserving landscaping and other conservation measures;</li> <li>c. Encouraging retrofitting existing development with water-conserving devices; and</li> <li>d. Encouraging use of recycled or grey water for landscaping</li> </ul>
Policy 3.C.7.	The County shall promote the use of reclaimed wastewater to offset the demand for new water supplies.
Policy 3.C.8.	The County shall support opportunities for groundwater users in problem areas to convert to surface water supplies.
Policy 3.C.9.	The County shall promote the use of surface water for agricultural use to reduce groundwater table reductions.
Policy 3.C.10.	The County shall implement policies and procedures stated in the County adopted "AB3030 Groundwater Management Plan" for the Chowchilla, Delta-Mendota, and Madera Basins.

<b>Goal 3.C</b>	<b>To ensure the availability of an adequate and safe water supply and the maintenance of high quality water in water bodies and aquifers used as sources of domestic and agricultural water supply.</b>
Policy 3.C.11.	The County shall encourage water conservation by farmers. To this end, the County support efforts to provide information on irrigation practices through the Agricultural Commissioner and U. C. Cooperative Extension. The County shall also support conservation efforts of the California Farm Bureau, U. S. Soil Conservation Service, resource conservation districts, and irrigation districts.
Policy 3.C.12.	The County shall support programs for the agricultural re-use of reclaimed water.
Policy 3.C.13.	The County shall work with local irrigation districts to preserve local water rights. The County shall oppose public and private sales of water rights to users outside Madera County.

<b>Goal 3.E</b>	<b>To provide efficient, cost-effective, and environmentally-sound storm drainage and flood control facilities.</b>
Policy 3.E.1	The County shall provide for expansion and development of storm drainage systems to meet the needs of existing and planned development.
Policy 3.E.2	The County shall require new development to pay its fair share of the costs of Madera County storm drainage and flood control improvements.
Policy 3.E.3	The County shall encourage project designs that minimize drainage concentrations and impervious coverage and maintain, to the extent feasible, natural site drainage conditions.
Policy 3.E.4	The County shall preserve creeks and rivers, as feasible, to maintain existing floodplain capacity. The County shall continue to require a drainage permit for any project that would potentially alter a watercourse.
Policy 3.E.5	Future drainage system discharges shall comply with applicable State and Federal pollutant discharge requirements.
Policy 3.E.6	The County shall encourage the use of natural stormwater drainage systems to preserve and enhance natural features.
Policy 3.E.7	The County shall consider recreational opportunities and aesthetics in the design of stormwater ponds and conveyance facilities.

<b>Goal 3.G</b>	<b>To ensure the prompt and efficient provision of law enforcement, fire, and emergency medical facility and service needs.</b>
Policy 3.G.1	The County shall ensure the provision of effective law enforcement, fire, and emergency medical services to unincorporated areas.
Policy 3.G.2	The County shall reserve adequate sites for sheriff, fire, and emergency medical facilities in unincorporated locations in Madera County.
Policy 3.G.3	The County shall require new development to pay its fair share of the costs for providing law enforcement, fire, and emergency medical facilities, subject to the requirements of California Government Code Section 66000 et seq.
Policy 3.G.4	The County shall require that new development is designed to maximize safety and security and minimize fire hazard risks to life and property.
Policy 3.G.5	The County shall limit development to very low densities in areas where emergency response times will average more than 20 minutes.

<b>Goal 3.H</b>	<b>To protect residents of and visitors to Madera County from injury and loss of life and to protect property and watershed resources from fires.</b>
Policy 3.H.1	The County shall encourage local fire protection agencies in Madera County to maintain the following as minimum fire protection standards (expressed as Insurance Service Organization (ISO) ratings): <ul style="list-style-type: none"> <li>a. ISO 4 in urban areas</li> <li>b. ISO 6 in suburban areas</li> <li>c. ISO 8 in rural areas</li> </ul>
Policy 3.H.2	The County shall encourage local fire protection agencies in the county to maintain the following as minimum standards (expressed as average first alarm response times to emergency calls): <ul style="list-style-type: none"> <li>a. 10 minutes in urban areas</li> <li>b. 15 minutes in suburban areas</li> <li>c. 20 minutes in rural areas</li> </ul>
Policy 3.H.3	The County shall require that new fire stations be located to achieve a service level capability consistent with existing and planned land uses.
Policy 3.H.4	The County shall require new development to develop or fund fire protection facilities that, at a minimum, maintain the above service level standards.
Policy 3.H.5	The County shall ensure that all proposed developments are reviewed for compliance with fire safety standards by responsible local fire agencies per the Uniform Fire Code and other state and local ordinances.
Policy 3.H.6	The County shall work with local fire protection agencies to eliminate structurally unsafe and fire-hazardous housing structures that are beyond repair or rehabilitation.
Policy 3.H.7	The County shall encourage local fire protection agencies to provide and maintain advanced levels of emergency medical services (EMS) to the public.

## Historical and Cultural Resources Element

<b>Goal 4.D</b>	<b>To identify, protect, and enhance Madera County's important historical, archaeological, paleontological, and cultural sites and their contributing environment.</b>
Policy 4.D.1	The County shall solicit the views of the local Native American community in cases where development may result in disturbance to sites containing evidence of Native American activity and/or to sites of cultural importance.
Policy4.D.2	The County shall coordinate with the cities and advisory councils in the county to promote the preservation and maintenance of Madera County's paleontological, archaeological, and historical resources.
Policy4.D.3	The County shall require that discretionary development projects identify and protect from damage, destruction, and abuse, important historical, archaeological, paleontological, and cultural sites and their contributing environment.
Policy4.D.4	The County shall, within its power, maintain confidentiality regarding the locations of archaeological sites in order to preserve and protect these resources from vandalism and the unauthorized removal of artifacts. If significant archaeological and cultural resources are open to the public, the County shall control public access to prevent damage or vandalism.
Policy 4.D.5	The County shall provide for the placement of historical markers or signs on adjacent county roadways and major thoroughfares to attract and inform visitors of important historic resource sites.
Policy 4.D.6	The County shall encourage the preservation of the original architectural character of significant historic structures and districts. To this end, the County shall use the State Historic Building Code.
Policy 4.D.7	The County will use existing legislation and propose local legislation for the identification and protection of cultural resources and their contributing environment.

<b>Goal 4.D</b>	<b>To identify, protect, and enhance Madera County's important historical, archaeological, paleontological, and cultural sites and their contributing environment.</b>
Policy 4.D.8	The County shall support the registration of cultural resources in appropriate landmark designations (i.e., National Register of Historic Places, California Historical Landmarks, Points of Historical Interest, or Local Landmark). The County shall assist private citizens seeking these designations for their property.

## Agricultural and Natural Resources

<b>Goal 5.C</b>	<b>To protect and enhance the natural qualities of Madera County's streams, creeks and groundwater.</b>
Policy 5.C.1	The County shall protect preserve areas with groundwater recharge capabilities and minimize placement of potential sources of pollution in such areas.
Policy 5.C.2	The County shall minimize sedimentation and erosion through control of grading, cutting of trees, removal of vegetation, placement of roads and bridges, and use of off-road vehicles. The County shall discourage grading activities during the rainy season, unless adequately mitigated, to avoid sedimentation of creeks and damage to riparian habitat.
Policy 5.C.3	The County shall require new development of facilities near rivers, creeks, reservoirs, or substantial groundwater recharge areas to mitigate any potential impacts of release of pollutants in flood waters, flowing river, stream, creek, or reservoir waters.
Policy 5.C.4	The County shall require the use of feasible and practical best management practices (BMPs) to protect streams from the adverse effects of construction activities, and shall encourage that storm drainage systems use BMPs.
Policy 5.C.5	The County shall approve only wastewater disposal facilities that will not contaminate groundwater or surface water.
Policy 5.C.6	The County shall require that natural watercourses are integrated into new development in such a way that they are accessible to the public and provide a positive visual element.
Policy 5.C.8	The County shall protect groundwater resources from contamination and further overdraft by encouraging water conservation efforts and supporting the use of surface water for urban and agricultural uses wherever feasible.
Policy 5.C.9	The County shall support the policies of the San Joaquin River Parkway Plan to protect the San Joaquin River as an aquatic habitat and a water source.

<b>Goal 5.D</b>	<b>To protect wetland communities and related riparian areas throughout Madera County as valuable resources.</b>
Policy 5.D.1	The County shall comply with the wetlands policies of the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife. Coordination with these agencies at all levels of project review shall continue to ensure that appropriate mitigation measures and the concerns of these agencies are adequately addressed.
Policy 5.D.2	The County shall require new development to mitigate wetland loss in both regulated and non-regulated wetlands through any combination of avoidance, minimization, or compensation. The County shall support mitigation banking programs that can provide the opportunity to mitigate impacts to rare, threatened, and endangered species and/or the habitat which supports these species in wetland and riparian areas.
Policy 5.D.3	The County shall require development to be designed in such a manner that pollutants and siltation will not significantly adversely affect the value or function of wetlands.

<b>Goal 5.D</b>	<b>To protect wetland communities and related riparian areas throughout Madera County as valuable resources.</b>
Policy 5.D.4	The County shall require riparian protection zones around natural watercourses. Riparian protection zones shall include the bed and bank of both low and high flow channels and associated riparian vegetation, the band of riparian vegetation outside the high flow channel, and buffers of 100 feet in width as measured from the top of bank of unvegetated channels and 50 feet in width as measured from the outer edge for the canopy of riparian vegetation. Exceptions may be made in existing developed areas where existing development and lots are located within the setback areas.
Policy 5.D.5	The County shall strive to identify and conserve remaining upland habitat areas adjacent to wetlands and riparian areas that are critical to the feeding or nesting of wildlife species associated with these wetland and riparian areas.
Policy 5.D.6	The County shall require new private or public developments to preserve and enhance existing native riparian habitat unless public safety concerns require removal of habitat for flood control or other public purposes. In cases where new private or public development results in modification or destruction of riparian habitat for purposes of flood control, the developers shall be responsible for creating new riparian habitats within or near the project area at a ratio of 3:1 acres of new habitat for every acre destroyed.
Policy 5.D.7	The County shall support the management of wetland and riparian plant communities for passive recreation, groundwater recharge, nutrient catchment, and wildlife habitats. Such communities shall be restored, where possible.
Policy 5.D.8	The County shall support the goals and policies of the San Joaquin River Parkway Plan to preserve existing habitat and maintain, enhance, or restore native vegetation to provide essentially continuous riparian and upland habitat for wildlife along the river between Friant Dam and the Highway 145 crossing.

<b>Goal 5.H</b>	<b>To preserve and enhance open space lands to maintain the natural resources of the county.</b>
Policy 5.H.1	The County shall support the preservation and enhancement of natural land forms, natural vegetation, and natural resources as open space. To the extent feasible, the County shall permanently protect as open space areas of natural resource value, including wetlands preserves, riparian corridors, woodlands, and floodplains.
Policy 5.H.2	The County shall require that new development be designed and constructed to preserve the following types of areas and features as open space to the maximum extent feasible: <ul style="list-style-type: none"> <li>a. High erosion hazard areas;</li> <li>b. Scenic and trail corridors;</li> <li>c. Streams and streamside vegetation;</li> <li>d. Wetlands;</li> <li>e. Other significant stands of vegetation;</li> <li>f. Wildlife corridors; and</li> <li>g. Any areas of special ecological significance.</li> </ul>
Policy 5.H.3	The County shall support the maintenance of open space and natural areas that are interconnected and of sufficient size to protect biodiversity, accommodate wildlife movement, and sustain ecosystems.
Policy 5.H.4	Recognizing the importance of both public and privately-owned open space, the County shall encourage both private and public ownership and maintenance of open space.
Policy 5.H.5	The County shall require that significant natural, open space, and cultural resources be identified in advance of development and incorporated into site-specific development project design.

## Safety Element

<b>Goal 6.A</b>	<b>To minimize the loss of life, injury, and property damage due to seismic and geological hazards.</b>
Policy 6.A.1	The County shall require the preparation of a soils engineering and geologic-seismic analysis prior to permitting development in areas prone to geological or seismic hazards (i.e., groundshaking, landslides, liquefaction, critically expansive soils).
Policy 6.A.2	In landslide hazard areas, the County shall prohibit avoidable alteration of land in a manner that could increase the hazard, including concentration of water through drainage, irrigation, or septic systems; removal of vegetative cover; and steepening of slopes and undercutting the bases of slopes. Areas of known landslides should be designated for open space uses.
Policy 6.A.3	The County shall limit development in areas of steep or unstable slopes to minimize hazards from landslides. Development will be prohibited in areas with slopes of 30 percent or more unless it can be demonstrated by a registered engineer or registered engineering geologist that such development will not present a public safety hazard.
Policy 6.A.4	The County shall continue to support scientific geologic investigations that refine, enlarge, and improve the body of knowledge on active fault zones, unstable areas, severe groundshaking, and other hazardous conditions in Madera County.

<b>Goal 6.B</b>	<b>To minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.</b>
Policy 6.B.1	The County shall prohibit uses in designated floodways except those that do not adversely affect flood elevations or velocities, and are tolerant of occasional flooding, such as agriculture, outdoor recreation, mineral extraction, and natural resource areas.
Policy 6.B.2	The County shall require evaluation of potential flood hazards prior to approval of development projects and shall regulate development in urban and urbanizing areas per State law addressing 100-year and 200-year level of protection consistent with the current Central Valley Flood Protection Plan or the Federal Emergency Management Agency (FEMA) standard of flood protection.
Policy 6.B.3	The County shall not approve any new development agreement, building permit or entitlement, or tentative or parcel map, or any other entitlement, unless it finds one of the following: (1) The flood control facilities provide a 100-year level of protection consistent with the current Central Valley Flood Protection Plan or the Federal Emergency Management Agency (FEMA) standard of flood protection; (2) Conditions imposed on the development will protect the property at a 100-year level of protection consistent with the current Central Valley Flood Protection Plan or the Federal Emergency Management Agency (FEMA) standard of flood protection.; or (3) The local flood management agency has made “adequate progress” on the construction of a flood protection system which will result in protection equal or greater than the a 100-year level of protection consistent with the current Central Valley Flood Protection Plan or the Federal Emergency Management Agency (FEMA) standard of flood protection.
Policy 6.B.4	The County shall require, for areas protected by levees, all new developments to include a notice within the deed that the property is protected from flooding by a levee and that the property can be subject to flooding if the levee fails or is overwhelmed.
Policy 6.B.5	The County shall require project applicants to secure an encroachment permit from the Central Valley Flood Protection Board for any project that falls within the jurisdiction regulated by the Board (e.g., levees, designated floodways).



<b>Goal 6.B</b>	<b>To minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.</b>
Policy 6.B.6	The County shall require flood-proofing of structures in areas subject to flooding and shall require that all development within special flood hazard areas (SFHA) be designed and constructed in a manner that will not cause floodwaters to be diverted onto adjacent property or increase flood hazards to other areas.
Policy 6.B.7	The County shall require adequate setbacks from flood control levees consistent with Federal, State, and local design and management standards, and for new development adjacent to an existing or planned levee to dedicate the levee footprint and necessary setback areas in a manner acceptable to the appropriate levee maintaining agency. The County shall prohibit new development from using levees as a primary access point.
Policy 6.B.8	The County shall provide verbal assistance or other cost-effective measures for reducing flood risk to existing structures located in Federal, State, and/or local determined special flood hazard areas.
Policy 6.B.9	The County shall strive to ensure that all levees protecting urban or urbanizing areas provide a minimum of 100-year flood protection in accordance with the Madera County Code (Title 14, Section IV. Flood Damage Prevention) and the Federal Emergency Management Agency (FEMA) standard of flood protection.
Policy 6.B.10	The County shall require that flood management programs avoid alteration of waterways and adjacent areas, whenever possible.
Policy 6.B.11	The County shall develop strategies to improve and maintain flood control facilities to withstand seismic and geologic impacts.
Policy 6.B.12	The County shall require new flood control projects within areas subject to any flood event to be constructed in a manner that will not cause floodwaters to be diverted onto adjacent property or increase flood hazards to property downstream and/or upstream.
Policy 6.B.13	The County shall require flood control structures, facilities, and improvements to be designed to conserve resources, incorporate and preserve scenic values, and to incorporate opportunities for recreation, where appropriate.
Policy 6.B.14	The County shall periodically update the Land Use Element to reflect current floodplain mapping data.
Policy 6.B.15	The County shall support Federal and State reservoir management practices and reservoir improvements that increase Madera County's level of flood protection.
Policy 6.B.16	The County shall ensure that all County flood plans and regulations are consistent with the Central Valley Flood Protection Plan.
Policy 6.B.17	The County shall support inspection and maintenance programs for dams protecting the county from flooding, such as the California Department of Water Resources Dam and Safety Program.
Policy 6.B.18	The County shall restrict uses in designated floodways to those that are tolerant of occasional flooding and do not restrict or alter flow of flood waters. Such uses may include agriculture, outdoor recreation, mineral extraction, and natural resource areas.
Policy 6.B.19	The County shall require that areas protected from flooding by levees be designed to provide multiple escape routes for residents and access for emergency services in the event of a levee or dam failure.
Policy 6.B.20	The County shall participate in the National Flood Insurance Program and the Community Rating System, including: maintaining at least the minimum National Flood Insurance Program requirements, and adopt more stringent standards to further promote sound flood plain management when appropriate; promoting the purchase of flood insurance; undertaking outreach campaigns to inform the public of the risk of flooding; and coordinating with Federal, State, and local agencies on efforts to enhance the effectiveness of the implementation of the National Flood Insurance Program.

<b>Goal 6.B</b>	<b>To minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.</b>
Policy 6.B.21	The County shall maintain and implement the following plans for dam failure and flood evacuation: Madera County Emergency Action Plan; and Madera County Local Hazard Mitigation Plan

<b>Goal 6.C</b>	<b>To minimize the risk of loss of life, injury, and damage to property and watershed resources resulting from unwanted fires.</b>
Policy 6.C.1	The County shall ensure that development in high-fire-hazard areas is designed and constructed in a manner that minimizes the risk from fire hazards and meets all applicable state and county fire standards. In areas with high or extreme wildfire hazards, the County shall limit parcel sizes to 22 acres or larger or encourage clustered or planned residential development with on-site fire suppression measures.
Policy 6.C.2	The County shall require that discretionary permits for new development in fire hazard areas be conditioned to include requirements for fire-resistant vegetation, cleared fire breaks, or a long-term comprehensive fuel management program. Fire hazard reduction measures shall be incorporated into the design of development projects in fire hazard areas.
Policy 6.C.3	New development shall be required to have water systems that meet County fire flow requirements. Where minimum fire flow is not available to meet County standards, alternate fire protection measures, including sprinkler systems, shall be identified and may be incorporated into development if approved by the appropriate fire protection agency.
Policy 6.C.4	The County shall review project proposals to identify potential fire hazards and prevent or mitigate such hazards to acceptable levels of risk.
Policy 6.C.5	The County shall require development to have adequate access for fire and emergency vehicles and equipment. All major subdivisions shall have two points of ingress and egress.
Policy 6.C.6	The County shall ensure that existing and new buildings of public assembly incorporate adequate fire protection measures to reduce the potential loss of life and property in accordance with state and local codes and ordinances.
Policy 6.C.7	The County shall encourage fire protection agencies to continue education programs in schools, service clubs, organized groups, industry, utility companies, government agencies, press, radio, and television in order to increase public awareness of fire hazards within the county.
Policy 6.C.8	The County shall work with local fire protection agencies, the California Department of Forestry and Fire Protection, and the U.S. Forest Service to promote the maintenance of existing fuel breaks and emergency access routes for effective fire suppression.
Policy 6.C.9	The County shall encourage and promote installation and maintenance of smoke detectors in existing residences and commercial facilities that were constructed prior to the requirement for their installation.
Policy 6.C.10	The County shall continue to work cooperatively with the California Department of Forestry and Fire Protection and local fire protection agencies in managing wildland fire hazards.

<b>Goal 6.E</b>	<b>To ensure the maintenance of an emergency action plan to effectively prepare for, respond to, recover from, and mitigate the effects of natural or technological disasters.</b>
Policy 6.E.1	The County shall prohibit the construction of facilities essential for emergencies and large public assembly in the 100-year floodplain, unless the structure and access to the structure are free from flood inundation. Additionally, the County shall require that these facilities are designed to ensure access during the occurrence of a flood.

<b>Goal 6.E</b>	<b>To ensure the maintenance of an emergency action plan to effectively prepare for, respond to, recover from, and mitigate the effects of natural or technological disasters.</b>
Policy 6.E.3	The County shall continue to maintain, periodically update, and test the effectiveness of its Emergency Action Plan.
Policy 6.E.4	The County shall coordinate emergency preparedness, response, recovery, and mitigation activities with special districts, service agencies, voluntary organizations, cities within the county, surrounding cities and counties, and state and federal agencies.
Policy 6.E.5	The County shall ensure that the siting of critical emergency response facilities such as hospitals, fire stations, sheriff's offices and substations, dispatch centers, emergency operations centers, and other emergency service facilities and utilities have minimal exposure to flooding, seismic and geological effects, fire, and explosions.

<b>Goal 6.F</b>	<b>To protect public health and safety through safe location of structures necessary for the protection of public safety and/or the provision of emergency services.</b>
Policy 6.F.1	The County shall seek to locate new public facilities necessary for emergency response, health care, and other critical functions outside areas subject to natural hazards, such as earthquakes or floods.
Policy 6.F.3	The County shall, within its authority, ensure that emergency dispatch centers, emergency operations centers, communications systems, vital utilities, and other essential public facilities necessary for the continuity of government be designed in a manner that will allow them to remain operational during and following an earthquake, flood, or other disaster.

<b>Goal 6.G</b>	<b>To minimize the risk of loss of life, injury, serious illness, damage to property, and economic and social dislocations resulting from the use, transport, treatment, and disposal of hazardous materials and hazardous materials wastes.</b>
Policy 6.G.1	The County shall ensure that the use and disposal of hazardous materials in the county complies with local, state, and federal safety standards
Policy 6.G.2	The County shall encourage source reduction, recycling, and on-site treatment of hazardous wastes to reduce hazardous waste generation and disposal.
Policy 6.G.3	The County shall discourage the development of residences or schools near known hazardous waste disposal or handling facilities.
Policy 6.G.4	The County shall review all proposed development projects that manufacture, use, or transport hazardous materials for compliance with the County's Hazardous Waste Management Plan (CHWMP).
Policy 6.G.5	The County shall strictly regulate the storage of hazardous materials and wastes.
Policy 6.G.6	The County shall ensure that industrial facilities are constructed and operated in accordance with current safety and environmental protection standards.
Policy 6.G.7	The County shall require that applications for discretionary development projects that will generate hazardous wastes or utilize hazardous materials include detailed information on hazardous waste reduction, recycling, and storage.
Policy 6.G.8	The County shall require that any business that handles a hazardous material prepare a plan for emergency response to a release or threatened release of a hazardous material.
Policy 6.G.9	The County shall encourage the State Department of Health Services and the California Highway Patrol to review permits for radioactive materials on a regular basis and to promulgate and enforce public safety standards for the use of these materials, including the placarding of transport vehicles.
Policy 6.G.10	The County shall identify sites as specified in the County Hazardous Waste Management Plan that are appropriate for hazardous material storage, maintenance, use, and disposal facilities due to potential impacts on adjacent land uses and the surrounding natural environment.

Goal 6.G	To minimize the risk of loss of life, injury, serious illness, damage to property, and economic and social dislocations resulting from the use, transport, treatment, and disposal of hazardous materials and hazardous materials wastes.
Policy 6.G.11	The County shall work with local fire protection and other agencies to ensure an adequate countywide response capability to hazardous materials emergencies.

### *Madera County Emergency Operations Plan (2010)*

The Madera County’s Emergency Operations Plan addresses the planned response to extraordinary emergency situations associated with natural disasters, technological incidents, weapons of mass destruction, and national security emergencies in or affecting the County of Madera. This plan accomplishes the following:

- Establishes the emergency management organization required to mitigate any emergency or disaster affecting Madera County.
- Identifies the policies, responsibilities and procedures required to protect the health and safety of Madera County communities, public and private property and the environmental effects of natural and technological emergencies and disasters.
- Establishes the operational concepts and procedures associated with Initial Response Operations (field response) to emergencies, the Extended Response Operations County Emergency Operations Center (EOC) activities and the recovery process.

This plan is designed to establish the framework for implementation of the National Incident Management System (NIMS) for Madera County, which is located within the Offices of California Emergency Management Mutual Aid Region V. It is intended to facilitate multi-agency and multi-jurisdictional coordination, particularly between Madera County and local governments, including special districts, tribes and state agencies, in emergency operations.

### *Climate Change and Health Profile Report – Madera County (2017)*

The Climate Change and Health Profile Report seeks to provide a county-level summary of information on current and projected risks from climate change and potential health impacts. This report represents a synthesis of information on climate change and health for California communities based on recently published reports of state agencies and other public data. This Climate Change and Health Profile Report is intended to inform, empower, and nurture collaboration that seeks to protect and enhance the health and well-being of all California residents.

This report is part of a suite of tools that is being developed by the California Department of Public Health to support local, regional, and statewide efforts of the public health sector to build healthy, equitable, resilient, and adaptive communities ready to meet the challenges of climate change. Along with a county-level climate change and health vulnerability assessment and state guidance documents, such as Preparing California for Extreme Heat: Guidance and Recommendations, the profile provides a knowledge base for taking informed action to address climate change.

### ***Madera County Community Wildfire Protection Plan (2008)***

Madera County officials recognized the potential disaster from wildfire that exists in eastern Madera County and in conjunction with wildland firefighting agencies within Madera County (United States Forest Service and California Department of Forestry and Fire Protection) are seeking ways to alleviate the wildfire problem and make the people, property, cultural and natural resources, more fire safe. In order to address the catastrophic fire potential it was determined that a Community Wildfire Protection Plan (CWPP) was needed for Madera County. A CWPP provides communities with an opportunity to influence where and how federal agencies implement fuel reduction projects on federal lands and how additional funds may be distributed for projects on nonfederal lands.

Upon completion of the assessment process, a plan for mitigating the hazards associated with wildfire was formulated for those communities classified as having a high-risk rating. Fuel reduction projects were considered for in and around these communities as well education and outreach programs to inform residents of the potential projects and other Firewise activities that will make themselves and communities more fire safe.

### ***Madera-Mariposa-Merced Unit Strategic Fire Plan (2016)***

The Madera-Mariposa-Merced Unit has written its annual Fire Plan with the intention of establishing goals and priorities that align with CAL FIRE'S Strategic Plan and the California Fire Plan while identifying goals and priorities specific to the Unit.

The California Fire Plan is the road map for reducing the risk of wildfire. The Madera-Mariposa-Merced Unit's fire plan identifies strategic goals and objectives that target the anticipation and reduction of wildfire within the boundaries of the Unit. For the challenges facing the Unit with excessive tree mortality rates due to bug kill and a fourth year of drought, the Fire Plan will also serve the Unit in determining a plan to address our most dangerous areas and targets of risk within the overall Fire Plan. This fire plan seeks to improve operational effectiveness, scale to budgetary and fiscal circumstances, foster a healthy ecosystem and improve firefighter safety by identifying working projects specific to each Battalion within the Unit.

The Fire Plan strives to reduce property loss, damage to the local environment and ecosystems from destructive wildfires, along with a reduction of suppression costs within the Madera-Mariposa-Merced Unit.

### ***Madera County Ordinances***

The Madera County General Plan provides policy direction for land use, development, open space protection, and environmental quality; however, this policy direction must be carried out through numerous ordinances, programs, and agreements. The following ordinances are among the most important tools for implementing the General Plan and/or are critical to the mitigation of hazards identified in this plan.

### ***Emergency Services and Disaster (Section 2.78)***

This chapter establishes the county emergency services organization and provides for the preparation and carrying out of the plans for the protection of persons and property within the county in the event of an

emergency; the direction of the emergency organization; the coordination of the emergency functions of the county with all other governmental agencies, incorporated areas, corporations, organizations, and affected private persons.

The Madera County disaster council is hereby created and shall consist of all the members of the board of supervisors. The chairman of the board shall be the chairman of the council. The director of emergency services shall be the secretary for the council. The duties of the council shall be to promote, receive, evaluate, coordinate, and make available the best information obtainable from all sources, toward the end that the most effective mobilization of all county resources and facilities, public and private, may be the foundation for the actions taken during emergency operations.

The council shall request representatives from the cities to participate in meetings concerning subjects which affect the cities.

### **Building and Construction (Chapter 14)**

This title is adopted to provide minimum standards to safeguard life or limb, health, property and public welfare, by regulating and controlling structural design, construction, materials, occupancy and location of all buildings and structures within the unincorporated area of the county. This title shall apply to the erection, construction, demolition, enlargement, alteration, repair, relocation, conversion, occupancy, change of occupancy, and maintenance of buildings, structures, swimming pools, and also the installation of electrical, plumbing, heating and cooling facilities and appurtenances necessary thereto within the unincorporated area of the county. The current edition of the California Building Standards Code, incorporating the following codes by reference and, except as otherwise provided herein, are adopted and shall govern standards for buildings and construction within their respective applications:

- The California Building Code, current edition, including the appendices, as adopted by the International Conference of Building Officials;
- The California Mechanical Code, current edition, including all appendices thereto;
- The Uniform Housing Code, current edition, including all appendices thereto, as adopted by the International Conference of Building Officials;
- The California Plumbing Code, current edition, including all appendices thereto;
- The California Electrical Code, current edition, including all appendices thereto;
- The Uniform Code for the Abatement of Dangerous Buildings, current edition, including all appendices thereto, as adopted by the International Conference of Building Officials;
- The Uniform Solar Energy Code, current edition, including all appendices thereto, as adopted by the International Association of Plumbing and Mechanical Officials;
- The California Fire Code, current edition, including those sections and appendices as more specified in Chapter 14.35;
- National Fire Codes, current edition, as adopted by the National Fire Protection Association;
- Uniform Swimming Pool, Spa, and Hot Tub Code, current edition, as adopted by the International Association of Plumbing and Mechanical Officials.

## **Fire Prevention Ordinance (Chapter 14.35)**

The California Fire Code and National Fire Protection Association Code (hereafter NFPA Code), as adopted by the board of supervisors, are amended as provided in this chapter and in Section 13.12.070 of the County code.

### **Chapter 14.38.010 - Grass and weeds—Discing.**

Subdivisions within the unincorporated areas of the county of Madera with no development, or very little development, tend to promote the growing of grass and weeds that at various times during the year can become a serious fire hazard. Such grass and weeds can, with difficulty and great expense, be disced into the ground. However, that method of control requires the county or a person contracting with the county, to enter in and upon the property to so disc the property. There is statutory authority for the permitting of the county under certain conditions to so enter and perform such fire protection work. The fire protection project can be accomplished by the county in a less expensive manner, but more importantly, it promotes the production of food and fiber and does not waste the green forage which is accomplished by discing it into the ground. With fire protection uppermost in the minds of the board of supervisors and promoting additional production of food and fiber, it has adopted this law for the protection of certain county areas.

## **Flood Damage Prevention (Chapter 14.60)**

The board of supervisors finds that the flood hazard areas of Madera County are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare. These flood losses are caused by uses that are inadequately elevated, floodproofed, or protected from flood damage. The cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities also contributes to flood losses.

It is the purpose of this chapter to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by legally enforceable regulations applied uniformly throughout the community to all publicly and privately owned land within flood prone, mudslide/mudflow, or flood related erosion areas. These regulations are designed to protect human life and health; minimize expenditure of public money for costly flood control projects; minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public; minimize prolonged business interruptions; minimize damage to public facilities and utilities such as water and gas mains; electric, telephone and sewer lines; and streets and bridges located in areas of special flood hazard; help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage; ensure that potential buyers are notified that property is in an area of special flood hazard; and ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

The legislature of the state of California has in Government Code Sections 65302, 65560, and 65800 conferred upon local governments the authority to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the board of supervisors of the county of Madera

does hereby adopt the following floodplain management regulations. In order to accomplish its purposes, this chapter includes regulations to:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- Control filling, grading, dredging, and other development which may increase flood damage; and
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

The county engineer is designated as the floodplain administrator and is appointed to administer, implement, and enforce this chapter by granting or denying development permits in accord with its provisions. A development permit shall be obtained before any construction or other development, including manufactured homes, within any area of special flood hazard established. In all areas of special flood hazards, the following standards are required:

- Anchoring. All new construction and substantial improvements of structures, including manufactured homes, shall be adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.
- Construction Materials and Methods. All new construction and substantial improvements of structures, including manufactured homes, shall be constructed:
  - ✓ With flood resistant materials, and utility equipment resistant to flood damage for areas below the base flood elevation;
  - ✓ Using methods and practices that minimize flood damage;
  - ✓ With electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding; and
  - ✓ Within Zone AH or AO, so that there are adequate drainage paths around structures on slopes to guide flood waters around and away from proposed structures.
- Elevation and Floodproofing.
  - ✓ Residential Construction. All new construction or substantial improvements of residential structures shall have the lowest floor, including basement:
    - In AE, AH, A1-30 zones, elevated to or above the base flood elevation.
    - In an AO zone, elevated above the highest adjacent grade to a height equal to or exceeding the depth number specified in feet on the FIRM, or elevated at least two feet above the highest adjacent grade if no depth number is specified.
    - In an A zone, without BFE's specified on the FIRM (unnumbered A zone), elevated to or above the base flood elevation, as determined under Section 14.60.110(C).
  - ✓ Upon the completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered civil engineer or licensed land surveyor, and verified by the community building inspector to be properly elevated. Such certification and verification shall be provided to the floodplain administrator.



- ✓ Nonresidential Construction. All new construction or substantial improvements of nonresidential structures shall either be elevated to conform with subsection (C)(1) of this section or be floodproofed, together with attendant utility and sanitary facilities, below the elevation recommended under subsection (C)(1) of this section, so that the structure is watertight with walls substantially impermeable to the passage of water; have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and be certified by a registered civil engineer or architect that the standards of this subsection are satisfied. Such certification shall be provided to the floodplain administrator.
- ✓ Flood Openings. All new construction and substantial improvements of structures with fully enclosed areas below the lowest floor (excluding basements) that are usable solely for parking of vehicles, building access or storage, and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwater. Designs for meeting this requirement must meet the following minimum criteria:
  - For non-engineered openings:
  - Have a minimum of two openings on different sides having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;
  - The bottom of all openings shall be no higher than one foot above grade;
  - Openings may be equipped with screens, louvers, valves or other coverings or devices provided that they permit the automatic entry and exit of floodwater; and
  - Buildings with more than one enclosed area must have openings on exterior walls for each area to allow flood water to directly enter; or
  - Be certified by a registered civil engineer or architect.
- ✓ Manufactured Homes.
  - Manufactured homes located outside of manufactured home parks or subdivisions shall meet the elevation and floodproofing requirement in subsection C of this section.
  - Manufactured homes placed within manufactured home parks or subdivisions shall meet the standards in subsection E of this section. Additional guidance may be found in FEMA Technical Bulletins TB 1-93 and TB 7-93.
- ✓ Garages and Low Cost Accessory Structures.
  - Attached Garages.
  - A garage attached to a residential structure, constructed with the garage floor slab below the base flood elevation (BFE), must be designed to allow for the automatic entry of flood waters. Areas of the garage below the BFE must be constructed with flood resistant materials.
  - A garage attached to a nonresidential structure must meet the above requirements or be dry floodproofed. For guidance on below grade parking areas, see FEMA Technical Bulletin TB-6.
- ✓ Detached Garages and Accessory Structures.
- ✓ "Accessory structures" used solely for parking (two car detached garages or smaller) or limited storage (small, low-cost sheds), as defined in Section 14.60.030, may be constructed such that its floor is below the base flood elevation (BFE), provided the structure is designed and constructed in accordance with the following requirements:
  - Use of the accessory structure must be limited to parking or limited storage;

- The portions of the accessory structure located below the BFE must be built using flood-resistant materials;
  - The accessory structure must be adequately anchored to prevent flotation, collapse and lateral movement;
  - Any mechanical and utility equipment in the accessory structure must be elevated or floodproofed to or above the BFE;
  - The accessory structure must comply with floodplain encroachment provisions in subsection H of this section; and
  - The accessory structure must be designed to allow for the automatic entry of flood waters in accordance with subsection (C)(3) of this section.
- ✓ Detached garages and accessory structures not meeting the above standards must be constructed in accordance with all applicable standards in this section.
- Utilities. All new and replacement water supply and sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters. On-site waste disposal systems shall be located to avoid impairment to them, or contamination from them during flooding.
- Subdivisions and Other Proposed Development.
- ✓ All new proposed subdivision maps and other proposed development, including proposals for manufactured home parks and subdivisions, greater than fifty lots or five acres, whichever is the lesser, shall:
    - Identify the special flood hazard areas (SFHA) and base flood elevations (BFE).
    - Identify the elevations of lowest floors of all proposed structures and pads on the final plans.
    - If the site is filled above the base flood elevation, the following as-built information for each structure shall be certified by a registered civil engineer or licensed land surveyor and provided as part of an application for a letter of map revision based on fill (LOMR-F) to the floodplain administrator:
      - Lowest floor elevation;
      - Pad elevation;
      - Lowest adjacent grade.
  - ✓ All subdivision proposals and other proposed development shall:
  - ✓ Be consistent with the need to minimize flood damage;
  - ✓ Have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage;
  - ✓ Provide adequate drainage to reduce exposure to flood hazards.
- Manufactured Homes. All manufactured homes in special flood hazard areas shall meet the anchoring standards in subsection A of this section, construction materials and methods requirements in subsection B of this section, flood openings requirements in subsection (C)(3) of this section, and garages and low cost accessory structure standards in subsection (C)(5) of this section. Manufactured homes located outside of manufactured home parks or subdivisions shall meet the elevation and floodproofing requirement in subsection C of this section.
- ✓ All manufactured homes that are placed or substantially improved on sites located in a new manufactured home park or subdivision, in an expansion to an existing manufactured home park or subdivision, or in an existing manufactured home park or subdivision on a site upon which a

manufactured home has incurred "substantial damage" as the result of a flood shall, if within Zones A1-30, AH, or AE on the community's flood insurance rate map, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

- ✓ All manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A1-30, AH, and AE on the community's flood insurance rate map that are not subject to the provisions of subsection (F)(1) of this section will be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement, and be elevated so that either the lowest floor of the manufactured home is at or above the base flood elevation, or the chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than thirty-six inches in height above grade.
  - ✓ Upon the completion of the structure, the elevation of the lowest floor including basement shall be certified by a registered civil engineer or licensed land surveyor, and verified by the community building inspector to be properly elevated. Such certification and verification shall be provided to the floodplain administrator.
- **Recreational Vehicles.** All recreational vehicles placed in Zones A1-30, AH, and AE will either be on the site for fewer than one hundred eighty consecutive days, or be fully licensed and ready for highway use, or meet the permit requirements of Section 14.60.120 of this chapter and the elevation and anchoring requirements for manufactured homes in subsection (F)(1) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.
- **Floodways.** Since floodways are an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:
- ✓ Until a regulatory floodway is adopted, no new construction, substantial development, or other development (including fill) shall be permitted within Zones A1-30 and AE, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other development, will not increase the water surface elevation of the base flood more than one foot at any point within the county of Madera.
  - ✓ Within an adopted regulatory floodway, the county of Madera shall prohibit encroachments, including fill, new construction, substantial improvements, and other development, unless certification by a registered civil engineer is provided demonstrating that the proposed encroachment shall not result in any increase in flood levels during the occurrence of the base flood discharge.
  - ✓ If subsections (H)(1) and (H)(2) of this section are satisfied, all new construction, substantial improvement, and other proposed new development shall comply with all other applicable flood hazard reduction provisions of this section.

## Subdivisions (Chapter 17)

The Subdivision Ordinance of Madera County is adopted to promote and protect the public health, safety and welfare through the orderly regulation of land division throughout the unincorporated area of Madera County.

- Provide the economic and social advantages resulting from orderly land division.
- Encourage and guide development consistent with the Madera County general plan and adopted specific plans.
- Provide lots of sufficient size and appropriate design so as to be usable for their intended purposes.
- Provide for the preservation of environmental assets and natural resources, including land, water, air, minerals, vegetation, wildlife, silence, historic or aesthetic sites, and open space.
- Ensure provision of adequate traffic circulation, utilities and services.
- General Plan. This title shall implement the objective established for the development of the county in its general plan, and a proposed subdivision, street plan, or land division shall be consistent with and considered in relation to said plan.
- Lot Standards. It shall establish minimum standards for lot areas and dimensions, and the creation of reasonable building sites.
- Improvement Standards. It shall provide standards for the construction and installation of streets, roads, alleys, highways, public utilities, and other improvements.
- Access Standards. It shall provide for adequate street widths, alignment, and means of ingress and egress to property.
- Suitability. It shall control the division of land which is subject to inundation or other impediments affecting use of the land.
- Regulation. It shall provide rules and regulations governing the contents of preliminary map, tentative parcel maps, parcel maps, tentative, and final subdivision maps, land division, records of survey, street dedication maps, the filing thereof, and other related matters.

This title shall apply, to the extent permitted by law, to all property in unincorporated Madera County whether owned by private persons, firms, corporations or organizations; by the United States or any of its agencies; by the state of California or any of its agencies or political subdivisions or by any authority or public entity organized under the laws of the state of California excluding Madera County.

## Zoning (Chapter 18)

The provisions of this title shall be held to be minimum requirements adopted to promote the health, safety, morals, comfort, prosperity and general welfare of the county. Among other purposes, such provisions are intended to provide for adequate light, air, sanitation, drainage, convenience of access, conservation of floodplains and woodlands, and safety from fire and other dangers; to promote the safety and efficiency of the public streets and highways; to aid in conserving and stabilizing the economic values of the community; to preserve and promote the general attractiveness and character of the community environment; to guide the proper distribution and location of population and of the various land uses, and otherwise provide for the healthy and prosperous growth of the community.

The zoning ordinance shall be composed of specific regulations controlling the uses of land, the density of population, the use and location of structures, and the height and bulk of these structures, the areas of open spaces surrounding the structures, areas and dimensions of sites, regulations concerning access, parking and loading areas; and a zoning plan. Except as may be otherwise specifically provided:

- No structure or building shall be erected, altered or enlarged, nor shall any site, building or structure be used or be designated to be used for any purpose other than those uses and purposes included among the permitted uses of these regulations or by a conditional use permit or zoning permit in the zoning district in which such buildings, structures or land is located, or as otherwise permitted in this title.

- No building or structure shall be constructed, substantially reconstructed or altered to exceed the structure height regulations designed for the zoning district in which the structure or building is located.
- No building or structure shall be constructed or substantially reconstructed, enlarged or moved into any zoning district except in compliance respectively to the structure height regulations, the structure location regulations, the lot dimension regulations, the off-street parking area requirements, the overlaid district regulations, and other specific regulations herein specified for the zoning district in which the building or structure is located.
- A lot or lots may be divided into new lots, in compliance with Madera County Ordinance No. 304, the parcel map ordinance, or Madera County Ordinance No. 278, the subdivision ordinance, codified in Title 17 of this code; provided that each new lot is equal to or exceeds the minimum lot dimension regulations of this title.
- No deed or conveyance of any portion of a lot shall be made which reduces the lot dimensions, minimum offsets, and setbacks, off-street parking spaces, or other minimum requirements applicable to that site and use below the minimum requirements of this title.

### *Madera County Plans/Studies*

### *State and Federal Programs*

A number of state and federal programs exist to provide technical and financial assistance to local communities for hazard mitigation. Some of the primary agencies/departments that are closely involved with local governments in the administration of these programs include:

- California Office of Emergency Services
- State of California Multi-Hazard Mitigation Plan;
- California Department of Water Resources;
- California Department of Forestry and Fire Protection (CAL FIRE);\*
- California Environmental Protection Agency;
- California Department of Fish and Game;\*
- California State Parks and Recreation Department\*
- California State Lands Commission;\*
- Federal Emergency Management Agency (Region IX);
- U.S. Army Corps of Engineers;\*
- Bureau of Reclamation;\*
- USDA Forest Service;\*
- National Parks Service;\*
- USDA Natural Resources Conservation Service;\*
- U.S. Environmental Protection Agency (Region IX); and
- American Red Cross.

\*Owns and/or manages land and/or facilities (or has some sort of administrative role, e.g., fire protection) in the County; potential partner for mitigation activities

## **4.4.2. Madera County’s Administrative/Technical Mitigation Capabilities**

Table 4-100 identifies the County personnel responsible for activities related to mitigation and loss prevention in the County.

**Table 4-100 Madera County Administrative/Technical Mitigation Capabilities**

Administration		Describe capability Is coordination effective?
Planning Commission	Y/N	County Department. Coordination is effective.
Mitigation Planning Committee	Y	For this planning process
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	County road and grounds crew. Coordination is effective.
Mutual aid agreements	Y	City of Firebaugh, Madera, and Chowchilla for fire and medical. Yosemite National Park for fire. Coordination is effective.
Other		
Is staffing adequate to enforce regulations?		
Is staff trained on hazards and mitigation?		
Staff		Is coordination between agencies and staff effective?
Chief Building Official	Y FT	Staff is trained and adequate regulations are in place. There is coordination when needed.
Floodplain Administrator	Y FT	Staff is trained and adequate regulations are in place. There is coordination when needed.
Emergency Manager	Y PT	Training is in progress.
Community Planner	N	
Civil Engineer	Y FT	Staff is trained and adequate regulations are in place. There is coordination when needed.
GIS Coordinator	N	
Other		
Describe capability Has capability been used to assess/mitigate risk in the past?		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Reverse 911 (MCALERT)
Hazard data and information	N	No retention of data
Grant writing	Y	Grant writing by department.
Hazus analysis	Y	Used by Environmental Health
Other		
How can these capabilities be expanded and improved to reduce risk?		

### 4.4.3. Madera County’s Fiscal Mitigation Capabilities

Table 4-101 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

*Table 4-101 Madera County Fiscal Mitigation Capabilities*

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	County funds with Board of Supervisor’s approval.
Authority to levy taxes for specific purposes	Y	County funds with Board of Supervisor’s approval.
Fees for water, sewer, gas, or electric services	Y	County funds with Board of Supervisor’s approval.
Impact fees for new development	Y	County funds with Board of Supervisor’s approval.
Storm water utility fee	Y	County funds with Board of Supervisor’s approval.
Incur debt through general obligation bonds and/or special tax bonds	Y	By election only.
Incur debt through private activities	N	
Community Development Block Grant	Y	Environmental Health has used in the past.
Other federal funding programs	Y	FEMA
State funding programs	Y	CDAA
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		

### 4.4.4. Mitigation Education, Outreach, and Partnerships

Table 4-102 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

*Table 4-102 Madera County Mitigation Education, Outreach, and Partnerships*

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Eastern Madera County Emergency Preparedness
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Fire
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	Y	Firewise groups
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		

#### 4.4.5. Other Mitigation Efforts

There are other mitigation efforts that have been completed in the past, as well as mitigation efforts that continue in the present. The County Fire Department has worked on both fuel breaks and fuel reduction programs at various times and places in the County (see Figure 4-82). The County opens cooling centers when temperatures spike (see Figure 4-83).



Figure 4-82 Madera County – Fuelbreak Inventory

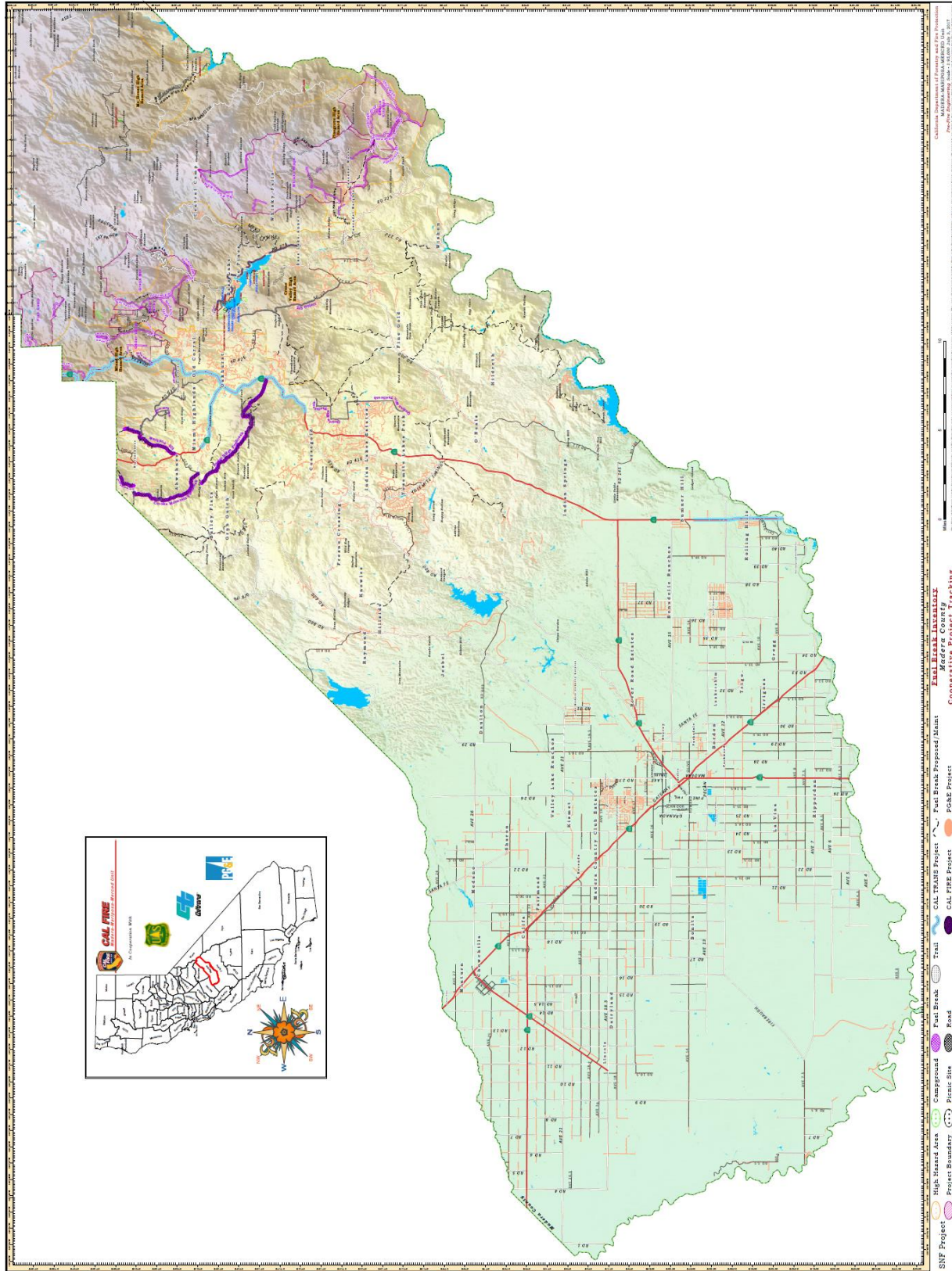


Figure 4-83 Madera County - Cooling Centers



OFFICE OF THE SHERIFF  
 COUNTY OF MADERA  
**COOLING CENTERS 2017**

**Madera County Valley Locations**

Name	Address	Days	Times
Rancho Hills Senior Center	37739 Berkshire Drive, Madera, CA 93638 559-645-4864	Monday to Friday	9am to 1pm

**Madera County Mountain Locations**

Name	Address	Days	Times
Grace Community Church	56442 Road 200, North Fork, CA 93643 559-877-2346	Monday to Friday	10am to 1pm
Coarsegold Community Center	35540 Highway 41, Coarsegold, CA 93614 559-683-7953	Monday to Friday	10am to 1pm
Yosemite Lakes Park Clubhouse	30250 Yosemite Springs Parkway, Coarsegold, CA 93614 559-658-7466	All Week	8am to 8pm
Sierra Senior Center	49111 Cinder Lane, Oakhurst, CA 93644 559-658-2200	Monday to Friday	9:30am to 1:30pm
		1 <sup>st</sup> and 2 <sup>nd</sup> Saturday of the Month	9:30am to 4pm

**City of Madera Locations**

Name	Address	Days	Times
Frank Bergon Senior Center	238 South "D" Street, Madera, CA 93638 559-673-4293	Monday to Friday	8am to 2:30pm
Pan Am Community Center	703 East Sherwood Way, Madera, CA 93638 559-675-2095	Monday to Friday	8am to 8pm

The County also noted that they have been working on a Sediment Removal project over the last year or two. The goal is to remove all the accumulated sand in the channels and to bring them back to its natural capacity. The County plans to start the project late fall 2017.



## Chapter 5 Mitigation Strategy

**Requirement §201.6(c)(3) and §201.7(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.**

This section describes the mitigation strategy process and mitigation action plan for the Madera County Local Hazard Mitigation Plan (LHMP) Update. It describes how the County and participating jurisdictions met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

### 5.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the Hazard Mitigation Planning Committee (HMPC) led to the mitigation strategy and mitigation action plan for this LHMP Update. As part of the LHMP Update process, a comprehensive review and update of the mitigation strategy portion of the plan was conducted by the HMPC. Some of the initial goals and objectives from the 2011 Madera County and City of Chowchilla LHMPs were refined and reaffirmed, some goals were deleted, and others were added. The end result was a new set of goals, reorganized to reflect the completion of or progress towards the 2011 actions, the updated risk assessment and the new priorities of this 2017 LHMP Update. To support the new LHMP goals, the mitigation actions from 2011 were reviewed and assessed for their value in reducing risk and vulnerability to the Planning Area from identified hazards and evaluated for their inclusion in this LHMP Update (See Chapter 2 What’s New). Section 5.2 below identifies the new goals and objectives of this LHMP Update and Section 5.4 details the new mitigation action plan.

Taking all of the above into consideration, the HMPC developed the following umbrella mitigation strategy for this LHMP Update:

- Communicate the hazard information collected and analyzed through this planning process as well as HMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
- Implement the action plan recommendations of this plan.
- Use existing rules, regulations, policies, and procedures already in existence.
- Monitor multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

### 5.1.1. Continued Compliance with NFIP

Given the flood hazard in the Planning Area, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP) by all communities. Detailed below is a description of Madera County’s flood management program to ensure continued compliance with the NFIP. Also to be considered are the numerous flood mitigation actions contained in this LHMP that support the ongoing efforts by the County to minimize the risk and vulnerability of the community to the flood hazard and to enhance their overall floodplain management program. A summary of the flood management programs and continued compliance with the NFIP for the incorporated communities and the Tribe are detailed in their jurisdictional annexes.

#### *Madera County’s Flood Management Program*

Madera County has participated in the Regular Phase of the NFIP since 1987. Since then, the County has administered floodplain management regulations that meet the minimum requirements of the NFIP. Under that arrangement, residents and businesses paid the same flood insurance premium rates as most other communities in the country.

The Community Rating System (CRS) was created in 1990. It is designed to recognize floodplain management activities that go above and beyond the NFIP’s minimum requirements. If a community implements public information, mapping, regulatory, loss reduction and/or flood preparedness activities and submits the appropriate documentation to FEMA, then its residents can qualify for a flood insurance premium rate reduction. The County does not currently participate in the CRS program, but may evaluate the overall value of joining CRS in the future during the implementation phase of this LHMP Update.

Presently, the County manages its floodplains in compliance with NFIP requirements and implements a floodplain management program designed to protect the people and property of the County. Floodplain regulations are a critical element in local floodplain management and are a primary component in the County’s participation in the NFIP. As well, the County’s floodplain management activities apply to existing and new development areas, implementing flood protection measures for structures and maintaining drainage systems to help reduce the potential of flooding within the County.

The County will continue to manage their floodplains in continued compliance with the NFIP. An overview of the County’s NFIP status and floodplain management program are discussed on Table 5-1.

*Table 5-1 Madera County NFIP Status*

NFIP Topic	Comments
<b>Insurance Summary</b>	
How many NFIP policies are in the community? What is the total premium and coverage?	910 policies \$860,562 annual premiums \$177,276,400 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	20 paid claims \$189,951.78 in paid claims 0 substantial damage claims

NFIP Topic	Comments
How many structures are exposed to flood risk within the community?	3,033 improved parcels in 1% annual chance flood zone 372 improved parcels in 0.2% annual chance flood zone
Describe any areas of flood risk with limited NFIP policy coverage	Undetermined
<b>Staff Resources</b>	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	Yes
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Permitting, GIS, inspections, public information
What are the barriers to running an effective NFIP program in the community, if any?	
<b>Compliance History</b>	
Is the community in good standing with the NFIP?	Yes
Are there any outstanding compliance issues (i.e., current violations)?	No
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	03/30/2015
Is a CAV or CAC scheduled or needed?	No
<b>Regulation</b>	
When did the community enter the NFIP?	8/4/1987
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Meet or exceed. See Appendix C.
Provide an explanation of the permitting process.	Every permit submitted to the planning department is routed through public works and therefore conditioned to be compliance with our National Flood Insurance Program. The Counties biggest challenges have been illegal structures that have been built without the permits.
<b>Community Rating System (CRS)</b>	
Does the community participate in CRS?	No
What is the community's CRS Class Ranking?	N/A
What categories and activities provide CRS points and how can the class be improved?	N/A
Does the plan include CRS planning requirements?	N/A

Source: FEMA/Madera County

### 5.1.2. Integration of Mitigation with Post Disaster Recovery and Mitigation Strategy Funding Opportunities

Hazard Mitigation actions are essential to weaving long-term resiliency into all community recovery efforts so that at-risk infrastructure, development, and other community assets are stronger and more resilient for

the next severe storm event. Mitigation measures to reduce the risk and vulnerability of a community to future disaster losses can be implemented in advance of a disaster event and also as part of post-disaster recovery efforts.

Mitigation applied to recovery helps communities become more resilient and sustainable. It is often most efficient to fund all eligible infrastructure mitigation through FEMA's Public Assistance mitigation program if the asset was damaged in a storm event. Mitigation work can be added to project worksheets if they can be proven to be cost-beneficial.

Integration of mitigation into post disaster recovery efforts should be considered by all communities as part of their post disaster redevelopment and mitigation policies and procedures. As detailed in Section 4.4, the Capability Assessment for the unincorporated County and in the Annex's for the other participating jurisdictions, post-disaster redevelopment and mitigation policies and procedures are evaluated and updated as part of the Emergency Operations Plan (EOP) updates and other emergency management plans for each community.

These EOP's, through its policies and procedures, seek to mitigate the effects of hazards, prepare for measures to be taken which will preserve life and minimize damage, enhance response during emergencies and provide necessary assistance, and establish a recovery system in order to return the community to their normal state of affairs. Mitigation is emphasized as a major component of recovery efforts.

### *Mitigation Strategy Funding Opportunities*

An understanding of the various funding streams and opportunities will enable the communities to match identified mitigation projects with the grant programs that are most likely to fund them. Additionally, some of the funding opportunities can be utilized together. Mitigation grant funding opportunities available pre- and post- disaster include the following.

#### **FEMA HMA Grants**

Cal OES administers three main types of HMA grants: (1) Hazard Mitigation Grant Program, (2) Pre-Disaster Mitigation Program, and (3) Flood Mitigation Assistance Program. Eligible applicants for the HMA include state and local governments, certain private non-profits, and federally recognized Indian tribal governments. While private citizens cannot apply directly for the grant programs, they can benefit from the programs if they are included in an application sponsored by an eligible applicant

#### **FEMA Public Assistance Section 406 Mitigation**

The Robert T. Stafford Disaster Relief and Emergency Assistance Act provides FEMA the authority to fund the restoration of eligible facilities that have sustained damage due to a presidentially declared disaster. The regulations contain a provision for the consideration of funding additional measures that will enhance a facility's ability to resist similar damage in future events.

#### **Community Development Block Grants**

The California Department of Housing and Community Development administers the State's Community Development Block Grant (CDBG) program with funding provided by the U.S. Department of Housing

and Urban Development. The program is available to all non-entitlement communities that meet applicable threshold requirements. All projects must meet one of the national objectives of the program – projects must benefit 51 percent low- and moderate-income people, aid in the prevention or clearance of slum and blight, or meet an urgent need. Grant funds can generally be used in federally declared disaster areas for CDBG eligible activities including the replacement or repair of infrastructure and housing damaged during, or as a result of, the declared disaster.

### Small Business Loans

SBA offers low-interest, fixed-rate loans to disaster victims, enabling them to repair or replace property damaged or destroyed in declared disasters. It also offers such loans to affected small businesses to help them recover from economic injury caused by such disasters. Loans may also be increased up to 20 percent of the total amount of disaster damage to real estate and/or leasehold improvements to make improvements that lessen the risk of property damage by possible future disasters of the same kind.

### Increased Cost of Compliance

Increased Cost of Compliance (ICC) coverage is one of several resources for flood insurance policyholders who need additional help rebuilding after a flood. It provides up to \$30,000 to help cover the cost of mitigation measures that will reduce flood risk. ICC coverage is a part of most standard flood insurance policies available under NFIP.

## 5.2 Goals and Objectives

**Requirement §201.6(c)(3)(i) and §201.7(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.**

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals, objectives, and mitigation actions were developed based on these tasks. The HMPC held a series of meetings and exercises designed to achieve a collaborative mitigation strategy as described further throughout this section. Appendix C documents the information covered in these mitigation strategy meetings, including information on the goals development and the identification and prioritization of mitigation alternatives by the HMPC.

During the initial goal-setting meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and to develop the mitigation strategy for the Madera County Planning Area.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- A time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

HMPC members were provided with the list of goals from the 2011 LHMPs as well as a list of other sample goals to consider. They were told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind. Each member was given three index cards and asked to write a goal statement on each. Goal statements were collected and grouped into similar themes and displayed on the wall of the meeting room. The goal statements were then grouped into similar topics. New goals from the HMPC were discussed until the team came to consensus. Some of the statements were determined to be better suited as objectives or actual mitigation actions and were set aside for later use. Next, the HMPC developed objectives that summarized strategies to achieve each goal.

Based on the risk assessment review and goal setting process, the HMPC identified the following goals and objectives, which provide the direction for reducing future hazard-related losses within the Madera County Planning Area.

***Goal 1: Minimize risk and vulnerability of Madera County to hazards and protect lives and prevent losses to property, public health and safety, economy, and the environment.***

- Identify strategies for mitigating hazards to reduce adverse impacts and hazard related losses.
- Provide protection for existing and future development.
- Provide protection for critical facilities, utilities, and services and minimize disruption.
- Provide protection for the environment and natural and cultural resources.
- Prevent repetitive losses and reoccurring damages from happening.
- Minimize hazard related losses through master planning of communities.

***Goal 2: Increase community outreach, education, and awareness of risk and vulnerability to hazards and promote preparedness and engagement to reduce hazard-related losses.***

- Inform and educate residents and businesses about all hazards they are exposed to, where they occur, and what they can do to mitigate exposure or damages.
- Emphasize preparedness and self-responsibility to residents.

***Goal 3: Improve communities' capabilities to prevent/mitigate hazard-related losses and to be prepared for, respond to, and recover from a disaster event.***

- Continued improvements to emergency services and public safety capabilities.
- Maintain coordination of disaster/emergency response plans and exercises with changing Department of Homeland Security/FEMA needs and with all agencies operating in Madera County.
- Develop/improve warning, evacuation, and sheltering procedures and information for residents, businesses, visitors, individuals with access and functional needs, and animals, with a focus on high risk areas.



- Improve/Maintain interagency communications. Ensure functionality and redundancy of communications, information technology, and other critical systems.
- Increase interoperability and use of shared resources and mutual aid among agencies operating in Madera County.
- Establish enhanced data collection and retention practices.
- Minimize the over dependence on governmental regulation and allow the public and markets to implement reasonable measures.
- Encourage more stable conditions that facilitate public and private stewardship.

***Goal 4: Increase and maintain wildfire prevention and protection in Madera County.***

- Reduce the wildfire risk and vulnerability in Madera County
- Reduce life safety issues, property loss, and damages associated with wildfires.
- Develop a countywide fuels reduction implementation strategy.
- Promote tree mortality mitigation activities.
- Promote and enhance fire-fighting capabilities (e.g., access roads, water supply, etc.)

***Goal 5: Improve community resiliency to drought conditions including establishing a sustainable water supply in Madera County.***

- Reduce the drought/water shortage risk and vulnerability in Madera County.
- Develop a comprehensive, countywide water plan to provide for existing development, to foster preservation of economic base, and to guide future development opportunities.
- Promote continued groundwater conservation.
- Increase water storage facilities to provide for consistent water supply and to mitigate flooding.
- Address drought impacts related to tree mortality to include dead tree removal that contributes to wildfire risk (i.e., increased fuel loads) and flood risk (i.e., downed trees blocking flood control facilities).

***Goal 6: Improve community resiliency to flooding in Madera County***

- Reduce the flood risk and vulnerability in Madera County.
- Reduce life safety issues, property loss, and damages associated with flooding.
- Review appropriate flood protection infrastructure improvements in both urban and non-urban areas to provide 100-year level of protection where feasible.

***Goal 7: Maintain FEMA eligibility for grant funding***

- Assure conformance to federal and state hazard mitigation initiatives and maximize potential for mitigation implementation.
- Position jurisdictions for grant funding through monitoring and communicating available grant programs, timelines, and processes to all communities.
- Reduce exposure to hazard-related losses through realistic mitigation project planning and implementation, ensuring that actions can be undertaken and sustained without excessive depletion of economic resources.

## 5.3 Identification and Analysis of Mitigation Actions

**Requirement §201.6(c)(3)(ii) and §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.**

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 4.1 was evaluated. Only those hazards that were determined to be a priority hazard were considered further in the development of hazard-specific mitigation actions.

These priority hazards (in alphabetical order) are:

- Agricultural Hazards: Severe Weather/Insect Pests
- Climate Change
- Dam Failure
- Drought and Water Shortage
- Earthquake
- Flood: 100/200/500–year
- Flood: Localized/Stormwater
- Hazardous Materials Transportation
- Levee Failure
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)
- Severe Weather: Wind and Tornado
- Severe Weather: Winter Storms/Snow
- Wildfire (smoke, tree mortality)

The HMPC eliminated the hazards identified below from further consideration in the development of mitigation actions because the risk of a hazard event in the County is unlikely or nonexistent, the vulnerability of the County is low, or capabilities are already in place to mitigate negative impacts. The eliminated hazards are:

- Landslides, Rockfalls, and Debris Flows
- Severe Weather: Fog
- Volcano

It is important to note, however, that all the Hazards Addressed in this plan are included in the countywide multi-hazard public awareness mitigation action as well as in other multi-hazard, emergency management actions.

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- Prevention

- Property protection
- Structural projects
- Natural resource protection
- Emergency services
- Public information

The HMPC was provided with examples of potential mitigation actions for each of the above categories. The HMPC was also instructed to consider both future and existing buildings in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix C provides a detailed review and discussion of the six mitigation categories to assist in the review and identification of possible mitigation activities or projects. Also utilized in the review of possible mitigation measures is FEMA’s publication on Mitigation Ideas, by hazard type. Prevention type mitigation alternatives were discussed for each of the priority hazards. This was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

### 5.3.1. Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA’s recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria; Smart Growth principles; and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- Social: Does the measure treat people fairly? (e.g., different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action includes:

- Contribution of the action to save life or property
- Availability of funding and perceived cost-effectiveness
- Available resources for implementation
- Ability of the action to address the problem

In addition to reviewing and incorporating the actions from the 2011 LHMPs, the committee also considered and defined numerous new actions. A comprehensive review of mitigation measures was performed using the criteria (alternatives and selection criteria) in Appendix C.

With these criteria in mind, HMPC members were each given a set of nine colored dots, three each of red, blue, and green. The dots were assigned red for high priority (worth five points), blue for medium priority

(worth three points), and green for low priority (worth one point). The team was asked to use the dots to prioritize actions with the above criteria in mind. The point score for each action was totaled. Appendix C contains the total score given to each identified mitigation action.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to prioritize recommended mitigation actions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority; however, this was not a quantitative analysis. The team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support.

Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.4. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

Recognizing the limitations in prioritizing actions from multiple jurisdictions and departments and the regulatory requirement to prioritize by benefit-cost to ensure cost-effectiveness, the HMPC decided to pursue actions that contributed to saving lives and property as first and foremost, with additional consideration given to the benefit-cost aspect of a project. This process drove the development of a determination of a high, medium, or low priority for each mitigation action, and a comprehensive prioritized action plan for the Madera County Planning Area.

## 5.4 Mitigation Action Plan

**Requirement §201.6(c)(3)(iii) and §201.7(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.**

This action plan was developed to present the recommendations developed by the HMPC for how the Madera County Planning Area can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on both future and existing development. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act.

Table 5-2 identifies all mitigation actions for all participating jurisdictions to this LHMP Update. For each mitigation action item included in Table 5-2, a detailed mitigation implementation strategy has been developed. Only those actions where the County is the lead jurisdiction are detailed further in this section. Actions specific to other participating jurisdictions, or where other jurisdictions are taking the lead, are detailed in each respective jurisdictional annex to this plan.

The action plan detailed below contains both new action items developed for this LHMP Update as well as old actions that were yet to be completed from the 2011 Plans. Table 5-2 indicates whether the action is new or from the 2011 LHMPs and Chapter 2 contains the details for each 2011 mitigation action item indicating whether a given action item has been completed, deleted, or deferred.

As described throughout this LHMP, Madera County has many risks and vulnerabilities to identified hazards. Although many possible mitigation actions, as detailed in Appendix C, were brainstormed and prioritized during the mitigation strategy meetings, the resulting mitigation strategy presented in this Chapter 5 of this LHMP focuses only on those mitigation actions that are both reasonable and realistic for the community to consider for implementation over the next 5-years covered by this plan. Thus, only a portion of the actions identified in Appendix C have been carried forward into the mitigation strategy presented in Table 5-2. Although many good ideas were developed during the mitigation action brainstorming process, the reality of determining which priority actions to develop and include in this plan came down to the actual priorities of communities, individuals and departments based in part on department direction, staffing, and available funding. The overall value of the mitigation action table in Appendix C is that it represents a wide-range of mitigation actions that can be consulted and developed for this plan during annual plan reviews and the formal 5-year update process.

It is also important to note that Madera County and the participating jurisdictions have numerous existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as stormwater and drainage plans, community wildfire protection plans/fire plans, and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The HMPC also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The participating communities are not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the CRS mitigation categories and criteria contained in Appendix C.

It should be noted that many of the projects submitted by each jurisdiction in Table 5-2 benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority.

*Table 5-2 Madera County Planning Area Mitigation Actions*

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
<b>Madera County</b>						
<b>Multi-Hazard Actions</b>						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X		Prevention
Action 2. Improved Public Outreach	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X	X	Public Information
Action 3. Review and Bring Current County Plans	1, 2, 3, 4, 5, 6, 7	New action	X	X		Public Information
Action 4. Shelter Emergency Plan	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 5. Training & Exercises	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 6. Recovery Plan	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 7. Countywide GIS Data Base	1, 2, 3, 4, 5, 6, 7	New action	X	X		Prevention Emergency Services
Action 8. Community Pet Education and Disaster Preparedness	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention Emergency Services
<b>Agricultural Actions</b>						
Action 9. Agriculture Emergency Plan	1, 2, 3, 7	New action	X	X		Prevention Emergency Services
<b>Climate Change Actions</b>						
Action 10. Climate Adaptation Plan	1, 2, 3, 7	New action	X	X		Prevention
<b>Dam Failure Actions</b>						
Action 11. Dam Monitoring	1, 2, 3, 7	New action	X	X		Prevention Emergency Services

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
<b>Drought Actions</b>						
Action 12. Well Rehabilitation Program	1, 2, 3, 5, 7	New action	X	X		Property Protection
Action 13. Public Water Systems	1, 2, 3, 5, 7	New action	X	X		Property Protection Natural Resource Protection
Action 14. Expand Surface Water Locations	1, 2, 3, 5, 7	New action	X	X		Property Protection Structural Projects
<b>Earthquake Actions</b>						
Action 15. Bridge Retrofits and Replacements	1, 2, 3, 6, 7	2011 action	X	X		Property Protection Structural Projects
<b>Flood Actions</b>						
Action 16. Relocate County fire station out of floodplain	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Structural Projects
Action 17. Relocation of Government Facilities in the Floodplain	1, 2, 3, 5, 7	2011 action	X	X	X	Property Protection Structural Projects
Action 18. Erosion Repair and Restoration Projects	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 19. Woody Debris Removals	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Natural Resource Protection
Action 20. Flood Insurance Promotion	1, 2, 3, 5, 7	New action	X	X	X	Prevention Public Information
Action 21. Stormwater Management Plan	1, 2, 3, 5, 7	New action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 22. Flood Studies and Action Project	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 23. Ash Slough Arundo Removal and Channel Clearing	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 24. Berenda Creek Arundo Removal, Channel Clearing and Levee Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 25. Berenda Slough Arundo Removal and Channel Clearing	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 26. Cottonwood Creek Channel Clearing and Levee Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 27. Dry Creek Channel Clearing and Levee/Embankment Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection



Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 28. Fresno River Channel Clearing and Levee/Embankment Repairs	1, 2, 3, 5, 7	New action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
<b>Hazardous Materials Actions</b>						
Action 29. Crude Oil Emergency Response	1, 2, 3, 7	New action	X	X		Emergency Services
Action 30. Hazardous Materials Decontamination Kits	1, 2, 3, 7	New action	X	X		Emergency Services
Action 31. Ethanol Emergency Response	1, 2, 3, 7	New action	X	X		Emergency Services
Action 32. Madera County ICS typing of Hazardous Materials Team	1, 2, 3, 7	New action	X	X		Emergency Services
Action 33. Mutual Aid Agreements	1, 2, 3, 7	New action	X	X		Emergency Services
Action 34. HAZ-MAT Response	1, 2, 3, 7	New action	X	X		Emergency Services
<b>Extreme Heat/Cold Actions</b>						
Action 35. Cooling/Warming Centers	1, 2, 3, 7	New action	X	X		Prevention Public Information
<b>Wind and Tornado Actions</b>						
Action 36. Woody Debris Removal - Roadway	1, 2, 3, 7	New action	X	X		Property Protection Natural Resource Protection
<b>Winter Storms/Snow Actions</b>						
Action 37. Snow Removal Plan	1, 2, 3, 7	New action	X	X		Property Protection
<b>Wildfire Actions</b>						
Action 38. Educate the public on fire safety and hazard reduction	1, 2, 3, 4, 7	New action	X	X		Public Information

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 39. Fuel Reduction	1, 2, 3, 4, 7	New action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 40. Pre-suppression plan and Wildland urban interface map	1, 2, 3, 4, 7	New action	X	X		Prevention Property Protection
Action 41. Fire Fighting Access Issues	1, 2, 3, 4, 7	New action	X	X		Property Protection Natural Resource Protection
Action 42. Tree Mortality	1, 2, 3, 4, 7	New action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 43. FireWise Communities	1, 2, 3, 4, 7	New action	X	X		Prevention Property Protection
Action 44. Community Chipping Program	1, 2, 3, 4, 7	New action	X	X		Prevention Property Protection
Action 45. Reforestation Projects	1, 2, 3, 4, 7	New action	X	X		Natural Resource Protection
<b>City of Chowchilla</b>						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X		Prevention
Action 2. Public awareness, education, outreach, and preparedness program enhancements for all hazards (simplify, multi-media, educate and clarify various emergency systems, messaging and training; promote self-responsibility)	1, 2, 3, 4, 5, 6, 7	2011 Action	X	X	X	Public Information
Action 3. Conduct evacuation and shelter planning for all communities and populations (to include all critical hazards, at risk populations, medical, ADA, animals, and with outreach and security components)	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention Emergency Services

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 4.Enhance and maintain GIS mapping of City assets and critical facilities	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention Emergency Services
Action 5.Explore additional surface water resources for City	1, 2, 3, 5, 7	New Action	X	X		Property Protection Structural Projects
Action 6.Provide backup generators for wells	1, 2, 3, 7	New Action	X	X		Property Protection
Action 7. Evaluate joining the National Flood Insurance Program	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Natural Resource Protection
Action 8.Erosion repair	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Natural Resource Protection
Action 9.Implement stormwater master plans	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 10. Undergrounding of stormwater system – Downtown area	1, 2, 3, 6, 7	2011 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
<b>City of Madera</b>						
Action 1.Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	1, 2, 3, 4, 5, 6, 7	New Action	X	X		Prevention
Action 2.Installation of variable frequency drives onto wells to increase capacity	1, 2, 3, 5, 7	New Action	X	X		Property Protection
Action 3.Install backup motors for wells with an emphasis on critical facilities. Provide backup generators for wells.	1, 2, 3, 5, 7	New Action	X	X		Property Protection
Action 4.Install Variable Frequency Drives (VFD) on Existing City Wells to Increase Capacity	1, 2, 3, 5, 7	New Action	X	X		Property Protection
Action 5.Provide Backup Generators for City Wells	1, 2, 3, 5, 7	New Action	X	X		Property Protection

Action Title	Goals Addressed	New Action/ 2011/2013 Action	Address Current Development	Address Future Development	Continued Compliance with NFIP	CRS Category
Action 6. Implement Improvements Recommended in the Storm Drainage System Master Plan	1, 2, 3, 6, 7	2011 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 7. 4th Street Flooding Improvements Installed in accordance with that recommended in the Storm Drainage System Master Plan	1, 2, 3, 6, 7	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 8. Conduct New Studies/Modeling and Mapping of the Fresno River within the City's Growth Boundary	1, 2, 3, 6, 7	New Action	X	X	X	Prevention
<b>North Fork Rancheria</b>						
Action 1. Prescription Burning Projects	1, 3, 4, 7	New Action	X	X		Property Protection Natural Resource Protection
Action 2. Defensible Space Projects	1, 3, 4, 7	New Action	X	X		Property Protection Natural Resource Protection
Action 3. Community Emergency Preparedness Meeting	1, 3, 4, 7	New Action	X	X		Prevention Emergency Services

## *Multi-Hazard Actions*

### *Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan*

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140).

**Project Description:** Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Safety Element of General Plan

**Responsible Office:** Madera County Planning Department

**Priority (H, M, L):** High

**Cost Estimate:** Jurisdictional board/staff time

**Benefits (avoided Losses):** Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

**Potential Funding:** Local budgets

**Timeline:** 2017-2022

### *Action 2. Improved Public Outreach*

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Reduced information to public regarding natural hazards.

**Project Description:** Improve by way of all streams of media messaging to the public on what to do in event of emergency

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Form a group from across county agencies to begin out reach

**Responsible Office:** All County Departments

**Priority (H, M, L):** Medium

**Cost Estimate:** \$50,000

**Benefits (Losses Avoided):** Improved public response in an event of emergency

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

***Action 3. Review and Bring Current County Plans***

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Expired and outdated County Plans

**Project Description:** Review all County Plans and begin updating them to bring them into five-year review cycle

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Form a group from across county agencies.

**Responsible Office:** All County Departments

**Priority (H, M, L):** High

**Cost Estimate:** \$70,000

**Benefits (Losses Avoided):** Improved public response in an event of emergency

**Potential Funding:** County Budget and/or Grants

**Timeline:** 5 years

***Action 4. Shelter Emergency Plan***

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** No pre-planning for Shelter Operations

**Project Description:** Start the process of building an annex of the County EOP for Shelter Operations.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Public Health and County OES to begin building a document

**Responsible Office:** Public Health and County OES

**Priority (H, M, L):** Low

**Cost Estimate:** \$30,000

**Benefits (Losses Avoided):** Improved public response in an event of emergency

**Potential Funding:** County Budget and/or Grants

**Timeline:** 5 years

*Action 5. Training & Exercises*

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Lack of on-going and continuous training

**Project Description:** Begin scheduled training every year with an end of the year training for all county departments

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Planning group from all county departments

**Responsible Office:** County OES

**Priority (H, M, L):** Low

**Cost Estimate:** \$500,000

**Benefits (Losses Avoided):** Improved response from County Employees

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

*Action 6. Recovery Plan*

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** No Systematic approach to recovery from a natural disaster

**Project Description:** Develop a systematic approach to begin the recovery process from the County.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Stakeholders from County, State and Federal Agencies can meet to develop an approach.

**Responsible Office:** All County Departments

**Priority (H, M, L):** High

**Cost Estimate:** \$30,000

**Benefits (Losses Avoided):** Rapid Recovery Process eliminating down time.

**Potential Funding:** County Budget and/or Grants

**Timeline:** 4 years

*Action 7. Countywide GIS Data Base*

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** No set database of County GIS Data

**Project Description:** Identify a County Department who can maintain the database and begin to centralize data

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Planning group from all county departments

**Responsible Office:** All County Departments

**Priority (H, M, L):** Medium

**Cost Estimate:** \$100,000



**Benefits (Losses Avoided):** Centralized Location for Map Data

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

***Action 8. Community Pet Education and Disaster Preparedness***

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Human emergency evacuations are hampered by the need to address the animals at the location. Safety for the families, their animals, the community, and emergency responders are all critical considerations during an emergency.

**Project Description:** Madera County Animal Services works in cooperation for animal rescue and sheltering efforts with CCADTR (Central California Animal Disaster Team). These efforts include assisting residents affected by the disaster and their challenges in transporting, sheltering, and reclaiming lost pets.

**Other Alternatives:** Housing animals in place. Local non-profit partners that have resources to shelter animals. Engaging HSUS (Humane Society of United States) for large scale disasters.

**Existing Planning Mechanisms through which Action will be Implemented:** OES Meetings with Sherriff's Office. Creating additional cooperative efforts with CCADT and vendors in the area.

**Responsible Office:** Madera County Animal Services, CCADT

**Priority (H, M, L):** Medium

**Cost Estimate:** No estimates available at this time.

**Potential Funding:** Donations based

**Benefits (Losses Avoided):** Increased human and animal safety. Reduced challenge for emergency responders.

**Timeline:** Continuous

## *Agricultural Actions*

### *Action 9. Agricultural Emergency Plan*

---

**Hazards Addressed:** Agricultural hazards

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Lack of Planning in event of Agricultural Emergencies

**Project Description:** Start the process of building an annex of the County EOP for Agricultural Emergencies

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** County Ag Commissioner and County OES to begin building a document

**Responsible Office:** County Ag Commissioner and County OES

**Priority (H, M, L):** Low

**Cost Estimate:** \$30,000

**Benefits (Losses Avoided):** Improved public response in an event of emergency

**Potential Funding:** County Budget and/or Grants

**Timeline:** 5 years

## *Climate Change Actions*

### *Action 10. Climate Adaptation Plan*

---

**Hazards Addressed:** Climate Change

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** No County Plan Addressing Climate Change

**Project Description:** Start the process of building an annex of the County EOP for Climate Adaptation.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** County OES to begin building a document

**Responsible Office:** County OES

**Priority (H, M, L):** Low

**Cost Estimate:** \$30,000

**Benefits (Losses Avoided):** Improved planning and prevention of a natural hazard.

**Potential Funding:** County Budget and/or Grants

**Timeline:** 5 years

## *Dam Failure Actions*

### *Action 11. Dam Monitoring*

---

**Hazards Addressed:** Dam Failure

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Lack of remote monitoring of dams

**Project Description:** Begin looking into installing surveillance cameras and/or flow monitoring equipment at local dams to allow remote monitoring of them.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Working with local dam operators to establish access to systems in place or install equipment or mobile equipment

**Responsible Office:** County OES

**Priority (H, M, L):** Low

**Cost Estimate:** \$50,000

**Benefits (Losses Avoided):** Improved incident awareness

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

## *Drought Actions*

### *Action 12. Well Rehabilitation Program*

---

**Hazards Addressed:** Drought

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** Residential wells going dry after consecutive years of drought

**Project Description:** Starting a program that will look into a way to rehabilitate those wells.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office:** Natural Resources

**Priority (H, M, L):** Low

**Cost Estimate:** \$1,000,000

**Benefits (Losses Avoided):** Self-Reliant Wells

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

### *Action 13. Public Water Systems*

---

**Hazards Addressed:** Drought

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** County/City Water Wells that are operating but could use improvements

**Project Description:** This project would address a few issues with the water systems by 1) Installation of variable frequency drives onto wells to increase capacity, 2) Install backup motors for wells (see master plan), with an emphasis on critical facilities, 3) Consolidations of Water Systems 4) Seismic retrofitting of tanks and water systems 5) Provide Back-Up Generators for Wells 6) Improve Tank locations for firefighting

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office:** Public Works

**Priority (H, M, L):** Low

**Cost Estimate:** \$1,000,000

**Benefits (Losses Avoided):** Self-Reliant Water Systems

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

*Action 14. Expand Surface Water Locations*

---

**Hazards Addressed:** Drought

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** Lack of surface water storage locations

**Project Description:** Locate and obtain locations that would be suitable for surface water storage

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office:** Natural Resources

**Priority (H, M, L):** Low

**Cost Estimate:** \$10,000,000

**Benefits (Losses Avoided):** Improved Flood Control and Water Storage

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

## *Earthquake Actions*

### ***Action 15. Bridge Retrofits and Replacements***

---

**Hazards Addressed:** Earthquake and Flood

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** The County has an inventory of aging bridges that have not been retrofitted or replaced

**Project Description:** Conduct a study of current bridges with in the county. Review the needs of those bridges or see if replacement is needed.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office:** Public Works

**Priority (H, M, L):** Medium

**Cost Estimate:** \$10,000,000

**Benefits (Losses Avoided):** Improved Public Safety

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

## *Flood Actions*

### **Action 16. Relocate County fire station out of floodplain**

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Madera County Fire Department Station 3 is located on property that is in a floodplain.

**Project Description:** Purchasing new property to build new fire station not in a flood plain.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Unknown

**Responsible Office/Partners:** Madera County Fire Department, Madera County Planning Department, Madera County Environmental Health

**Project Priority:** High

**Cost Estimate:** 6,000,000

**Benefits (Losses Avoided):** Eliminate property damage to the county and loss of services during an emergency.

**Potential Funding:** General fund

**Timeline:** 3 years

### **Action 17. Relocation of Government Facilities in the Floodplain**

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Government Building and Facilities that were built within the floodplain.

**Project Description:** A number of county buildings are located in the floodplain such as three schools and two fire stations. This project would look at moving the schools or elevating them.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** Public Works, Fire, County Department of Education



**Project Priority:** Low

**Cost Estimate:** 20,000,000

**Benefits (Losses Avoided):** Eliminate property damage to the county and loss of services during an emergency.

**Potential Funding:** General fund

**Timeline:** 3 years

***Action 18. Erosion Repair and Restoration Projects***

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Areas of erosion repair

**Project Description:** Identify locations in need of erosion repair after winter storms and increased water flows.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** Flood, Public Works

**Project Priority:** Low

**Cost Estimate:** \$10,000

**Benefits (Losses Avoided):** Reduce flood damage to public road and waterways.

**Potential Funding:** General fund

**Timeline:** 3 years

***Action 19. Woody Debris Removals***

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** After years of lack of management, the bamboo in the Chowchilla, Ash and Brenda Sloughs has become over grown and causes water movement problems and fire problems.

**Project Description:** Conduct a cleanup of all three sloughs removing the problem plants and start a management plan of routine clean up.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** Flood, Public Works

**Project Priority:** Low

**Cost Estimate:** \$50,000

**Benefits (Losses Avoided):** Reduce flood damage to public road and waterways.

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

***Action 20. Flood Insurance Promotion***

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Lack of public information regarding the flood insurance program.

**Project Description:** Engage the public regarding the flood insurance program and the availability of flood insurance.

**Other Alternatives:** No action.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Pull a group of Public Information Officers from different county agencies to begin planning outreach.

**Responsible Office/Partners:** Flood, Public Works

**Project Priority:** Low

**Cost Estimate:** \$20,000

**Benefits (Losses Avoided):** Improved recovery efforts after a flood event.

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

**Action 21. Stormwater Management Plan**

---

**Hazards Addressed:** Flooding/Localized Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Lack of implementation of the Stormwater Management Plan

**Project Description:** Bridge partnerships between local government and citizens regarding storm water management

**Other Alternatives:** No action.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Begin Public Outreach and build a group of stakeholders.

**Responsible Office/Partners:** Flood, Public Works

**Project Priority:** Low

**Cost Estimate:** \$10,000

**Benefits (Losses Avoided):** Improved management of water during flood events, including possible ARKStorm

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

**Action 22. Flood Studies and Action Projects**

---

**Hazards Addressed:** Flooding/Localized Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Lack of information on locations to begin mitigation of constant flood prone areas

**Project Description:** Begin by doing a county-wide study of flood prone areas and assess the best way to mitigate those locations. After the locations are identified begin projects to deal with those. Problems Areas Known: A) Fresno River Area B) Oakhurst Basin Area C) Madera Acres D) Madera Ranchos E) 4th Street in the City of Madera

**Other Alternatives:** No action.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** Flood, Public Works

**Project Priority:** Low

**Cost Estimate:** \$500,000

**Benefits (Losses Avoided):** Improved management of water during flood events, including possible ARKStorm

**Potential Funding:** County Budget and/or Grants

**Timeline:** 3 years

***Action 23. Ash Slough Arundo Removal and Channel Clearing***

---

**Hazards Addressed:** Flooding / Levee Failure/ Bridge Failures

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Arundo Donax is an aggressive plant that has invaded our channels and embankments, resulting in destabilization of our banks and levees causing erosion as well as altering the stream flows by redirecting the water and causing undercuts. Also sheathing several of our bridges. Due to lack of funding, this plant has been allowed to grow and in some areas it is over 20-foot tall which impedes the flows severely.

**Project Description:** Remove approximately 15 miles of Arundo Donax, and Sediment on the Ash Slough.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Regional Water Management Group, Integrated Regional Water Management Plan, Storm Water Resource Plan

**Responsible Office/Partners:** Potential partnership with Chowchilla Water District, City of Chowchilla Public Works

**Project Priority:** Medium

**Cost Estimate:** \$80,000 per mile = \$1,200,000

**Benefits (Losses Avoided):** Bridge protection, Flood Protection of Homes and Crops, Increased in groundwater recharge

**Potential Funding:** FEMA, Prop 1

**Timeline:** 3 to 5 years

**Action 24. Berenda Creek Arundo Removal, Channel Clearing and Levee Repairs**

---

**Hazards Addressed:** Flooding/Levee Failure/Bridge Failures

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Arundo Donax is an aggressive plant that has invaded our channels and embankments, resulting in destabilization of our banks and levees causing erosion as well as altering the stream flows by redirecting the water and causing undercuts. This invasive plant has put a threat to several of our bridges. Due to lack of funding, this plant has been allowed to grow and is now impeding the flows severely. Additionally, this Creek suffered serious breaches due to the recent storms events and will need permanent repairs.

**Project Description:** Remove approximately 13 miles of Arundo Donax, and Sediment on Berenda Creek as well as permanent repairs to the Creek due to the recent floods.

**Other Alternatives:** No action.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Regional Water Management Group, Integrated Regional Water Management Plan, Storm Water Resource Plan

**Responsible Office/Partners:** Potential partnership with Madera Irrigation District

**Project Priority:** Medium

**Cost Estimate:** \$80,000 per mile = \$1,040,000

**Benefits (Losses Avoided):** Bridge protection, Invasive Species Management, Increased in groundwater recharge

**Potential Funding:** FEMA, Prop 1

**Timeline:** 2 to 5 years

**Action 25. Berenda Slough Arundo Removal and Channel Clearing**

---

**Hazards Addressed:** Flooding / Levee Failure/ Bridge Failures

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Arundo Donax is an aggressive plant that has invaded our channels and embankments, resulting in destabilization of our banks and levees causing erosion as well as altering the stream flows by redirecting the water and causing undercuts. Also sheathing several of our bridges. Due to lack of funding, this plant has been allowed to grow and in some areas it is over 20-foot tall which impedes the flows severely.

**Project Description:** Remove approximately 18 miles of Arundo Donax, and Sediment on the Berenda Slough.

**Other Alternatives:** No action.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Regional Water Management Group, Integrated Regional Water Management Plan, Storm Water Resource Plan

**Responsible Office/Partners:** Potential partnership with Madera Irrigation District, Chowchilla Water District

**Project Priority:** Medium

**Cost Estimate:** \$80,000 per mile = \$1,440,000

**Benefits (Losses Avoided):** Bridge protection, Flood Protection of Homes and Crops, Increased in groundwater recharge

**Potential Funding:** FEMA, Prop 1

**Timeline:** 3 to 5 years

***Action 26. Cottonwood Creek Channel Clearing and Levee Repairs***

---

**Hazards Addressed:** Flooding / Levee Failure/ Bridge Failures

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Arundo Donax is an aggressive plant that has invaded our channels and embankments, resulting in destabilization of our banks and levees causing erosion as well as altering the stream flows by redirecting the water and causing undercuts. This invasive species has become a threat to several of our bridges. Due to lack of funding, this plant has been allowed to grow and is now impeding the flows severely. Additionally, this Creek suffered serious breaches due to the recent storms events and will need permanent repairs.

**Project Description:** Remove approximately 12 miles of Arundo Donax and Excessive Overgrowth Vegetation, and Sediment on Cottonwood Creek as well as permanent repairs to the Creek due to the recent floods.

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Regional Water Management Group, Integrated Regional Water Management Plan, Storm Water Resource Plan

**Responsible Office/Partners:** Potential partnership with Madera Irrigation District

**Project Priority:** Medium

**Cost Estimate:** \$90,000 per mile = \$1,080,000

**Benefits (Losses Avoided):** Bridge protection, Levee Protection, Increased in groundwater recharge

**Potential Funding:** FEMA, Prop 1

**Timeline:** 2 to 4 years

**Action 27. *Dry Creek Channel Clearing and Levee/Embankment Repairs***

---

**Hazards Addressed:** Flooding / Levee Failure/ Bridge Failures

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Arundo Donax is an aggressive plant that has invaded our channels and embankments, resulting in destabilization of our banks and levees causing erosion as well as altering the stream flows by redirecting the water and causing undercuts. This invasive species has become a threat to several of our bridges. Due to lack of funding, this plant has been allowed to grow and is now impeding the flows severely. Additionally, this Creek suffered serious breaches due to the recent storms events and will need permanent repairs.

**Project Description:** Remove approximately 7 miles of Arundo Donax and Excessive Overgrowth Vegetation, and Sediment on Dry Creek, as well as permanent repairs to the Creek's embankments due to the recent floods.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Regional Water Management Group, Integrated Regional Water Management Plan, Storm Water Resource Plan

**Responsible Office/Partners:** Potential partnership with Madera Irrigation District

**Project Priority:** Medium

**Cost Estimate:** \$90,000 per mile = \$630,000

**Benefits (Losses Avoided):** Bridge protection, Levee Protection, Increased in groundwater recharge

**Potential Funding:** FEMA, Prop 1

**Timeline:** 2 to 3 years

**Action 28. *Fresno River Channel Clearing and Levee/Embankment Repairs***

---

**Hazards Addressed:** Flooding / Levee Failure/ Bridge Failures

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Arundo Donax is an aggressive plant that has invaded our channels, embankments, and Levees (Project Levees and non Project Levees) resulting in destabilization of our banks and levees causing erosion as well as altering the stream flows by redirecting the water and causing undercuts. This invasive species has become a threat to several of our bridges. Due to lack of funding, this plant has been allowed to grow and is now impeding the flows severely. Additionally, this Creek suffered serious breaches due to the recent storms events and will need permanent repairs.

**Project Description:** Remove approximately 23 miles of Arundo Donax and Excessive Overgrowth Vegetation, and Sediment on the River, as well as permanent repairs to the River's embankments and Levees due to the recent floods.

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Regional Water Management Group, Integrated Regional Water Management Plan, Storm Water Resource Plan

**Responsible Office/Partners:** Potential partnership with Madera Irrigation District, City of Madera, Lower San Joaquin Levee District

**Project Priority:** Medium

**Cost Estimate:** \$80,000 per mile = \$1,840,000

**Benefits (Losses Avoided):** Bridge protection, Levee Protection, Increased in groundwater recharge

**Potential Funding:** FEMA, Prop 1

**Timeline:** 2 to 4 years



## *Hazardous Materials Actions*

### *Action 29. Crude Oil Emergency Response*

---

**Hazards Addressed:** Hazardous Material Transportation

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Crude oil is the number one hazardous material transported through Madera County by rail. Crude oils flammable properties makes suppressing these fires difficult. Suppressing these fires takes special training and equipment.

**Project Description:** Train first responders in Crude oil firefighting. Work with rail companies on preventive safety measures. Purchase foam and equipment with Crude oil suppression capabilities.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Unknown

**Responsible Office/Partners:** Madera County Fire Department, Madera County Sheriff's Office, Madera County Environmental Health, UPRR and BNSF

**Project Priority:** Medium

**Cost Estimate:** 500,000

**Benefits (Losses Avoided):** Better training and knowledge in Crude oil firefighting.

**Potential Funding:** Budgets, Grants and Donations

**Timeline:** 3 years

### *Action 30. Hazardous Materials Decontamination Kits*

---

**Hazards Addressed:** Hazardous Materials Transportation

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** During Hazardous Material spills the public can become contaminated with product. To decontaminate these people they may be required to remove their contaminated outer garment. These kits will assist first responders to provide modesty and comfort for the person who is contaminated.

**Project Description:** Purchase equipment for Decontamination kits and provide training to first responders on proper use of these kits.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Unknown

**Responsible Office/Partners:** Madera County Fire Department

**Project Priority:** Medium

**Cost Estimate:** 9,000

**Benefits (Losses Avoided):** Provides modesty to public, property tracking for contaminated victims and minimizes exposure to outside elements.

**Potential Funding:** Grants and Budgets

**Timeline:** 2 Years

***Action 31. Ethanol Emergency Response***

---

**Hazards Addressed:** Hazardous Material Transportation

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** The Ethanol Plant on 12 produces 40 million gallons of Ethanol yearly; this production has increased the traffic of trucks carrying Ethanol. There is also loading of trucks with Ethanol daily at the plant.

**Project Description:** Train first responders in ethanol firefighting, Work with plant on preventive safety measures. Purchase foam and equipment with ethanol suppression capabilities.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Unknown

**Responsible Office/Partners:** Madera County Fire Department, Madera County Sheriff's Office, Madera County Environmental Health and Pacific Ethanol

**Project Priority:** Medium

**Cost Estimate:** 500,000

**Benefits (Losses Avoided):** Better training and knowledge in ethanol firefighting.

**Potential Funding:** Budget, Grants and Donations

**Timeline:** 3 years

***Action 32. Madera County ICS typing of Hazardous Materials Team***

---

**Hazards Addressed:** Hazardous Material Transportation

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Madera County Fire Department currently has a non-ICS typed Hazardous Materials Team. Madera County Fire Department would like to get the Hazardous Materials Team to a Type 2 team.

**Project Description:** Purchase required equipment to meet type 2 qualification according to FIRESCOPE standards.

**Other Alternatives:** Apply for CAL OES type 2 hazardous materials unit.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Unknown

**Responsible Office/Partners:** Madera County Fire Department and Madera City Fire Department

**Project Priority:** Low

**Cost Estimate:** \$800,000

**Benefits (Losses Avoided):** Property loss to private industries and environmental impact.

**Potential Funding:** Budgets and Grants

**Timeline:** 3 years

***Action 33. Mutual Aid Agreements***

---

**Hazards Addressed:** Hazardous Material Transportation

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Keep Mutual Aid Agreements in place.

**Project Description:** Work with other Counties and Agencies to keep Mutual Aid Agreements in place or to expand current agreements

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Fire, Law Enforcement and EMS Mutual Aid Coordinators will work with other agencies for the maintenance of these agreements

**Responsible Office/Partners:** Madera County Fire Department and Madera City Fire Department

**Project Priority:** Low

**Cost Estimate:** \$100,000

**Benefits (Losses Avoided):** Property loss to private industries and environmental impact.

**Potential Funding:** County Budget and Grants

**Timeline:** 3 years

***Action 34. HAZ-MAT Response***

---

**Hazards Addressed:** Hazardous Material Transportation

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** The County HAZ-MAT Team is not a state recognized team.

**Project Description:** Identify training, gear and equipment that will bring the county HAZ-MAT Team to a State Recognized Team.

**Other Alternatives:** No Action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Fire will have to meet to come up with a list of needs.

**Responsible Office/Partners:** Madera County Fire Department and Madera City Fire Department

**Project Priority:** Low

**Cost Estimate:** \$1,000,000

**Benefits (Losses Avoided):** Improved Public Safety

**Potential Funding:** County Budgets and Grants

**Timeline:** 3 years

## *Extreme Heat/Cold Actions*

### **Action 35.     Cooling/Warming Centers**

---

**Hazards Addressed:** Extreme Heat and Cold

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Lack of transportation for certain populations during extreme heat and cool.

**Project Description:** Locate funding and create a system to pick up and drop off certain populations to locations designated as cooling/warming centers

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Public Health and County OES to begin to research other systems to find an effective system.

**Responsible Office/Partners:** County OES, Public Health

**Project Priority:** Low

**Cost Estimate:** \$10,000

**Benefits (Losses Avoided):** Providing more services to sensitive populations

**Potential Funding:** Budgets and Grants

**Timeline:** 3 years

## *Wind and Tornado Actions*

### **Action 36. Woody Debris Removal - Roadway**

---

**Hazards Addressed:** Wind and Tornado

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** County Roads are unable to keep up with tree maintenance and removal when needed

**Project Description:** Identify and develop a program to locate problem trees and remove them before they cause issues.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Public Works Planning group will have to develop options.

**Responsible Office/Partners:** County OES, County Roads, Public Works

**Project Priority:** Low

**Cost Estimate:** \$10,000

**Benefits (Losses Avoided):** Improved management of trees during possible wind events or flood events including a possible ARKStorm event

**Potential Funding:** Budgets and Grants

**Timeline:** 3 years

## *Winter Storms/Snow Actions*

### *Action 37. Snow Removal Plan*

---

**Hazards Addressed:** Winter Storms and Freeze

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Removal of Snow from Roadways and County Facilities.

**Project Description:** Provide a plan and method to remove large amounts of snow from the County

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** County OES, County Roads, Public Works

**Project Priority:** Low

**Cost Estimate:** \$10,000

**Benefits (Losses Avoided):** Formalized Plan in case of heavy snow incident

**Potential Funding:** Budgets and Grants

**Timeline:** 3 years

## *Wildfire Actions*

### **Action 38. Educate the public on fire safety and hazard reduction**

---

**Hazards Addressed:** Wildfire

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** The number one cause of fires is human caused. Educating the public on fire safety and hazard reduction, will reduce the number of fires and minimize fire damage to life and property.

**Project Description:** Develop literature, flyers and/or maps to educate the public on wildfire awareness and hazard reduction. Continue school programs and educating the public with social media, newspaper and public service announcements.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Fire Plans

**Responsible Office/Partners:** CAL FIRE, USFS, BLM and Madera County Fire Dept.

**Project Priority:** Medium

**Cost Estimate:** 500,000

**Benefits (Losses Avoided):** Educating the public on fire safety and hazard reduction

**Potential Funding:** Grants

**Timeline:** On going

### **Action 39. Fuel Reduction**

---

**Hazards Addressed:** Wildfire

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** Large accumulation of fuel causes fire hazard to communities and critical infrastructure.

**Project Description:** Fuel breaks, Chipping programs, Fuel reduction, Vegetation Management Program Prescribed burns.

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** CWPP

**Responsible Office/Partners:** CAL FIRE, USFS, BLM, MID and private land owners



**Project Priority:** High

**Cost Estimate:** \$1,500 per acre

**Benefits (Losses Avoided):** Minimize devastation of wildfire to life property and natural resources.

**Potential Funding:** Grants

**Timeline:** On going

***Action 40. Pre-suppression plan and Wildland urban interface map***

---

**Hazards Addressed:** Wildfire evacuation and Structure defense.

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** Create pre-suppression plans that identify evacuation routes and areas of structure defense in areas at high risk of wildfires.

**Project Description:** Using GIS establish data points of evacuation routes, structure protection areas and water sources. This data can be produced into maps to have at incident command post and EOC. Use data to produce map books for first responders to assist in evacuations during wildfires.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Unknown

**Responsible Office/Partners:** Madera County Fire Dept, CAL FIRE, USFS, USPS, Madera Sheriff's Office.

**Project Priority:** Medium

**Cost Estimate:** 1,000,000

**Benefits (Losses Avoided):** Loss of life, first responders can get to evacuees faster and with set decision points evacuations can be enacted quicker.

**Potential Funding:** Grants

**Timeline:** 3 years

***Action 41. Fire Fighting Access Issues***

---

**Hazards Addressed:** Wildfire

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** Fire Fighting Access to remote locations

**Project Description:** Begin a multiple avenue approach to improve access issues. 1) Improve Current and Better Selection of New Equipment, 2) Improve County Building Codes and Requirements, 3) Bolster County Code Requirements

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Stakeholders from County, State and Federal Agencies can meet to develop an approach.

**Responsible Office/Partners:** Madera County Fire Dept,

**Project Priority:** High

**Cost Estimate:** \$4,000,000

**Benefits (Losses Avoided):** Improved response from County Employees

**Potential Funding:** Grants

**Timeline:** 3 years

*Action 42. Tree Mortality*

---

**Hazards Addressed:** Wildfire /Drought

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** Plan to deal with County Tree Mortality Issues

**Project Description:** Come up with a Tree Morality Plan to begin dealing with the problems faced.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** Madera County Fire Dept,

**Project Priority:** High

**Cost Estimate:** \$5,000,000

**Benefits (Losses Avoided):** Improved Public Safety

**Potential Funding:** Grants

**Timeline:** 3 years

*Action 43. FireWise Communities*

---

**Hazards Addressed:** Wildfire

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** A small amount of Madera County communities are FireWise Communities

**Project Description:** Increase the public outreach regarding the program and the benefits of the program.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Fire will have to meet to come up with a list of needs.

**Responsible Office/Partners:** Madera County Fire Dept,

**Project Priority:** High

**Cost Estimate:** \$50,000

**Benefits (Losses Avoided):** Improved Public Safety

**Potential Funding:** Grants

**Timeline:** 3 years

*Action 44. Community Chipping Program*

---

**Hazards Addressed:** Wildfire

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** No public chipping program exists.

**Project Description:** Employ a county chipping program for communities to bring their brush to the road for chipping.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** Madera County Fire Dept,

**Project Priority:** High

**Cost Estimate:** \$200,000

**Benefits (Losses Avoided):** Improved Public Safety

**Potential Funding:** Grants

**Timeline:** 3 years

***Action 45. Reforestation Projects***

---

**Hazards Addressed:** Wildfire

**Goals Addressed:** 1, 2, 3, 4, 7

**Issue/Background:** No program exists.

**Project Description:** A program to replant trees affected by wildfire.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The County will form a Planning and Research Committee to begin the process. After the group is formed, the group will guide the process from there.

**Responsible Office/Partners:** Madera County Fire Dept,

**Project Priority:** Low

**Cost Estimate:** \$100,000

**Benefits (Losses Avoided):** Improved Public Safety

**Potential Funding:** Grants

**Timeline:** 3 years



## Chapter 6 Plan Adoption

**Requirement §201.6(c)(5) and §201.7(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).**

The purpose of formally adopting this LHMP Update is to secure buy-in from Madera County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this Plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of the Disaster Mitigation Act (DMA) of 2000. For Madera County and the incorporated communities this adoption also establishes compliance with AB 2140 requiring adoption by reference or incorporation into the Safety Element of the General Plan. Two resolutions were created – one for Madera County and the incorporated communities and one for the North Fork Rancheria.

The governing board for each participating jurisdiction has adopted this 2017 Local Hazard Mitigation Plan by passing a resolution. A copy of the generic resolutions and the executed copies are included in Appendix D: Adoption Resolutions.



## Chapter 7 Plan Implementation and Maintenance

**Requirement §201.6(c)(4) and §201.7(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.**

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

Chapter 3 Planning Process includes information on the implementation and maintenance process since the 2011 Madera County LHMP and the 2011 City of Chowchilla LHMP were adopted. This section includes information on the implementation and maintenance process for this plan, which is a combined update to the two aforementioned plans.

### 7.1 Implementation

Once adopted, the Plan Update faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the participating jurisdictions will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned to the actions during the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as general plans, stormwater plans, Fire Plans, Emergency Operations Plans (EOPS), evacuation plans, and other hazard and emergency management planning efforts for Madera County and participating jurisdictions. The County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation can be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the Madera County community and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This could include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the participating jurisdictions will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal programs and earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

### *Responsibility for Implementation of Goals and Activities*

The elected officials and staff appointed to head each department within the County, Cities, and Tribe are charged with implementation of various activities in the plan. During the annual review as described later in this section, an assessment of progress on each of the goals and activities in the plan should be determined and noted. At that time, recommendations should be made to modify timeframes for completion of activities, funding resources, and responsible entities. On an annual basis, the priority standing of various activities may also be changed. Some activities that are found not to be doable may be deleted from the plan entirely and activities addressing problems unforeseen during plan development may be added.

#### **7.1.1. Role of Hazard Mitigation Planning Committee (HMPC) in Implementation and Maintenance**

With adoption of this plan, the participating jurisdictions will be responsible for the plan implementation and maintenance. The HMPC identified in Appendix A (or similar committee), led by Madera County OES, will reconvene each year to ensure mitigation strategies are being implemented and to record the implementation status of each mitigation action. As such, Madera County and the other participating jurisdictions will continue its relationship with the HMPC, and:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the various governing boards or councils of all participating jurisdictions; and
- Inform and solicit input from the public.

The primary duty of the participating jurisdictions is to see the plan successfully carried out and to report to their community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County website (and others as appropriate).

## 7.2 Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

### 7.2.1. Maintenance Schedule

The Madera County OES, as the HMPC lead, is responsible for initiating plan reviews and consulting with the other participating jurisdictions. In order to monitor progress and update the mitigation strategies identified in the action plan, Madera County OES and the individual jurisdictions will revisit this plan annually and following a hazard event. The HMPC will meet annually to review progress on plan implementation and will provide annual evaluation reports. The HMPC will also submit a five-year written update to the State and FEMA Region IX, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be fully approved and adopted in late 2017, the next plan update for the Madera County Planning Area will occur in 2022.

### 7.2.2. Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or annexation).
- Increased vulnerability resulting from unforeseen or new circumstances.

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Changes will be made to the plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. All mitigation actions will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as the HMPC deems appropriate and necessary, and as approved by the appropriate governing boards or councils of the other participating jurisdictions. In keeping with the five-year update process, the HMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the governing boards or councils.



## *Annual Review Process*

For the LHMP Update review process, the Madera County OES will be responsible for coordinating, scheduling, and facilitating reviews and maintenance of the plan. The LHMP is intended to be a living document. Review of the LHMP will normally occur on an annual basis each year and will be conducted by the HMPC as follows:

- The Madera County OES will place an advertisement in the local newspaper advising the public of the date, time, and place for each annual review of the plan and will be responsible for leading the meeting to review the plan.
- Notices will be mailed or emailed to the members of the HMPC, federal, state, and local agencies, non-profit groups, local planning agencies, representatives of business interests, neighboring communities, and others advising them of the date, time, and place for the review.
- County/City/District/Tribal officials will be noticed by email and telephone or personal visit and urged to participate.
- Members of the Communities' Planning Commission and other appointed commissions and groups will also be noticed by email and either by telephone or personal visit.
- Prior to the review, department heads and others tasked with implementation of the various activities will be queried concerning progress on each activity in their area of responsibility and asked to present a report at the review meeting.
- The local news media will be contacted and a copy of the current plan will be available for public comment at Madera County and other participating jurisdictions.
- After the review meeting, minutes of the meeting and an annual report will be prepared by the HMPC and forwarded to the news media (public) and other interested stakeholders. The report will also be presented to the County and governing boards for other participating jurisdictions and a request will be made that the Boards take action to recognize and adopt any changes resulting from the review.

## *Criteria for Annual Reviews*

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan. More specifically, the reviews should include the following information:

- Community growth or change in the past year.
- The number of substantially damaged or substantially improved structures by flood zone
- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services
- The dates of hazard events descriptions
- Documented damages due to the event
- Closures of places of employment or schools and the number of days closed
- Road or bridge closures due to the hazard and the length of time closed
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings

- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Hazard Mitigation Plan. Review of the status of implementation of projects (mitigation strategies) including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

### 7.2.3. Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective is incorporation of the hazard mitigation plan recommendations and their underlying principles into other County and City plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated in Section 7.1 of this plan, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. The point is re-emphasized here. As described in this plan's capability assessment, the County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- County, City, and Tribal general and master plans
- County, City, and Tribal Emergency Operations Plans and other emergency management efforts
- County, City, and Tribal ordinances
- Flood/stormwater management/master plans
- Fire Plans/Community Wildfire Protection plans
- Capital improvement plans and budgets
- Other plans and policies outlined in the capability assessments in the jurisdictional annexes
- Other plans, regulations, and practices with a mitigation focus

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc., as appropriate. As described in Section 7.1 Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- monitoring other planning/program agendas;
- attending other planning/program meetings;
- participating in other planning processes; and
- monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Examples of incorporation of the LHMP into existing planning mechanisms include:

1. As recommended by Assembly Bill 2140, each community should adopt (by reference or incorporation) this LHMP into the Safety Element of their General Plan(s). Evidence of such adoption (by formal, certified resolution) shall be provided to CAL OES and FEMA.

2. Integration of flood actions identified in this mitigation strategy with the actions and implementation priorities established in existing Watershed and Stormwater Drainage Plans.
3. Integration of wildfire actions identified in this mitigation strategy with the actions and implementation priorities established in existing Fire Plans, including local CWPPs.
4. Integration of many of the infrastructure, roads, and facility improvement projects with the jurisdictional Capital Improvement Programs.
5. Using the risk assessment information to update the hazard analysis and other data, such as Critical Facility locations, in local Emergency Operations Plans and other emergency management planning documents.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

#### **7.2.4. Continued Public Involvement**

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

##### ***Public Involvement Process for Annual Reviews***

The public will be noticed by placing an advertisement in local media and social media specifying the date and time for the review and inviting public participation. The HMPC, local, state, and regional agencies will be notified and invited to attend and participate.

##### ***Public Involvement for Five-year Update***

When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the HMPC will be responsible for coordinating the activities necessary to involve the greater public. The HMPC will develop a plan for public involvement and will be responsible for disseminating information through a variety of media channels detailing the plan update process. As part of this effort, public meetings will be held and public comments will be solicited on the plan update draft.



## *Prelude to Jurisdictional Annexes*

For this 2017 Madera County LHMP Update, the **Jurisdictional Annexes**, working in conjunction with the Base Plan, detail the hazard mitigation planning elements specific to participating jurisdictions, beyond the unincorporated County which is covered in the Base Plan. Each Annex is not intended to be a standalone document, but appends to, supplements, and incorporates by reference the information contained in the Base Plan, as the umbrella document for this planning effort. As such, all Chapters 1-7 of the Base Plan and associated appendices, including the planning process and other procedural requirements and planning elements apply to and were met by each participating jurisdiction.

These Jurisdictional Annexes provide additional information specific to each participating jurisdiction, with a focus on providing additional details on the risk assessment and mitigation strategy beyond that provided in the Base Plan.



# Annex A City of Chowchilla

## A.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Chowchilla, a new participating jurisdiction to the Madera County Local Hazard Mitigation Plan (LHMP) Update. In 2011, the City completed their own stand-alone plan. The City has joined with the County in this Plan Update. This Annex also updates the 2011 City of Chowchilla LHMP; thus the City is considered a previous participating jurisdiction subject to the DMA LHMP Update requirements. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to the City of Chowchilla, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

## A.2 Planning Process

As described above, the City of Chowchilla followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Madera County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. City planning participants, their positions, and how they participated in the planning process are shown in Table A-1. Additional details on plan participation and City representatives are included in Appendix A.

*Table A-1 City of Chowchilla Planning Team*

Name	Position/Title	How Participated
Celeste Gray	Public Works - Administrative Analyst	Attended HMPC meetings. Provided data on hazard history. Filled out hazard ID table. Provided information on capabilities. Updated old actions. Reviewed plan drafts.
Harry Turner	Fire Department Fire Chief	Provided history of previous plans and history of the City in regard to emergency services that are needed.

Coordination with other community planning efforts is paramount to the successful implementation of this plan. This section provides information on how the City integrated the previously-approved 2011 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2011 LHMP through other plans and programs shown in Table A-2.

*Table A-2 2011 LHMP Incorporation*

Planning Mechanism 2011 LHMP Was Incorporated/Implemented In.	Details?
---	The 2011 LHMP was not incorporated into any planning mechanism. The City has been understaffed since 2009, and this was just one of the projects that was not financially feasible in making General Plan Updates

### *Sources*

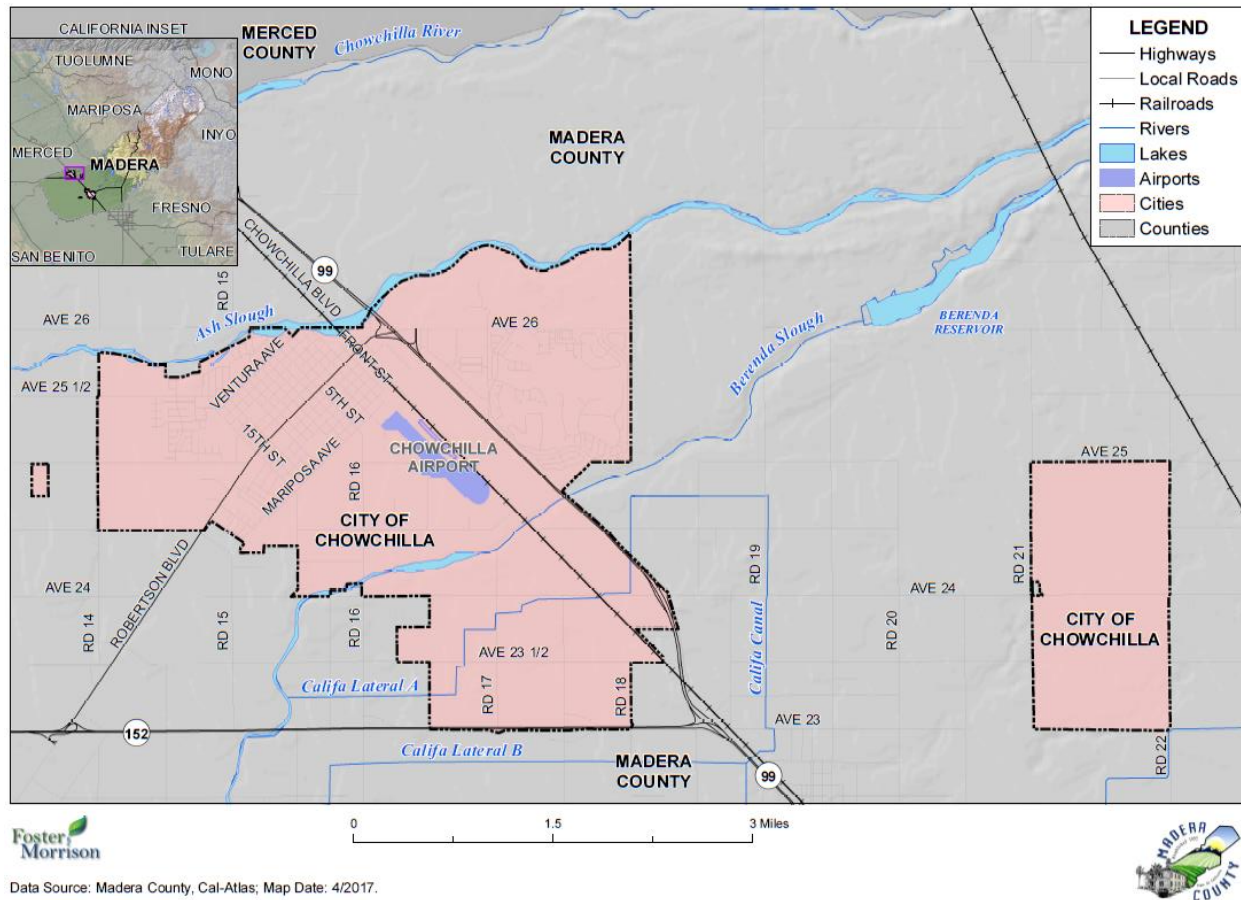
In addition to sources referenced in the Base Plan in Chapter 4, the following sources were used to complete this Annex:

- 2014-2023 Chowchilla Housing Element
- City of Chowchilla General Plan
- City of Chowchilla Public Safety Element

## **A.3 Community Profile**

The community profile for the City of Chowchilla is detailed in the following sections. Figure A-1 displays a map and the location of the City of Chowchilla within Madera County.

Figure A-1 City of Chowchilla



### A.3.1. Geography and Climate

Situated in the heart of the fertile San Joaquin Valley at the very center of California, Chowchilla is today a farming community, just as it was when it was first developed. Located just south of the Chowchilla River and to the west of the Chowchilla Mountain in the Sierras. Chowchilla covers four square miles with 480 acres and adjacent to the city limit is another 880 acres that are industrially zoned. The City is serviced by two railroads (Santa Fe and Union Pacific) and two major highways –north and south by Highway 99 and to the west by Highway 152.

The climate of Chowchilla is Mediterranean. Chowchilla receives an average of about 12 inches of precipitation per year. The wettest months are January, February, and March with March being the wettest. Chowchilla has dry, hot summers, and mild to cool, rainy winters. Chowchilla experiences frequent fog from November to March and overcast days are common, especially in January. In 2005, Chowchilla had twenty consecutive cloudy, rainy days. There are days with moderate to heavy rain during the winter months. In January, the high temperature may drop as low as 45°F. During the summer, when there is usually no rain, the temperature may reach as high as 110°F.

### **A.3.2. History**

Chowchilla’s colorful past began in the spring of 1844 when John Fremont and his party were making their way across what is now Madera County. In Fremont’s memoirs we find the following recording: “Continuing along we came upon broad and deeply-worn trails which had been freshly traveled by large bands of horses, apparently coming from the San Joaquin Valley. But we heard enough to know that they came from the settlements on the coast. These and indications from horse bones dragged about by wild animals – wolves or bears – warned us that we were approaching the villages of Horse-thief Indians, a party who had just returned from a successful raid.” This brief mention of the “Horse-thief Indians” gives us an introduction through the eyes of the white man, of the early inhabitants of the Chowchilla area.

The Chowchilla Indians lived along the several channels of the Chowchilla River in the plains region of Central California. According to one authority, the Chowchilla tribe may well have been a very populous tribe. At least we know they were a warlike one and the name Chowchilla was a byword for bravery to the southernmost end of Yokuts territory in the southern end of the San Joaquin Valley.

Around 1910, Mr. Orlando Alison Robertson (Pioneer) became interested in land development in California. It was during that year he organized the United States Farm Land Company. He established a general office in Sacramento and maintained offices in Winnipeg, St. Paul and Denver.

At the time Mr. Robertson became interested in the Chowchilla area, he was estimated to be worth over four million dollars. Mr. Robertson believed that Chowchilla was ready for immediate development and held ambitious hopes for transforming the land into prosperous farms owned by happy people. He put all his money into the Chowchilla venture against the advice of his financial counselors and, as we shall see, it cost him heavily.

On May 22, 1912, Mr. Robertson purchased the Chowchilla Ranch from the California Pastoral & Agricultural Company Ltd. Over half of this ranch was divided into tracts for sale to farmers and the northeast corner of the property was set aside for the site of the town which became known as Chowchilla.

Though Chowchilla lies in the center of California and beside the main lines of the Southern Pacific, it was not the outgrowth of a geographic or economic need. It was, in fact, the result of the thinking and planning of one man: O. A. Robertson. The City of Chowchilla was incorporated in 1923. Since that time and after a few annexations, the City now comprises four square miles.

### **A.3.3. Economy**

In the past decade, the City of Chowchilla has seen substantial growth since 2000. The unemployment rate is approximately 8.5% as of April of 2017. Agriculturally oriented Madera County tends to have higher unemployment rates and greater seasonal variations in unemployment than found within the City. US Census estimates show economic characteristics for the City of Chowchilla. These are shown in Table A-3.



*Table A-3 City of Chowchilla Civilian Employed Population 16 years and Over*

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	528	15.8%
Construction	67	2.0%
Manufacturing	271	8.1%
Wholesale trade	98	2.9%
Retail trade	247	7.4%
Transportation and warehousing, and utilities	183	5.5%
Information	42	1.3%
Finance and insurance, and real estate and rental and leasing	41	1.2%
Professional, scientific, and management, and administrative and waste management services	289	8.7%
Educational services, and health care and social assistance	708	21.2%
Arts, entertainment, and recreation, and accommodation and food services	316	9.5%
Other services, except public administration	194	5.8%
Public administration	351	10.5%

Source: US Census Bureau American Community Survey 2009-2013 Estimates

The City of Chowchilla is home to many industries and companies. Some of the largest employers in the City are:

- Brake Parts, Inc
- Certainteed Corp
- Valley State Prison for Women
- Chowchilla Elementary School District
- Chowchilla Union High School District

Information on the tax base of the City and the greater County are discussed in Section 1.5 of the Base Plan.

### **A.3.4. Population**

The California Department of Finance estimated the January 1, 2017 total population for the City of Chowchilla was 18,840.

## **A.4 Hazard Identification**

Chowchilla’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Chowchilla (see Table A-4).

**Table A-4 City of Chowchilla—Hazard Identification Assessment**

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests	Significant	Likely	Negligible	Low	Medium
Climate Change	Extensive	Likely	Limited	Low	–
Dam Failure	Significant	Unlikely	Critical	Low	Medium
Drought and Water Shortage	Extensive	Likely	Negligible	Medium	Medium
Earthquake	Extensive	Occasional	Critical	Medium	Low
Flood: 1% and 0.2% Annual Chance	Limited	Occasional/Unlikely	Limited	Medium	Medium
Flood: Localized/Stormwater	Limited	Highly Likely	Limited	Medium	Low
Hazardous Materials Transportation	Significant	Likely	Limited	Medium	Low
Landslides, Rockfalls, and Debris Flows	Limited	Unlikely	Limited	Low	Low
Levee Failure	Significant	Occasional	Limited	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Significant	Likely	Limited	Low	Low
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Fog	Extensive	Likely	Negligible	Medium	Low
Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Significant	Highly Likely	Limited	Medium	Low
Severe Weather: Winter Storms/Snow	Significant	Likely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Limited	Low	Low
Wildfire (smoke, tree mortality)	Limited	Likely	Limited	Medium	Medium
<b>Geographic Extent</b> Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		<b>Magnitude/Severity</b> Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid			
<b>Probability of Future Occurrences</b> Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		<b>Significance</b> Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact			
		<b>Climate Change Impact:</b> Low: Climate change is not likely to increase the probability of this hazard. Medium: Climate change is likely to increase the probability of this hazard. High: Climate change is very likely to increase the probability of this hazard.			

## A.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Chowchilla’s hazards and assess the City’s vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the Base Plan. The hazard profile discusses the threat specific to the City of Chowchilla and describes previous occurrences of hazard events and the likelihood of future occurrences. The vulnerability assessment for the City analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the Madera County Planning Area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

### A.5.1. Hazard Profiles

At the beginning of each hazard vulnerability assessment in Section **Error! Reference source not found.**, a brief statement is given as to how the hazard affects the City, and provides information on past occurrences. The intent of this section is to provide jurisdictional specific information on hazards.

### A.5.2. Vulnerability Assessment

This section identifies Chowchilla’s values at risk, critical facilities and infrastructure, natural resources, historic and cultural assets, and growth and development trends.

#### *Values at Risk*

The April 2017 Assessor’s data obtained from the Madera County Assessor’s Office formed the basis of this analysis. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. As a result, overall value information is low and does not likely reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table A-5 shows the 2017 Assessor’s values (e.g., the values at risk) broken down by property type for the City of Chowchilla.

*Table A-5 City of Chowchilla – Total Values at Risk by Property Use*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Agricultural	160	32	\$21,307,747	\$2,838,232	\$2,838,232
Commercial	289	171	\$37,032,351	\$70,599,111	\$70,599,111
Government	51	3	\$4,373,606	\$314,641	\$314,641
Industrial	35	24	\$6,847,747	\$40,455,124	\$60,682,686

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Institutional	53	27	\$777,254	\$5,298,665	\$5,298,665
Residential	4,079	3,501	\$149,032,667	\$397,792,211	\$198,896,106
Utilities	296	1	\$34,943	\$5,655	\$5,655
Unknown	17	1	\$300,883	\$10,000	\$10,000
<b>Total</b>	<b>4,980</b>	<b>3,760</b>	<b>\$219,707,198</b>	<b>\$517,313,639</b>	<b>\$338,645,096</b>

Source: Madera County April 2017 Parcel/Assessor's Data

### *Critical Facilities and Infrastructure*

For purposes of this plan, a critical facility is defined as:

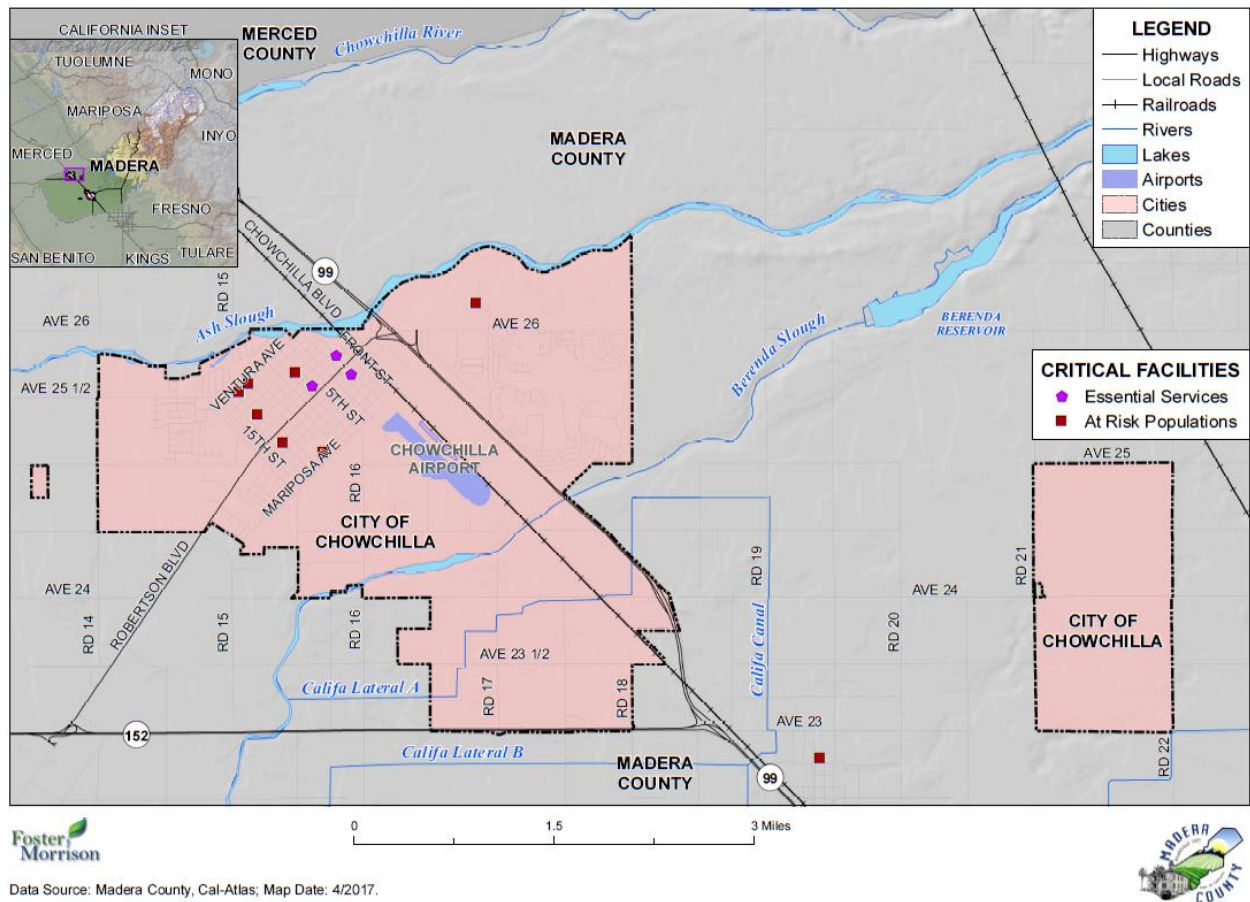
*Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

This definition was refined by separating out three classes of critical facilities as further described in Section 4.3.1 of the Base Plan.

An inventory of critical facilities in the City of Chowchilla from Madera County GIS is shown on Figure A-2 and detailed in

Table A-6. Details of critical facility definition, type, name, address, and jurisdiction by hazard zone are listed in Appendix F.

Figure A-2 City of Chowchilla – Critical Facilities



Data Source: Madera County, Cal-Atlas; Map Date: 4/2017.

Table A-6 City of Chowchilla – Critical Facilities Inventory

Critical Facility Type	Critical Facility Count
<b>Essential Services</b>	
Central Switching Station / Communications	1
Fire Station	1
Public Safety Facility / 911 PSAP	1
<b>Essential Services Total</b>	<b>3</b>
<b>At Risk Populations</b>	
Convalescent Hospital	2
School	5
<b>At Risk Populations Total</b>	<b>7</b>
<b>City of Chowchilla Grand Total</b>	<b>10</b>

Source: Madera County GIS

## *Historic and Cultural Resources*

The California Office of Historic Preservation database shows that the City of Chowchilla has one registered federal historic site. This is shown on Table A-8.

*Table A-7 City of Chowchilla – Historical Resources*

Resource Name (Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City
Robertson Boulevard, State Highway 233 (P724)				X	11/20/1989	Chowchilla

Source: California Department of Parks and Recreation Office of Historic Preservation, <http://ohp.parks.ca.gov/>

## *Natural Resources*

The City of Chowchilla has a variety of natural resources of value to the community. The City noted that it lies in the San Joaquin Valley. The portion of the discussion on the natural resources of the County in Section 4.3.1 applies to the City as well.

## *Growth and Development Trends*

### **Past Growth**

The City of Chowchilla saw slow growth until the 1930s. Growth was strong for the 1930s, 40s, and 50s. Growth slowed in the 1960s, then was moderate through 1990. From 1990 to 2010 growth was very strong. Between 2010 and 2017, the City has experienced a smaller population growth. This can be seen in Table A-8.

*Table A-8 City of Chowchilla – Population Growth 1930 to 2017*

Year	Population	Percent increase or decrease
1930	847	–
1940	1,957	131.1%
1950	3,893	98.9%
1960	4,525	16.2%
1970	4,349	-3.9%
1980	5,122	17.8%
1990	5,930	15.8%
2000	11,127	87.6%
2010	18,720	68.2%
2017	18,840	0.6%

Source: US Census Bureau, California Department of Finance

## Special Populations

The City is classified as a Disadvantage Community, therefore the population of those elderly, disabled, low income, or migrant farm workers is higher than other cities. There is one area of the town that is of middle working class, but a majority of the population is considered a Disadvantaged Community.

Because the City is limited with staff at city hall, the City has very limited number of personnel to notify special needs populations in the event of hazardous event, and the City relies heavily on the County to send out the necessary information.

## Development since 2011 Plan

The City of Chowchilla Building Department tracks total building permits issued since 2011 for their jurisdiction. These are tracked by total development, property use type, and hazard risk area. These are shown in Table A-9 and Table A-10. All development in the identified hazard areas, including the 1% annual chance floodplains and high wildfire risk areas, were completed in accordance with all current and applicable development codes and standards and should be adequately protected. Thus, with the exception of more people living in the area potentially exposed to natural hazards, this growth should not cause a significant change in vulnerability of the City to identified priority hazards.

*Table A-9 Total Development Since 2011*

Property Use	2011	2012	2013	2014	2015	2016
Residential	33	0	1	1	7	15
Commercial	1				2	
Industrial	1			1		
Other						
<b>Total</b>	<b>35</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>9</b>	<b>15</b>

Source: From the City of Chowchilla internal tracking permit database.

There has been slow development in the City since the recession. Development has begun a steady incline since 2016.

*Table A-10 Development in Hazard Areas since 2011*

Property Use	1% Annual Chance Flood	Wildfire Risk Area	Other	Other
Residential	0	0	0	0
Commercial	0	0	0	0
Industrial	0	0	0	0
Other	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Source: Collected information from FEMA website/GIS Files for 1% Annual Chance Flood

Collected Information from CAL FIRE website/GIS Files for Wildfire Risk

## Future Development

Estimates of future populations in the City was performed for the 2014-2023 City of Chowchilla Housing Element. By 2040, Chowchilla is projected to have a population of 34,129 persons or 27,837 in the general population. This projected population increase is based on growth in cities that will bring Chowchilla from about 7.4 percent in 2009, to 8.67 percent in 2016, to about 16.3 percent of the County's total population in 2040. Growth projections from the 2014-2023 Housing Element can be found in Table A-11.

*Table A-11 City of Chowchilla – Future Population Projections*

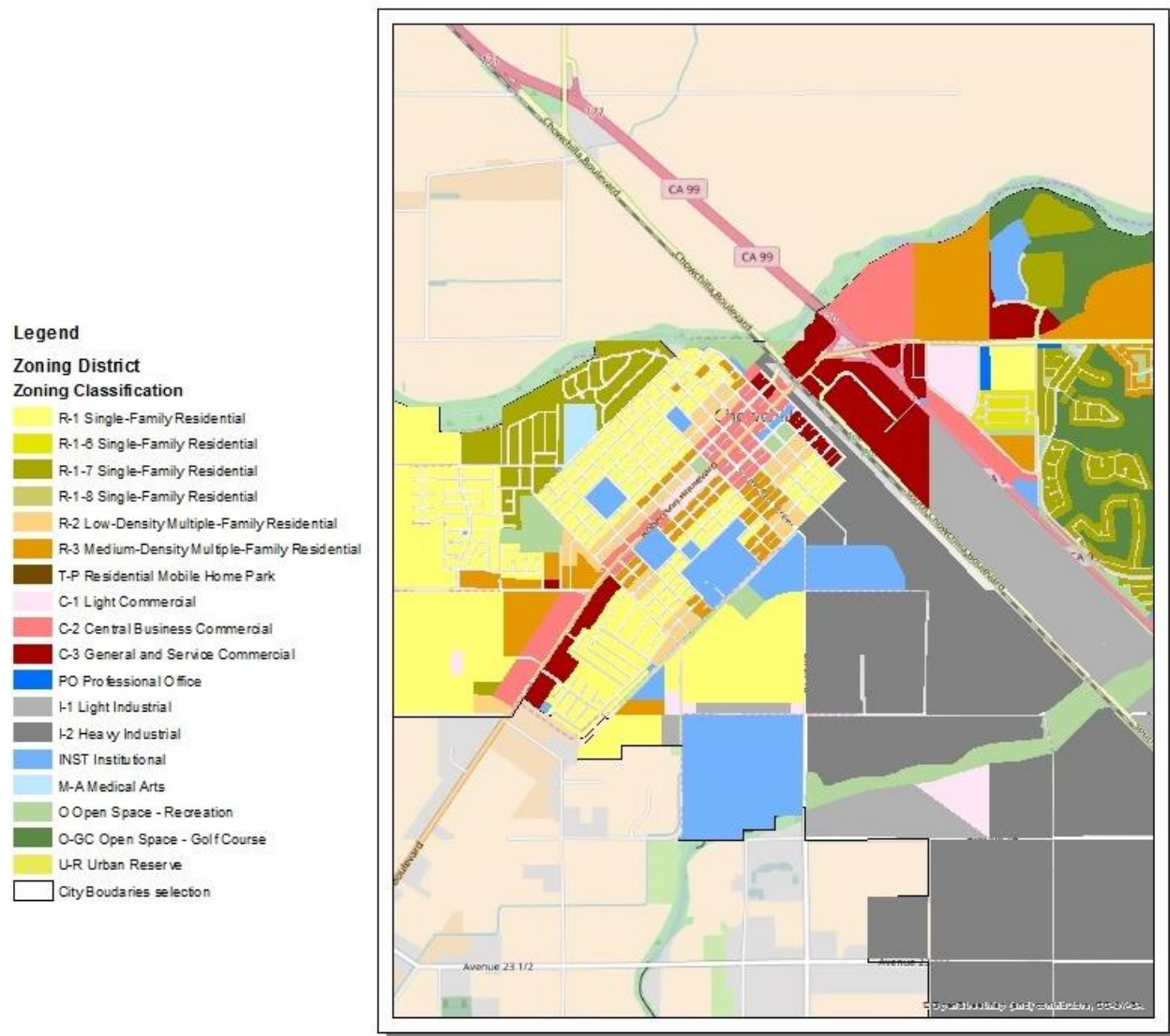
Location	2015	2020	2030	2040	2050
Chowchilla	12,855	14,9090	24,518	34,129	47,508

Source: City of Chowchilla 2014-2023 Housing Element

Growth is currently occurring in the City. The City Planning Team noted that future growth will happen on the east side of 99 and Ash Slough. Targeted growth will also focus on the industrial park. A zoning map for the City is shown in Figure A-3.



Figure A-3 City of Chowchilla – Zoning Map



Source: City of Chowchilla

More general information on growth and development in Madera County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Madera County Vulnerability and Assets at Risk of the Base Plan.

### A.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table A-4 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Madera County Planning Area). Methodologies for calculating loss estimates are the same as those described in Section 4.3 of the Base Plan. In general, the most vulnerable structures are those located within

the floodprone areas, WUI areas, unreinforced masonry buildings, and buildings built prior to the introduction of modern building codes.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

### *Drought and Water Shortage*

**Likelihood of Future Occurrence**—Likely

**Vulnerability**—Medium

### **Hazard Profile and Problem Description**

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

### **Past Occurrences**

The City Planning Team noted that drought is a regional phenomenon. Any droughts that affected the greater County also affected the City. More information on past droughts can be found in Section 4.2.11 of the Base Plan.

### **Vulnerability to Drought**

The vulnerability of Chowchilla to drought is citywide, but impacts may vary and include reduction in water supply, agricultural losses, and an increase in dry fuels. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The City of Chowchilla is a rural community that is surrounded largely by farmland that is rich in agriculture for a variety of crops including dairy, poultry, horse and cattle ranches that may utilize surface water deliveries

from approximately June –September and/or from ground water pumping systems. Since Chowchilla relies on ground water wells, drought and water shortage can cause acute problems.

### Future Development

As the population in the area continues to grow, so will the demand for water. Water shortages in the future may be worsened by drought, as the City relies on groundwater for its water source. Increased planning including conjunctive use will be needed to account for population growth and increased water demands.

### *Earthquake*

**Likelihood of Future Occurrence**–Occasional

**Vulnerability**–Medium

### Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth’s outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth’s crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake’s magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

### Past Occurrences

The City of Chowchilla has a low level of historic seismic activity. Since 1872 to 2009 there has been no significant property damage or loss of life due to earthquakes occurring within or near the City. Maximum recorded intensities have reached magnitude of  $\geq 4.5$  which is a very light reading according the California Historical Earthquake Online Database. According to the California Geological Survey, the Quaternary fault located closest to Madera County is Hartely Springs Fault located in Mono County.

### Vulnerability to Earthquake

The City of Chowchilla is located in the less seismically active western region Madera County, referred to as an area of “light seismicity”. Earthquake activity has not been a serious hazard in the City of Chowchilla’s history, nor is it probable that it will become a serious hazard in the future.

There are, however, unreinforced masonry buildings in the City that may be at greater risk to earthquake. The City Planning Team noted that there is no inventory of these buildings. A number of the buildings in downtown area are not reinforced as structures are built on hollow clay blocks.

## Future Development

Future development in the City will be built to 2013 California Building Code (CBC). The 2013 CBC factors in the risks of earthquake into the building code.

### *Flood: 1% and 0.2% Annual Chance*

**Likelihood of Future Occurrence**—Occasional (1%)/Unlikely (0.2%)

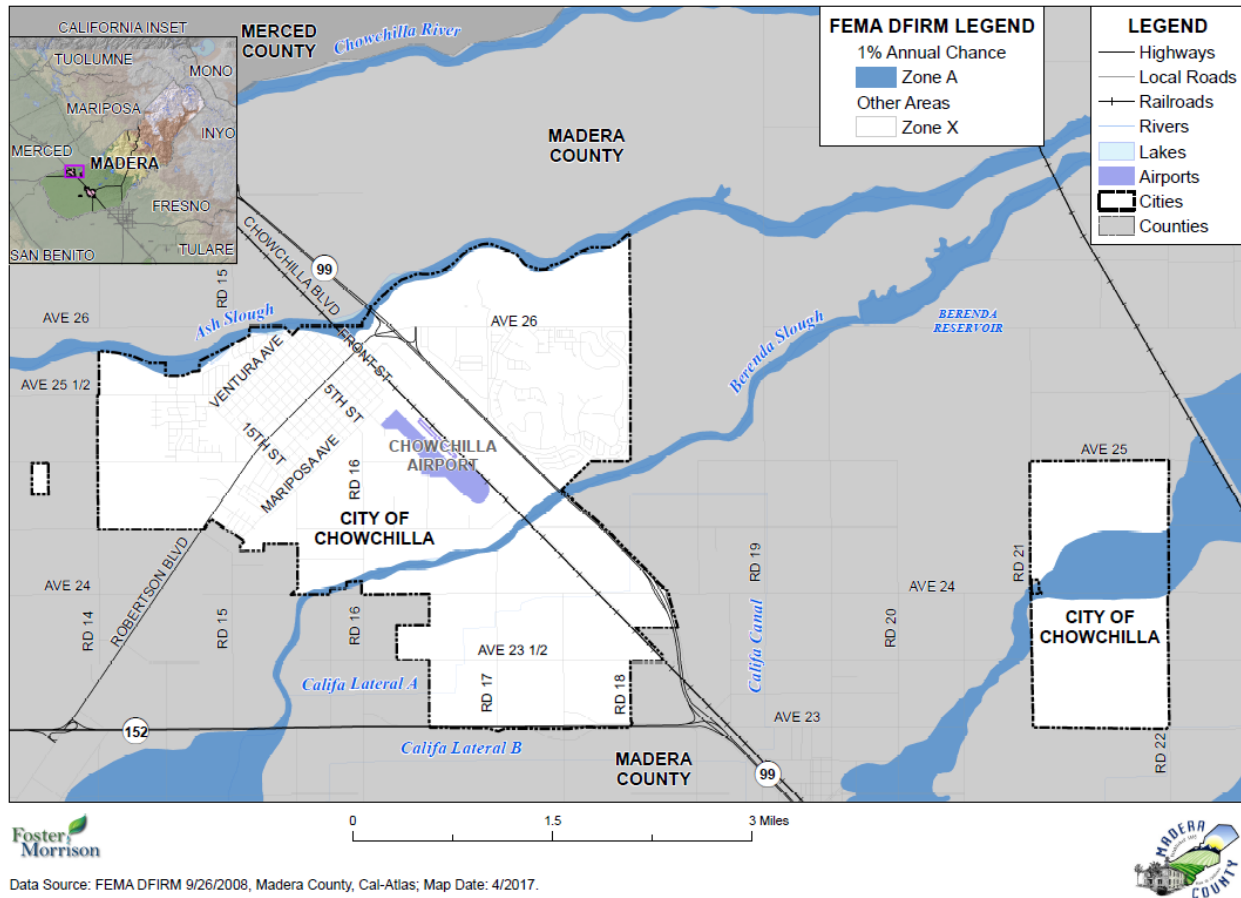
**Vulnerability**—Medium

## Hazard Profile and Problem Description

Chowchilla is traversed by several stream systems and is at risk to both the 100-year flood as well as to localized stormwater flooding. In the Chowchilla area, the construction of Buchanan, Hidden and Friant Dams, as well as levee improvements along the sloughs and rivers, have eliminated the major flooding problems along the San Joaquin, Fresno, and Chowchilla Rivers whereby eliminating the risk of historical floods as were seen in the 1950's in the County of Madera and Chowchilla Area. However, although the historical floods have been reduced, during winter storms and extreme cold, the heavy snowfall in the mountains above Chowchilla starts to melt creating the potential for flooding. The lakes, dams, levees, sloughs and waterways become swollen and the Department of Engineering must release water down the Berenda and Ash Slough channels heading downstream to counties and cities which have flood prone areas. When these releases happen, the City of Chowchilla's most probable vulnerability to flooding and flood damage is along the natural Ash Slough Channel when the sandy drainage channel become stressed or cannot hold the water releases breaking away from the banks during period of high flow. Ash Slough is a distributary channel of the Chowchilla River that enters the Bypass system. The design capacity of Ash Slough at its confluence with the Eastside Bypass is 5,000 cfs based on O&M manuals described in the draft State Plan of Flood Control.

FEMA has identified Ash Slough, Berenda Slough and the Chowchilla River as floodways. This is seen in Figure A-4. Federally designated flood zones are limited to the defined bank and channels of Ash Slough, Berenda Slough and Chowchilla River. No base flood elevation has been determined for the 1% annual chance floodplains. The remainder of the City is designated as Zone X – an area determined to be outside the 0.2 percent annual chance floodplain. The 2040 General Plan minimizes public exposure and property damage from potential floods by designating land adjacent to Ash Slough and Berenda Slough as Open Space.

Figure A-4 City of Chowchilla – FEMA DFIRM Flood Zones



### Past Occurrences

Prior to the construction of Berenda Dam/Eastman Reservoir in 1962 (later renamed Berenda Reservoir), and Buchanan Dam/Eastman Lake in 1975, the City of Chowchilla experienced significant flooding back to 1950 documented in the Interior Central California Climate Calendar (National Weather Service in Hanford, CA) and the Chowchilla Historical Society. In 1950 and 1955, significant flooding caused rivers to swell and homes and businesses were inundated with water. In 1950, the rains brought more than fifteen inches of water in some high areas and snowpack melts resulted in historic flooding. In the 1990’s, there were a few events that were beyond normal. During wet seasons, the City experienced potential levee breaks on both side banks of the Chowchilla River and Ash Slough which runs alongside and through the City of Chowchilla. These facilities reduce flood risk to Chowchilla and agricultural land; however, the potential for a flood hazard is still possible.

### Vulnerability to Flooding

#### Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Chowchilla. The methodology described in Section 4.3.7 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table A-12 shows the property

use, improved parcel count, improved values, estimated contents, and total values that fall in a floodplain in the City.

**Table A-12 City of Chowchilla – Count and Improved Value by Property Use and Detailed Flood Zone**

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>1% Annual Chance Flood Hazard</b>						
<b>Zone A</b>						
Agricultural	1	0	\$10,823	\$0	\$0	\$10,823
Commercial	7	4	\$627,369	\$1,340,653	\$1,340,653	\$3,308,675
Government	1	0	\$77,801	\$0	\$0	\$77,801
Industrial	2	1	\$10,353	\$29,658	\$44,487	\$84,498
Institutional	1	0	\$1,634	\$0	\$0	\$1,634
Residential	11	10	\$246,371	\$842,810	\$421,405	\$1,510,586
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>Zone A Total</b>	<b>23</b>	<b>15</b>	<b>\$974,351</b>	<b>\$2,213,121</b>	<b>\$1,806,545</b>	<b>\$4,994,017</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>23</b>	<b>15</b>	<b>\$974,351</b>	<b>\$2,213,121</b>	<b>\$1,806,545</b>	<b>\$4,994,017</b>
<b>Zone X (unshaded) –Outside of Mapped Flood Hazard</b>						
Agricultural	159	32	\$21,296,924	\$2,838,232	\$2,838,232	\$26,973,388
Commercial	282	167	\$36,404,982	\$69,258,458	\$69,258,458	\$174,921,898
Government	50	3	\$4,295,805	\$314,641	\$314,641	\$4,925,087
Industrial	33	23	\$6,837,394	\$40,425,466	\$60,638,199	\$107,901,059
Institutional	52	27	\$775,620	\$5,298,665	\$5,298,665	\$11,372,950
Residential	4,068	3,491	\$148,786,296	\$396,949,401	\$198,474,701	\$744,210,398
Utilities	296	1	\$34,943	\$5,655	\$5,655	\$46,253
Unknown	17	1	\$300,883	\$10,000	\$10,000	\$320,883
<b>Zone X (unshaded) Total</b>	<b>4,957</b>	<b>3,745</b>	<b>\$218,732,847</b>	<b>\$515,100,518</b>	<b>\$336,838,551</b>	<b>\$1,070,671,916</b>
<b>Grand Total</b>	<b>4,980</b>	<b>3,760</b>	<b>\$219,707,198</b>	<b>\$517,313,639</b>	<b>\$338,645,096</b>	<b>\$1,075,665,933</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

Table A-13 summarizes Table A-12 above and shows City of Chowchilla loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones. As shown in this table, there is no 500-year flood risk in the City.

*Table A-13 City of Chowchilla – Flood Loss Summary*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood	23	15	\$974,351	\$2,213,121	\$1,806,545	\$4,019,666	\$803,933	0.11%
0.2% Annual Chance Flood**	0	0	\$0	\$0	\$0	\$0	\$0	0.00%
<b>Grand Total</b>	<b>23</b>	<b>15</b>	<b>\$974,351</b>	<b>\$2,213,121</b>	<b>\$1,806,545</b>	<b>\$4,019,666</b>	<b>\$803,933</b>	<b>0.11%</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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

According to Table A-12 and Table A-13, the City of Chowchilla has 15 improved parcels and approximately \$ 4 million of structure and contents value in the 1% annual chance floodplain. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.7 of the Base Plan, there is a 1% chance in any given year of a flood event causing roughly \$803,933 in damage in the City of Chowchilla. A loss ratio of 0.11% indicates that losses in Chowchilla to flood would be relatively limited, as less than an eighth of a percent of the total values in the City would be damaged.

### Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.8 of the Base Plan, was used for the City of Chowchilla as well as for the County as a whole. Table A-14 and Table A-15 represents a detailed and summary analysis, respectively, of total acres for each FEMA DFIRM flood zone in the City.

*Table A-14 City of Chowchilla – Flooded Acres by Land Use Type*

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
<b>1% Annual Chance Flood Hazard</b>		
<b>Zone A</b>		
Agricultural	18	0

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
Commercial	10	7
Government	23	0
Industrial	11	4
Institutional	0	0
Residential	7	3
Utilities	0	0
Unknown	0	0
<b>Zone A and 1% Annual Chance Total</b>	<b>69</b>	<b>15</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

*Table A-15 City of Chowchilla – Flooded Acres Summary*

Flood Zone	Total Flooded Acres	Improved Flooded Acres	% of Improved Flooded Acres
1% Annual Chance Flood Hazard	69	15	0.4%
0.2% Annual Chance Flood Hazard*	0	0	0.0%
Outside of Flood Zone	6,785	3,813	99.6%
<b>Grand Total</b>	<b>6,854</b>	<b>3,827</b>	<b>100.0%</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

\*This count only includes those acres in the 0.2% annual chance floodplain, exclusive of the 1% annual chance floodplain. The 0.2% annual chance flood, in actuality, also includes all acres in the 1% annual chance floodplain.

### Population at Risk

The DFIRM flood zones were overlaid on the parcel layer. Those residential parcel centroids that intersect the severity zones were counted and multiplied by the 2010 Census Bureau average household factors for Chowchilla. According to this analysis, there is a total population of 9 residents of the City at risk to flooding, all in the 1% annual chance floodplain. This is shown in Table A-16.

*Table A-16 City of Chowchilla – Count of Improved Residential Parcels and Population by Flood Zone*

Flood Zone	Improved Residential Parcels*	Population**
1% Annual Chance	3	9
0.2% Annual Chance)	0	0
<b>Total</b>	<b>3</b>	<b>9</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data, US Census Bureau

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

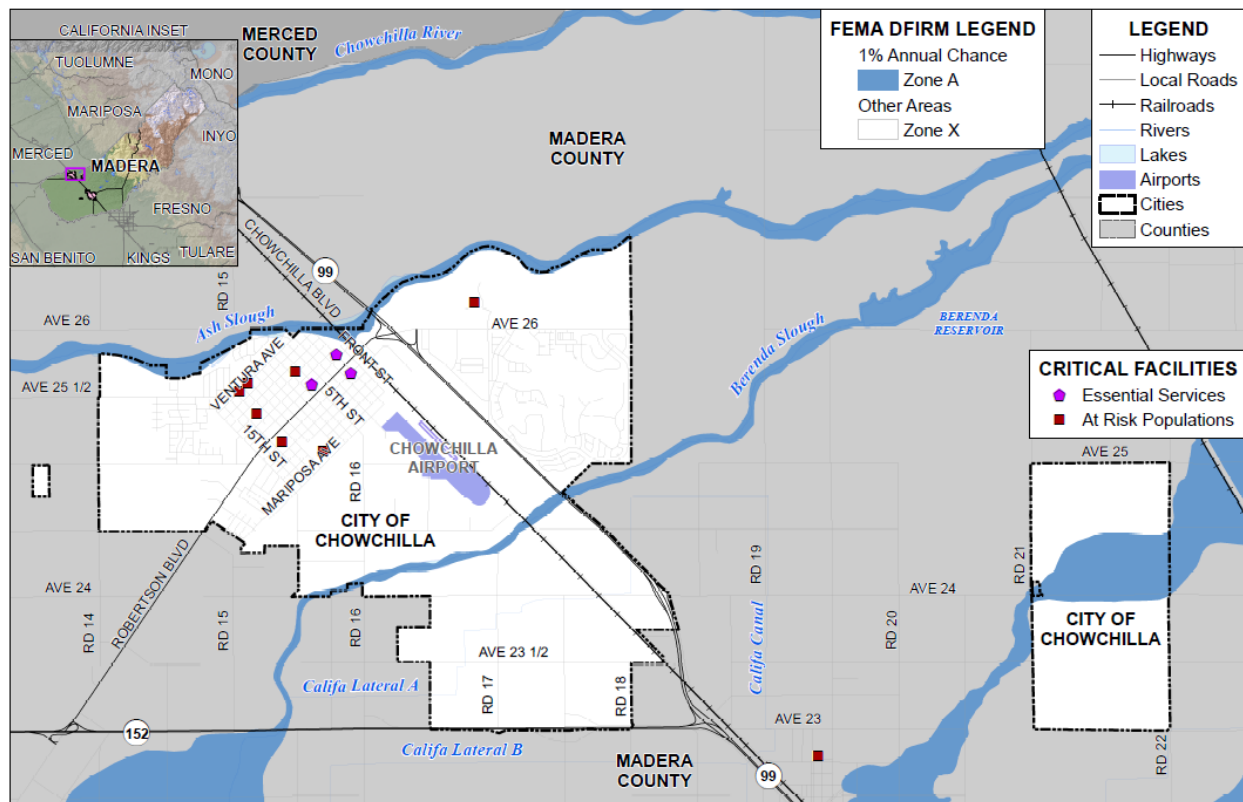
\*\* Average household populations from the 2010 US Census were used: Chowchilla– 3.04



## Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Chowchilla in identified FEMA DFIRMs. GIS was used to determine whether the facility locations intersects a DFIRM flood hazard areas, and if so, which zone it intersects. Details of critical facilities in the floodplain in the City of Chowchilla are shown in Figure A-5. As shown on the figure, Chowchilla has no critical facilities located in 1% annual chance or 0.2% annual chance DFIRM flood zones. All of the City’s critical facilities fall within Zone X, the area determined to be outside the 0.2% flood. Details of critical facility definition, type, name and address and jurisdiction by flood zone are listed in Appendix F.

*Figure A-5 City of Chowchilla – Critical Facilities and Flood Zones*



Data Source: FEMA DFIRM 9/26/2008, Madera County, Cal-Atlas; Map Date: 4/2017.



## Historical, Cultural, and Natural Resources at Risk

The City of Chowchilla has significant cultural and natural resources located throughout the City as previously described. Vulnerability analysis of these resources was not possible due to data limitations. However, any resource located in the 1% and 0.2% annual chance floodplains are at risk.



## Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Chowchilla does not participate in the NFIP flood insurance program.

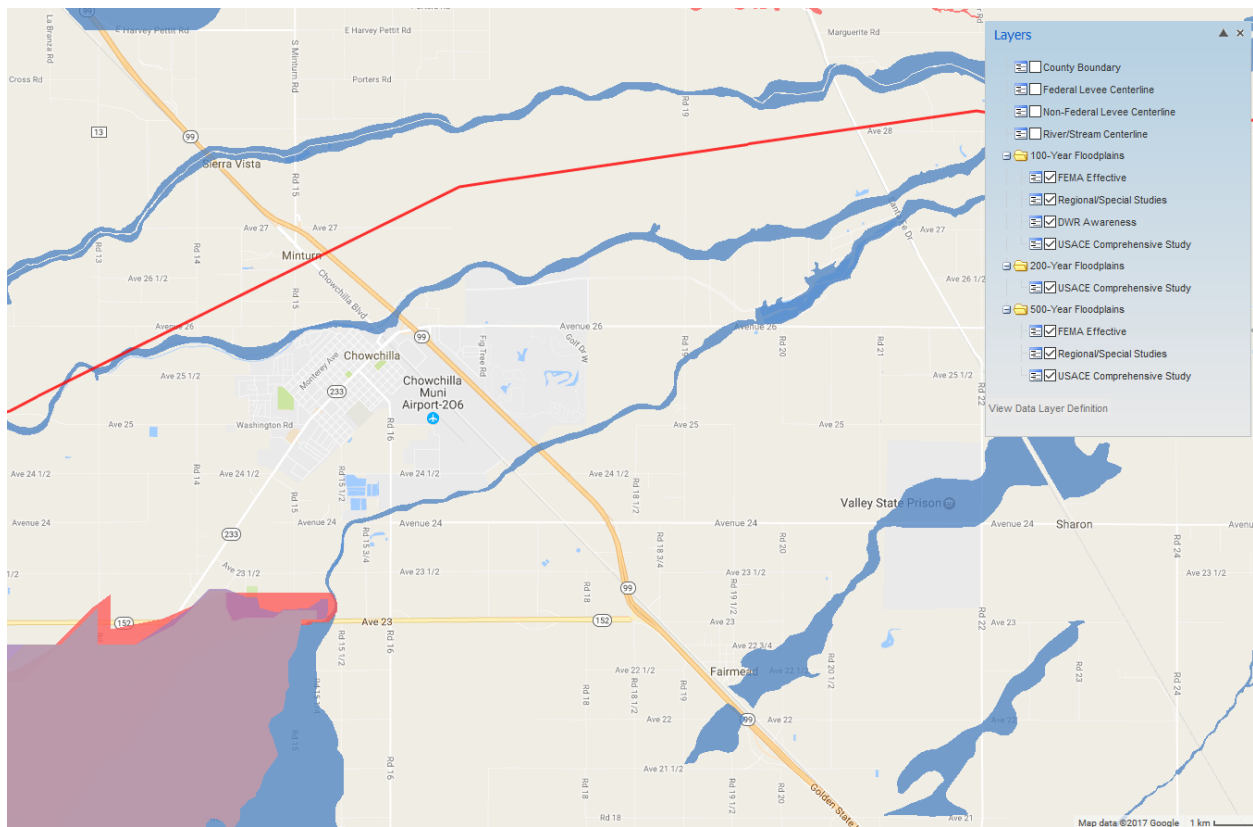
### California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Madera County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Sacramento-San Joaquin (SAC-SJ) Valley watershed. SB 5 requires that these maps contain the best available information on flood hazards and be provided to cities and counties in the SAC-SJ Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-, and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications. They are for the same flood frequency; however, they may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. This provides the community and residents with an additional tool for understanding potential flood hazards not currently mapped as a regulated floodplain. Improved awareness of flood risk can reduce exposure to flooding for new structures and promote increased protection for existing development. Informed land use planning will also assist in identifying levee maintenance needs and levels of protection. By including the FEMA 100-year floodplain, it also supports identification of the need and requirement for flood insurance. The BAM map for Chowchilla is shown in Figure A-6.

**Figure A-6 City of Chowchilla Best Available Map**



Source: California DWR

Legend explanation: Blue - FEMA 100-Year, Orange – Local 100-Year (developed from local agencies), Red – DWR 100-year (Awareness floodplains identify the 100-year flood hazard areas using approximate assessment procedures.), Pink – USACE 100-Year (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 200-Year (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 500-Year, Grey – Local 500-Year (developed from local agencies), Purple – USACE 500-Year (2002 Sac and San Joaquin River Basins Comp Study).

## Future Development

The City enforces the floodplain ordinance. If any development is to occur in the floodplain, it would have to conform to the elevation standards of the floodplain ordinance. No development is expected in the floodplain in the future.

### *Flood: Localized Stormwater Flooding*

**Likelihood of Future Occurrence**–Highly Likely  
**Vulnerability**–Medium

## Hazard Profile and Problem Description

Flooding and other issues caused by severe weather events, primarily heavy rains and thunderstorms, can often pose a risk to the community. Local drainage flooding occurs primarily due to infrequent, high-intensity rainfall events, and swelling dams, reservoirs and rivers due to quick snow melts from the above

mountain range. Primary concerns include impacts to infrastructure that provides a means of ingress and egress throughout the community.

### Past Occurrences

The City note that localized flooding occurs annually. No past occurrences where damages occurred in the City could be recalled.

### Vulnerability to Localized Flooding

Localized flooding from high-intensity rainfall events, of which there can be a few a year, typically manifests as flooded ponding along some surface streets. Road closures are seldom and water levels recede quickly leaving only minor cleanup of silt and debris. The drainage channel for Ash Slough is “natural.” This natural channel with increased vegetation can become clogged or obstructed. Moderate to high intensity rainfall may cause overflows. Table A-17 identifies known and past occurrences of such areas and the associated problems encountered. This list is an initial inventory of key problem areas and is not intended to be a complete inventory of all problems and locations associated with severe weather events and localized flooding in the City of Chowchilla.

*Table A-17 City of Chowchilla’s Road List of Localized Flooding Problem Areas*

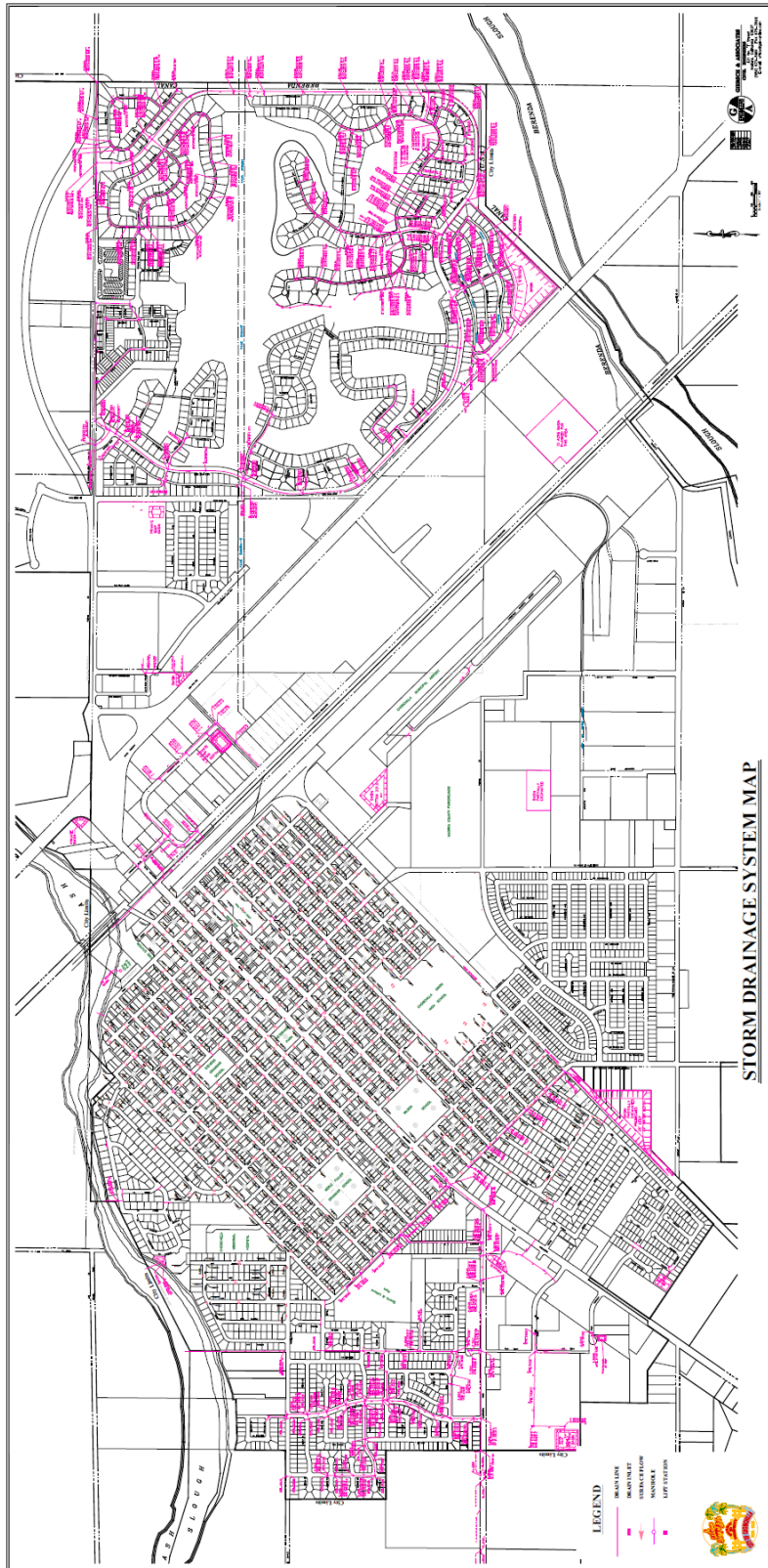
Road Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Robertson Blvd.	X	X		X		X	
Kings Ave	X	X		X			
Lake Ave	X	X		X			
N 1 <sup>st</sup> – N 15 <sup>th</sup>	X	X		X			
S 1 <sup>st</sup> – S 15 <sup>th</sup>	X	X		X			
Monterey Ave	X	X		X			
Sonoma Ave	X	X		X			
Ventura Ave	X	X		X			
Trinity Ave	X	X		X			
Orange Ave	X	X		X			
Humboldt Ave	X	X		X			
Alameda Ave	X	X		X			
Colusa Ave	X	X		X			
Mariposa Ave	X	X		X			

Source: City of Chowchilla

Currently a large portion of the downtown area in the City of Chowchilla lacks underground storm drainage infrastructure (see Figure A-7). Since the town is flat and the City experiences only periodic heavy downpour, the storm water will make its way to DI’s (Drain inlets) located at the end of 15th St and Robertson Blvd. The City Planning Team noted that if there is a heavy downpour for an hour it will take about an hour for the downtown area to reach the DI’s located at the end of 15th St and Robertson Blvd and

the flooding will subside. For most residents, the water on the road during a downpour is a way of life and although annoying to residents, it's a fact of life that they have accepted. The City Planning Team also noted that if a nearby dam were to break, the City lacks the underground infrastructure to deal with that type of flooding. The City is hoping to develop a Pavement Management plan in the 2017-2018 fiscal year to determine the level of our pavement deterioration.

Figure A-7 City of Chowchilla – Storm Drainage System Map



Source: City of Chowchilla

## Future Development

Future development in the City will add more impervious surfaces and need to drain those waters. The City will need to be proactive to ensure that increased development has proper siting and drainage for stormwaters. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses.

## *Hazardous Materials Transportation*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

## Hazard Profile and Problem Description

The significance of environmental or human exposure to hazardous materials depends on the type, location, and quantity of the material released. In the Chowchilla area, hazardous materials may be transported via roadways, railways, and airways. Hazardous materials and wastes are regulated by federal and state laws and are required to be recycled or properly disposed. Transport of hazardous materials is also heavily regulated. However, illegal storage and disposal and unintentional releases of hazardous materials from leaks and accidents can still occur.

In the City of Chowchilla and outlying area, a mobile hazardous event is most likely to occur along Highways 99, 152 and SR233 and along railroad tracks. Trucks and rail cars that use these transportation corridors commonly carry a variety of hazardous materials including gasoline, other petroleum products, and other chemicals known to cause human health problems.

## Past Occurrences

The United States Department of Transportation Pipeline and Hazardous Materials Safety Administration’s (PHMSA) Office of Hazardous Materials Safety performs a range of functions to support the safe transport of hazardous material. One of these functions is the tracking of hazardous materials incidents in the United States. The database was searched for hazardous materials incidents in Chowchilla. A summary of rail and highway incidents since 1970 in the City are shown in Table A-18. 5 separate events were contained in the database.

*Table A-18 City of Chowchilla – Hazardous Materials Incidents by Jurisdiction Since 1970*

Date of Incident	Incident City	Incident Route	Mode of Transportation	Transportation Phase	Commodity Short Name	Quantity Released	Amount of Damages
11/5/1974	Chowchilla	Unknown	Highway	N/A	Nitro Carbo Nitrate	100 lbs	\$0
4/12/1977	Chowchilla	Unknown	Highway	N/A	Organic Phosphate	100 lbs	\$0
10/10/1978	Chowchilla	Unknown	Highway	N/A	Sodium Chlorate	1,013 gal.	\$0

Date of Incident	Incident City	Incident Route	Mode of Transportation	Transportation Phase	Commodity Short Name	Quantity Released	Amount of Damages
2/16/1988	Chowchilla	Unknown	Highway	N/A	Ammonia Anhydrous	1,875 gal.	\$0
6/13/1988	Madera	Unknown	Highway	N/A	Sodium Hydroxide	4 gal.	\$0
<b>Totals</b>							<b>\$0</b>

Source: PHMSA Database – Search dates 01/01/1970 – 05/01/2017

The City Planning Team also noted events that happened in 1995, and two events in 2004.

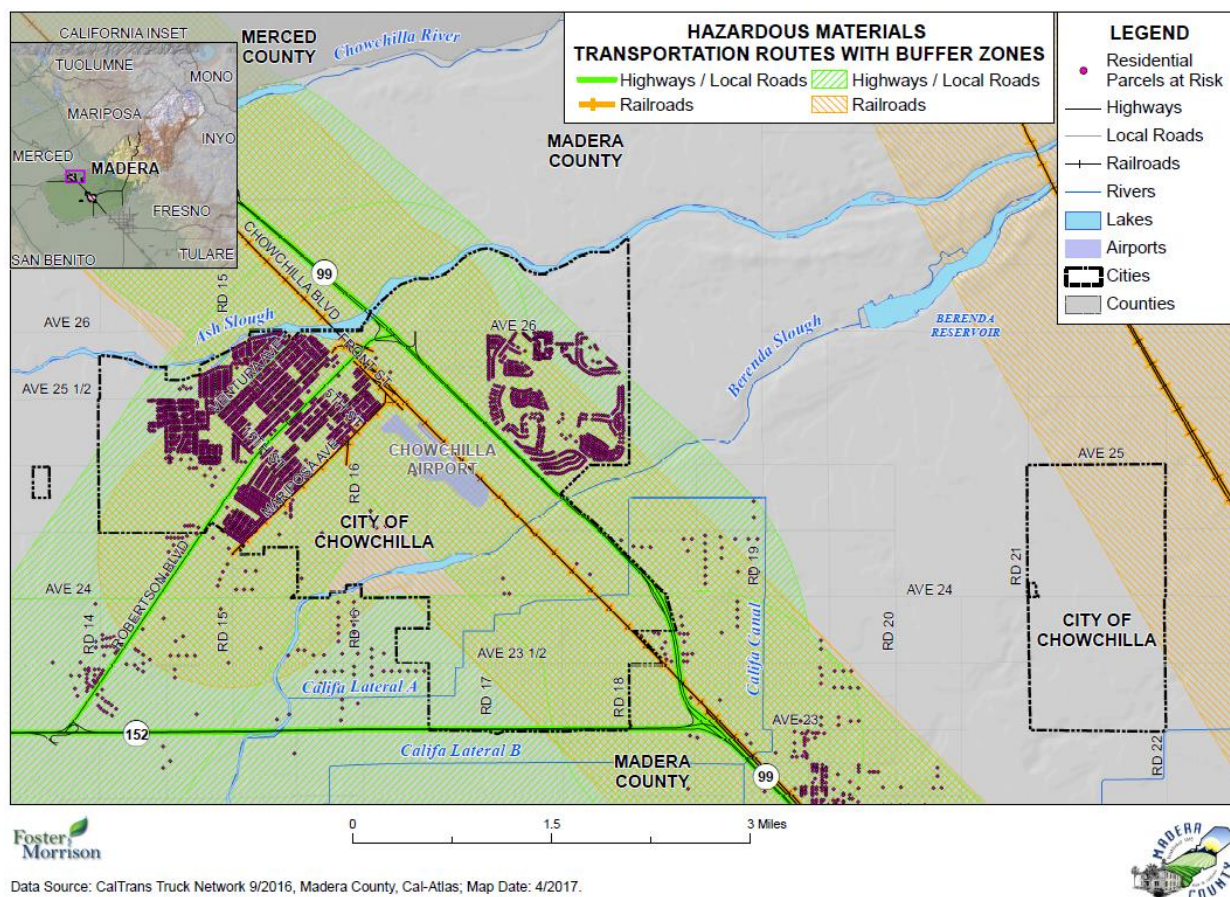
### Vulnerability to Hazardous Materials

It is often quite difficult to quantify the potential losses from human-caused hazards. While the facilities themselves have a tangible dollar value, loss from a human-caused hazard often inflicts an even greater toll on a community, both economically and emotionally. The impact to identified assets will vary from event to event and depend on the type, location, and nature of a specific hazardous material incident. Given the difficulty in quantifying the losses associated with technological hazards, this section focuses on analyzing key Planning Area/City assets relative to the hazardous materials sites and transportation corridors (highway and rail).

An analysis of the potential vulnerability of the City to a transportation-related hazardous materials release was conducted using GIS within identified transportation corridors. To evaluate the areas most vulnerable, a one-mile buffer was applied to both sides of State Routes 99 and 152; as well as the BNSF and Union Pacific railroad tracks. The result is a two-mile buffer zone around each transportation corridor that is used for risk-analysis. More information on this methodology can be found in Section 4.3.10 of the Base Plan. The buffer zone and residential parcels at risk are shown in Figure A-8.



*Figure A-8 City of Chowchilla – Residential Parcels in Hazardous Material Buffer Zones*



### Populations at Risk

To determine the populations at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS to determine the residential population that resides within the two-mile buffer zone of the highway and railroad corridors. Using GIS, the buffered corridor was overlaid on the improved residential parcel data and results tabulated for the City of Chowchilla as found in Table A-19. Those parcel centroids that intersect the buffered corridor were counted and multiplied by the 2010 Census Bureau average household factors for the City. According to this analysis, there is a total population of 10,433 in the buffered corridor.

*Table A-19 City of Chowchilla– Populations at Risk in Hazardous Material Buffer Zones*

Jurisdiction	Residential Parcels	Population
Chowchilla	3,432	10,433

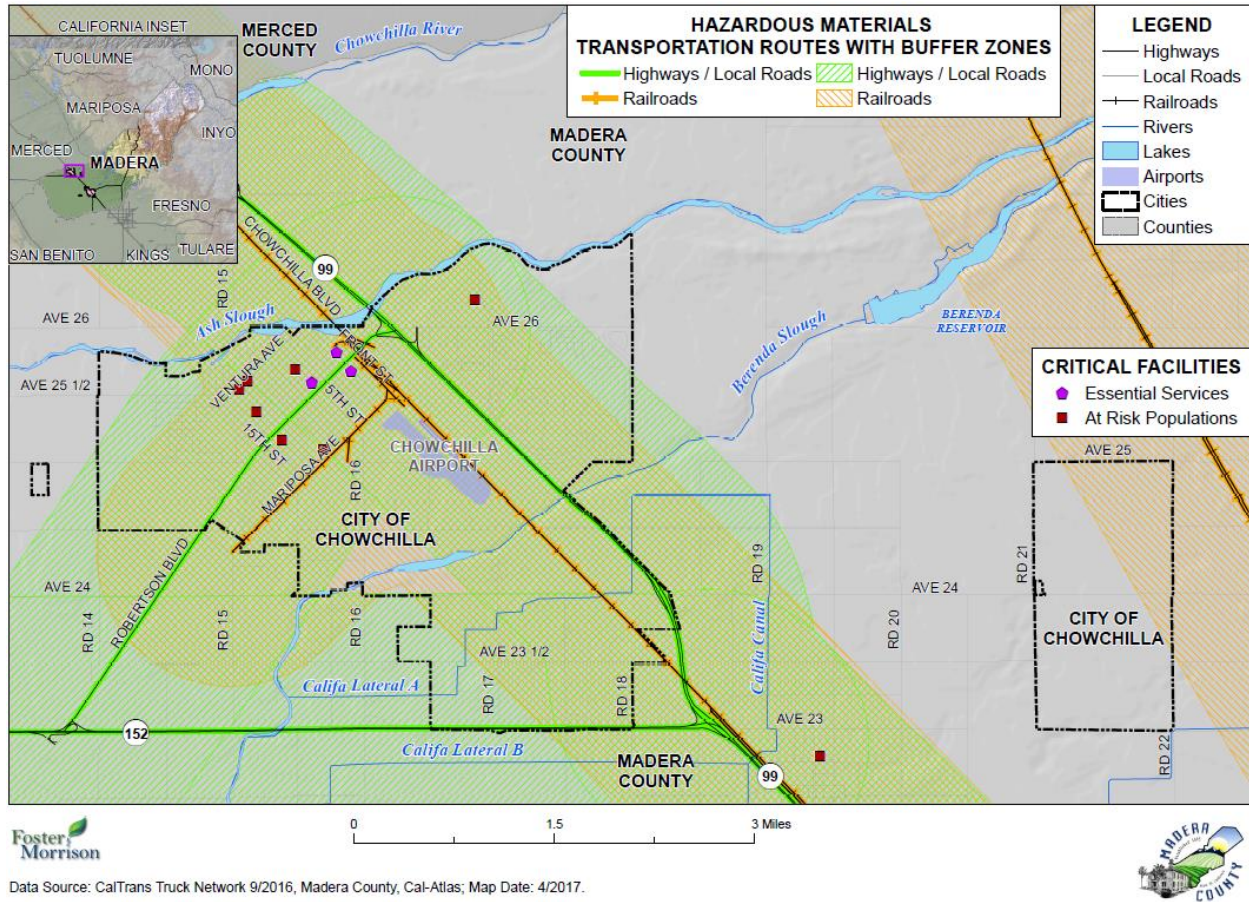
Source: Cal Trans, Madera County GIS, US Census Bureau

\* Census Bureau 2010 average household sizes are: Chowchilla – 3.04

## Critical Facilities

To determine the critical facilities at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS to determine the facilities located within the two-mile buffer zone of the highway and railroad corridors. Using GIS, the buffered corridor was overlaid on the Madera County critical facilities layer and results tabulated for the City, shown in Figure A-9 and detail in Table A-20. There are 10 facilities in the buffered corridor in the Planning Area.

*Figure A-9 City of Chowchilla – Critical Facilities in Hazardous Material Buffer Zones*



*Table A-20 City of Chowchilla – Critical Facilities in Hazardous Material Buffer Zones*

Critical Facility Type	Critical Facility Count
<b>Essential Services</b>	
Central Switching Station / Communications	1
Fire Station	1
Public Safety Facility / 911 PSAP	1
<b>Essential Services Total</b>	<b>3</b>

Critical Facility Type	Critical Facility Count
<b>At Risk Populations</b>	
Convalescent Hospital	2
School	5
<b>At Risk Populations Total</b>	<b>7</b>
<b>Grand Total</b>	<b>10</b>

Source: Cal Trans, National Pipeline Mapping System 2016, Madera County GIS

### Historical, Cultural, and Natural Resources at Risk

The City of Chowchilla has significant cultural and natural resources located throughout the City as previously described. Vulnerability analysis of these resources was not possible due to data limitations. However, any resource within the hazardous material buffer zone is potentially at risk.

### Future Development

Development will continue to happen within hazardous materials transportation zones. Those who choose to develop in these areas should be made aware of the risks associated with living within close proximity to a hazardous materials transportation route.

### *Levee Failure*

**Likelihood of Future Occurrence**—Occasional

**Vulnerability**—Medium

### Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the stream bank, raising the level of the land around the stream. To construct a man-made levee, workers place dirt or concrete along the stream banks, creating an embankment. This embankment is flat at the top, and slopes at an angle down to the water. For added strength, sandbags are sometimes placed over dirt embankments.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. Levees reduce, not eliminate, the risk to individuals and structures located behind them.

### Past Occurrences

In the 1990's, there were a few events that were beyond normal. During wet seasons, the City experienced potential levee breaks on both side banks of the Chowchilla River and Ash Slough which runs alongside and through the City of Chowchilla. These facilities reduce flood risk to Chowchilla and agricultural land

however the potential for a flood hazard is possible. However, the City Planning Team noted no past occurrences of levee failure in the City.

### Vulnerability to Levee Failure

There are numerous levee systems in Madera County, including those around the City of Chowchilla. None of them are accredited by FEMA as providing protection against the 100-year flood. Due to this, no GIS analysis could be performed on leveed zones in the County or City. However, with both project and non-project levees present within the Madera County Planning Area, buildings and people living and working in areas protected by levees are vulnerable to the effects of failures.

Based on input from the HMPC, the following concerns were identified with respect to a potential failure of a levee within the City. At this point, little concern is placed upon this issue unless the City of Chowchilla is to experience a more than wet winter as witnessed in 2016/2017. However, there is some concern that Ash Slough will need some stabilization in order to transport irrigation water to the needed areas.

### Future Development

Future development in the City is not expected in levee protected areas.

### *Severe Weather: Extreme Heat*

**Likelihood of Future Occurrence**–Highly Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

According to FEMA, “Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.” Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat. Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the urban heat island effect.

### Past Occurrences

The City Planning Team note that since extreme heat is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.2.3.

### Vulnerability to Extreme Heat

Health impacts are the primary concern with this hazard, though economic impacts are also an issue. The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing

homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable.

Reliance on air conditioning causes a strain on the electrical energy in the Chowchilla area. Occasionally peak demands outweigh supply and a condition known as brown-out occurs. This is an extremely dangerous situation for electrical equipment as it operates without the needed electricity causing damage to the systems. Days of extreme heat have been known to result in medical emergencies, civil unrest, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts.

### Future Development

Vulnerability to extreme heat will increase as the average age of the population in each City shifts. Greater numbers of future senior citizens will result from the large number of baby boomers in the City. The elderly are more at risk to the effects of extreme heat, especially those without proper air conditioning. However, many of the residents of the City are accustomed to living with extreme heat and take precautions to guard against the threat of extreme heat.

### *Severe Weather: Fog*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

The San Joaquin Valley can produce some extremely dangerous fogs in the winter and early spring months. These are a type of radiation fog called “tule fog.” Tule fog forms on cold and clear nights, when the ground is moist and there is very little wind. Under such conditions the ground cools quickly and thus cools the air above it as well. The moisture in this cooled air condenses and can create extremely dense fog. Since the air may be stagnant and there is little evaporative effect from the sun in winter months, tule fogs can last for several days and, in some instances, over a week. Under these conditions, visibility is often reduced to 600 feet, but can drop to less than 10 feet.

### Past Occurrences

The City Planning Team note that since fog is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.2.4.

### Vulnerability to Fog

Tule fog is likely to occur annually during the winter months in low-lying regions of the County of Madera, including the City of Chowchilla. When tule fog forms, a severe risk is posed to traffic with the potential for multi-car pileups, especially on Highway 99 or 152. The City of Chowchilla is vulnerable to potential accidents from seasonal tule fog reducing visibility on City streets, roads and SR 233/Robertson Boulevard. This may have an economic impact on the City due to delays in transportation times or even the shutting

down of Highway 99/152. The same dense and lingering fog can also produce adverse health effects in those with respiratory ailments.

### Future Development

Many of the residents of the City are accustomed to living with fog and take precautions to guard against the threat of fog, such as slowing down while traveling.

### *Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)*

**Likelihood of Future Occurrence**–Highly Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

According to historical hazard data, severe weather is an annual occurrence in the City of Chowchilla. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past.

### Past Occurrences

The City Planning Team noted that heavy rains occur yearly, but did not recall any damaging events.

### Vulnerability to Heavy Rains and Storms

Problems associated with the primary effects of severe weather include flooding, pavement deterioration, washouts, high water crossings, landslide/mudslides, debris flows, and downed trees. Table A-17, discussed above in the discussion of the flood hazard and found at the end of this document, details those areas within the City that are most often affected during these heavy storm events. Most of the localized flooding identified in Table A-17 is generally limited to flooding within the street ROW and only has limited impact to private property.

### Future Development

The City enforces the state building code and other ordinances, which regulate construction techniques and drainage criteria that minimize damage from heavy storms and rain. Future development in the City is subject to these building codes and ordinances. New critical facilities such as communications towers should be built to withstand hail damage, lightning, and heavy rains. Roadways should be constructed with adequate drainage conveyances.

## *Severe Weather: Wind and Tornado*

**Likelihood of Future Occurrence**–Highly Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

On an annual basis, the City of Chowchilla experiences severe storms accompanied by strong wind and wind gusts. High winds combined have caused significant damage to public infrastructure (primarily the electric grid). In the City of Chowchilla high winds occur in the winter, generally from November through March, although high winds may also occur in other months.

### Past Occurrences

On an annual basis, the City of Chowchilla experiences severe storms accompanied by strong wind and wind gusts. Not all of these winds cause damages. In March of 1998, the NDCD recorded high winds that caused \$1,500 in damages to the City. Tornadoes in the City have occurred in the past as well. On January 14, 1995, a F1 (weak) tornado touched down in the City of Chowchilla. Its path was approximately 1 mile long damaging three city park sites (uprooted trees, roof damage, etc.), the roof/interior of an elementary school, and portions of buildings and homes in the community. Three other tornadoes have occurred in the Chowchilla area in 1991, 1998, and 2008. All were F0 tornadoes, and no damages were recorded.

### Vulnerability to Wind and Tornadoes

Strong wind is a frequent type of severe weather occurrence in the area. Wind often accompanies the region's storms and has caused damage in the past. Buildings that house populations at risk such as schools, nursing homes, hospitals, and urgent care facilities are at risk to wind and tornadoes. Also at risk are power lines, which can arc or be damaged during high wind events. The City has had power outages and damages to electric lines in past storms.

### Future Development

The City enforces the state building code and other ordinances, which regulate construction techniques that minimize damage from high winds. Future development in the City is subject to these building codes.

## *Wildfire*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

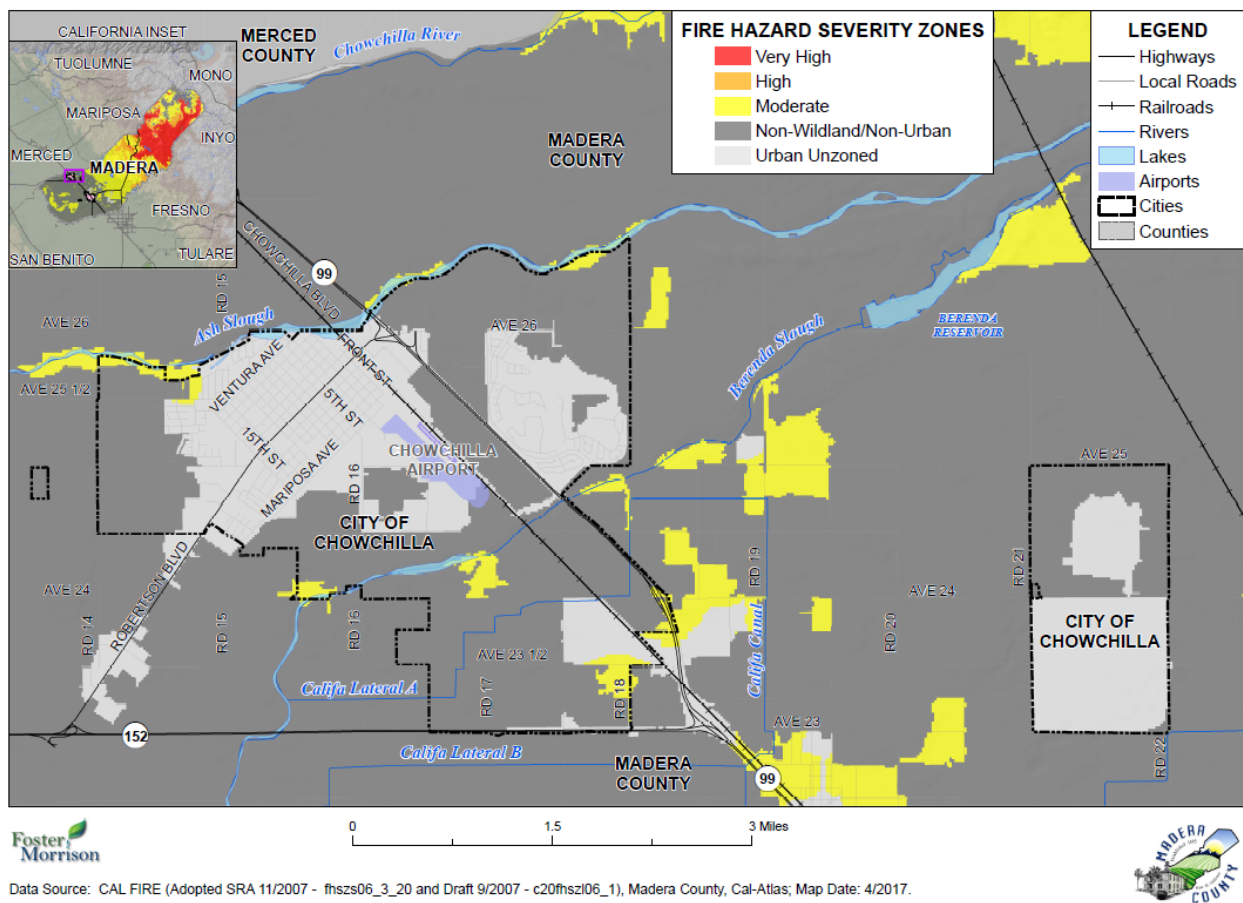
### Hazard Profile and Problem Description

Three types of fires are of concern to the City of Chowchilla: wildland, wildland urban interface, and, to a lesser extent, structural fires. According to the Safety Element of Chowchilla's General Plan, the risk of a wildfire fire is related to a combination of factors. Factors which may influence the potential of a wildfire include the extent and type of vegetation, temperature, humidity, wind and fuel moisture content. The

Central Valley experiences long, dry summers. The major urban / wildland interface areas of moderate fire risk include the Ash Slough and Berenda Slough corridors. The vegetative habitat associated with Ash or Berenda Sloughs can be highly flammable during the warm, dry summer months. Urban development (e.g., residential, commercial land uses) adjacent to these corridors will increase the potential risk of personal injury or property damage from a wildland fire.

Following the methodology described in Section 4.3.2 Vulnerability of Madera County to specific hazards, a wildfire map for the City of Chowchilla was created (see Figure A-10). Wildfire threat within the City ranges is low, with small portions of the City in moderate zones. The highest threat occurs along the eastern edge of the City.

*Figure A-10 City of Chowchilla’s Fire Hazard Severity Zones*



### Past Occurrences

The City Planning Team noted no major wildfires that have occurred near the City, or threatened people and property inside the City limits.



## Vulnerability to Wildfire

### Values at Risk

Analysis results for Chowchilla are shown in Table A-21, which summarizes total parcel counts, improved parcel counts and their structure and land values by property use.

*Table A-21 City of Chowchilla – Count and Value of Parcels by Property Use and Fire Hazard Severity Zones*

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value*
<b>Very High</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>Very High Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>High</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>High Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Moderate</b>						
Agricultural	3	1	\$250,862	\$13,865	\$13,865	\$278,592
Commercial	1	1	\$238,540	\$103,804	\$103,804	\$446,148
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	34	30	\$1,287,222	\$3,880,009	\$1,940,005	\$7,107,236

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value*
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>Moderate Total</b>	<b>38</b>	<b>32</b>	<b>\$1,776,624</b>	<b>\$3,997,678</b>	<b>\$2,057,674</b>	<b>\$7,831,976</b>
<b>Non-Wildland/Non-Urban</b>						
Agricultural	151	29	\$18,919,827	\$1,695,957	\$1,695,957	\$22,311,741
Commercial	44	8	\$9,577,190	\$12,979,283	\$12,979,283	\$35,535,756
Government	11	0	\$86,059	\$0	\$0	\$86,059
Industrial	8	6	\$3,021,727	\$3,169,760	\$4,754,640	\$10,946,127
Institutional	1	0	\$1,634	\$0	\$0	\$1,634
Residential	733	391	\$36,654,099	\$75,736,152	\$37,868,076	\$150,258,327
Utilities	111	1	\$25,726	\$5,655	\$5,655	\$37,036
Unknown	3	1	\$250,025	\$10,000	\$10,000	\$270,025
<b>Non-Wildland/Non-Urban Total</b>	<b>1,062</b>	<b>436</b>	<b>\$68,536,287</b>	<b>\$93,596,807</b>	<b>\$57,313,611</b>	<b>\$219,446,705</b>
<b>Urban Unzoned</b>						
Agricultural	6	2	\$2,137,058	\$1,128,410	\$1,128,410	\$4,393,878
Commercial	244	162	\$27,216,621	\$57,516,024	\$57,516,024	\$142,248,669
Government	40	3	\$4,287,547	\$314,641	\$314,641	\$4,916,829
Industrial	27	18	\$3,826,020	\$37,285,364	\$55,928,046	\$97,039,430
Institutional	52	27	\$775,620	\$5,298,665	\$5,298,665	\$11,372,950
Residential	3,312	3,080	\$111,091,346	\$318,176,050	\$159,088,025	\$588,355,421
Utilities	185	0	\$9,217	\$0	\$0	\$9,217
Unknown	14	0	\$50,858	\$0	\$0	\$50,858
<b>Urban Unzoned Total</b>	<b>3,880</b>	<b>3,292</b>	<b>\$149,394,287</b>	<b>\$419,719,154</b>	<b>\$279,273,811</b>	<b>\$848,387,252</b>
<b>Grand Total</b>						
<b>Grand Total</b>	<b>4,980</b>	<b>3,760</b>	<b>\$219,707,198</b>	<b>\$517,313,639</b>	<b>\$338,645,096</b>	<b>\$1,075,665,933</b>

Source: Madera County April 2017 Parcel/Assessor's Data, CAL FIRE

## Population at Risk

The Fire Hazard Severity Zone dataset was overlaid on the parcel layer. Those residential parcel centroids that intersect the severity zones were counted and multiplied by the 2010 Census Bureau average household factors for the City of Chowchilla. According to this analysis, there is a total population of 91 residents of Chowchilla at risk to moderate or higher wildfire risk. This is shown in Table A-22.

**Table A-22 City of Chowchilla – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone**

Fire Severity Zone	Improved Residential Parcels	Population*
Very High	0	0
High	0	0
Moderate	30	91
<b>Total</b>	<b>30</b>	<b>91</b>

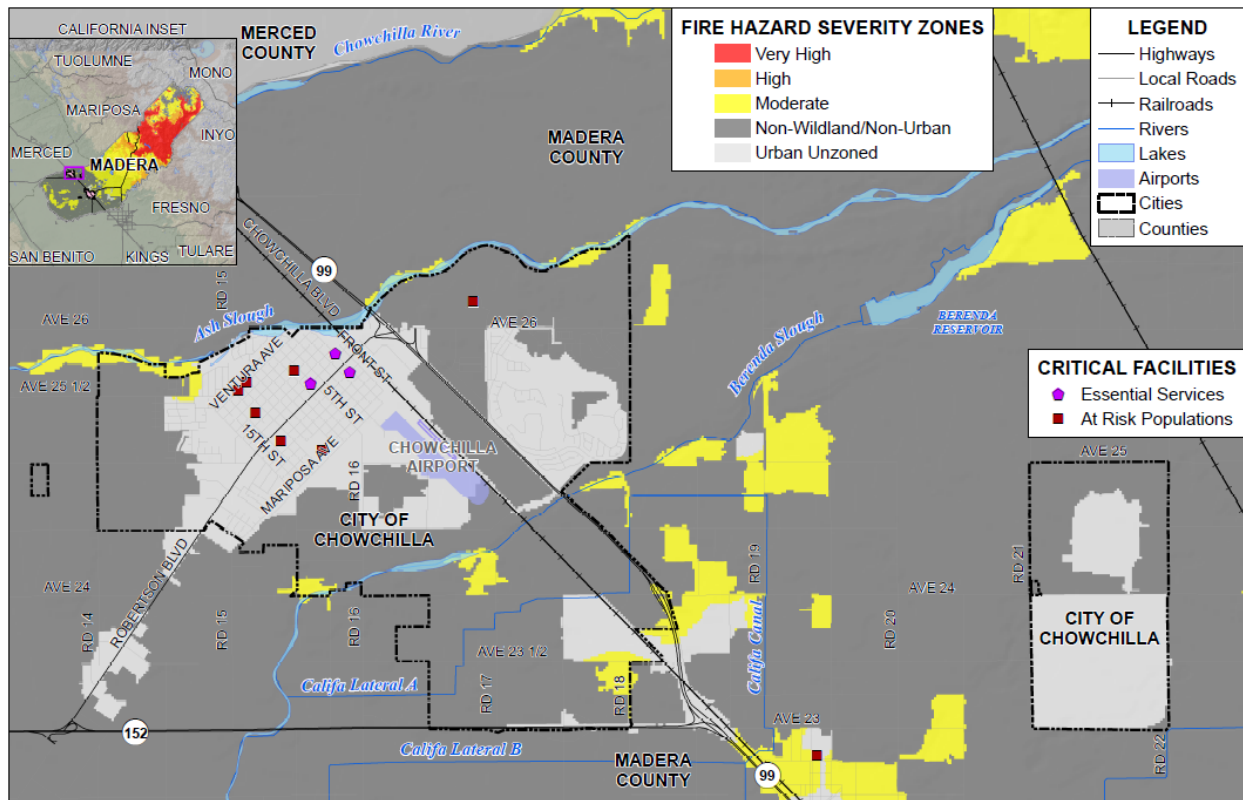
Source: Madera County April 2017 Parcel/Assessor's Data, CAL FIRE

\* Average household populations for Chowchilla (3.04) from the 2010 US Census were used

### Critical Facilities at Risk

Wildfire analysis was performed on the critical facility inventory in Madera County and all jurisdictions, including the City of Chowchilla. GIS was used to determine whether the facility locations intersect a fire severity zone provided by CAL FIRE, and if so, which zone it intersects. There are no facilities in the moderate or higher fire hazard severity zones in the City. This is shown in Figure A-11. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

**Figure A-11 City of Chowchilla – Critical Facilities in the Fire Hazard Severity Zones**



Data Source: CAL FIRE (Adopted SRA 11/2007 - fhzs06\_3\_20 and Draft 9/2007 - c20fhsl06\_1), Madera County, Cal-Atlas, Map Date: 4/2017.



## Historical, Cultural, and Natural Resources at Risk

The City of Chowchilla has significant cultural and natural resources located throughout the City as previously described. Vulnerability analysis of these resources was not possible due to data limitations. However, any resource in a wildfire zone is potentially at risk.

## Future Development

There are small patches of moderate fire hazard zones in the City. Development may occur in the moderate or higher wildfire severity areas; however, City ordinances for building in these areas are enforced.

## A.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

### A.6.1. Regulatory Mitigation Capabilities

Table A-23 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Chowchilla.

*Table A-23 City of Chowchilla's Regulatory Mitigation Capabilities*

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan	Y	Listed under Public Section, but the mitigation strategy might be referred to in our CEQA document
Capital Improvements Plan	Y	Yes, possibly, ask Jason
Economic Development Plan		
Local Emergency Operations Plan	Y	Yes, no, possibly
Continuity of Operations Plan	Y	Yes, no, yes
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	City does not, Army Core of Engineer may have or Bureau of Reclamation
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	

Building Code, Permitting, and Inspections		Y/N	Are codes adequately enforced?
Building Code	Y	Version/Year: 2013 CBC	
Building Code Effectiveness Grading Schedule (BCEGS) Score		Score:	
Fire department ISO rating:	Y	Rating: 6	
Site plan review requirements	Y		
Is the ordinance an effective measure for reducing hazard impacts?			
Land Use Planning and Ordinances		Y/N	Is the ordinance adequately administered and enforced?
Zoning ordinance	Y	Yes, yes	
Subdivision ordinance	Y	Yes, yes	
Floodplain ordinance	Y	But it has not been updated since 1973	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N		
Flood insurance rate maps	Y	Access, not city property-through county	
Elevation Certificates	N		
Acquisition of land for open space and public recreation uses	Y		
Erosion or sediment control program	N		
Other			
How can these capabilities be expanded and improved to reduce risk?			

Source: City of Chowchilla

### *2040 City of Chowchilla General Plan Program*

The City of Chowchilla General Plan Program serves as the blueprint for future growth and development and provides comprehensive planning for the future. It encompasses what the City is now, and what it intends to be, and provides the overall framework of how to achieve this future condition (see the discussion in Section 4.3.1 Growth and Development Trends).

The General Plan includes a Safety Element that focuses on safety issues to be considered in planning for the present and future development of the Chowchilla Planning Area. Identified hazards include wildfire, geologic/seismic, flooding, and other natural and man-made hazards. Mitigation-related goals are presented below.

Safety Element Goals	
Goal 1	Minimize community exposure to harmful impacts caused by natural or man made hazards.
Goal 2	Minimize community exposure to risks associated with the transport, distribution, use and storage of hazardous materials.
Goal 3	Minimize community exposure to toxic air pollutant emissions and noxious odors from industrial, manufacturing and processing facilities.

## Safety Element Goals

Goal 4	Provide adequate public safety facilities and services in a timely manner to meet existing and planned growth requirements.
--------	---

### *Mitigation Related Ordinances*

#### **Emergency Services (Chapter 2.28)**

The purposes of this chapter are to provide for the preparation and carrying out of plans for the protection of persons and property within this City in the event of a disaster; to provide for the coordination of civil defense and disaster functions of this City with all other public agencies, private persons, corporations and organizations in compliance with the state of California's Standardized Emergency Management System. Any expenditures made in connection with such civil defense or disaster activities, including mutual aid activities, shall be deemed conclusively to be for the benefit of the inhabitants and the property of the City.

#### **Buildings and Construction (Title 15)**

This Title lays out the regulations the City places on the construction of buildings. It adopts the following codes:

- 2013 California Building Standards Code
- 2013 California Electrical Code
- 2013 California Mechanical Code
- 2013 California Plumbing Code

#### **Fire Prevention Code (Section 15.12)**

Pursuant to the provisions of Section 50022.2 of the Government Code of the State of California, the City Council of the City of Chowchilla does hereby adopt by specific reference thereto and incorporates herein by said reference the provisions, rules, and regulations specified and set forth in the 2013 California Fire Code, of the 2013 California Code of Regulations Title 24, including Appendix Chapters, copies of which are file in the community and economic development department, for public record and inspection. It adopts the following:

- The California Fire Code shall be enforced by the Bureau of Fire Prevention in the Fire Department of the City of Chowchilla, which is hereby established and which shall be operated under the supervision of the fire department.
- The chief in charge of the bureau of fire prevention shall be appointed by the City Council.
- The chief of the fire department may detail such members of the fire department as inspectors as shall from time to time be necessary. The chief of the fire department shall recommend to the City Council the employment of technical inspectors, who, when such authorization is made, shall be selected through an examination to determine their fitness for the position. The examination shall be open to members and nonmembers of the fire department, and appointments made after examination shall be for an indefinite term with removal only for cause.
- A report of the bureau of fire prevention shall be made annually and transmitted to the superintendent of public works of the City; it shall contain all proceedings under the California Fire Code, with such

statistics as the chief of the fire department may wish to include therein; the chief of the fire department shall also recommend any amendments to such code which, in his judgment, are desirable.

### Subdivisions (Chapter 17)

This title shall be known as and may be cited as the subdivision ordinance of the City and is deemed necessary in order to protect the public health, safety and general welfare, including the orderly growth and development of the City; the beneficial use of land in the public interest; the conservation, stabilization and protection of property values; and to assure provision for necessary utilities, public roads, and other public conveniences in subdivided areas.

### Zoning (Chapter 18)

The purposes of this zoning title are to furnish a guide for the orderly physical growth and development of the City, to promote and protect the public health, safety, comfort and general welfare, and to implement the general plan of the City. This zoning title shall apply to property owned by private persons, firms, corporations or organizations, and by the City of Chowchilla or any of its agencies.

### A.6.2. Administrative/Technical Mitigation Capabilities

Table A-24 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Chowchilla.

*Table A-24 City of Chowchilla’s Administrative and Technical Mitigation Capabilities*

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	Local
Mitigation Planning Committee	N	County/None other than LHMP group
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Local – Very limited
Mutual aid agreements	N	Fire only – Madera county
Other		
Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	N	
Floodplain Administrator	Y/N	Ordinance does not state, but as listed above the ordinance has not been updated since 1973
Emergency Manager	Y	No, Some, Yes
Community Planner	Y	Contracted out
Civil Engineer	Y/PT	Contracted out
GIS Coordinator	N	

Other		
Describe capability		
Technical	Y/N	Has capability been used to assess/mitigate risk in the past?
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Through mutual use agreement with Madera county / Yes
Hazard data and information	Y	Standard information/ Yes
Grant writing	Y	Contracted / Yes
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		

Source: City of Chowchilla

### A.6.3. Fiscal Mitigation Capabilities

Table A-25 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

*Table A-25 City of Chowchilla's Fiscal Mitigation Capabilities*

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	
Storm water utility fee	Y	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	Y	
Other federal funding programs	N	
State funding programs	Y	
Other		
How can these capabilities be expanded and improved to reduce risk?		

Source: City of Chowchilla



### A.6.4. Mitigation Education, Outreach, and Partnerships

Table A-26 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information. More information can be found below the table.

*Table A-26 City of Chowchilla’s Mitigation Education, Outreach, and Partnerships*

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Water conservation / staff very limited
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		

### A.6.5. Other Mitigation Efforts

The City of Chowchilla has many other ongoing mitigation efforts that include the following:

- Partnerships with the County and other entities on mitigation efforts in and around the City.

## A.7 Mitigation Strategy

### A.7.1. Mitigation Goals and Objectives

The City of Chowchilla adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

### A.7.2. NFIP Mitigation Strategy

The City of Chowchilla does not currently participate in the NFIP. The City thought this is because of the very small floodplain in the City, approximately 23 unimproved and 15 improved acres, and the small City

staff and limited resources available to administer the program. However, as part of this LHMP Update effort, the City is adding a mitigation action that will evaluate the City's future participation in the program.

### **A.7.3. Mitigation Actions**

The planning team for the City of Chowchilla identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

#### ***Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan***

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140). Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Safety Element of General Plan

**Responsible Office:** City of Chowchilla Planning Department

**Priority:** High

**Cost Estimate:** Jurisdictional board/staff time

**Potential Funding:** Local budgets

**Benefits (avoided Losses):** Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

**Timeline:** As soon as possible

#### ***Action 2. Public awareness, education, outreach, and preparedness program enhancements for all hazards (simplify, multi-media, educate and clarify various emergency systems, messaging and training; promote self-responsibility)***

---

**Hazards Addressed:** Multi Hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Currently the City has little funding to do any outreach, this is because of limited staff, and still trying to recover from the downturn in 2009.

**Project Description:** Use modern technology to outreach citizens, this could be done through a text message system, email generator, etc. Also, let the public know what emergency services are offered from the City. Basic outreach is also needed. Our staff lack the training to even implement some of these functions of emergency services

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office/Partners:** Citywide

**Project Priority:** Low

**Cost Estimate:** 15,000

**Benefits (Losses Avoided):** Public education and outreach on hazards will result in a more informed and better prepared community enabling them to take responsibility and action to minimize their risk and vulnerability to future hazard events.

**Potential Funding:** Grants that deal with emergency services, City Budgets

**Timeline:** 5 years

*Action 3. Conduct evacuation and shelter planning for all communities and populations (to include all critical hazards, at risk populations, medical, ADA, animals, and with outreach and security components)*

---

**Hazards Addressed:** Emergency Services/Multi Hazard

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** At this point the City of Chowchilla relies heavily on the County of Madera to provide these needs to the citizens of chowchilla, it would be beneficial to be able to operate some of area shelters on a smaller scale in city limits until the County is able to reach the City, and serve the needs required.

**Project Description:** Train staff and volunteers to understand how to react in a hazard situation and able to keep City calm until a larger organization can come in and assess the hazard at hand.

**Other Alternatives:** No action.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** None in the City, other than what the County of Madera offers.

**Responsible Office/Partners:** City Wide and Volunteers

**Project Priority:** Low

**Cost Estimate:** 5,000

**Benefits (Losses Avoided):** Increased resilience to hazards.

**Potential Funding:** FEMA, ADA grant, state grants, federal grants-partnership between cities and county.

**Timeline:** Ongoing

***Action 4. Enhance and maintain GIS mapping of City assets and critical facilities***

---

**Hazards Addressed:** Emergency Services/Multi hazard

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** In the City of Chowchilla we DO NOT have a GIS system. We have PDF files of maps and are unable to locate even parcels without the APN book. This does not allow the City to be efficient when trying to determine right of ways, fire information, street information. The City does not have the funding or the knowledge to even build a GIS system.

**Project Description:** To build a GIS system for the City, offer training and implement the use of GIS across the City.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** One person in Public Works has minimal knowledge of the GIS system, but would like to take training at a local university to further knowledge. This can be looked into after employee has finished the probationary period. (February 2018)

**Responsible Office/Partners:** City Wide

**Project Priority:** High

**Cost Estimate:** 50,000

**Benefits (Losses Avoided):** This will provide Citywide benefits to more effectively track and address all hazard-related issues specific to critical infrastructure and the existing built environment.

**Potential Funding:** Technology Grant, Education grant

**Timeline:** 5 years

***Action 5. Explore additional surface water resources for City***

---

**Hazards Addressed:** Drought/Water Supply

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** Drought in California happens often, with recent droughts being some of the worst in recent history. In the next coming years, although the drought warnings have been lifted future water supplies that needs to be explored, how to store surface water and build infrastructure that will minimize the impact if the drought occurs. With development in the City more people are using natural resources daily.

**Project Description:** Research and seek alternative to using surface water, instead of relying heavily on groundwater.

**Other Alternatives:** Rely heavily on only groundwater

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** None

**Responsible Office/Partners:** Public Works

**Project Priority:** Low

**Cost Estimate:** 5,000

**Benefits (Losses Avoided):** Ensuring a reliable water source is critical to public health, property protection, and the continued viability of the City.

**Potential Funding:** Water grants, state water board, Federal Funding, desalination funding

**Timeline:** 10 years

***Action 6. Provide backup generators for wells***

---

**Hazards Addressed:** Earthquake

**Goals Addressed:** 1, 2, 3, 7

**Issue/Background:** Nothing is implemented in the City

**Project Description:** Need to seek funding to purchase generators

**Other Alternatives:** No action.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** None

**Responsible Office/Partners:** Public Works

**Project Priority:** Medium

**Cost Estimate:** 8,000

**Benefits (Losses Avoided):** Quicker recovery to potable water supplies post-earthquake.

**Potential Funding:** FEMA, state and federal grants

**Timeline:** 2 years

***Action 7. Evaluate joining the National Flood Insurance Program***

---

**Goals Addressed:** 1, 2, 3, 6, 7 **Hazards Addressed:** Flood, Levee Failure

**Issue/Background:** The City does not currently belong to the NFIP. The City currently has approximately 23 unimproved acres and 15 improved acres in the Special Flood Hazard Area (SFHA) that are not able to access flood insurance under the NFIP. Further there are no regulations guiding development within SFHAs.

**Project Description:** This project will evaluate the benefits vs the costs of the City joining the NFIP.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** If the City moves forward with this effort, initially this will be implemented through a new City Ordinance that would be developed to meet or exceed NFIP requirements.

**Responsible Office/Partners:** City Public Works

**Project Priority:** Medium

**Cost Estimate:** Staff time and

**Benefits (Losses Avoided):** Property protection and life safety. Additionally, access to flood insurance by City residents will provide monies to address future flood losses for those with flood insurance.

**Potential Funding:** City budgets

**Timeline:** 1-2 years

***Action 8. Erosion repair***

---

**Hazards Addressed:** Flood/ Levee Failure

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** The Central Valley is riddled with hard water because of the heavy agricultural farming that happens in this economy, therefore because of this, cities are left with very hard water, calcium build up, causing erosion damage.

**Project Description:** Take an inventory of all erosion areas within City Limits and develop a plan to implement in order to take care of the Erosion on local infrastructure.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** None

**Responsible Office/Partners:** Public Works

**Project Priority:** Moderate

**Cost Estimate:** 100,000

**Benefits (Losses Avoided):** Life safety, property protection, natural resource protection.

**Potential Funding:** Water, flood state and federal grants

**Timeline:** 5 years

***Action 9. Implement stormwater master plans***

---

**Hazards Addressed:** Flood

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** County and City are in need of new and updated Master Plans or just need them in general. The City of Chowchilla is in desperate need of a Master Plan.

**Project Description:** Develop a Master Plan to help mitigate the future impact needs of the City of Chowchilla.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** None

**Responsible Office/Partners:** Public Works

**Project Priority:** Important

**Cost Estimate:** 25,000

**Benefits (Losses Avoided):** Life safety, property protection, natural resource protection.

**Potential Funding:** Measure T Funding, Prop 1A

**Timeline:** 1 year

**Action 10.      *Undergrounding of stormwater system – Downtown area***

---

**Hazards Addressed:** Flood

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Since the town was built the original part of town does not have underground stormwater infrastructure. Because the town is flat, in a heavy down pour the main streets are flooded for about an hour, but moving water from one side of the town to other is still a safety hazard

**Project Description:** Develop a scope of work and a stormwater master plan to determine the best possible solution to build new infrastructure.

**Other Alternatives:** No action

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** None

**Responsible Office/Partners:** Public Works

**Project Priority:** High

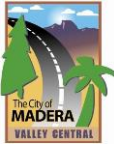
**Cost Estimate:** 2,500,000

**Benefits (Losses Avoided):** Life safety, property protection, natural resource protection.

**Potential Funding:** Prop 1A, water grants, low interest loans

**Timeline:** 10 years





## Annex B City of Madera

### B.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Madera, a new participating jurisdiction to the Madera County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This annex provides additional information specific to the City of Madera, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

### B.2 Planning Process

As described above, the City of Madera followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Madera County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. City planning participants, their positions, and how they participated in the planning process are shown in Table B-1. Additional details on plan participation and City representatives are included in Appendix A.

*Table B-1 City of Madera Planning Team*

Name	Position/Title	How Participated
Keith Helmuth	City Engineer	Attended planning meetings. Provided input and document review. Supplied updated information.
Eugene Haynes	Administrative Analyst	Attended planning meetings. Provided input and document review. Supplied updated information.
Wendy Silva	Director of Human Resources	Attended planning meetings. Provided input and document review. Supplied updated information.
Dave Randall	Public Works Operations Director	Attended planning meetings. Provided input and document review. Supplied updated information.
Chris Boyle	Planning Manager	Attended planning meetings. Provided input and document review. Supplied updated information.
Steve Frazier	Police Chief	Attended planning meetings. Provided input and document review. Supplied updated information.
Dino Lawson	Police Commander	Attended planning meetings. Provided input and document review. Supplied updated information.
Paula Nunez	HR Technician II	Attended planning meetings. Provided input and document review. Supplied updated information.
Robin Bravo	Administrative Analyst	Attended planning meetings. Provided input and document review. Supplied updated information.

Name	Position/Title	How Participated
Mary Church	Administrative Analyst	Attended planning meetings. Provided input and document review. Supplied updated information.
Brent Richardson	City Attorney	Document review prior to Council consideration
David Tooley	City Administrator	Document review prior to Council consideration
David Merchen	Director of Community Development	Document review prior to Council consideration

Coordination with other community planning efforts is paramount to the successful implementation of this plan. This section provides information on how the City integrated the previously-approved 2011 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2011 LHMP through other plans and programs shown in Table B-2.

*Table B-2 2011 LHMP Incorporation*

Planning Mechanism 2011 LHMP Was Incorporated/Implemented In.	Details?
Housing Element update	Portions of the plan were added to the Housing Element when it was last updated.

### *Sources*

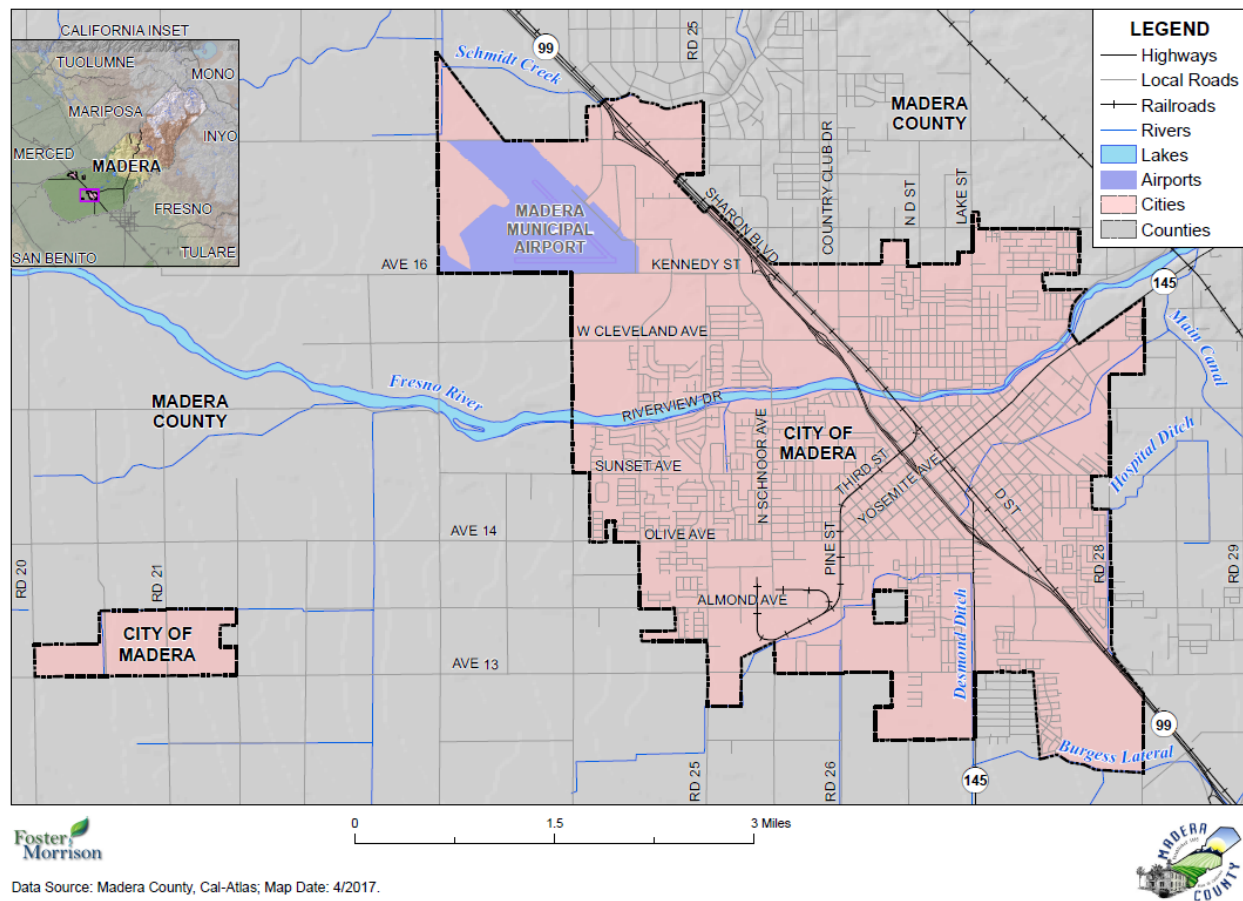
In addition to sources referenced in the Base Plan in Chapter 4, the following sources were used to complete this annex:

- City of Madera General Plan
- City of Madera General Plan Housing Element

## **B.3 Community Profile**

The community profile for the City of Madera is detailed in the following sections. Figure B-1 displays a map and the location of the City of Madera within Madera County.

*Figure B-1 City of Madera*



### B.3.1. Geography and Climate

The City of Madera is the county seat of Madera County. The City has industrial parks, recreational parks, food and meat processing plants, wineries, and agricultural excellence in diversified farming – all of which contribute to a solid and substantial economy.

The City of Madera is located about midway and toward the eastern edge of the San Joaquin Valley. The Fresno River flows east to west through the City. The terrain around Madera itself is generally level with an abrupt upward slope about 10 miles eastward to the foothills of the Sierra Nevada. The main Sierra Nevada Range is located about 50 miles to the east and extends from 12,000 to more than 14,000 feet in elevation. About 30 miles west of the City lie the foothills of the Coastal Range. The City of Madera is situated on a young alluvial fan with permeable to moderately permeable soil.

The climate around the City of Madera is dry, mild in winter and hot in summer; nearly nine-tenths of the year's precipitation falls in the six months from November to April. Humidity is commonly as low as 15 percent and has been recorded as low as 8 percent. In contrast, humidity readings may reach 90 percent during the morning hours of December and January. The normal daily maximum temperature advances to a high of 99 degrees during the latter part of July. The daily maximum temperature during the warmest

month has ranged from 76 degrees to 115 degrees. Winter temperatures are usually mild but during infrequent cold spells minimum readings occasionally drop below freezing. Heavy frost occurs almost every year, and the first heavy frost in the autumn usually occurs during the last week of November. The last frost in the spring is in early March.

### B.3.2. History

The City of Madera had its beginnings with William Thurman, a lumberman, in 1875 when the area was still part of Fresno County. A V-shaped water flume, 54 miles in length, carried lumber from the high country to Madera by gravity flow. The railhead and later SH-99 marked Madera for its place of importance in the San Joaquin Valley. Madera was chartered as an incorporated city, March 27, 1907.

### B.3.3. Economy

The City of Madera, which lies in the County of Madera, has seen substantial growth since 1990. The unemployment rate is approximately 8.2% as of April of 2017. Agriculturally oriented Madera County tends to have higher unemployment rates and greater seasonal variations in unemployment than the City of Madera City. US Census estimates show economic characteristics for the City of Madera. These are shown in Table B-3.

*Table B-3 City of Madera Civilian Employed Population 16 years and Over*

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	6,958	28.8%
Construction	1,022	4.2%
Manufacturing	2,310	9.6%
Wholesale trade	426	1.8%
Retail trade	2,685	11.1%
Transportation and warehousing, and utilities	987	4.1%
Information	221	0.9%
Finance and insurance, and real estate and rental and leasing	424	1.8%
Professional, scientific, and management, and administrative and waste management services	1,191	4.9%
Educational services, and health care and social assistance	4,272	17.7%
Arts, entertainment, and recreation, and accommodation and food services	1,618	6.7%
Other services, except public administration	804	3.3%
Public administration	1,211	5.0%

Source: US Census Bureau American Community Survey 2009-2013 Estimates

The City of Madera is home to many industries and companies. Some of the largest employers in the City are shown on Table B-4.

*Table B-4 City of Madera – Major Employers*

Employer Name	Location	Industry
Ardagh Group	Madera	Glass Containers
B A C	Madera	Assembly & Fabricating Service
Baltimore Aircoil Co	Madera	Refrigerating Equip-Commercial
Georgia-Pacific Madera	Madera	Paper-Manufacturers
Home Depot	Madera	Home Centers
JBT Food Tech	Madera	Food Processing Equipment & Supplies
Lamanuzzi & Pantaleo Cold Stge	Madera	Fruits & Vegetables-Growers & Shippers
Lion Brothers Farm-Newstone	Madera	Farming Service
Lowe's Home Improvement	Madera	Home Centers
Madera City Hall	Madera	Government Offices-City, Village & Township
Madera Community Hospital	Madera	Hospitals
Madera High School	Madera	Schools
Madera Packing Shed	Madera	Sheds-Tool & Utility
Madera South High School	Madera	Schools
Millview School	Madera	Schools
Mission Bell Winery	Madera	Wineries
Primerica Financial Svc	Madera	Financial Advisory Services
San Joaquin Wine Co Inc	Madera	Wineries
Span Construction Inc	Madera	Contractors-Equip/Supplies-Dealers/Services
Valley Children's Hospital	Madera	Hospitals

Information on the tax base of the City and the greater County are discussed in Section 1.5 of the Base Plan.

### **B.3.4. Population**

The California Department of Finance estimated the January 1, 2017 total population for the City of Madera was 66,082.

## **B.4 Hazard Identification**

Madera's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Madera (see Table B-5).

*Table B-5 City of Madera—Hazard Identification Assessment*

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests	Limited	Occasional	Limited	High	Medium
Climate Change	Extensive	Highly Likely	Catastrophic	High	High
Dam Failure	Significant	Unlikely	Catastrophic	High	Low
Drought and Water Shortage	Extensive	Likely	Negligible	Moderate	High
Earthquake	Extensive	Unlikely	Limited	High	Low
Flood: 1% and 0.2% Annual Chance	Significant	Unlikely	Critical	High	High
Flood: Localized/Stormwater	Limited	Likely	Negligible	Low	High
Hazardous Materials Transportation	Limited	Unlikely	Negligible	Low	Low
Landslides, Rockfalls, and Debris Flows	Limited	Unlikely	Negligible	Low	Low
Levee Failure	Limited	Unlikely	Negligible	Low	Low
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Medium	High
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Medium	High
Severe Weather: Fog	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)	Extensive	Likely	Limited	Medium	High
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Winter Storms/Snow	Extensive	Likely	Limited	Medium	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire (smoke, tree mortality)	Limited	Occasional	Negligible	Low	Low
<p><b>Geographic Extent</b>                      Limited: Less than 10% of planning area                      Significant: 10-50% of planning area                      Extensive: 50-100% of planning area</p> <p><b>Probability of Future Occurrences</b>                      Highly Likely: Near 100% chance of occurrence in next year, or happens every year.                      Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.                      Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.                      Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p><b>Magnitude/Severity</b>                      Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths                      Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability                      Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability                      Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p><b>Significance</b>                      Low: minimal potential impact                      Medium: moderate potential impact                      High: widespread potential impact</p> <p><b>Climate Change Impact:</b>                      Low: Climate change is not likely to increase the probability of this hazard.                      Medium: Climate change is likely to increase the probability of this hazard.                      High: Climate change is very likely to increase the probability of this hazard.</p>					

## B.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Madera’s hazards and assess the City’s vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the Base Plan. The hazard profile discusses the threat to the Planning Area and describes previous occurrences of hazard events and the likelihood of future occurrences. The vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the Planning Area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

### B.5.1. Hazard Profiles

At the beginning of each hazard vulnerability assessment in Section B.5.3, a brief statement is given as to how the hazard affects the City, and provides information on past occurrences. The intent of these section is to provide jurisdictional specific information on hazards.

### B.5.2. Vulnerability Assessment

This section identifies Madera’s values at risk, critical facilities and infrastructure, historic and cultural resources, natural resources, and growth and development trends.

#### *Values at Risk*

The April 2017 Assessor’s data obtained from the Madera County Assessor’s Office formed the basis of this analysis. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table B-6 shows the 2017 Assessor’s values (e.g., the values at risk) broken down by property type for the City of Madera.

*Table B-6 City of Madera – Total Values at Risk by Property Use*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Agricultural	54	21	\$15,599,646	\$1,375,375	\$16,975,021
Commercial	1,011	756	\$149,776,558	\$380,288,618	\$530,065,176
Government	140	7	\$7,902,235	\$1,206,773	\$9,109,008
Industrial	238	108	\$29,036,522	\$105,604,507	\$134,641,029
Institutional	84	63	\$3,348,429	\$23,439,765	\$26,788,194

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Residential	14,218	13,165	\$533,242,661	\$1,471,380,915	\$2,004,623,576
Utilities	233	4	\$447,563	\$305,052	\$752,615
Unknown	73	8	\$5,921,938	\$5,795,090	\$11,717,028
<b>Total</b>	<b>16,051</b>	<b>14,132</b>	<b>\$745,275,552</b>	<b>\$1,989,396,095</b>	<b>\$2,734,671,647</b>

Source: Madera County April 2017 Parcel/Assessor's Data

### *Critical Facilities and Infrastructure*

For purposes of this plan, a critical facility is defined as:

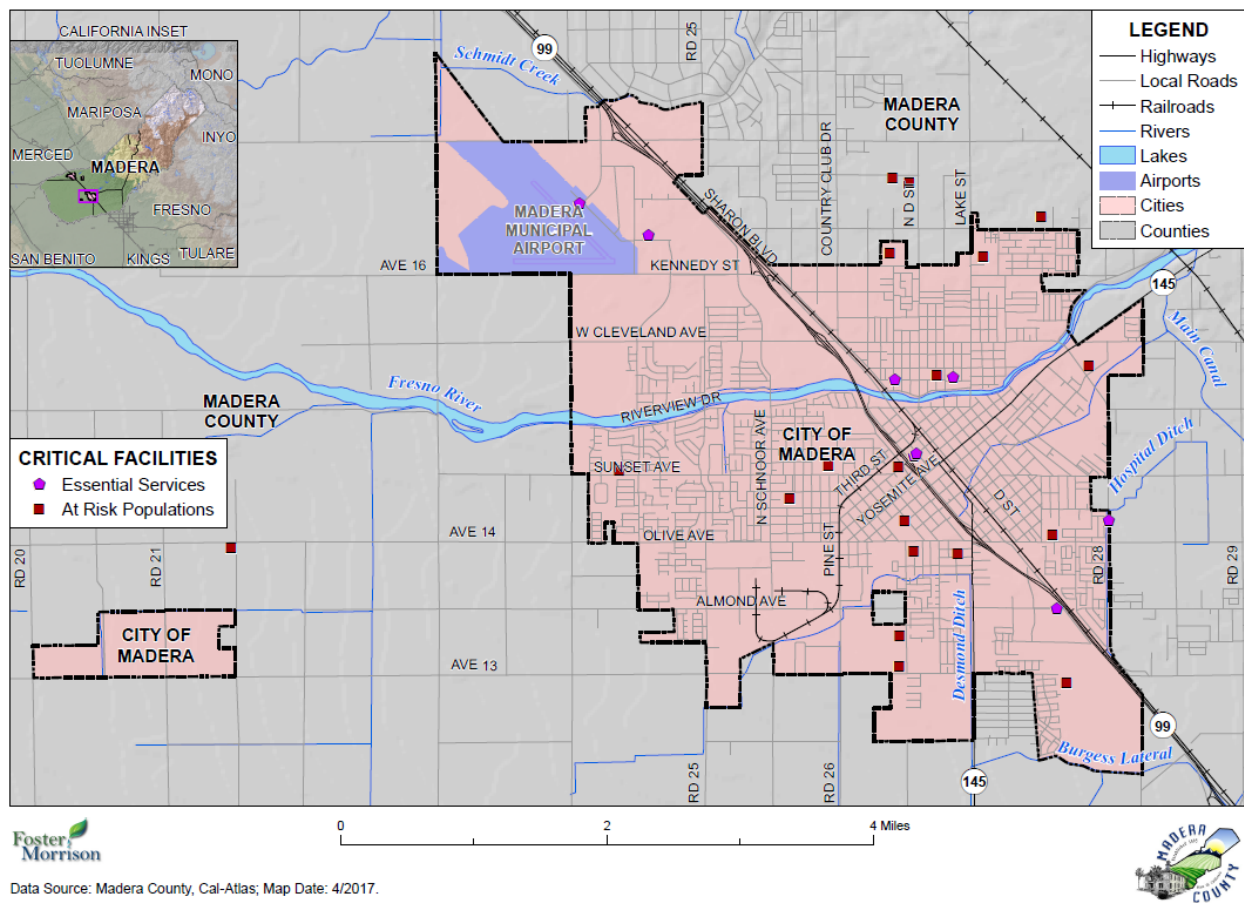
*Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

This definition was refined by separating out three classes of critical facilities as further described in Section 4.3.1 of the Base Plan.

An inventory of critical facilities in the City of Madera from Madera County GIS is shown on Figure B-2 and detailed in Table B-7. Details of critical facility definition, type, name, address, and jurisdiction by hazard zone are listed in Appendix F.



Figure B-2 City of Madera – Critical Facilities



Data Source: Madera County, Cal-Atlas; Map Date: 4/2017.

Table B-7 City of Madera – Critical Facilities Inventory

Critical Facility Type	Critical Facility Count
<b>Essential Services</b>	
Airport and Radio Tower	1
City Hall Admin Critical Infrastructure	1
Community Services / Engineering and Infrastructure Services / IT Communications	1
Critical Communications	1
Emergency Dispatch Center	1
Fire Command Center	1
Medical Center	1
Police Dispatch Communication Center	1
<b>Essential Services Total</b>	<b>8</b>
<b>At Risk Populations</b>	
School	15
<b>At Risk Populations Total</b>	<b>15</b>

<b>City of Madera Grand Total</b>	<b>23</b>

Source: Madera County GIS

### *Historic and Cultural Resources*

The California Office of Historic Preservation database shows that the City of Madera has one registered federal historic site. This is shown on Table B-8.

*Table B-8 City of Madera – Historical Resources*

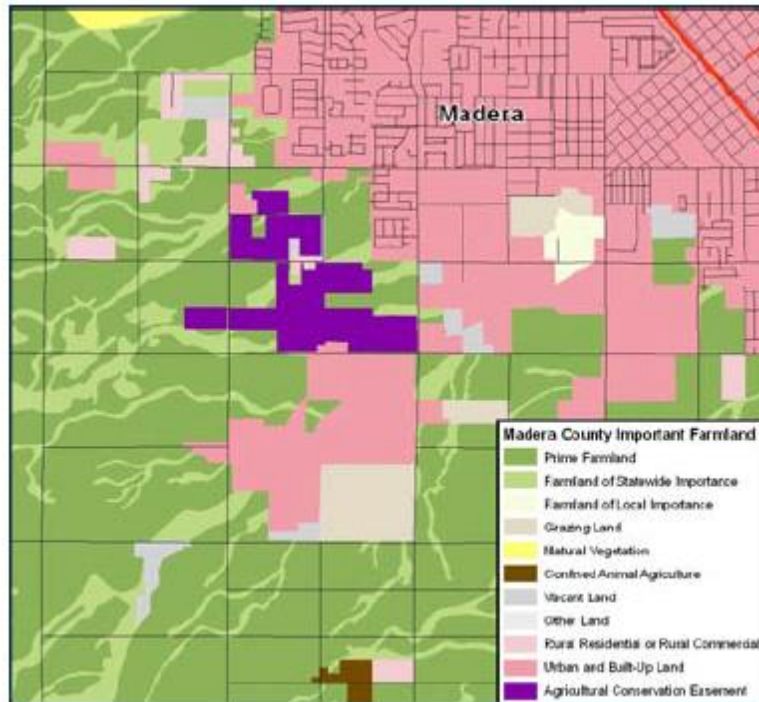
Resource Name (Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City
Madera County Courthouse (N108)	X				9/3/1971	Madera

Source: California Department of Parks and Recreation Office of Historic Preservation, <http://ohp.parks.ca.gov/>

### *Natural Resources*

The City of Madera has a variety of natural resources of value to the community. As one of the primary sources of regional income, agriculture activity and the prime soils that support it are critical to the future of Madera. In the current city limits, about 950 acres—about one-tenth of the city—are in agricultural use (mostly near the Madera Airport, where land use restrictions preclude most urban uses). As is the case throughout the Central Valley, some farmland in Madera County is being lost to urbanization to meet the needs of the region’s growing population. In 2002, Madera County farmers joined with County agricultural officials and state and federal conservation agencies to create an area of protected agriculture land in the southwest area of Madera. The 440-acre area (shown on Figure B-3) was established to help direct growth away from the west edge of Madera in recognition of the agricultural value the land in this area represents. While the protected area creates an irregular and noncontiguous barrier, its presence clearly reflects the intent to keep these and other lands further to the west in agricultural production.

Figure B-3 City of Madera – Farmlands near City



Source: City of Madera 2009 General Plan Conservation Element

The California Natural Diversity Database (a computerized database that shows where sensitive plants and animals have been found) documents seven plant and animal special-status species that have been found in the past in the City. The Database also shows one “natural community” that has also been found in the City. (Note: The list below is of species whose presence has been recorded within a one-mile radius of the City in the CNDDDB. Other sensitive plants and animals have been found in or have the potential to be found in the City, but are not recorded in the CNDDDB.) Sensitive plants and animals that have been found in the City and are in the CNDDDB are listed below.

- Burrowing Owl;
- California Tiger Salamander;
- Blunt nosed leopard lizard;
- California linderiella (“fairy shrimp”);
- Vernal pool fairy shrimp;
- Madera leptosiphon;
- Hairy orcutt grass.

Although most of the City has been changed from its natural condition by farming and urban uses, a few areas of natural habitat remain. These include:

- Annual grasslands;
- Riparian areas;
- Wetlands.

In addition, according to state records, one type of “Natural Community” is found in the City. This Natural Community, Northern Hardpan Vernal Pool, contains vernal pools (which fill seasonally during the rainy season) that could harbor sensitive plant and animal species (including fairy shrimps). These vernal pools are generally found in annual grasslands, grasslands where the soils include an impermeable clay-pan layer below the surface, conditions which are widely distributed in the eastern portion of the City.

## *Growth and Development Trends*

### **Past Growth**

The City of Madera has seen consistent growth since the 1910s, with a small slowing between 1960 and 1970. From 1990 to 2010 growth was very strong. Between 2010 and 2017, the City has experienced a smaller population growth. This can be seen in Table B-9.

*Table B-9 City of Madera – Population Growth 1910 to 2017*

Year	Population	Percent increase or decrease
1910	2,404	–
1920	3,444	43.3%
1930	4,665	35.5%
1940	6,457	38.4%
1950	10,497	62.5%
1960	14,430	37.5%
1970	16,044	11.2%
1980	21,732	35.5%
1990	29,281	35.32
2000	43,207	47.6%
2010	61,416	42.1%
2017	66,082	7.6%

Source: US Census Bureau, California Department of Finance

### **Special Populations**

Madera, California is located in the exact center of the state, with Madera County encompassing 2,147 square miles and the City of Madera covering approximately 14 square miles. The most recent California Department of Finance population estimate provided in 2017 was 156,492 for Madera County, of those 66,082 (or 42%) reside in the City of Madera.

The population of the City of Madera is as diverse as the plethora of agricultural products grown in the region. From the 2010 census, the racial makeup of Madera was 49.9% White, 3.4% African American, 3.1% Native American, 2.2% Asian, 0.1% Pacific Islander, 36.8% from other races, and 4.4% from two or more races. Hispanic or Latino of any race accounted for 76.7% of the population. Approximately 33% of the population is foreign born. The median age for Madera is 27.6, and seniors 65 years-old and older make up 7.6% of the City’s population. The average median household income is \$40,457, with senior household

median income at \$33,293. Just under 28% of individuals live below the federal poverty level. However, for foreign born residents, almost 31% live below the poverty level. Poverty rates are also higher among the disabled with 32% for disabled females and 31% for disabled males. Madera’s senior population is especially vulnerable with 23% of seniors living alone, and 6% of Madera senior households having an annual income of less than \$10,000 and 33% with incomes of less than \$20,000 annually. Approximately 9% of the population under the age of 65 has a disability, and 13% percent of the population do not have health insurance.

### Development since 2011 Plan

The City searched through building permits issued from July 2011 through July 2017. The following was found:

- New Single Family – 711
- New Multi Family – 1
- New Commercial Buildings – 10

The City does not track building permits by hazard risk areas. However, effective building codes and construction standards within the City will assist mitigating potential losses from any new development. With continued population growth, the City’s vulnerability to flood, and possibly wildfire, will likely continue to increase as well.

### Future Development

Estimates of future populations in the City was performed for the 2016-2024 City of Madera Housing Element. By 2035, Madera is projected to have a population of 137,975 in the general population. Growth projections from the 2014-2023 Housing Element can be found in Table B-10.

*Table B-10 City of Madera – Future Population Projections*

Location	2020	2035
Madera	98,914	137,975

Source: City of Madera 2014-2023 Housing Element

A land use map for the City is shown in Figure B-4.



More general information on growth and development in Madera County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Madera County of the Base Plan.

### **B.5.3. Vulnerability to Specific Hazards**

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table B-5 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Madera County Planning Area). Methodologies for calculating loss estimates are the same as those described in Section 4.3 of the Base Plan. In general, the most vulnerable structures are those located within the flood prone areas, WUI areas, unreinforced masonry buildings, and buildings built prior to the introduction of modern building codes.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

#### *Agricultural Hazards: Severe Weather/Insect Pests*

**Likelihood of Future Occurrence**—Likely

**Vulnerability**—Medium

#### **Hazard Profile and Problem Description**

Given the importance of agriculture to Madera County and the City of Madera, agricultural hazards continue to be an ongoing concern. The primary causes of agricultural losses are severe weather events, such as drought, freeze, and insect infestations. According to the City Planning Team, agricultural losses occur on an annual basis in agricultural areas of the City and are usually associated with severe weather events and insect infestations.

## Past Occurrences

The City Planning Team noted that historically, the State of California and the Central Valley in particular have experienced a multi-year drought. This is an ongoing hazard. Freezes generally occur at least once per year. Both freezes and droughts can have devastating financial impacts on agriculture.

## Vulnerability to Agricultural Hazards

As one of the primary sources of regional income, agriculture activity and the prime soils that support it are critical to the future of Madera. In the current City limits, about 950 acres—about one-tenth of the city—are in agricultural use (mostly near the Madera Airport, where land use restrictions preclude most urban uses). The vulnerability of the City is mainly economic.

## Future Development

In 2002, Madera County farmers joined with County agricultural officials and state and federal conservation agencies to create an area of protected agriculture land in the southwest area of Madera. The 440-acre area (shown on Figure B-3 above) was established to help direct growth away from the west edge of the City of Madera in recognition of the agricultural value the land in this area represents. While the protected area creates an irregular and noncontiguous barrier, its presence clearly reflects the intent to keep these and other lands further to the west in agricultural production. This protected area will not be developed.

## *Climate Change*

**Likelihood of Future Occurrence**—Likely

**Vulnerability**—Medium

## Hazard Profile and Problem Description

Climate change will require the City of Madera to prepare for warmer and more extreme temperatures, decreased water supply, drought, flooding, increasing energy and water demand, and public health risks. In California, average temperatures are projected to rise as much as 9 degrees Fahrenheit by 2100. This is especially pertinent for Madera where extreme heat events are likely to increase and urban heat islands may intensify already high temperatures. Characterized by asphalt roads, concrete roofs, and energy use, urban developments modify the natural landscape using materials that create and/or retain heat.

## Past Occurrences

The City Planning Team noted that climate change is an ongoing vulnerability. Specific past occurrences were not known.

## Vulnerability to Climate Change

The City's population, resources, and economy are vulnerable to climate change impacts, particularly flooding, extreme heat, extreme cold and water supply.



## Future Development

The State of California is taking the lead on state-wide policies to address development and climate change. The City of Madera will follow that lead. Environmental impacts will be considered as development occurs. Specific to the potential for increased flooding, the City may need to consider redesigning/reconstructing storm drainage facilities based on previous assumptions of rainfall that may in the future result in existing facilities being undersized.

## *Dam Failure*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

## Hazard Profile and Problem Description

Dam failures can result from a number of natural or man-made causes such as earthquakes, erosion of the face or foundation, improper siding, rapidly rising flood waters, structural/design flaws, and deliberate human actions. Madera’s location downstream of Hidden Dam also raises the potential for flooding in the highly unlikely event of a failure of the dam.

## Past Occurrences

The City Planning Team noted no past occurrences of dam failure to affect the City.

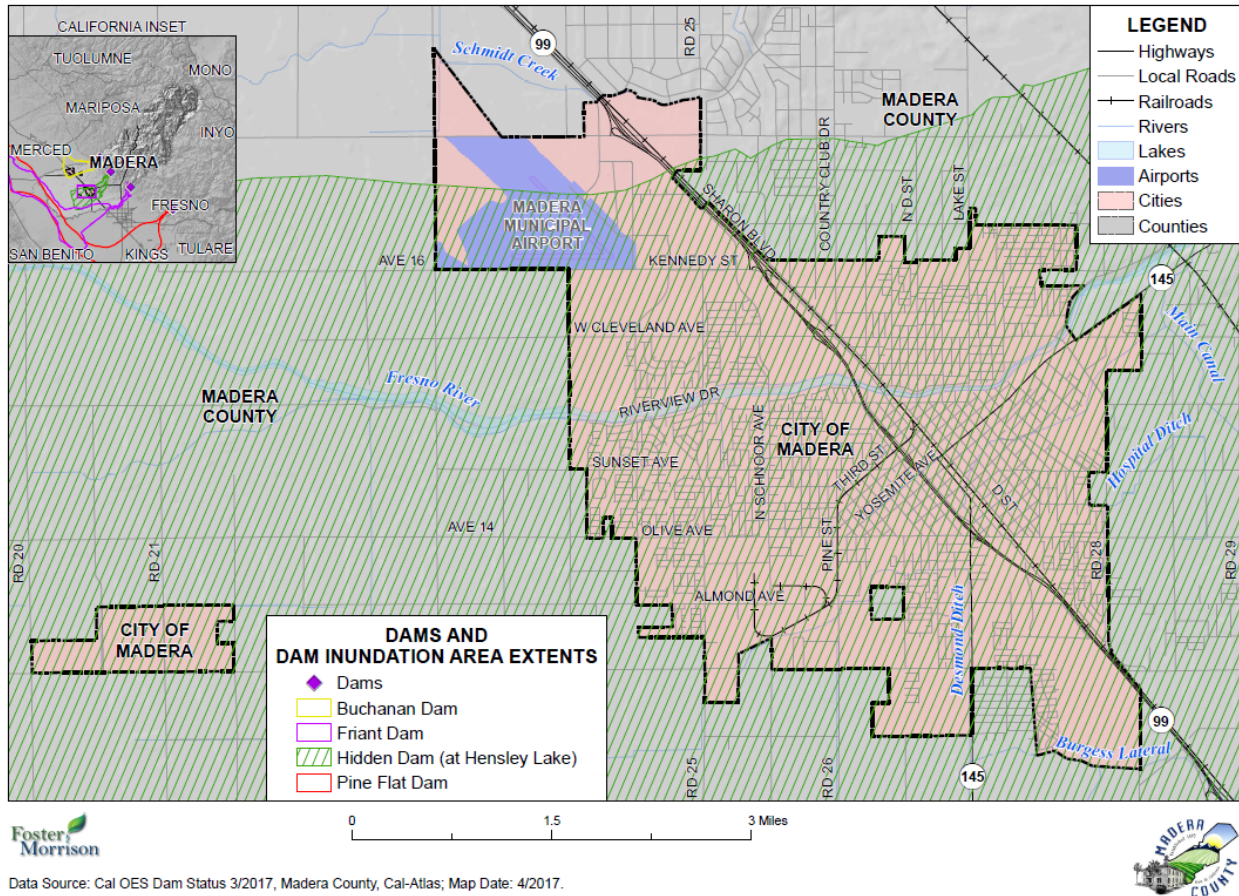
## Vulnerability to Dam Failure

The City of Madera is at risk to dam failure flooding. The following sections note the values, populations, and critical facilities at risk to dam failure.

## Values at Risk

Dam inundation areas, as obtained from Cal OES, were used as the basis of this dam inundation analysis. The Base Plan shows the dam inundation areas of the four dams of concern for the County. Those dams are the Buchanann Dam, Friant Dam, Hidden Dam, and Pine Flat Dam. Of greatest concern to the City of Madera is the Hidden Lake Dam. The inundation area for it is shown on Figure B-5.

Figure B-5 City of Madera – Dam Inundation Map



Madera County’s April 2017 Assessor Data and the County’s GIS parcel data, obtained from Madera County, were used for the county inventory of parcels and values. The methodology used in Section 4.3.5 of the Base Plan was used for the City of Madera. Table B-11 contains the dam inundation analysis results for the City of Madera. These tables show the property use type, number of parcels, and values at risk (including contents) to dam failure.

Table B-11 City of Madera – Values and Parcels in the Dam Inundation Zone by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value*
Agricultural	46	16	\$14,486,265	\$1,340,410	\$15,826,675
Commercial	987	749	\$133,523,625	\$371,140,624	\$504,664,249
Government	139	6	\$7,877,015	\$525,003	\$8,402,018
Industrial	220	97	\$26,690,127	\$85,417,445	\$112,107,572
Institutional	84	63	\$3,348,429	\$23,439,765	\$26,788,194
Residential	14,216	13,164	\$533,063,090	\$1,471,261,426	\$2,004,324,516
Utilities	232	4	\$447,562	\$305,052	\$752,614

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value*
Unknown	72	8	\$5,921,937	\$5,795,090	\$11,717,027
<b>City of Madera Total</b>	<b>15,996</b>	<b>14,107</b>	<b>\$725,358,050</b>	<b>\$1,959,224,815</b>	<b>\$2,684,582,865</b>

Source: Cal OES, Madera County April 2017 Parcel/Assessor's Data

## Population at Risk

A separate analysis was performed to determine population in flood zones. Using GIS, the dam inundation area dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the Census Bureau average household size for the City (see Table B-12). According to this analysis, there is a population of 50,286 in the City of Madera in dam inundation areas.

*Table B-12 City of Madera – Population at Risk to Dam Inundation Flooding*

Jurisdiction	Improved Residential Parcels	Population*
City of Madera	13,164	50,286

Source: Cal OES; US Census Bureau 2010 Estimates, Madera County April 2017 Parcel/Assessor's Data

\* Census Bureau 2010 average household sizes are: Madera – 3.82

## Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Madera in identified Cal OES dam inundation zones. GIS was used to determine whether the facility locations intersects a dam inundation area. Details of critical facilities in the Hidden Dam inundation area in the City of Madera are shown in Figure B-6 and Table B-13. As shown on the figure, Madera has 23 critical facility located the Hidden Dam inundation area. Details of critical facility definition, type, name and address and jurisdiction by flood zone are listed in Appendix F.

Figure B-6 City of Madera – Dam Inundation Areas and Critical Facilities

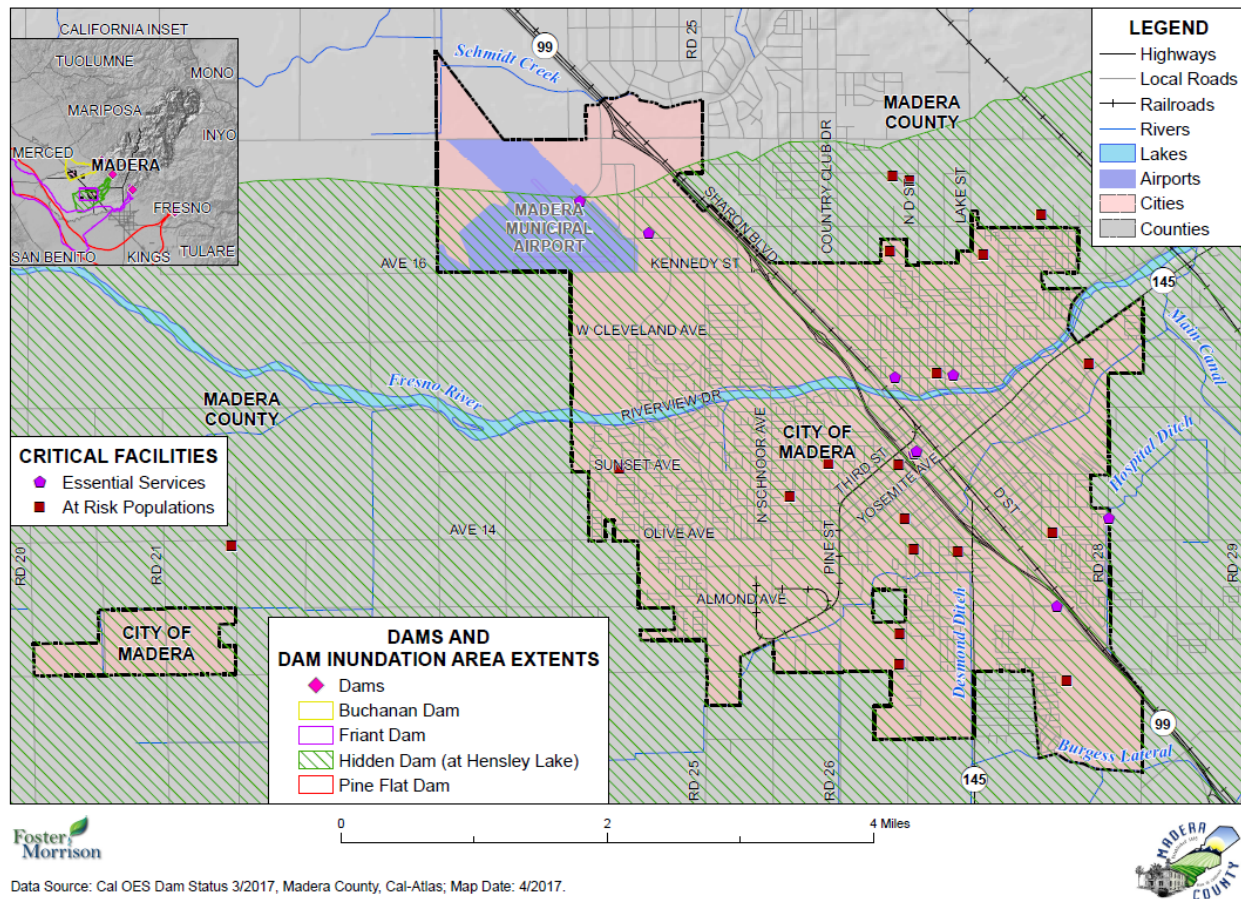


Table B-13 City of Madera – Dam Inundation and Critical Facilities

Critical Facility Category / Dam Inundation Source	Critical Facility Type	Critical Facility Count
<b>Hidden Dam</b>		
Essential Services	Airport and Radio Tower	1
	City Hall Admin Critical Infrastructure	1
	Community Services / Engineering and Infrastructure Services / IT Communications	1
	Critical Communications	1
	Emergency Dispatch Center	1
	Fire Command Center	1
	Medical Center	1
	Police Dispatch Communication Center	1
<b>Total</b>		<b>8</b>

Critical Facility Category / Dam Inundation Source	Critical Facility Type	Critical Facility Count
At Risk Populations	School	15
	<b>Total</b>	<b>15</b>
<b>City of Madera Total</b>		<b>23</b>

Source: Cal OES, Madera County GIS

## Future Development

The City does not anticipate it would adjust development based on the potential for dam failure. At present, the most likely approach would be to monitor/analyze the existing dam for deficiencies and correct them as they are identified rather than moving development outside the inundation zones or attempt to elevate an entire City.

## *Drought and Water Shortage*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

## Hazard Profile and Problem Description

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

## Past Occurrences

The City Planning Team noted that the City has experienced multiple, consecutive years of drought. In addition, current and all past occurrences have resulted in accelerated decline of the water table.

## Vulnerability to Drought

The vulnerability of Madera to drought is citywide, but impacts may vary and include reduction in water supply, agricultural losses, and an increase in dry fuels. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The City of Madera is a community surrounded largely by farmland that is rich in agriculture for a variety of crops including dairy, poultry, horse and cattle ranches that may utilize surface water deliveries from approximately June – September and/or from ground water pumping systems. During periods of droughts when the surrounding agricultural uses cannot receive surface deliveries of water, their increased pumping of ground water directly impacts the City’s ability to pump from the common aquifer. Which can cause problems such as reduced pumping capacity and water quality.

## Future Development

As the population in the area continues to grow, and as grazing land is converted to irrigated crops, so will the demand for water. Water shortages in the future may be worsened by drought, as the City relies on groundwater for its water source. Increased planning including conjunctive use will be needed to account for population growth and increased water demands.

## *Earthquake*

**Likelihood of Future Occurrence**—Occasional

**Vulnerability**—Medium

## Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

## Past Occurrences

No earthquakes of magnitude 5.5 or greater have ever been recorded in the Madera area, nor have there been reports of damage in the area from earthquakes of such magnitude outside the City in Madera County. The most recent notable earthquake affecting Madera occurred on May 30, 2003, with a magnitude of 3.1 and an epicenter located approximately 6 miles west-northwest of Madera.

## Vulnerability to Earthquake

The City Planning Team noted that no active earthquake faults are located in the City—the closest active faults are 50 or more miles distant. The lack of faults in the City reduces the possibility of damage from earth shaking in the City. Madera is also not subject to liquefaction, a common earthquake-related hazard

## Future Development

Future development in the City will be built to 2013 California Building Code (CBC). The 2013 CBC factors in the risks of earthquake into the building code.

## Flood: 1%/0.2% Annual Chance

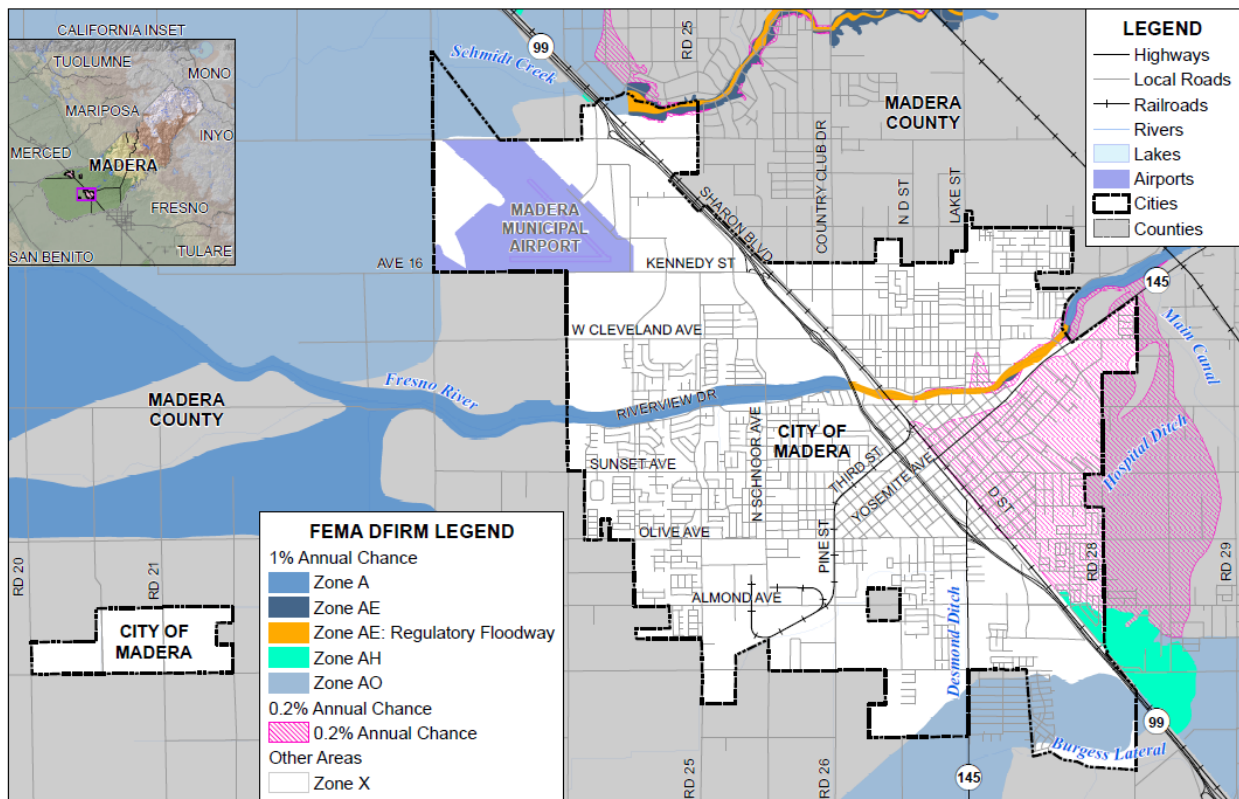
Likelihood of Future Occurrence—Occasional/Unlikely

Vulnerability—Medium

## Hazard Profile and Problem Description

Madera is traversed by several stream systems and is at risk to both the 1% (100-year) and 0.2% (500-year) annual chance flood. FEMA has identified DFIRM flood zones for the City. This is seen in Figure B-7.

Figure B-7 City of Madera – FEMA DFIRM Flood Zones



Data Source: FEMA DFIRM 9/26/2008, Madera County, Cal-Atlas; Map Date: 4/2017.



## Past Occurrences

In the past, flooding in Madera was a relatively frequent event. Floods struck Madera in 1938, 1943, 1945, 1950, 1952, 1955, 1956, 1958, 1962, 1963, and 1969. The era of flooding in Madera ended with the construction of the Hidden Dam on the Fresno River upstream of the City. Since the construction of the dam in 1976, no floods have occurred in the City.

## Vulnerability to Flooding

### Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Madera. The methodology described in Section 4.3.7 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table B-14 shows the property use, improved parcel count, improved values, estimated contents, total values and estimated loss of parcels that fall in a floodplain in the City.

*Table B-14 City of Madera – Count and Improved Value by Property Use and Detailed Flood Zone*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>1% Annual Chance Flood Hazard</b>						
<b>Zone A</b>						
Agricultural	5	0	\$2,761	\$0	\$0	\$2,761
Commercial	0	0	\$0	\$0	\$0	\$0
Government	3	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	53	44	\$2,218,923	\$6,490,788	\$3,245,394	\$11,955,105
Utilities	2	0	\$0	\$0	\$0	\$0
Unknown	1	0	\$0	\$0	\$0	\$0
<b>Zone A Total</b>	<b>64</b>	<b>44</b>	<b>\$2,221,684</b>	<b>\$6,490,788</b>	<b>\$3,245,394</b>	<b>\$11,957,866</b>
<b>Zone AE</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	1	0	\$6,116,586	\$0	\$0	\$6,116,586
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	3	3	\$76,768	\$130,060	\$65,030	\$271,858
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>Zone AE Total</b>	<b>4</b>	<b>3</b>	<b>\$6,193,354</b>	<b>\$130,060</b>	<b>\$65,030</b>	<b>\$6,388,444</b>
<b>Zone AE Floodway</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	1	0	\$65,266	\$0	\$0	\$65,266
Government	2	0	\$0	\$0	\$0	\$0



Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	5	2	\$60,456	\$163,347	\$81,674	\$305,477
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	2	0	\$471	\$0	\$0	\$471
<b>Zone AE Floodway Total</b>	<b>10</b>	<b>2</b>	<b>\$126,193</b>	<b>\$163,347</b>	<b>\$81,674</b>	<b>\$371,214</b>
<b>Zone AH</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	95	91	\$4,848,009	\$12,451,631	\$6,225,816	\$23,525,456
Utilities	1	0	\$1	\$0	\$0	\$1
Unknown	0	0	\$0	\$0	\$0	\$0
<b>Zone AH Total</b>	<b>96</b>	<b>91</b>	<b>\$4,848,010</b>	<b>\$12,451,631</b>	<b>\$6,225,816</b>	<b>\$23,525,457</b>
<b>Zone AO</b>						
Agricultural	8	8	\$5,225,236	\$369,166	\$369,166	\$5,963,568
Commercial	0	0	\$0	\$0	\$0	\$0
Government	1	1	\$170,119	\$9,543	\$9,543	\$189,205
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	1	1	\$144,470	\$14,147	\$14,147	\$172,764
Residential	300	288	\$13,138,577	\$33,570,214	\$16,785,107	\$63,493,898
Utilities	7	0	\$51	\$0	\$0	\$51
Unknown	0	0	\$0	\$0	\$0	\$0
<b>Zone AO Total</b>	<b>317</b>	<b>298</b>	<b>\$18,678,453</b>	<b>\$33,963,070</b>	<b>\$17,177,963</b>	<b>\$69,819,486</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>491</b>	<b>438</b>	<b>\$32,067,694</b>	<b>\$53,198,896</b>	<b>\$26,795,876</b>	<b>\$112,062,466</b>
<b>0.2% Annual Chance Flood Hazard (Zone X – Shaded)**</b>						
Agricultural	5	3	\$513,202	\$258,038	\$258,038	\$1,029,278
Commercial	262	202	\$18,446,283	\$55,003,356	\$55,003,356	\$128,452,995
Government	32	2	\$498,555	\$76,478	\$76,478	\$651,511
Industrial	24	6	\$552,949	\$217,303	\$325,955	\$1,096,207

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count*	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Institutional	23	19	\$633,943	\$3,411,390	\$3,411,390	\$7,456,723
Residential	2,416	1,922	\$66,247,954	\$177,737,705	\$88,868,853	\$332,854,512
Utilities	43	1	\$57,406	\$162,846	\$162,846	\$383,098
Unknown	20	2	\$123,395	\$999,479	\$999,479	\$2,122,353
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>2,825</b>	<b>2,157</b>	<b>\$87,073,687</b>	<b>\$237,866,595</b>	<b>\$149,106,394</b>	<b>\$474,046,676</b>
<b>Zone X – unshaded (Outside of Mapped Flood Hazard)</b>						
Agricultural	36	10	\$9,858,447	\$748,171	\$748,171	\$11,354,789
Commercial	747	554	\$125,148,423	\$325,285,262	\$325,285,262	\$775,718,947
Government	102	4	\$7,233,561	\$1,120,752	\$1,120,752	\$9,475,065
Industrial	214	102	\$28,483,573	\$105,387,204	\$158,080,806	\$291,951,583
Institutional	60	43	\$2,570,016	\$20,014,228	\$20,014,228	\$42,598,472
Residential	11,346	10,815	\$446,651,974	\$1,240,837,170	\$620,418,585	\$2,307,907,729
Utilities	180	3	\$390,105	\$142,206	\$142,206	\$674,517
Unknown	50	6	\$5,798,072	\$4,795,611	\$4,795,611	\$15,389,294
<b>Zone X (unshaded) Total</b>	<b>12,735</b>	<b>11,537</b>	<b>\$626,134,171</b>	<b>\$1,698,330,604</b>	<b>\$1,130,605,621</b>	<b>\$3,455,070,396</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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

Table B-15 summarizes Table B-14 above and shows City of Madera loss estimates and shows improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

*Table B-15 City of Madera – Flood Loss Summary*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count *	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood	317	298	\$18,678,453	\$33,963,070	\$17,177,963	\$51,141,033	\$10,228,207	0.37%
0.2% Annual Chance Flood**	2,825	2,157	\$87,073,687	\$237,866,595	\$149,106,394	\$386,972,989	\$77,394,598	2.83%

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count *	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
<b>Grand Total</b>	3,142	2,455	\$105,752,140	\$271,829,665	\$166,284,357	\$438,114,022	\$87,622,804	3.20%

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

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

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

According to Table B-14 and Table B-15, the City of Madera has 298 improved parcels and approximately \$51 million of structure and contents value in the 1% annual chance floodplain; and 2,157 improved parcels and approximately \$387 million of structure and contents values in the 0.2% annual chance floodplain. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.7 of the Base Plan, there is a 1% chance in any given year of a flood event causing roughly \$10,228,207 and a 0.2% annual chance in any given year of a flood event causing \$77,394,598 million in damage in the City of Madera. A loss ratio of 3.2% indicates that losses in Madera to flood would be sizable, but that the City would most likely be able to recover.

### Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.8 of the Base Plan, was used for the City of Madera as well as for the County as a whole. Table B-16 and Table B-17 represents a detailed and summary analysis, respectively, of total acres for each FEMA DFIRM flood zone in the City.

*Table B-16 City of Madera – Flooded Acres by Land Use Type*

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
<b>1% Annual Chance Flood Hazard</b>		
<b>Zone AE Floodway</b>		
Agricultural	0	0
Commercial	0	0
Government	7	0
Industrial	0	0
Institutional	0	0
Residential	6	0
Utilities	0	0
Unknown	12	0
<b>Zone AE Floodway Total</b>	<b>26</b>	<b>0</b>
<b>Zone AE</b>		

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
Agricultural	0	0
Commercial	98	0
Government	0	0
Industrial	0	0
Institutional	0	0
Residential	0	0
Utilities	0	0
Unknown	0	0
<b>Zone AE Total</b>	<b>98</b>	<b>0</b>
<b>Zone A</b>		
Agricultural	45	0
Commercial	0	0
Government	32	0
Industrial	0	0
Institutional	0	0
Residential	37	13
Utilities	2	0
Unknown	0	0
<b>Zone A Total</b>	<b>117</b>	<b>13</b>
<b>Zone AH</b>		
Agricultural	0	0
Commercial	0	0
Government	0	0
Industrial	0	0
Institutional	0	0
Residential	20	11
Utilities	0	0
Unknown	0	0
<b>Zone AH Total</b>	<b>20</b>	<b>11</b>
<b>Zone AO</b>		
Agricultural	387	387
Commercial	0	0
Government	7	7
Industrial	0	0
Institutional	14	14
Residential	43	41
Utilities	18	0

Flood Zone / Property Use	Total Flooded Acres	Improved Flooded Acres
Unknown	0	0
<b>Zone AO Total</b>	<b>469</b>	<b>449</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>729</b>	<b>473</b>
<b>0.2% Annual Chance Flood Hazard (Zone X – Shaded)*</b>		
Agricultural	39	15
Commercial	106	67
Government	58	0
Industrial	9	4
Institutional	8	6
Residential	578	363
Utilities	63	0
Unknown	15	5
Zone X (shaded) Total	876	461
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>876</b>	<b>461</b>
<b>Zone X – unshaded (Outside of Mapped Flood Area)</b>		
Agricultural	332	116
Commercial	1,062	622
Government	1,549	61
Industrial	698	350
Institutional	156	87
Residential	2,755	2,311
Utilities	337	2
Unknown	101	15
<b>Zone X (unshaded) Total</b>	<b>6,990</b>	<b>3,565</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

\*This parcel count only includes those acres in the 0.2% annual chance floodplain, exclusive of the 1% annual chance floodplain. The 0.2% annual chance flood, in actuality, also includes all acres in the 1% annual chance floodplain.

*Table B-17 City of Madera – Flooded Acres Summary*

Flood Zone	Total Flooded Acres	Improved Flooded Acres	% of Improved Flooded Acres
1% Annual Chance Flood Hazard	729	473	10.5%
0.2% Annual Chance Flood Hazard*	876	461	10.2%
Outside of Flood Zone	6,990	3,565	79.2%
<b>Grand Total</b>	<b>8,595</b>	<b>4,499</b>	<b>100.0%</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data

\*This parcel count only includes those acres in the 0.2% annual chance floodplain, exclusive of the 1% annual chance floodplain. The 0.2% annual chance flood, in actuality, also includes all acres in the 1% annual chance floodplain.

## Population at Risk

The DFIRM flood zones were overlaid on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Madera. According to this analysis, there is a total population of 1,635 and 7,342 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table B-18.

*Table B-18 City of Madera – Count of Improved Residential Parcels and Population by Flood Zone*

Flood Zone	Improved Residential Parcels*	Population**
1% Annual Chance	428	1,635
0.2% Annual Chance	1,922	7,342
<b>Total</b>	<b>2,350</b>	<b>8,977</b>

Source: FEMA 9/26/2008 DFIRM, Madera County April 2017 Parcel/Assessor's Data, US Census Bureau

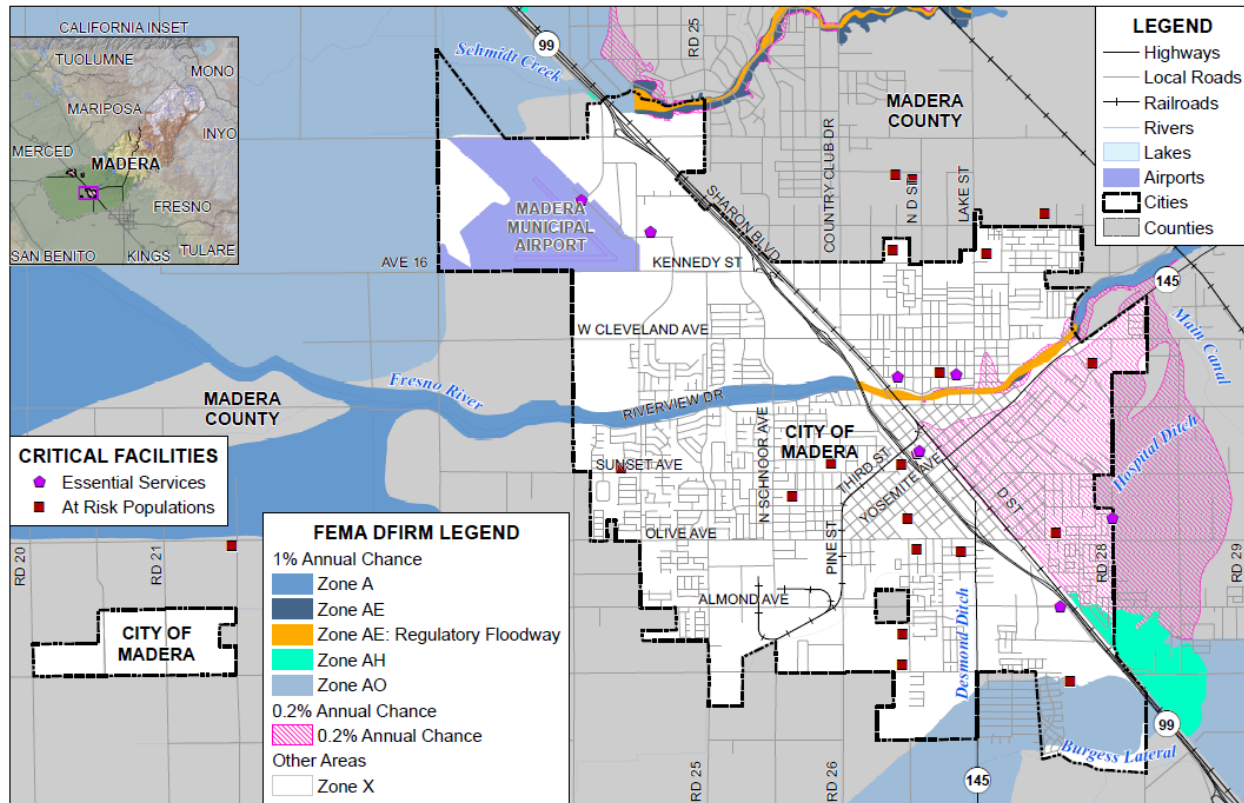
\*With respect to improved parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

\*\* Average household populations from the 2010 US Census were used: Madera– 3.82

## Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Madera in identified FEMA DFIRMs. GIS was used to determine whether the facility locations intersects a DFIRM flood hazard areas, and if so, which zone it intersects. Details of critical facilities in the floodplain in the City of Madera are shown in Figure B-8 and Table B-19. As shown on the figure, Madera has one critical facility located in 1% annual chance and two in the 0.2% annual chance DFIRM flood zones. Details of critical facility definition, type, name and address and jurisdiction by flood zone are listed in Appendix F.

Figure B-8 City of Madera – Critical Facilities and Flood Zones



Data Source: FEMA DFIRM 9/26/2008, Madera County, Cal-Atlas; Map Date: 4/2017.



Table B-19 City of Madera – Critical Facilities in DFIRM Flood Zones

Critical Facility Category / Flood Zone	Critical Facility Type	Critical Facility Count
<b>1% Annual Chance Flood Hazard</b>		
<b>Zone AO</b>		
At Risk Populations	School	1
	<b>Total</b>	<b>1</b>
<b>1% Annual Chance Flood Hazard Total</b>		<b>1</b>
<b>0.2% Annual Chance Flood Hazard (Zone X – Shaded)</b>		
Essential Services	Fire Command Center	1
	<b>Total</b>	<b>1</b>
At Risk Populations	School	2
	<b>Total</b>	<b>2</b>
<b>0.2% Annual Chance Flood Hazard Total</b>		<b>3</b>

Source: FEMA 9/26/2008 DFIRM, Madera County GIS



## Historical, Cultural, and Natural Resources at Risk

The City of Madera has significant cultural and natural resources located throughout the City as previously described. Vulnerability analysis of these resources was not possible due to data limitations. However, any resource located in the 1% and 0.2% annual chance floodplains are at risk.

## Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Madera joined the National Flood Insurance Program (NFIP) on June 4, 1987. The City does not participate in the CRS program. NFIP data indicates that as of September 19, 2016, there were 28 flood insurance policies in force in the City with \$7,741,500 of coverage. Yearly premiums for flood insurance total \$15,785. Of the 28 policies, 27 were residential (single-family homes), and 1 was multi-family or other residential, and none were non-residential. 5 of the policies were in A zones, and the remaining 23 were in B, C, and X zones. The GIS parcel analysis detailed above identified 298 parcels in the 100-year flood zone. 5 policies for 298 parcels in the 100-year floodplain equates to insurance coverage of 1.7 percent. There have been 8 historical claims for flood losses totaling \$88,293.47. There have been no substantial damage claims in the City. There are also no repetitive loss or severe repetitive loss structures in the City.

## California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Madera County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Sacramento-San Joaquin (SAC-SJ) Valley watershed. SB 5 requires that these maps contain the best available information on flood hazards and be provided to cities and counties in the SAC-SJ Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-, and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications. They are for the same flood frequency; however, they may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. This provides the community and residents with an additional tool for understanding potential flood hazards not currently mapped as a regulated floodplain. Improved awareness of flood risk can reduce exposure to flooding for new structures and promote increased protection for existing development. Informed land use planning will also assist in identifying levee maintenance needs and levels of protection. By including the FEMA 100-year floodplain, it also supports identification of the need and requirement for flood insurance. The BAM map for Madera is shown in Figure B-9.



*Figure B-9 City of Madera Best Available Map*



Source: California DWR

Legend explanation: Blue - FEMA 100-Year, Orange – Local 100-Year (developed from local agencies), Red – DWR 100-year (Awareness floodplains identify the 100-year flood hazard areas using approximate assessment procedures.), Pink – USACE 100-Year (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 200-Year (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 500-Year, Grey – Local 500-Year (developed from local agencies), Purple – USACE 500-Year (2002 Sac and San Joaquin River Basins Comp Study).

## Future Development

The City enforces the floodplain ordinance. If any development is to occur in the floodplain, it would have to conform to the elevation standards of the floodplain ordinance. No development is expected in the floodplain in the future.

## *Severe Weather: Extreme Cold and Freeze*

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Medium

## Hazard Profile and Problem Description

According to the NWS and the Western Regional Climate Center (WRCC), winter events can include extreme cold and freeze conditions. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until the damage can be repaired. Power outages can have a significant impact on communities, especially critical facilities such as public utilities. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

## Past Occurrences

The City Planning Team noted that the Central Valley as a whole generally experiences a hard freeze every two to three years. Within the City, these freezes generally lead to above-ground pipe cracking.

## Vulnerability to Cold and Freeze

Extreme cold and freeze events happen in Madera County and the City of Madera each year. Extreme cold often accompanies a winter storm or is left in its wake. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers leading to power outages. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures and ice can cause accidents and road closures and can cause significant damage to the agricultural industry. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Vulnerable populations to cold and freeze include:

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

Also of concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of extreme cold and freeze.

In addition to vulnerable populations, pets and livestock are at risk to freeze and cold. However, many residents of the City are self-sufficient and accustomed to rural living and the climate extremes that are part of the territory.

## Future Development

Future development built to code should be able to withstand snow loads from severe winter storms. Pipes at risk of freezing should be mitigated by either burying or insulating them from freeze as new facilities are improved or added. Current County codes provide such provisions for new construction. Vulnerability to extreme cold will increase as the average age of the population in the City shifts. Greater numbers of future senior citizens will result from the large number of baby boomers in the Planning Area as well as people retiring to the area. However, as previously mentioned, many of the residents of the City are self-sufficient and accustomed to rural living.

## *Severe Weather: Extreme Heat*

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Medium

## Hazard Profile and Problem Description

According to FEMA, “Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.” Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or

her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat. Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the urban heat island effect.

### Past Occurrences

The City Planning Team noted that the Central Valley as a whole experiences extreme heat each summer and sometimes into fall.

### Vulnerability to Extreme Heat

Health impacts are the primary concern with this hazard, though economic impacts are also an issue. The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable.

Reliance on air conditioning causes a strain on the electrical energy in the Madera area. Occasionally peak demands outweigh supply and a condition known as brown-out occurs. This is an extremely dangerous situation for electrical equipment as it operates without the needed electricity causing damage to the systems. Days of extreme heat have been known to result in medical emergencies, civil unrest, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts.

### Future Development

Vulnerability to extreme heat will increase as the average age of the population in each City shifts. Greater numbers of future senior citizens will result from the large number of baby boomers in the City. The elderly are more at risk to the effects of extreme heat, especially those without proper air conditioning. However, many of the residents of the City are accustomed to living with extreme heat and take precautions to guard against the threat of extreme heat.

### *Severe Weather: Fog*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

The San Joaquin Valley can produce some extremely dangerous fogs in the winter and early spring months. These are a type of radiation fog called “tule fog.” Tule fog forms on cold and clear nights, when the ground is moist and there is very little wind. Under such conditions the ground cools quickly and thus cools the air above it as well. The moisture in this cooled air condenses and can create extremely dense fog.

Since the air may be stagnant and there is little evaporative effect from the sun in winter months, tule fogs can last for several days and, in some instances, over a week. Under these conditions, visibility is often reduced to 600 feet, but can drop to less than 10 feet.

### Past Occurrences

The City Planning Team note that the Central Valley experiences fog routinely during the winter months. Generally, foggy conditions that preclude safe travel occur two to three times per year.

### Vulnerability to Fog

Tule fog is likely to occur annually during the winter months in low-lying regions of the County of Madera, including the City of Madera. When tule fog forms, a severe risk is posed to traffic with the potential for multi-car pileups, especially on Highway 99. This may have an economic impact on the City due to delays in transportation times or even the shutting down of Highway 99. The same dense and lingering fog can also produce adverse health effects in those with respiratory ailments.

### Future Development

Many of the residents of the City are accustomed to living with fog and take precautions to guard against the threat of fog, such as slowing down while traveling.

### *Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)*

**Likelihood of Future Occurrence**–Highly Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

According to historical hazard data, severe weather is an annual occurrence in the City of Madera. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past.

### Past Occurrences

The City Planning Team noted that the City experiences generally at least one heavy rainfall event each winter, however it hasn't gone past the level of a 25-year storm in several years. The rainfall causes localized flooding.

### Vulnerability to Heavy Rains and Storms

Problems associated with the primary effects of severe weather include flooding, pavement deterioration, washouts, high water crossings, landslide/mudslides, debris flows, and downed trees. Most of the localized flooding in the City is generally limited to flooding within the street ROW and only has limited impact to

private property. It is anticipated that a 100-year rainfall event would impact private facilities to varying degrees in various parts of the City.

### Future Development

The City enforces the state building code and other ordinances, which regulate construction techniques that minimize damage from heavy storms and rain. Future development in the City is subject to these building codes. New critical facilities such as communications towers should be built to withstand hail damage, lightning, and heavy rains.

### *Severe Weather: Wind and Tornado*

**Likelihood of Future Occurrence**–Highly Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

On an annual basis, the City of Madera experiences severe storms accompanied by strong wind and wind gusts. High winds combined have caused significant damage to public infrastructure (primarily the electric grid). In the City of Madera high winds occur in the winter, generally from November through March, although high winds may also occur in other months.

### Past Occurrences

The City Planning Team noted no past occurrences of wind and tornado that had damaging effects on the City.

### Vulnerability to Wind and Tornadoes

Strong wind is a frequent type of severe weather occurrence in the area. Wind often accompanies the region's storms and has caused damage in the past. Buildings that house populations at risk such as schools, nursing homes, hospitals, and urgent care facilities are at risk to wind and tornadoes. Also at risk are power lines, which can arc or be damaged during high wind events. The City has had power outages and damages to electric lines in past storms.

### Future Development

The City enforces the state building code and other ordinances, which regulate construction techniques that minimize damage from high winds. Future development in the City is subject to these building codes.

### *Severe Weather: Winter Storms/Snow*

**Likelihood of Future Occurrence**–Highly Likely

**Vulnerability**–Medium

## Hazard Profile and Problem Description

According to the NWS and the WRCC, winter snow storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, closing roads, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

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

### Past Occurrences

The City Planning Team noted no notable snow events have occurred in recent history. Hail and light snowfall have occurred; however, accumulation of snow and/or hail generally does not occur within the City on the valley floor.

### Vulnerability to Winter Storms and Snow

The western portion of the Madera County Planning Area, where the City of Madera is located, does experience rare snowfall on a seasonal basis; mostly between the months of November through March. Winter weather can occasionally be accompanied by high winds, which can cause downed trees and power lines, power outages, accidents, and road closures. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets to impacts of severe winter weather in the City. The ability for the City to continue to operate during periods of winter storm and snow is paramount. Vulnerable populations to winter storms and snow include:

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

However, many residents of the City are self-sufficient and accustomed to the climate extremes that are part of the territory. The residents of nursing homes and elder care facilities are especially vulnerable to extreme weather events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of winter storm and heavy snows.

Other impacts to the City as a result of winter snow storms include damage to infrastructure, frozen pipes, utility outages, road closures, traffic accidents, and interruption in business and school activities. Also of concern is the impact to populations with special needs such as the elderly and those requiring the use of

medical equipment. Delays in emergency response services can be of significant concern. Further, there are economic impacts associated with areas prone to heavy snow. Although the eastern portion of the county is the most vulnerable to the effects of snow, snowfall occurring in the lower elevations can create significant issues, as residents working and living in those areas may not be as prepared for snowfall.

### Future Development

Future development built to code should be able to withstand snow loads from severe winter storms. Current City codes provide such provisions for new construction. Vulnerability to winter snow storms will increase as the average age of the population in the County shifts. Greater numbers of future senior citizens will result from the large number of baby boomers in the City and surrounding area.

### *Wildfire*

**Likelihood of Future Occurrence**–Likely

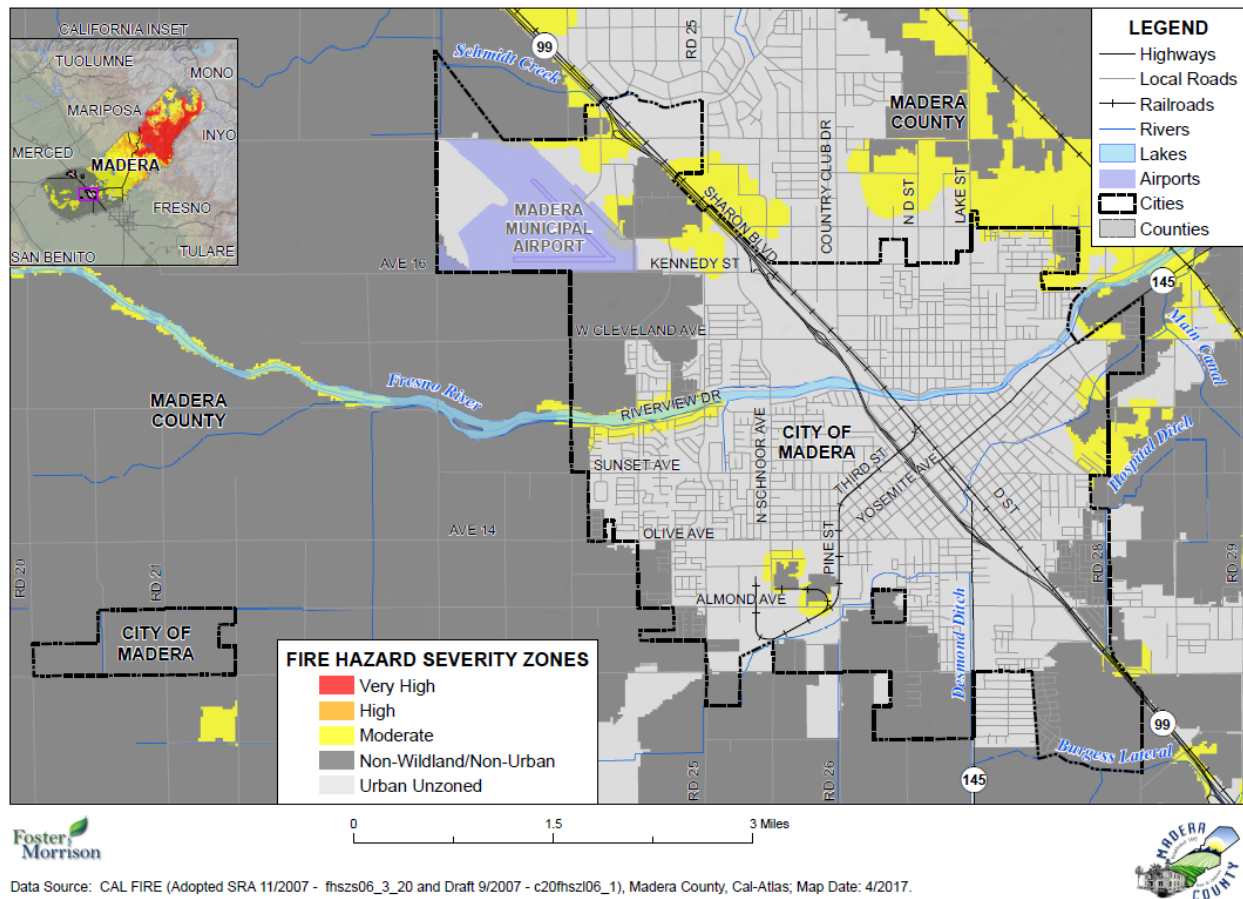
**Vulnerability**–Medium

### Hazard Profile and Problem Description

Although rated as low by the City Planning Team, due to wildfire’s importance in the County and the State of California, it is included here. Wildfires can cause short-term and long-term disruption to the County as a whole. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the County by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires may result in casualties and can destroy buildings and infrastructure.

Following the methodology described in Section 4.3.2 Vulnerability of Madera County to specific hazards, a wildfire map for the City of Madera was created (see Figure B-10). Wildfire threat within the city ranges from low to moderate. The highest threat occurs along the eastern edge of the City.

Figure B-10 City of Madera's Fire Hazard Severity Zones



### Past Occurrences

The City Planning Team noted that there are no notable wildfire events within the City limits within recent history. Vegetation fires occur during the dry months but these are small and quickly contained.

### Vulnerability to Wildfire

#### Values at Risk

Analysis results for Madera are shown in Table B-20, which summarizes total parcel counts, improved parcel counts and their structure values by occupancy type as well as the percentage of parcels affected by fire.



*Table B-20 City of Madera – Count and Value of Parcels by Property Use and Fire Hazard Severity Zones*

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value*
<b>Very High</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>Very High Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>High</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
Utilities	0	0	\$0	\$0	\$0	\$0
Unknown	0	0	\$0	\$0	\$0	\$0
<b>High Total</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Moderate</b>						
Agricultural	9	1	\$450,697	\$73,549	\$73,549	\$597,795
Commercial	28	15	\$7,763,191	\$10,579,302	\$10,579,302	\$28,921,795
Government	3	0	\$3,814	\$0	\$0	\$3,814
Industrial	15	4	\$2,438,666	\$5,557,179	\$8,335,769	\$16,331,614
Institutional	0	0	\$0	\$0	\$0	\$0
Residential	584	517	\$21,609,599	\$64,078,678	\$32,039,339	\$117,727,616
Utilities	14	0	\$8,959	\$0	\$0	\$8,959
Unknown	3	0	\$1	\$0	\$0	\$1
<b>Moderate Total</b>	<b>656</b>	<b>537</b>	<b>\$32,274,927</b>	<b>\$80,288,708</b>	<b>\$51,027,959</b>	<b>\$163,591,594</b>
<b>Non-Wildland/Non-Urban</b>						
Agricultural	26	14	\$13,929,785	\$995,381	\$995,381	\$15,920,547
Commercial	20	4	\$5,549,304	\$3,031,372	\$3,031,372	\$11,612,048

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value*
Government	17	2	\$2,879,561	\$16,797	\$16,797	\$2,913,155
Industrial	81	10	\$9,695,627	\$13,359,401	\$20,039,102	\$43,094,130
Institutional	2	2	\$379,863	\$573,507	\$573,507	\$1,526,877
Residential	1,999	1,640	\$93,368,776	\$226,511,495	\$113,255,748	\$433,136,019
Utilities	33	0	\$6,700	\$0	\$0	\$6,700
Unknown	2	0	\$46,074	\$0	\$0	\$46,074
<b>Non-Wildland/Non-Urban Total</b>	<b>2,180</b>	<b>1,672</b>	<b>\$125,855,690</b>	<b>\$244,487,953</b>	<b>\$137,911,906</b>	<b>\$508,255,549</b>
<b>Urban Unzoned</b>						
Agricultural	19	6	\$1,219,164	\$306,445	\$306,445	\$1,832,054
Commercial	963	737	\$136,464,063	\$366,677,944	\$366,677,944	\$869,819,951
Government	120	5	\$5,018,860	\$1,189,976	\$1,189,976	\$7,398,812
Industrial	142	94	\$16,902,229	\$86,687,927	\$130,031,891	\$233,622,047
Institutional	82	61	\$2,968,566	\$22,866,258	\$22,866,258	\$48,701,082
Residential	11,635	11,008	\$418,264,286	\$1,180,790,742	\$590,395,371	\$2,189,450,399
Utilities	186	4	\$431,904	\$305,052	\$305,052	\$1,042,008
Unknown	68	8	\$5,875,863	\$5,795,090	\$5,795,090	\$17,466,043
<b>Urban Unzoned Total</b>	<b>13,215</b>	<b>11,923</b>	<b>\$587,144,935</b>	<b>\$1,664,619,434</b>	<b>\$1,117,568,027</b>	<b>\$3,369,332,396</b>
<b>Grand Total</b>						
	<b>16,051</b>	<b>14,132</b>	<b>\$745,275,552</b>	<b>\$1,989,396,095</b>	<b>\$1,306,507,891</b>	<b>\$4,041,179,538</b>

Source: Madera County April 2017 Parcel/Assessor's Data, CAL FIRE

## Population at Risk

The Fire Hazard Severity Zone dataset was overlaid on the parcel layer. Those residential parcel centroids that intersect the severity zones were counted and multiplied by the 2010 Census Bureau average household factors for each jurisdiction and unincorporated area. Results were tabulated by jurisdiction. According to this analysis, there is a total population of 91 residents of Madera at risk to moderate or higher wildfire risk. This is shown in Table B-21.

*Table B-21 City of Madera – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone*

Fire Severity Zone	Improved Residential Parcels	Population*
Very High	0	0
High	0	0
Moderate	517	1,975
<b>Total</b>	<b>517</b>	<b>1,975</b>

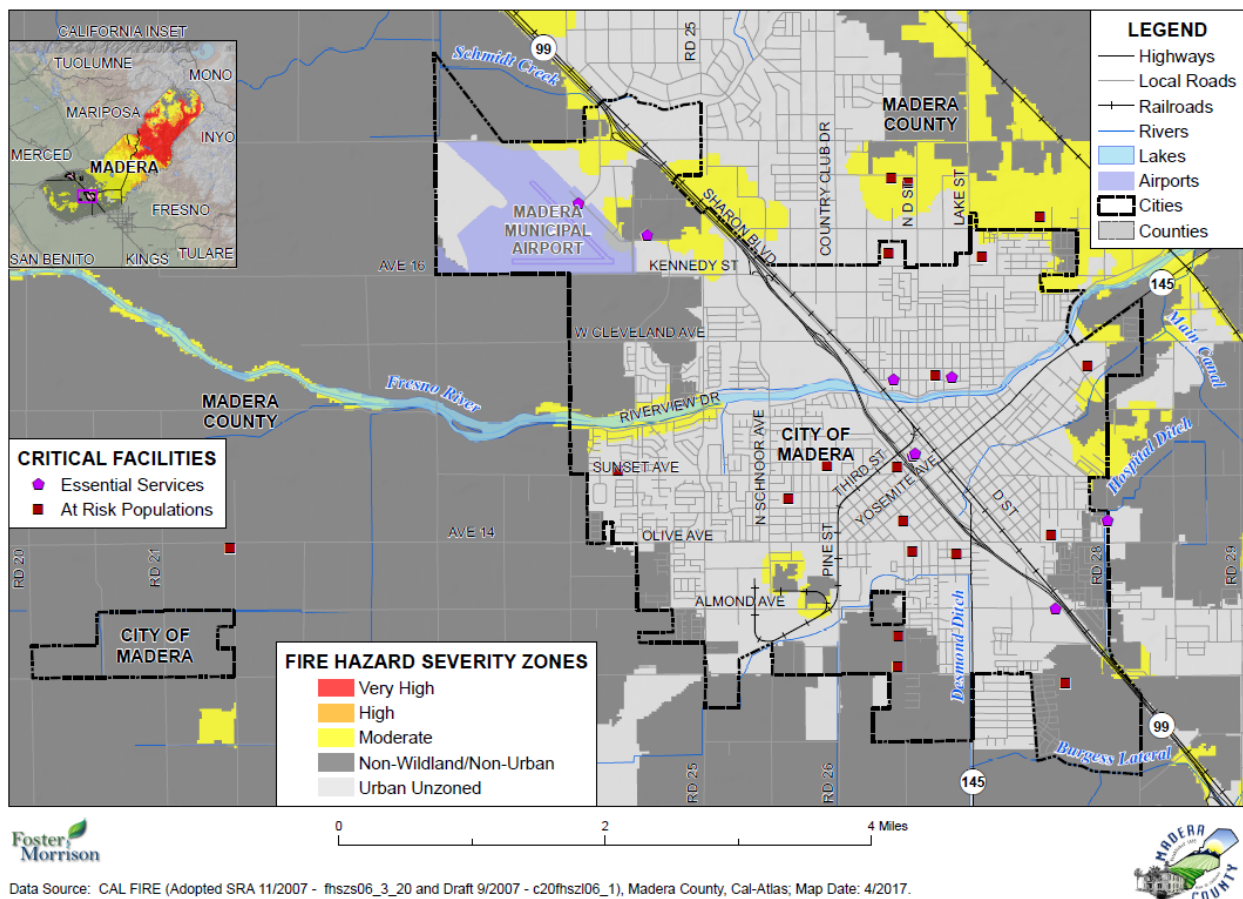
Source: Madera County April 2017 Parcel/Assessor's Data, CAL FIRE

\* Average household populations for Madera (3.82) from the 2010 US Census were used

### Critical Facilities at Risk

Wildfire analysis was performed on the critical facility inventory in Madera County and all jurisdictions. GIS was used to determine whether the facility locations intersect a fire hazard severity zones provided by CAL FIRE, and if so, which zone it intersects. There are no facilities in the moderate or higher fire hazard severity zones in the City. These are shown in Figure B-11. Details of critical facility definition, type, name and address and jurisdiction by fire severity zone are listed in Appendix F.

*Figure B-11 City of Madera – Critical Facilities in the Fire Hazard Severity Zones*



## Historical, Cultural, and Natural Resources at Risk

The City of Madera has significant cultural and natural resources located throughout the City as previously described. Vulnerability analysis of these resources was not possible due to data limitations. However, any resources located in fire hazard severity zones are potentially at risk.

## Future Development

There are small patches of moderate fire hazard zones in the City. Development may occur in the moderate or higher wildfire severity areas; however, City ordinances for building in these areas are enforced.

## B.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts. This builds upon the capability assessment found in Section 4.4 of the Base Plan.

### B.6.1. Regulatory Mitigation Capabilities

Table B-22 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Madera.

*Table B-22 City of Madera’s Regulatory Mitigation Capabilities*

Plans	Y/N Year	Does the plan/program address hazards?
		Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan	Y 2014	Storm Drainage Master Plan, yes to all questions
Capital Improvements Plan	Y 2017/18	Yes to all questions – as funded.
Economic Development Plan		
Local Emergency Operations Plan	Y 2017	Yes to all questions
Continuity of Operations Plan	Y 2017	
Transportation Plan	Y 2009	Within General Plan
Stormwater Management Plan/Program	Y 2014	Storm drainage master plan. Yes to all questions.
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	

Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Climate action plan.
<b>Building Code, Permitting, and Inspections</b>	<b>Y/N</b>	<b>Are codes adequately enforced?</b>
Building Code	Y	Version/Year: 2016
Building Code Effectiveness Grading Schedule (BCEGS) Score		Score:
Fire department ISO rating:	Y	Rating: 4
Site plan review requirements	Y	Yes as required by Planning or Engineering
		<b>Is the ordinance an effective measure for reducing hazard impacts?</b>
<b>Land Use Planning and Ordinances</b>	<b>Y/N</b>	<b>Is the ordinance adequately administered and enforced?</b>
Zoning ordinance	Y	It is effective and enforced.
Subdivision ordinance	Y	It is effective and enforced.
Floodplain ordinance	Y	It is effective and enforced.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	Y	
Elevation Certificates	Y	Included in proposed update to Floodplain Management Ordinance
Acquisition of land for open space and public recreation uses	N	The City does not have a Quimby Act Ordinance
Erosion or sediment control program	N	
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		
They can be reviewed routinely for necessary updates and modifications.		

Source: City of Madera

### *2009 City of Madera General Plan*

In 2009, after an extensive visioning process and public comment, the City adopted an updated General Plan which “represents the product of years of efforts on the part of residents and businesses in the community working to maintain and improve Madera’s quality of life and implement the community’s shared vision for the future”.

The General Plan serves as the City’s blueprint for long term development. The General Plan contains goals, policies and implementation strategies that address Madera’s growth and the quality of life of its residents. The General Plan is organized into chapters, or elements, that cover specific topics. Madera’s Plan covers all of the mandatory features required by the State of California, as well as several optional topics that were emphasized through Vision 2025. A total of ten topical elements are included in the Madera General Plan: Community Design, Circulation and Infrastructure, Conservation, Health and Safety, Housing, Land Use, Noise, Historic and Cultural Resources, Parks and Recreation, and Sustainability.

These goals and policies adopted as part of the General Plan are the standards that all new development in the City is measured by. The City must find that new project proposed within the City limits are consistent with the General Plan as part of any approval process

The General Plan includes a Health and Safety Element that focuses on safety issues to be considered in planning for the present and future development of the Madera Planning Area. Identified hazards include dam failure, geologic/seismic, flooding, and other natural and man-made hazards. Mitigation-related goals are presented below.

Health and Safety Element Goals	
Goal HS-1	A safe and healthy environment for all Maderans that includes: clean air and water; adequate levels of police and fire protection; safe housing; and safe places to work and play.
Goal HS-2	A healthy and fit population with access to health care, healthful food, and places to be active and exercise.
Goal HS-3	Working with other agencies to protect residents and businesses from hazards caused by flooding.
Goal HS-4	Working with other agencies to protect and manage natural drainage ways, floodplains and flood retention basins, to maintain flood carrying capacity in harmony with environmental, recreational and open space objectives.

### *Mitigation Related Ordinances*

#### **Emergency Services (Title III, Chapter 2)**

The declared purposes of this chapter are to provide for the preparation and carrying out of plans for the protection of persons and property within the city in the event of an emergency or disaster and to provide for the coordination of the emergency functions of the city with all public agencies and affected private persons, corporations, and organizations. Any expenditures made in connection with such emergency and disaster activities, including mutual aid activities, shall be deemed conclusively to be for the direct protection and benefit of the inhabitants and property of the City.

#### **Buildings Regulations (Title IX)**

This Title lays out the regulations the City places on the construction of buildings. Pursuant to Cal. Gov't Code § 50022.1 through 50022.6, the texts of those certain publications of the International Conference of Building Officials, the International Association of Plumbing and Mechanical Officials, the Western Fire Chiefs Association and the National Fire Protection Association, together with parts of the appendices thereto, the 2007 California Building Code, based on the 2006 International Building Code, the 2007 California Mechanical Code, based on the 2006 Uniform Mechanical Code, the 2007 California Fire Code, based on the 2006 International Fire Code, the 2007 California Plumbing Code, based on the 2006 Uniform Plumbing Code, the Uniform Swimming Pool, Spa and Hot Tub Code - 2006 Edition, the 2007 California Electrical Code, based on the 2005 National Electrical Code, the 2007 Energy Code, the 2009 International Property Maintenance Code, the 1997 Uniform Code for the Abatement of Dangerous Buildings, and the 2006 International Existing Building Code are hereby adopted as the rules, regulations and standards within this city as to all matters therein contained except as herein otherwise provided. The mandatory requirements of the listed appendices to such codes shall be enforceable to the same extent as if contained

in the body of such Code of said regulations and one copy of said regulations are and shall be at all times kept on file with the office of the City Clerk in accordance with Cal. Gov't Code § 50022.6.

### **Subdivisions (Title X, Chapter 2)**

It is the purpose of this chapter to regulate and control the division of land within the city and to supplement the provisions of the Subdivision Map Act concerning the design, improvement, and survey data of subdivisions, the form and content of all maps provided for by the Subdivision Map Act and the procedure to be followed in securing the official approval of the Development Review Committee, Planning Commission, the Planning Department, and City Council regarding such maps. To accomplish this purpose, the regulations outlined in this chapter are determined to be necessary for the preservation of the public health, safety, and general welfare, to promote orderly growth and development and to promote open space, conservation, protection, and proper use of land and to insure provision for adequate traffic circulation, utilities, and services.

### **Zoning (Title X, Chapter 3)**

An official land use plan for the city is adopted and established to promote the growth of the city in an orderly manner and to promote and protect the public health, safety, peace, comfort, and general welfare, and to provide the economic and social advantages resulting from an orderly planned use of land resources.

### **Floodplain Management (Title III, Chapter 3)**

This chapter applies to all areas of special flood hazard, areas of flood-related erosion hazards, and areas of mud flow hazards identified by the Federal Emergency Management Agency or the Federal Insurance Administration in a scientific and engineering report entitled "Flood Insurance Study for the City of Madera, California" dated September 26, 2008, with an accompanying Flood Insurance Rate Map which is on file with the office of the City Clerk and to which reference is made. This Flood Insurance Study is a minimum area of applicability of this chapter and may be supplemented by studies for other areas which allow implementation of this chapter and which are recommended to the City Council by the Flood Plain Administrator.

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with all of the rules, requirements, terms, and provisions of a resolution of the City Council which shall be adopted pursuant to this chapter to implement this chapter.

### **Weed Abatement Regulations (Title III, Chapter 3-15)**

The purpose of this chapter is to protect citizens and residential neighborhoods of the city from noxious weeds and wildfire. The chapter is essential for maintaining the city healthy, clean, and safe from any pernicious, natural and/or unnatural materials, including without limitations weeds, rubbish, dirt, and/or brush which constitute a public nuisance.

## B.6.2. Administrative/Technical Mitigation Capabilities

Table B-23 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Madera.

*Table B-23 City of Madera's Administrative and Technical Mitigation Capabilities*

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Public Works and Parks
Mutual aid agreements	Y	
Other		
		Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Staff	Y/N FT/PT	
Chief Building Official	Y FT	Staffing is adequate and trained. Coordination is effective.
Floodplain Administrator	Y FT	Staffing is adequate and trained. Coordination is effective.
Emergency Manager	Y FT	Staffing is adequate and trained. Coordination is effective.
Community Planner	Y FT	Staffing is adequate and trained. Coordination is effective.
Civil Engineer	Y FT	Staffing is adequate and trained. Coordination is effective.
GIS Coordinator	N	
Other		
		Describe capability Has capability been used to assess/mitigate risk in the past?
Technical	Y/N	
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Nixel and NextDoor apps; coordination with County Sheriff for Everbridge
Hazard data and information	N	
Grant writing	Y	
Hazus analysis		
Other		
How can these capabilities be expanded and improved to reduce risk?		

Source: City of Madera



### B.6.3. Fiscal Mitigation Capabilities

Table B-24 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

*Table B-24 City of Madera’s Fiscal Mitigation Capabilities*

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Annual CIP budget adopted by Council
Authority to levy taxes for specific purposes	Y	With public vote
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	
Storm water utility fee	Y	
Incur debt through general obligation bonds and/or special tax bonds	Y	The City can, but generally does not.
Incur debt through private activities	N	
Community Development Block Grant	Y	
Other federal funding programs	Y	
State funding programs	Y	
Other		
How can these capabilities be expanded and improved to reduce risk?		

Source: City of Madera

### B.6.4. Mitigation Education, Outreach, and Partnerships

Table B-25 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information. More information can be found below the table.

*Table B-25 City of Madera’s Mitigation Education, Outreach, and Partnerships*

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)”
Natural disaster or safety related school programs	Y	Water Conservation mitigates effects of drought. The City’s Water Conservation Program currently offers several rebates to decrease water use and increase efficiency in homes (e.g. turf replacement, clothes washer rebate, drip irrigation, etc.). Public Outreach through staffing booths at community events, public service announcements on social media, and water patrol, provide education on conservation and responsible water use. The City will continue to make efforts to educate the public on the importance of conservation and plans on expanding conservation programs.
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		

### B.6.5. Other Mitigation Efforts

The City also makes sand for sandbags available seasonally to mitigate property damage to residences in the event of a flood.

The City has made a concentrated effort over the last few years to connect with neighborhoods and organize neighborhoods with block captains. The purpose is so that neighbors know each other, know their government officials/services, and are connected to each other and committed to an investment in their neighborhood. Neighborhood Watch has been successful:

- The are 84 organized Neighborhood Watches across the City:
- 46 of the 84 are certified and 38 are in progress toward certification
- Quarterly Neighborhood Watch Leaders meeting are hosted to update the leaders about matters pertaining to public safety or community engagement. They then take the information and share with their neighbors and those who participate in their Neighborhood Watch Program.
- The program is promoted by canvassing neighborhoods, attending resource fairs, tabling at community events, and through social media accounts and the City’s website. To date since July 2015, members have canvassed over 50 neighborhoods and contacted over 5000 residents.

- The program has spawned many successful outcomes. In various neighborhoods, it has helped (1) bust neighborhood drug dealers and confiscate their drugs and weapons; (2) connect neighbors together to promote proactive neighborhood policing; (3) improved law enforcement-community relations; (4) educate residents on ways they could promote neighborhood safety and improve their neighborhood's standards of living.

### National Night Out

- In 2017, there were had 53 block parties across Madera. This is about 2,150 Maderans celebrating this year's National Night Out on August 1st.
- Two days later, on August 3rd, the Madera Police Department in conjunction with other law enforcement agencies had planned and implemented National Night Out Connect event. Around 2,000 Maderans continuing the spirit of celebrating National Night Out at the Madera Fairgrounds.
- During NNO, law enforcement and community residents mingled, socialized, and bonded together, both in their neighborhoods on Tuesday, August 1st and at a centralized location on Thursday, August 3rd (NNO Connect).

Through communications with American Red Cross, the City learned that they were short on local volunteers. Our neighborhood outreach staff worked with ARC to organize volunteer education events. Since partnering with American Red Cross (ARC), we have successfully recruited and trained 10 volunteers who are prepared to help ARC respond to any emergency within City or County of Madera. This past January, we canvassed neighborhoods to install smoke detectors in homes that did not have any or had less than the minimum required detectors in the home. There were over 50 detectors installed, mostly were in homes owned by senior citizens. We are currently planning our next Smoke Detectors Drive and are continuing our efforts to recruit volunteers and collaborate with our local Cal-Fire.

The City also has an annual weed abatement program where properties that aren't maintained are cleaned/plowed by the City and then the property owner is billed. This is to help prevent grass/wild fires within the City.

## B.7 Mitigation Strategy

### B.7.1. Mitigation Goals and Objectives

The City of Madera adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

### B.7.2. NFIP Mitigation Strategy

The City of Madera joined the National Flood Insurance Program (NFIP) on June 4, 1987. As a participant of the NFIP, the City of Madera has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the City. The City of Madera will continue to comply with the requirements of the NFIP in the future. In addition, the City of Madera actively participates with the County to address local NFIP issues through a regional approach. Many of the program activities are the same for the City of Madera as for Madera County since participation at the County level includes all local jurisdictions.

The City’s regulatory activities apply to existing and new development areas of the City; implementing flood protection measures for existing structures and new development, and maintaining drainage systems. The goal of the program is to enhance public safety, and reduce impacts and losses while protecting the environment. The City’s Municipal Code has a Flood Damage Prevention Section under the Zoning Ordinance that regulates construction in the floodplain. The City intends to continue to implement the ordinance and participate at the regional level with Madera County implementing appropriate measures to mitigate exposure and damages within designated flood prone areas.

The National Flood Insurance Program’s (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The City of Madera is not a current participant in the CRS program.

More information about the floodplain administration in the City of Madera can be found in Table B-26.

*Table B-26 City of Madera Compliance with NFIP*

NFIP Topic	Comments
<b>Insurance Summary</b>	
How many NFIP policies are in the community? What is the total premium and coverage?	28 policies \$15,785 in annual premiums \$7,741,500 of coverage in force
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	8 paid losses \$88,293n paid claims 0 substantial damage claims
How many structures are exposed to flood risk within the community?	298 (1% annual chance flood) 2,157 (0.2% annual chance flood)
Describe any areas of flood risk with limited NFIP policy coverage	None know.
<b>Staff Resources</b>	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	Y
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Permit review, inspections, engineering capability, respond to public inquiry
What are the barriers to running an effective NFIP program in the community, if any?	Funding
<b>Compliance History</b>	
Is the community in good standing with the NFIP?	Y
Are there any outstanding compliance issues (i.e., current violations)?	N
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	7/21/2016
Is a CAV or CAC scheduled or needed?	N
<b>Regulation</b>	
When did the community enter the NFIP?	1987
Are the FIRMs digital or paper?	Digital

NFIP Topic	Comments
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Meet
Provide an explanation of the permitting process.	An expanded permitting process is included in the upcoming update to the floodplain management ordinance. It is a multi-step process that has several levels of review
<b>Community Rating System</b>	
Does the community participate in CRS?	No
What is the community's CRS Class Ranking?	–
What categories and activities provide CRS points and how can the class be improved?	–
Does the plan include CRS planning requirements?	–

### B.7.3. Mitigation Actions

The planning team for the City of Madera identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

#### *Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan*

---

**Hazards Addressed:** All hazards

**Goals Addressed:** 1, 2, 3, 4, 5, 6, 7

**Issue/Background:** Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140).

**Project Description:** Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

**Other Alternatives:** No action

**Existing Planning Mechanisms through which Action will be Implemented:** Safety Element of General Plan

**Responsible Office:** City of Madera Planning Department

**Priority:** High

**Cost Estimate:** Jurisdictional board/staff time

**Potential Funding:** Local budgets

**Benefits (avoided Losses):** Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

**Timeline:** As soon as possible

***Action 2. Installation of variable frequency drives onto wells to increase capacity***

---

**Hazards Addressed:** Drought & Water Supply

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** To better regulate the water supply to increase efficiency (not capacity) on high production wells.

**Project Description:** Well 20, Well 21

**Other Alternatives:** No action.

**Existing Planning Mechanisms through which Action will be Implemented:**

**Responsible Office:** City & County

**Priority:** Medium

**Cost Estimate:** \$25,000 each (\$50,000 total)

**Potential Funding:** To be determined

**Benefits (avoided Losses):** Water pressure spikes and dips.

**Timeline:** 1-2 years

***Action 3. Install backup motors for wells with an emphasis on critical facilities. Provide backup generators for wells.***

---

**Hazards Addressed:** Drought & Water Supply/ Earthquakes

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** Ensure water distribution is preserved during natural disasters.

**Project Description:** City to purchase more backup generators for critical wells (3).

**Other Alternatives:** CNG Motors.

**Existing Planning Mechanisms through which Action will be Implemented:**

**Responsible Office:** City Public Works, City Engineering & County

**Priority:** Medium

**Cost Estimate:** \$100,000 each (\$300,000 total)

**Potential Funding:** To be determined

**Benefits (avoided Losses):** Critical wells will still pump if electricity is lost.

**Timeline:** 3 years

***Action 4. Install Variable Frequency Drives (VFD) on Existing City Wells to Increase Capacity***

---

**Hazards Addressed:** Drought, Water Supply

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** Addresses capacity of wells as they are impacted by fluctuating water levels. Installation of these improvements are more directly affect the anticipated long term drop in water levels. Without the use of VFDs, the efficiency of wells decreases as water levels drop. VFDs compensate for this lowering of the water level.

**Project Description:** Install VFDs at wells where water level fluctuation has shown a decrease in well efficiency. Installation of VFDs shall proceed at wells most susceptible to this affect.

**Other Alternatives:** No action.

**Existing Planning Mechanisms through which Action will be Implemented:** City's Capital Improvement Program

**Responsible Office:** City Engineering Department/City Public Works

**Priority:** High

**Cost Estimate:** \$160,000 (first 4 wells that have been identified)

**Potential Funding:** To be determined

**Benefits (avoided Losses):** Avoidance of property damage and to a lesser degree injuries associated with flood events

**Timeline:** 2 years for initial wells

**Action 5. Provide Backup Generators for City Wells**

---

**Hazards Addressed:** Earthquake, Water Supply

**Goals Addressed:** 1, 2, 3, 5, 7

**Issue/Background:** Earthquakes, and other natural disasters, have potential to cause widespread power outages that may interfere with City's ability to deliver water to residents and businesses.

**Project Description:** Install generators at well in accordance with recommendation provided in the City's Water System Master Plan

**Other Alternatives:** No action.

**Existing Planning Mechanisms through which Action will be Implemented:** City's Water System Master Plan and Capital Improvement Program

**Responsible Office:** City Engineering Department

**Priority:** Medium

**Cost Estimate:** \$1,200,000 (8 generators)

**Potential Funding:** Water Rates (assuming sufficient reserve exist)

**Benefits (avoided Losses):** Preserve ability to provide potable, and to a minimal degree, irrigation water to residents

**Timeline:** 2-10 years

**Action 6. Implement Improvements Recommended in the Storm Drainage System Master Plan**

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Addresses flooding concerns/issues within the City of Madera that range from nuisance flooding to larger events that may cause significant property damage.

**Project Description:** Install unfunded improvements identified in the Storm Drainage System Master Plan, on a prioritized basis.

**Other Alternatives:** No action.

**Existing Planning Mechanisms through which Action will be Implemented:** City's Storm Drainage System Master Plan and Capital Improvement Program



**Responsible Office:** City Engineering Department

**Priority:** High

**Cost Estimate:** \$45,000,000

**Potential Funding:** To be determined

**Benefits (avoided Losses):** Avoidance of property damage and injuries associated with flood events

**Timeline:** 2 to 25 years

---

**Action 7.**      *4th Street Flooding Improvements Installed in accordance with that recommended in the Storm Drainage System Master Plan*

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Addresses flooding concerns/issues within the 4th Street right-of-way near City Hall.

**Project Description:** Install unfunded improvements identified in the Storm Drainage System Master Plan.

**Other Alternatives:** No action.

**Existing Planning Mechanisms through which Action will be Implemented:** City's Storm Drainage System Master Plan and Capital Improvement Program

**Responsible Office:** City Engineering Department

**Priority:** High

**Cost Estimate:** \$2,000,000

**Potential Funding:** Grants

**Benefits (avoided Losses):** Avoidance of property damage and to a lesser degree injuries associated with flood events

**Timeline:** 2 to 5 years

---

**Action 8.**      *Conduct New Studies/Modeling and Mapping of the Fresno River within the City's Growth Boundary*

---

**Hazards Addressed:** Flooding

**Goals Addressed:** 1, 2, 3, 6, 7

**Issue/Background:** Portion of the river are not modeled while other portions appear to be dated with respect to current understanding of what a 100-year storm may represent. As such, an accurate understanding of flooding risks may not be available.

**Project Description:** Perform modeling of the Fresno River with the City's growth boundary. Update FIRM maps as may be necessary to incorporate revised flood zones.

**Other Alternatives:** No action.

**Existing Planning Mechanisms through which Action will be Implemented:** City's Capital Improvement Program - Action is required to include this in this document.

**Responsible Office:** City Engineering Department

**Priority:** Medium

**Cost Estimate:** \$150,000

**Potential Funding:** Grants

**Benefits (avoided Losses):** Preserve ability to provide potable, and to a minimal degree, irrigation water to residents as supplies may be affected during periods of drought

**Timeline:** 2-10 years



## Annex C North Fork Rancheria

### C.1 Introduction

This Annex details the hazard mitigation planning elements specific to the North Fork Rancheria (NFR) of Mono Indians, a previously participating jurisdiction to the Madera County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the NFR. This Annex provides additional information specific to the NFR, with a focus on providing additional details on the risk assessment and mitigation strategy for this community. This annex addresses items in the DMA 2000 requirements for tribal mitigation planning.

### C.2 Planning Process

As described above, the NFR followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Madera County Hazard Mitigation Planning Committee (HMPC), the Rancheria formulated their own internal planning team to support the broader planning process requirements. NFR planning participants, their positions, and how they participated in the planning process are shown in Table C-1. Additional details on plan participation and NFR representatives are included in Appendix A.

*Table C-1 North Fork Rancheria Planning Team*

Name	Position/Title	How Participated
Katie Parra	Administrative Assistant	Provided hazard ID table. Provided past occurrences of hazards. Provided capability information. Attended Meetings.
Christina McDonald	Environmental Director	Provided past occurrences. Provided input on hazards and NFR assets. Provided mitigation actions. Provided documents regarding hazards and historic, natural, and cultural facilities.

The NFR coordinated with other tribal entities during the creation of this plan to seek their input. The letter sent to these entities can be found in Appendix A. No input was received as of the submittal of this plan. Any comments received will inform the upcoming stand-alone plan.

- Big Sandy Rancheria
- Cold Spring Rancheria
- United States Bureau of Indian Affairs

Coordination with other community planning efforts is paramount to the successful implementation of this plan. This section provides information on how the NFR integrated the previously-approved 2011 Plan into existing planning mechanisms and programs. Specifically, the NFR incorporated into or implemented

the 2011 LHMP through other plans and programs shown in Table C-2. The NFR will incorporate the information found in this annex, as well as in the upcoming stand-alone plan, to inform the draft EOP, as well as any other planning process in order to further mitigation work.

*Table C-2 2011 LHMP Incorporation*

Planning Mechanism 2011 LHMP Was Incorporated/Implemented In.	Details?
Draft Emergency Operation Plan	Used Madera County LHMP and Emergency Operation Plan as a resource document.

The mitigation planning process for the Madera County LHMP Update was integrated with FEMA mitigation programs and initiatives. Information on FEMA mitigation programs and initiatives is included in Section C.6 of this annex. With the exception of the CDBG, the NFR did not take advantage of other funding sources during the past five years. More information on how the Tribe aligns with or intends to align with those programs and initiatives will be included in the upcoming stand-alone tribal plan.

The NFR Tribal government will continue to comply with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend its plan whenever necessary to reflect changes in tribal or federal laws and statutes as required in 44 CFR 13.11(d).

### *Sources*

In addition to sources referenced in the Base Plan in Chapter 4, the following sources were used to complete this annex:

- Emergency Operations Plan
- HUD Environmental Assessment – June 2017
- North Fork Rancheria Housing Project Environmental Assessment

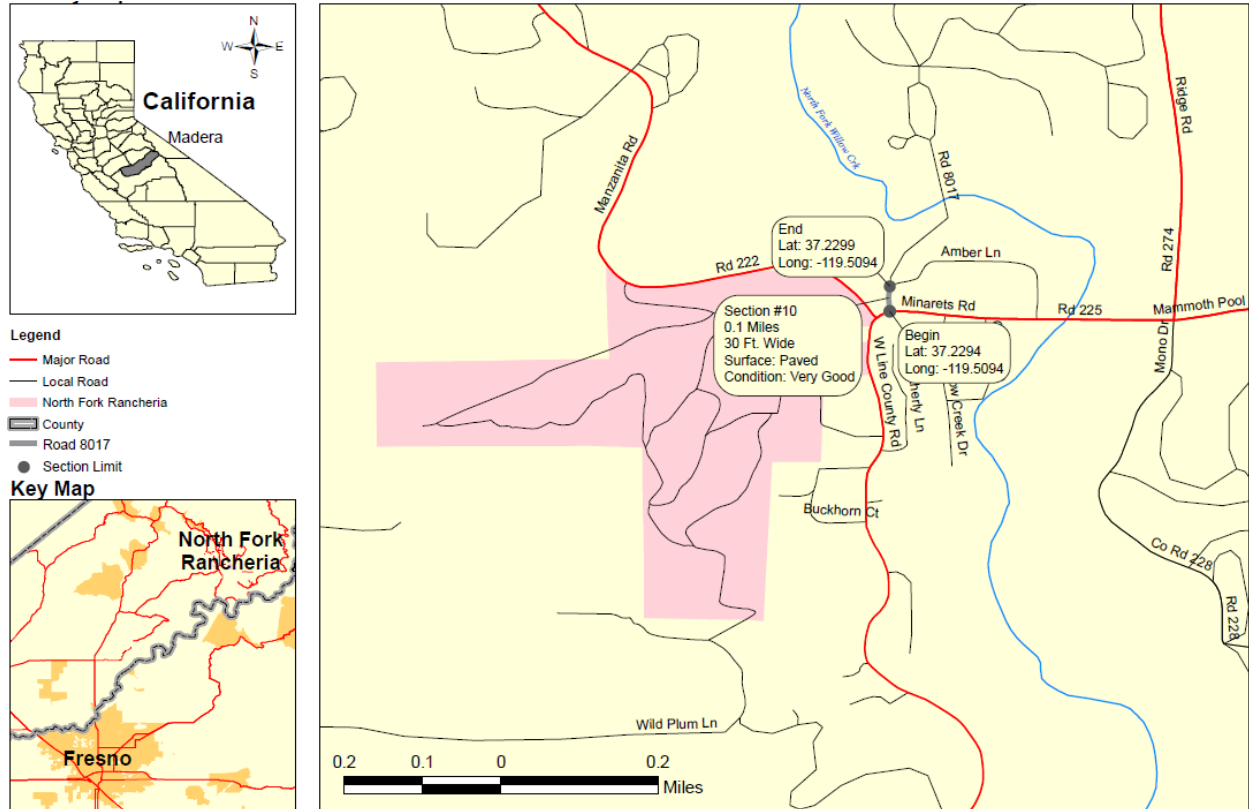
## **C.3 Community Profile**

The community profile for the NFR is detailed in the following sections. Figure C-1 displays a map and the location of the NFR within Madera County and shows 61.5 acres of North Fork Rancheria Trust lands. Figure C-2 shows the trust allotment lands under the NFR’s purview. Used for tribal housing, community and family wellness youth center, and proposed tribal convenience store. Over 20 tribal residences are located on the allotments.

The North Fork Rancheria of California is a federally recognized tribe as determined under 25 CFR Part 83 and listed in 63 FR 71941. The Tribal Government, created by the Constitution of the North Fork Rancheria and adopted May 18, 1996, authorizes the Tribal Council to conduct executive, legislative, and business functions. The five-member Tribal Council is elected by eligible voters of enrolled Tribal Citizens who comprise the General Council. Tribal enrollment presently exceeds 1,700 citizens. Rancheria lands are

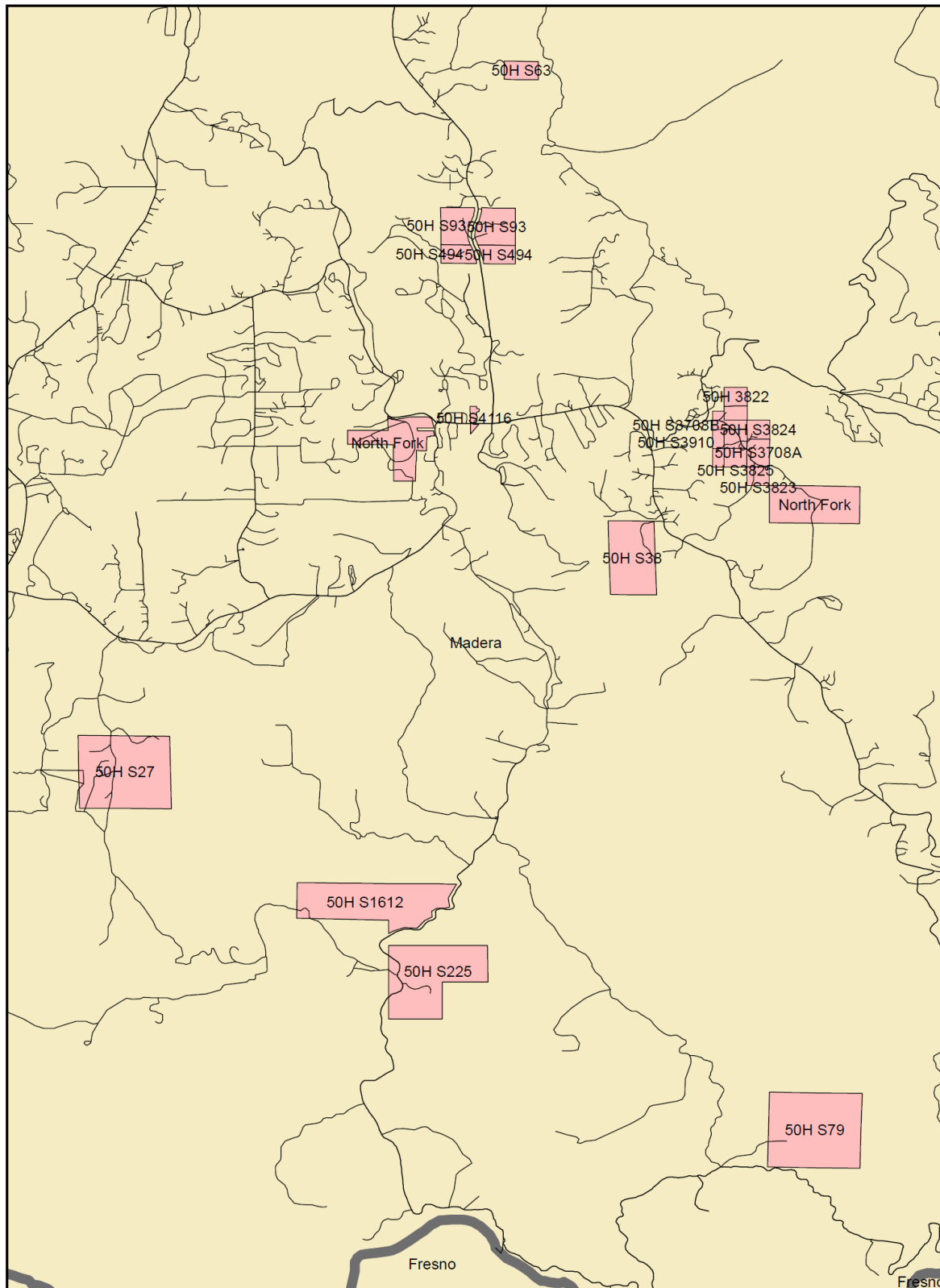
used for commercial, tribal government, and residential purposes. There are no significant tribal lands being used for agriculture or recreation.

*Figure C-1 North Fork Rancheria*



Source: North Fork Rancheria

Figure C-2 North Fork Rancheria Trust Allotment Lands



Source: North Fork Rancheria

### C.3.1. Geography and Climate

The North Fork Rancheria tribal lands (fee and trust lands) occupies 80 acres along the western edge of the Sierra National Forest, about 50 miles northeast of Fresno, California. Their tribal headquarters are located in North Fork of Madera County, California. North Fork is an unincorporated community in Madera County, California. It is located 22 miles east of Raymond, 9.89 miles south east of Bass Lake and 14 miles from Oakhurst. The North Fork Rancheria is located in the foothills of the Sierra Nevada at an elevation of 2,638 feet. North Fork has a Mediterranean climate with cool, rainy winters and hot, dry summers. Its average annual precipitation is 33.43 inches. The tribe also has 305 acres of land held in trust along Highway 99 and Avenue 17 near the City of Madera.

### C.3.2. History

The Tribe is comprised primarily of North Fork Mono, a label given them by an ethnographer in the 1910s to describe people then living along and north of the San Joaquin River. By the early 20th Century, non-Native acquisition of lands in the San Joaquin Valley, both on the flat plain and the surrounding foothills, had resulted in the North Fork Mono concentrating around the town of North Fork near the Sierra National Forest. This is how the Tribe became known as the North Fork Band or North Fork Mono. However, ancestors of the Tribe also include members of Yokut and Miwok linguistic groups. Further, the town of North Fork is only one place among many of significance to the Tribe, as their use and occupancy of lands in the San Joaquin Valley, and around the City of Madera in particular, is extensive.

#### *Pre-Contact*

The North Fork Mono, as well the other San Joaquin Valley tribes, made their homes in the friendlier climates of the foothills but used the Valley floor—which was not conducive to year-round habitation—for its resources: to hunt big-game, fish, gather reeds for basket making, and for ceremonies and trade. In the San Joaquin Valley, tribal groups used and occupied overlapping territories, and access to specific regions was regulated by protocols determined by a complex interdependent system of social, political, and economic ties between groups. The North Fork Mono were key players in this regional complex.

#### *Contact Era*

The arrival of non-Natives in the San Joaquin Valley, as early as the 1810s, thoroughly disrupted aboriginal life there, as these incursions pushed Native peoples further into the foothills and mountains, in order to flee from the kidnapping, violence, and disease which decimated their populations. With the 1849 California Gold Rush, tensions between Native peoples and miners as well as settlers escalated rapidly in the San Joaquin Valley, and culminated in the Mariposa Indian War of 1850-51. In response, the federal government sent three treaty commissioners to California to negotiate treaties with San Joaquin and other Native peoples for peace and the cession of land in exchange for the establishment of reservations.

#### *Reservation Period*

The interests of the North Fork Mono were represented directly in the ensuing treaty negotiations by trusted chiefs of neighboring Mono and non-Mono tribes with whom they had kinship and socio-political ties. The

April 29, 1851, treaty expressly provided that the ancestors of the Tribe were intended beneficiaries of the treaty. This and two other treaties reserved adjacent tracts of Native lands on the Valley floor where the present-day City of Madera is located.

The lands reserved in these treaties were quickly overrun by settlers, ranchers, miners and, later, farmers, leaving only a series of small “Indian farms” operating over a large area. One of these, the Fresno River Farm, was located in the immediate vicinity of the present-day City of Madera and later became the headquarters for the entire reservation. Although Congress eventually refused to ratify the treaties based on objections from the California Legislature, by 1854 the Fresno River Farm or Reservation was viewed as one of the five reservations authorized by Congress a year earlier. In 1856, the Indian Agent for the Fresno River Reservation identified a significant number of ancestors of the Tribe who lived on, visited, and recognized the Reservation as their home and headquarters. At the same time, most Native people, including ancestors of the Tribe, integrated the Reservation into their yearly subsistence cycle, spending part of the year on reservation lands cultivating crops and collecting treaty-stipulated goods, and part of the year off reservation grounds hunting, gathering, and fishing.

Operation of the Reservation was plagued with problems, however, and in 1860 the Reservation was closed. The Tribe’s ancestors subsequently integrated into the mining, lumber, ranching, and agricultural economies, thereby adapting their use and occupancy of the Valley floor and foothills to supply their subsistence in new ways.

### *Land Acquisitions*

Beginning in the 1890’s, the federal government made a limited number of land allotments to Native people. Because very few public domain lands were available, the government turned to the National Forests for lands that could become Indian allotments. Consequently, most lands allotted to Tribal ancestors were in the Sierra National Forest, although some were within approximately 18 miles of the City of Madera. In 1903, a Presbyterian Mission was established in the town of North Fork. Native parents began sending their children to be educated and sheltered at the Mission while continuing their migratory patterns by working as wage laborers on farms and logging operations in the San Joaquin Valley. In 1916, at the urging of the Mission, the Federal Government purchased the 80-acre North Fork Rancheria next to the Mission to provide shelter to families whose children were attending the Mission. The rocky soil and precipitous landscape were unsuitable for farming, however, and the Rancheria never was able to support more than a few families.

### *Termination and Restoration*

In 1961, the federal government terminated the Tribe’s federally recognized status and transferred the Rancheria land to fee for the lone resident then living on the Rancheria. The Tribe’s status as a federally recognized Indian tribe was restored in 1983 under a court-approved settlement. Four years later, the lands within the Rancheria boundaries were restored as “Indian Country.” The Tribe subsequently elected a governing body and later adopted a constitution in 1996. Today, the Tribe is the largest restored Tribe in California with nearly 1,800 tribal citizens whose ancestors have used, occupied, and accessed the lands surrounding the City of Madera throughout history and up to the present.



### **C.3.3. Economy**

The logging industry was the economic engine in North Fork until the mid 1990's. When the North Fork mill shut down the businesses in the area closed and many people moved from the area, and those that stayed found new employment, or fell into poverty that is still the case today. The economy in North Fork is mainly tourism and recreational based due to the vicinity of the Sierra National Forest. The three main employers in the North Fork area is: the United States Forest Service, Chawanakee Unified School District and the North Fork Rancheria. The tribe has social, environmental, housing and roads programs that are staffed by 46 employees with more than half Native American. The tribe provides low income housing and social service programs for the tribal population. Unemployment is 29.13%, according to the Tribe.

### **C.3.4. Population**

The tribal enrollment of the North Fork Rancheria is approximately 2,713. 500 live in Madera County.

## **C.4 Hazard Identification**

North Fork Rancheria's planning team identified the hazards that affect the NFR and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to NFR (see Table C-3).

**Table C-3 North Fork Rancheria—Hazard Identification Assessment**

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests	Limited	Occasional	Negligible	Low	High
Climate Change	Extensive	Likely	Negligible	Medium	High
Dam Failure	Significant	Unlikely	Critical	High	Medium
Drought and Water Shortage	Significant	Likely	Critical	Medium	High
Earthquake	Significant	Occasional	Critical	High	Medium
Flood: 100/200/500-year	Significant	Occasional	Critical	Low	Medium
Flood: Localized/Stormwater	Extensive	Likely	Limited	Medium	High
Hazardous Materials Transportation	Significant	Occasional	Limited	Medium	Low
Landslides, Rockfalls, and Debris Flows	Significant	Likely	Limited	High	Medium
Levee Failure	Limited	Unlikely	Negligible	Low	Medium
Severe Weather: Extreme Cold and Freeze	Significant	Likely	Limited	Medium	High
Severe Weather: Extreme Heat	Significant	Likely	Limited	Medium	High
Severe Weather: Fog	Limited	Occasional	Negligible	Low	Medium
Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)	Significant	Likely	Limited	Medium	High
Severe Weather: Wind and Tornado	Significant	Occasional	Limited	Medium	High
Severe Weather: Winter Storms/Snow	Significant	Likely	Limited	Medium	High
Volcano	Significant	Likely	Limited	Low	Medium
Wildfire (smoke, tree mortality)	Extensive	Highly Likely	Critical	High	High
<b>Geographic Extent</b> Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		<b>Magnitude/Severity</b> Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid			
<b>Probability of Future Occurrences</b> Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		<b>Significance</b> Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact			
		<b>Climate Change Impact:</b> Low: Climate change is not likely to increase the probability of this hazard. Medium: Climate change is likely to increase the probability of this hazard. High: Climate change is very likely to increase the probability of this hazard.			

## C.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the Tribe’s hazards and assess the NFR’s vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the Base Plan. The hazard profile discusses the threat to the Planning Area and describes previous occurrences of hazard events and the likelihood of future occurrences. The vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the Planning Area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

It should be noted here that while the North Fork Rancheria participated in this 2017 LHMP Update, due to the lack of any mapped GIS data, including any tribal land boundaries, they are addressed in this Base Plan as part of the unincorporated County. Further, the North Fork Rancheria recently received a FEMA grant and have started the process of developing their own North Fork Rancheria LHMP. Thus, any data gaps or deficiencies identified specific to the North Fork Rancheria in this LHMP Update, will be addressed in their standalone LHMP.

### C.5.1. Hazard Profiles

At the beginning of each hazard vulnerability assessment in Section C.5.3, a brief statement is given as to how the hazard affects the NFR, as well as past occurrences. The intent of these section is to provide jurisdictional specific information on hazards.

### C.5.2. Vulnerability Assessment

This section identifies the Tribe’s values at risk, critical facilities and infrastructure, natural resources, historic and natural resources, and growth and development trends.

#### *Values at Risk*

The North Fork Rancheria provided information on homes on NFR lands. It is important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table C-4 shows the values and locations of homes on NFR lands.

*Table C-4 North Fork Rancheria – Total Values at Risk by Property Use*

Address	Lot/Unit	APN	Square Footage	Completion / Acquisition Date	Value
32890 Wah Up Way, North Fork, CA 93643	Lot #1	060-040-070, 060-040-078, 060-040-079, 060-040-080	1,868	8/1/2008	\$238,513.24
32899 Wah Up Way, North Fork, CA 93643	Lot #2		1,860	9/23/2008	\$187,045.42

Address	Lot/Unit	APN	Square Footage	Completion / Acquisition Date	Value
32891 Wah Up Way, North Fork, CA 93643	Lot #3		1,356	8/23/2012	\$271,689.70
32873 Wah Up Way, North Fork, CA 93643	Lot #4		1,503	2/3/2014	\$223,551.90
32855 Wah Up Way, North Fork, CA 93643	Lot #5		1,525	1/9/2015	\$308,903.01
56094 Kunugib Way, North Fork, CA 93643	Lot #6		1,052	8/18/2009	\$199,001.24
56959 Kunugib Way, North Fork, CA 93643	Lot #7		1,052	7/23/2011	\$190,879.51
56971 Kunugib Way #A, North Fork, CA 93643	Lot #8		1,052	4/30/2010	\$224,216.75
56971 Kunugib Way #B, North Fork, CA 93643	Lot #9		1,052	4/30/2010	\$224,216.75
33001 Wah Up Way, North Fork, CA 93643	Lot #10		1,304	6/1/2015	\$183,645.83
33013 Wah Up Way #A, North Fork, CA 93643	Lot #11A		780	8/1/2015	\$280,854.01
33013 Wah Up Way #B, North Fork, CA 93643	Lot #11B		780	8/1/2015	
33025 Wah Up Way, North Fork, CA 93643	Lot #12		1,737	6/3/2016	\$307,458.30
57128 Rd 225, North Fork, CA 93643	Willow Creek #1A	060-520-007	1,109	5/12/2010	\$557,724.85
57128 Rd 225, North Fork, CA 93643	Willow Creek #1B		1,160	5/12/2010	
57112 Rd 225, North Fork, CA 93643	Willow Creek #2A		918	6/3/2011	\$332,213.20
57112 Rd 225, North Fork, CA 93643	Willow Creek #2B		918	6/3/2011	
57118 Rd 225, North Fork, CA 93643	Willow Creek #3		1,356	8/30/2012	\$220,775.41
57002 Rd 225, North Fork, CA 93643	Willow Creek #4		1,356	9/30/2012	\$205,451.09
57030 Amber Lane, North Fork, CA 93643		060-520-032	1,040	3/1/2008	\$234,506.27
57031 Amber Lane #101, North Fork, CA 93643		060-520-030	1,040	10/1/2007	\$214,037.69
57031 Amber Lane #102, North Fork, CA 93643			1,040	11/1/2017	\$210,274.86
57034 Amber Lane, North Fork, CA 93643		060-520-031	1,683	5/19/2010	\$198,701.94
1598 5th Street, Clovis, CA 93611		491-174-29	1,192	2/27/2009	\$196,239.15

Address	Lot/Unit	APN	Square Footage	Completion / Acquisition Date	Value
5947 E. Ramona Ave., Fresno, CA 93727		496-064-18	1,370	3/10/2009	\$182,009.58
6078 E. Fountain Way, Fresno, CA 93727		310-484-11	1,410	3/20/2009	\$206,691.68
6653 N. Constance Ave., Fresno, CA 93722		506-464-16	1,465	12/12/2014	\$153,594.63
5519 W. Chennault Ave., Fresno, CA 93722		502-201-06	1,319	9/18/2015	\$214,537.78
2375 Beverly Ave., Clovis, CA 93611		551-211-22	1,658	8/31/2016	\$257,548.72
33143 Rd 222, North Fork, CA 93643	Manzanita Plaza/Tribal Government Offices	060-130-002		11/15/2004	\$930,132.87
56900 Kunugib, North Fork, CA 93643	Community Center	060-040-070, 060-040-078, 060-040-079, 060-040-080	4015	7/1/2006	\$636,500.74
56901 Kunugib, North Fork, CA 93643	Family Wellness Youth Center		2000	10/31/2008	\$564,302.00
33400 Douglas Ranger Station Rd., North Fork, CA 93643	Fire Station	060-110-038	3200	5/10/2013	\$1,059,022.59
57911 Old Mill Site Court, North Fork, CA 93643	TANF Building	060-110-039	3096	2/26/2014	\$605,000.00
57901 Old Mill Site Court, North Fork, CA 93643	Transportation and Training Center		3487	7/24/2014	\$605,000.00
57907 Old Mill Site Court, North Fork, CA 93643	Housing Services Building		3553		\$896,530.39
NA	Commercial Lot Rd 222	060-120-007			\$ 75,000.00
NA	Mill Site - North Parcel	060-110-037			\$155,000.00

Source: North Fork Rancheria

### ***Critical Facilities and Infrastructure***

For purposes of this plan, a critical facility is defined as:

*Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

This definition was refined by separating out three classes of critical facilities as further described in Section 4.3.1 of the Base Plan. It was noted by the Tribe that the three classes definition did not provide full coverage of tribal facilities. The tribe noted the following as critical facilities:

- Manzanita Plaza/Tribal Government Offices
- Fire Station (Madera County operates facility)
- TANF building
- Transportation and Training Center
- Housing Services Building

In addition, the NFR noted that they rely on many of the critical facilities and infrastructure located throughout the Madera County Planning Area.

### *Natural Resources*

The NFR is dominated by mixed chaparral woodland, consisting mostly of buck brush (*Ceanothus cuneatus*), ponderosa pine (*Pinus ponderosa*), manzanita (*Arctostaphylos viscida*), buckeye (*Aesculus californicus*), poison oak (*Toxicodendron diversilobum*), interior live oak (*Quercus wislizenii*), and elderberry (*Sambucus mexicana*). Elderberry shrubs occur throughout the NFR with some degree of congregation. The elderberry shrubs serve as a host to the federally listed valley elderberry longhorn beetle.

The California Department of Fish and Game's Natural Diversity Database denotes several sensitive species and habitats from the North Fork quadrangle map. Research was performed for the NFR during a reconnaissance survey for a housing development in 2000. The report ran the eight quadrangle maps surrounding the site to produce a thorough list of sensitive species and habitats in the general area. These species and habitats include:

- Birds
  - ✓ Great Gray Owl
  - ✓ Golden Eagle
  - ✓ Prairie Falcon
  - ✓ Yellow Billed Cuckoo
- Mammals
  - ✓ California Mastiff Bat
  - ✓ Sierra Nevada Red Fox
- Amphibians
  - ✓ Foothill Yellow-legged Frog
  - ✓ California Tiger Salamander
  - ✓ Western Spadefoot (Toad)
- Invertebrates
  - ✓ Valley Elderberry Longhorn Beetle
  - ✓ California Linderiella (Shrimp)
  - ✓ Vernal Pool Tadpole Shrimp
  - ✓ Molestan Blister Beetle

- ✓ Dry Creek Cliff Strider Bug
- Reptiles
  - ✓ Western Pond Turtle
- Plants
  - ✓ Tree-anemone
  - ✓ Yosemite Ivesia
  - ✓ Orange Lupine
  - ✓ Flaming Trumpet
  - ✓ Hartweg' s Golden Sunburst
  - ✓ Madera Linanthus
  - ✓ Mariposa Pussypaws
  - ✓ Succulent Owl's-clover
  - ✓ Bogg' s Lake Hedge-hyssop
  - ✓ Shuteye Peak Fawn Lily
  - ✓ San Joaquin Valley Orcutt Grass
  - ✓ Spiny-sepaled Button-celery
- Habitats
  - ✓ Central Valley Drainage Rainbow Trout I Cyprinid Stream
  - ✓ Central Valley Drainage Rainbow Trout I Squawfish Stream
  - ✓ Northern Basalt Flow Vernal Pool

According to a wetland delineation study done in 2000 by Hartesveldt Ecological Consulting, there are very little wetlands (less than one acre) in the NFR.

### *Historic, Cultural, and Sacred Resources*

The California Office of Historic Preservation database shows that the NFR area has one registered federal historic site. This is shown on Table C-5.

*Table C-5 North Fork Rancheria – Historical Resources*

Resource Name (Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City
Jessie B. Ross Cabin (P751)				X	8/8/1991	North Fork

Source: California Department of Parks and Recreation Office of Historic Preservation, <http://ohp.parks.ca.gov/>

In addition, the County of Madera has over 1,000 known recorded archaeological sites (historic and prehistoric) and an estimated 1,000 unknown sites that have yet to be recorded. Due to the confidential nature of these sites the tribe is not able to provide a list of the historical or cultural resources. However, their significance provides information on the history of the tribe, landscape, environment, and spiritual connectivity to the land in Madera County.

According to the North Fork Rancheria, there are no or sacred sites on the Tribe’s 62-acre parcel. However, the Tribe recognizes that the potential exists for as-yet-undiscovered sites of cultural significance, as this

area was inhabited by tribes for thousands of years. There are numerous instances of culturally significant plant materials which continue to be collected for food, medicine, and basketry by the Tribe.

### *Growth and Development Trends*

The tribe began open enrollment in the late 1990’s and there haven’t been data sets developed to track population trends. Current enrollment is 2,173 people (adults and children).

### *Special Populations*

The Tribe noted that there are populations of low income, elderly, and disabled people in the Tribe. Transportation corridors and utilities are a concern for vulnerable tribal populations. Medical needs include dialysis patients, and cancer treatment patients. Utilities may impact medical machines that are used by dialysis, cancer, or diabetes patients.

### *Development since 2011 Plan*

The NFR Indian Housing Authority tracked total building permits issued since 2011 for their jurisdiction. These are tracked by total development, property use type, and hazard risk area. These are shown in Table C-6 and Table C-7. All development in the identified hazard areas, including the 1% annual chance floodplains and high wildfire risk areas, were completed in accordance with all current and applicable development codes and standards and should be adequately protected. Thus, with the exception of more people living in the area potentially exposed to natural hazards, this growth should not cause a significant change in vulnerability of the County to identified priority hazards.

*Table C-6 Total Development Since 2011*

Property Use	2011	2012	2013	2014	2015
Residential	3	2	0	1	4
Commercial	0	0	0	0	0
Industrial	0	0	0	0	0
Other	0	0	1	2	0
<b>Total</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>4</b>

Source: North Fork Rancheria Indian Housing Authority

*Table C-7 Development in Hazard Areas since 2011*

Property Use	1% Annual Chance Flood	Wildfire Risk Area	Other	Other
Residential	0	10	0	0
Commercial	0	0	0	0
Industrial	0	0	0	0
Other	0	3	0	0
<b>Total</b>	<b>0</b>	<b>13</b>	<b>0</b>	<b>0</b>

Source: North Fork Rancheria Indian Housing Authority



## Future Development

The Tribe has federally approved designated tribal land for future tribal housing that may include up to 37 single family housing dwelling units. The Tribe has built 13 homes located on the 61.5 acres and 9 units located on fee land. Current development includes a 211,500 gallon storage tank (potable water and fire suppression) on the 61.5 acres (funded through the Department of Housing and Urban Development)

More general information on growth and development in Madera County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Madera County Vulnerability and Assets at Risk of the Base Plan.

### C.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table C-3 as high or medium significance hazards. Impacts of past events and vulnerability of the NFR to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Madera County Planning Area). In general, the most vulnerable structures are those located within the floodprone areas, WUI areas, unreinforced masonry buildings, and buildings built prior to the introduction of modern building codes.

An estimate of the vulnerability of the NFR to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

### *Climate Change*

**Likelihood of Future Occurrence**—Likely

**Vulnerability**—Medium

### Hazard Profile and Problem Description

Climate change will require the County and the NFR to prepare for warmer and more extreme temperatures, decreased water supply, drought, flooding, increasing energy and water demand, and public health risks.

In California, average temperatures are projected to rise as much as 9 degrees Fahrenheit by 2100. This is especially pertinent for the NFR where extreme heat events are likely to increase both wildfire risk as well as drought stresses on trees.

### Past Occurrences

The Tribe noted that in 2016 in eastern Madera County, there was a loss of acorn, sourberries and other tribal plant resources. Crop yields were low due to dry conditions of high severity fire impacts.

### Vulnerability to Climate Change

The NFR's population, resources, and economy are vulnerable to climate change impacts, particularly flooding, extreme heat, wildfire, and water supply. The Tribe noted that there may be impacts to both water resources and the food supply from climate change.

### Future Development

The NFR has implemented through grant funding, installation of photovoltaic solar panels on two tribal buildings and 16 homes. The tribal trust land has water meters installed for future water conservation efforts. The development of a tribal master plan for growth and development is a tribal goal.

### *Dam Failure*

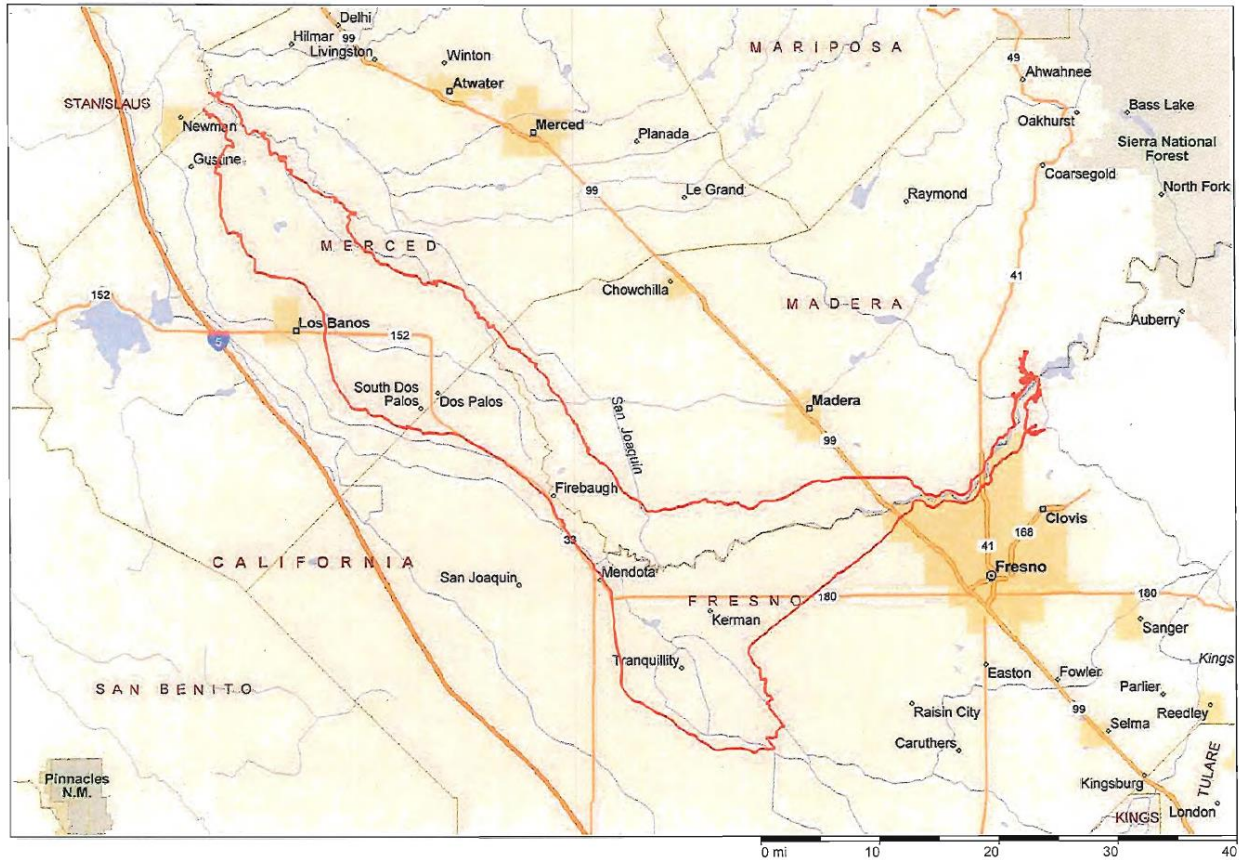
**Likelihood of Future Occurrence**–Unlikely

**Vulnerability**–High

### Hazard Profile and Problem Description

Dam failures can result from a number of natural or man-made causes such as earthquakes, erosion of the face or foundation, improper siding, rapidly rising flood waters, structural/design flaws, and deliberate human actions. The NFR's location downstream of Friant Dam and the Crane Valley Dam also raises the potential for flooding in the highly unlikely event of a failure of the dam. Dam inundation areas for these dams are shown on Figure C-3 and Figure C-4, respectively.

Figure C-3 Friant Dam Inundation Area

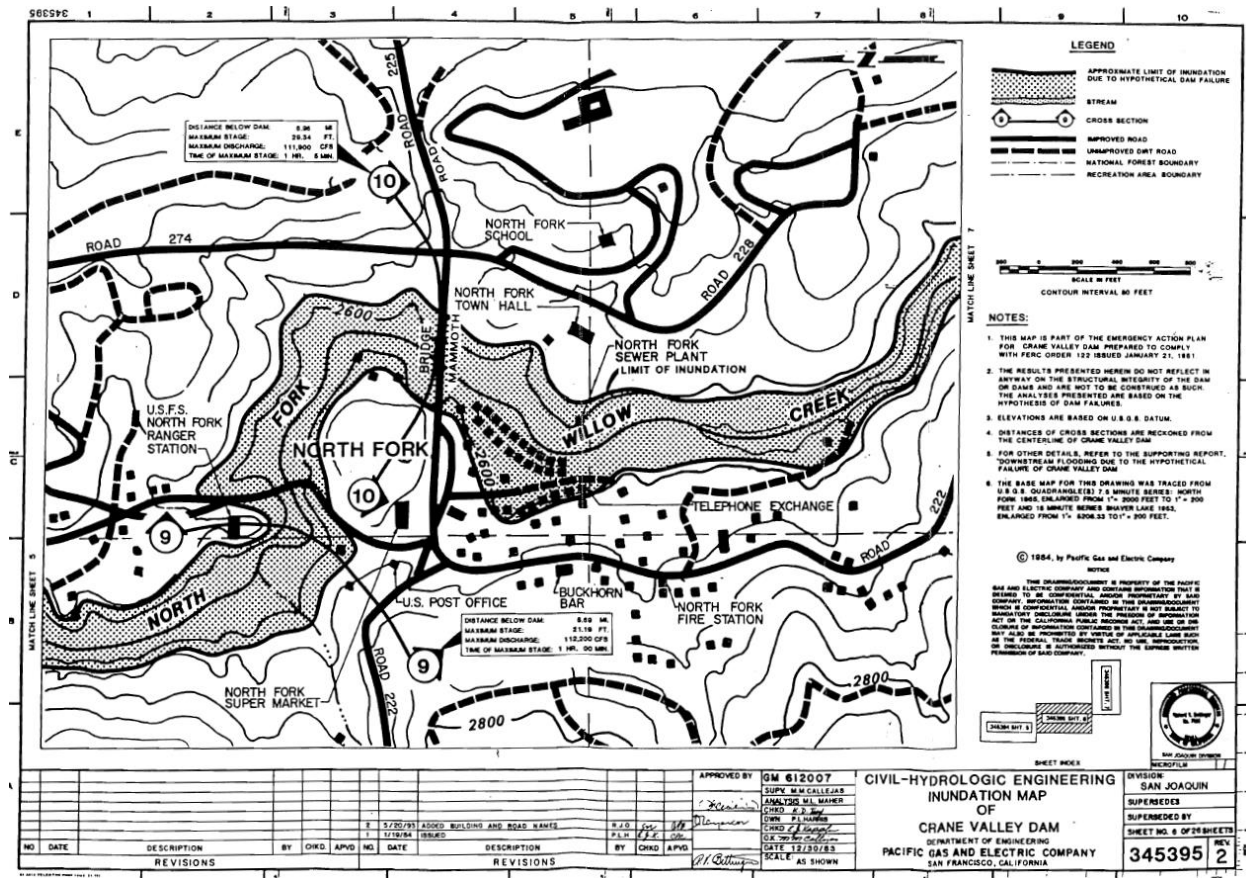


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Height 299 ft, Capacity 520,500 af

Source: North Fork Rancheria

Figure C-4 Crane Valley Dam Inundation Areas



### Past Occurrences

There have been no past occurrences of dam failure to affect the NFR.

### Vulnerability to Dam Failure

The NFR has many properties at risk from a dam failure of either the Friant or Crane Valley dams. The Crane Valley Dam has the potential to damage 22 housing units and 2 tribal facilities. Flooding and associated debris has the potential to damage infrastructure (roads, water, communication and utility lines), personal property, and tribal properties (residential and commercial type structures).

### Future Development

Due to the low risk of dam failure, future development will be allowed to occur in dam inundation areas. Construction codes and freeboard requirements will be enforced in the floodplain areas.

### Drought and Water Shortage

#### Likelihood of Future Occurrence—Likely

## Vulnerability–Medium

### Hazard Profile and Problem Description

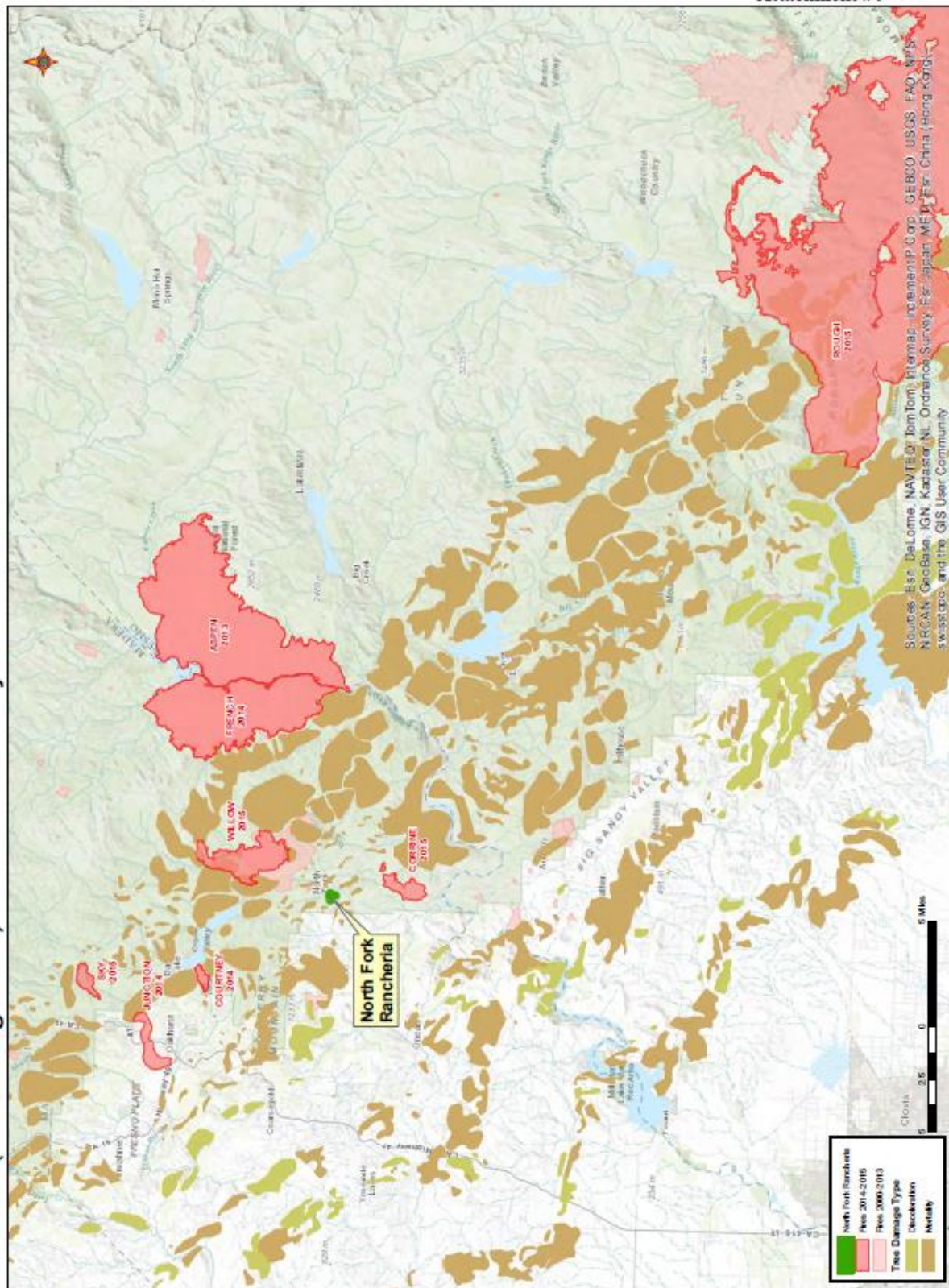
Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

### Past Occurrences

The state experienced four straight years of drought. The drought left the Sierra Nevada Mountains with nearly no snowpack, which is critical for replenishing the state’s water reservoirs. A recent study had put tree-ring data sets together to represent precipitation and temperature over the last 500 years. The study measured the width of the tree-rings of more than 1,500 blue oak trees in central California. Then by comparing these data sets with Sierra Nevada, snowpack records dating back to the 1930’s, the researchers were able to reconstruct the history of snowpack in the region back to the year 1500. The study determined that the 2015 snowpack level was the lowest it has been in 500 years. The drought left reservoirs at record low levels and depleted groundwater in underground aquifers.

The drought was particularly devastating to trees in the region. Tree mortality has been increasing across the Sierra National Forest over the last several years, and large areas of dead trees are very prominent, and continue to grow. According to the Sierra National Forest, Forest Health Advisory, the total loss of trees of all trees is currently at 27%.<sup>3</sup> The drought conditions have significantly weakened trees, causing them to become vulnerable to pests and disease. The unprecedented tree mortality has dramatically increased the risk of large wildfires and helped fuel recent fires. The U.S. Forest Service prepared a fire history map and overlay of the tree mortality in the proximity of North Fork Rancheria (Figure C-5). Tree mortality in the Sierra Nevada Mountains has increased by 26 million since October 2015, increasing the total loss of trees to an excess of 66 million since 2010 and has significantly increased the risk of catastrophic wildfires.

Figure C-5 North Fork Rancheria – Wildfires and Tree Mortality



Source: US Forest Service

## Vulnerability to Drought

The vulnerability of the NFR to drought covers the entire tribe, but impacts may vary and include reduction in water supply, agricultural losses, and an increase in dry fuels. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The NFR is a rural community that is surrounded largely by forest lands. Past droughts have increased the wildfire risk significantly. Since the NFR relies on ground water wells, drought and water shortage can cause acute problems.

## Future Development

As the population in the area continues to grow, so will the demand for water. Water shortages in the future may be worsened by drought, as the NFR relies on groundwater for its water source. Increased planning including conjunctive use will be needed to account for population growth and increased water demands.

## *Earthquake*

**Likelihood of Future Occurrence**—Occasional

**Vulnerability**—High

## Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

## Past Occurrences

No earthquakes of magnitude 5.5 or greater have ever been recorded in the NFR area, nor have there been reports of damage in the area from earthquakes of such magnitude in Madera County. There have been three notable earthquakes affecting NFR:

- May 30, 2003 – An earthquake with a magnitude of 3.1 and an epicenter located approximately 6 miles west-northwest of Madera. No damages were reported in the NFR.
- July 7, 2016 – Earthquake was felt in North Fork (tribal staff attending Tribal Forum meeting at USFS Bass Lake District Office). Epicenter was 4.5 on the Richter Scale.
- August 18, 2016 – An earthquake occurred near Olancho, CA. The Tribal Government Office was evacuated during the event. The earthquake was felt in North Fork. Epicenter was 3.5 on the Richter Scale.

## Vulnerability to Earthquake

The Tribe noted that no active earthquake faults are located in the NFR Planning Area—the closest active faults are 50 or more miles distant. The lack of faults in the Planning Area means that the potential for buildings to be damaged if they are placed atop a fault does not exist. There are faults in the region, but the likelihood of shaking that causes damages in the NFR is low. NFR is also not subject to liquefaction, a common earthquake-related hazard.

## Future Development

Future development in the NFR will be built to 2013 California Building Code. The 2013 CBC factors in the risks of earthquake into the building code.

### *Flood: Localized Flooding*

**Likelihood of Future Occurrence**—Likely  
**Vulnerability**—Medium

## Hazard Profile and Problem Description

Flooding and other issues caused by severe weather events, primarily heavy rains and thunderstorms, can often pose a risk to the community. Local drainage flooding occurs primarily due to infrequent, high-intensity rainfall events, and swelling dams, reservoirs and rivers due to quick snow melts from the above mountain range. Primary concerns include impacts to infrastructure that provides a means of ingress and egress throughout the community.

## Past Occurrences

The Tribe noted an event the week of January 9<sup>th</sup> of 2017. Tribe has had to replace carpet (\$1,600 value) in first floor of Tribal Government Office (from previous storms) and tribal community had mandatory evacuations (2016-2017 fall and winter season). During the 2016-2017 winter storms Madera County Office of Emergency Services issued mandatory evacuations for the South and North Forks of Willow Creek. The North Fork is south of the Crane Valley Dam and flooding became an imminent threat to public safety. The winter of 2016/2017 also brought periods of heavy rains, which caused washouts in Eastern Madera County and the NFR.

## Vulnerability to Localized Flooding

Localized flooding from high-intensity rainfall events, of which there can be a few a year, typically manifests as flooded ponding along some surface streets. Road closures are seldom and water levels recede quickly leaving only minor cleanup of silt and debris. Moderate to high intensity rainfall may cause overflows.

The North Fork Rancheria has an inventory of road systems identified with the Bureau of Indian Affairs (BIA). These roads are within the localized area of North Fork, CA. The road inventory is updated and funding is received from the BIA for repairs. Normal wear and tear of roads has been observed, and an



increase in repairs has been noted due to the 2016-2017 fall and winter weather season. These recent storms have caused increases in potholes, a spring on Wind Dancer Road (asphalt grinding surface) has impacted the middle section of that road, a culvert on Willow Canyon Drive (asphalt grinding surface) needs to be replaced, the Dick allotment road has increased ruts and potholes to the asphalt grinding surface, the tribal fire access road on the 61.5 acres in North Fork, above the Buckhorn, has erosion issues on the dirt surface roadway, no impacts to the asphalt grinding portion of the road, and Wah Up Way road leading to the tribal Community Center will need a culvert replacement and road repair due to road settling since the install of road.

Table C-8 identifies known and past occurrences of such areas and the associated problems encountered. This list is an initial inventory of key problem areas and is not intended to be a complete inventory of all problems and locations associated with severe weather events and localized flooding in the NFR.

*Table C-8 North Fork Rancheria – Road List of Localized Flooding Problem Areas*

Road Name	Flooding	Pavement Deterioration	Washouts	High Water/ Creek Crossing	Landslides/ Mudslides	Debris	Downed Trees
Wind Dancer Rd.						X	
Willow Canyon			X			X	
Dick Allotment		X				X	
Mission Dr.		X				X	
Wah Up Way						X	

Source: North Fork Rancheria

### Future Development

Future development in the NFR will add more impervious surfaces and need to drain those waters. The Tribe will need to be proactive to ensure that increased development has proper siting and drainage for stormwaters. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses.

### *Hazardous Materials Transportation*

**Likelihood of Future Occurrence**–Occasional

**Vulnerability**–Medium

### Hazard Profile and Problem Description

The tribal trust land on Highway 99 and Avenue 17 in the City of Madera is proposed for future economic development. Since 2004 the tribe has worked on economic development for a casino project. Hazardous Material Transport on the Highway 99 corridor is a concern for the Tribe.

## Past Occurrences

There are no past occurrences affecting the area because the property hasn't been developed. Concern is for the anticipation of future events that would lead to hazardous materials issues.

## Vulnerability to Hazardous Materials

The risks identified by the Tribe include:

- Madera trust land property- Highway 99 and Avenue 17.

## Future Development

Development will continue to happen within hazardous materials transportation zones. Those who choose to develop in these areas should be made aware of the risks associated with living within close proximity to a hazardous materials transportation route.

## *Landslides, Rockfalls, and Debris Flows*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–High

## Hazard Profile and Problem Description

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

The susceptibility of an area to landslides depends on many variables including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas.

## Past Occurrences

Minimal landslides have occurred in the area, but due to recent wildland fires the soils are now susceptible to land slide and soil erosion is now a concern. (Mission Fire 2017)

## Vulnerability to Landslide

The tribal community members living in the Mission allotment areas may be at risk for erosion caused landslides that could be minor, but pose threats to the roads (egress and ingress).

## Future Development

The Tribe noted that future development would most likely not be impacted by landslides.

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

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

## Hazard Profile and Problem Description

According to the NWS and the Western Regional Climate Center (WRCC), winter events can include extreme cold and freeze conditions. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until the damage can be repaired. Power outages can have a significant impact on communities, especially critical facilities such as public utilities. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

## Past Occurrences

The Tribe noted an event in January of 2007. A severe freeze in area occurred, and the State had also declared an emergency. Tribal Citizens required rehabilitation to homes due to interior structural damage due to pipes freezing. Three to four homes were impacted. Assistance was provided through the North Fork Rancheria Indian Housing Authority.

## Vulnerability to Cold and Freeze

Extreme cold and freeze events happen in Madera County and the NFR each year. Extreme cold often accompanies a winter storm or is left in its wake. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers leading to power outages. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures and ice can cause accidents and road closures and can cause significant damage to the agricultural industry. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Vulnerable populations to cold and freeze include:

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

Also of concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of extreme cold and freeze.

In addition to vulnerable populations, pets and livestock are at risk to freeze and cold.

### Future Development

Future development built to code should be able to withstand snow loads from severe winter storms. Pipes at risk of freezing should be mitigated by either burying or insulating them from freeze as new facilities are improved or added. Current County codes provide such provisions for new construction. Vulnerability to extreme cold will increase as the average age of the population in the Tribe shifts.

### *Severe Weather: Extreme Heat*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

### Hazard Profile and Problem Description

According to FEMA, “Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.” Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat. Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality.

### Past Occurrences

The Planning Team for the Tribe noted that there have been only minor impacts due to utility outages during heat events. These dates haven’t been noted but have occurred at a minimum of 1-2 times a year, depending on the weather conditions.

### Vulnerability to Extreme Heat

Health impacts are the primary concern with this hazard, though economic impacts are also an issue. The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable.

Reliance on air conditioning causes a strain on the electrical energy in the NFR area. Occasionally peak demands outweigh supply and a condition known as brown-out occurs. This is an extremely dangerous situation for electrical equipment as it operates without the needed electricity causing damage to the systems. Days of extreme heat have been known to result in medical emergencies, civil unrest, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts.

## Future Development

Vulnerability to extreme heat will increase as the average age of the population in the NFR shifts. Greater numbers of future senior citizens will result from the lagging population in the NFR. The elderly are more at risk to the effects of extreme heat, especially those without proper air conditioning.

### *Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)*

**Likelihood of Future Occurrence**–Likely

**Vulnerability**–Medium

## Hazard Profile and Problem Description

According to historical hazard data, severe weather is an annual occurrence in the NFR. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past.

## Past Occurrences

The Tribe noted an event in December of 1996 and January of 1997. Heavy rains caused creeks and streams in the area to become swollen and overrun their banks. Damage occurred to the San Joaquin River bridge (Auberry and Powerhouse Roads-Kerckhoff Lake) and bridge located below Friant Dam (Millerton Lake). A new bridge was placed at Kerckhoff Lake.

The Tribe noted another event in the winter 2016 and spring of 2017. Multiple period of heavy rain caused road closures and washouts in eastern Madera County, including areas around the NFR.

## Vulnerability to Heavy Rains and Storms

Problems associated with the primary effects of severe weather include flooding, pavement deterioration, washouts, high water crossings, landslide/mudslides, debris flows, and downed trees. Most of the localized flooding in the NFR is generally limited to flooding within the street right-of-way and only has limited impact to private property. The Planning Team for the Tribe noted that most of the runoff is on the roads, culverts are adequate if they are maintained and clear of debris, most culverts and associated roads have debris buildup, which is a factor in stormwater runoff flood events.

## Future Development

The County enforces the state building code in the NFR area and other ordinances, which regulate construction techniques that minimize damage from heavy storms and rain. Future development in the NFR is subject to these building codes. New critical facilities should be built to withstand hail damage, lightning, and heavy rains.

## *Severe Weather: Wind and Tornado*

**Likelihood of Future Occurrence**—Occasional

**Vulnerability**—Medium

### Hazard Profile and Problem Description

On an annual basis, the NFR experiences severe storms accompanied by strong wind and wind gusts. High winds combined have caused significant damage to public infrastructure (primarily the electric grid). In the NFR high winds occur in the winter, generally from November through March, although high winds may also occur in other months.

### Past Occurrences

The Tribe noted a high wind event that occurred in the 1980s. The exact date was unclear, but a Mono Wind blew down a family tack room. 2x8 plywood boards were blown 15-25 yards from their original location.

The Tribe noted a high wind event that occurred on April 27, 2017. Due to drought conditions and recent winter storm, winds pushed a large black oak tree over. The tree fell across Mission Dr. in North Fork, CA.

### Vulnerability to Wind and Tornadoes

Strong wind is a frequent type of severe weather occurrence in the area. Wind often accompanies the region's storms and has caused damage in the past. Buildings that house populations at risk such as schools, nursing homes, and urgent care facilities are at risk to wind and tornadoes. Also at risk are power lines, which can arc or be damaged during high wind events. The NFR has had power outages and damages to electric lines in past storms.

### Future Development

The County enforces the State building code in the NFR and other ordinances, which regulate construction techniques that minimize damage from high winds. Future development in the NFR is subject to these building codes.

## *Severe Weather: Winter Storms/Snow*

**Likelihood of Future Occurrence**—Likely

**Vulnerability**—Medium

### Hazard Profile and Problem Description

According to the NWS and the WRCC, winter snow storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, closing roads, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and

unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

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

### Past Occurrences

Severe winter storms have had impacts to tribal operations and the community. The tribe has had to close the building due to snow events, and the tribal personnel policy addresses emergency leave for natural disasters (December 19, 1998 NFR Personnel Policy and Procedures). The tribe also has internal memorandums specific to snow and other weather related events for office closures.

### Vulnerability to Winter Storms and Snow

The middle portion of the Madera County Planning Area, where the NFR is located, does experience snowfall on a seasonal basis; mostly between the months of November through March. Winter weather can occasionally be accompanied by high winds, which can cause downed trees and power lines, power outages, accidents, and road closures. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets to impacts of severe winter weather in the County. The ability for the NFR to continue to operate during periods of winter storm and snow is paramount. Vulnerable populations to winter storms and snow include:

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

The residents of nursing homes and elder care facilities are especially vulnerable to winter storm events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of winter storm and heavy snows.

Other impacts to the Tribe as a result of winter snow storms include damage to infrastructure, frozen pipes, utility outages, road closures, traffic accidents, and interruption in business and school activities. Also of concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. Delays in emergency response services can be of significant concern. Further, there are economic impacts associated with areas prone to heavy snow. Although the eastern portion of the county is the most vulnerable to the effects of snow, snowfall occurring in the lower elevations can create significant issues, as residents working and living in those areas may not be as prepared for snowfall.

## Future Development

Future development built to code should be able to withstand snow loads from severe winter storms. Current County codes provide such provisions for new construction. Vulnerability to winter snow storms will increase as the average age of the population in the NFR shifts.

### *Wildfire*

**Likelihood of Future Occurrence**–Highly Likely

**Vulnerability**–Extremely High

## Hazard Profile and Problem Description

Wildfires can cause short-term and long-term disruption to the NFR. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the Tribe by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires may result in casualties and can destroy buildings and infrastructure.

Long standing drought conditions, coupled with unprecedented tree mortality has led to the California Governor declaring a State of Emergency for Madera County. The most recent forest service survey has found there to be in excess of 66 million dead trees in California, with areas near North Fork experiencing up to a 90 percent loss in Ponderosa Pine Trees. These conditions have resulted in extreme fire activity in recent years, and has contributed to the community of North Fork being designated as “High” to “Very High” fire threat as based on the California Department of Forestry and Fire Protection’s (CAL FIRE) Fire and Resource Assessment Program (FRAP). The drought and tree mortality represent a unique and unusual circumstance and have been identified by the Tribe, local, regional, and state agencies. The threat of fire is urgent and immediate, and as independently verified, the Tribe lacks the most basic infrastructure to protect public safety, the tribe’s land, housing stock, community facilities, and greater community. As expressed by the Madera County Fire Marshall, lives of emergency responders, citizens and visitors remain at risk without basic services.

## Past Occurrences

Recent fires have made infrastructure needs increasingly evident to the Tribe. Fire has been an extreme threat to North Fork, and inadequate fire protection is threatening the long-term viability of the tribe’s housing and community development. For the past three consecutive years, the community of North Fork has served as an incident command post and the heli-base for firefighters. In 2015, two separate fires approached within a two-mile radius of North Fork and the Tribe’s land. The Willow Fire started on July 25, 2015 and burned until August 13, 2015 consuming a total of 5,702 acres. The Corrine Fire started on June 18, 2015 and burned until June 25, 2015 consuming a total of 920 acres. Both incidents threatened the community of North Fork and caused evacuation for tribal citizens living in the vicinity. We used the Tribe’s Community Center as a temporary evacuation center for tribal citizens during the Corrine Fire until Red Cross established a shelter in Oakhurst due to the threat of fire approaching the community. In 2014, the French Fire burned 13,837 acres in close proximity to North Fork and in 2013; the Aspen Fire burned 22,820 acres. In 2017, the Mission Fire, which burned 1,035 acres, burned through the tribal



allotments causing damage to one well and minor damage to road surfaces, and a leach line. Significant damage occurred to archaeological sites.

### Vulnerability to Wildfire

Tribal lands, allotments, and fee lands are highly vulnerable to wildfire. Dense fuels are a large factor that places the tribal community at risk. These fuels consist of manzanita, chaparral, live oak, grasses, ponderosa pine, and gray pine. Additional risks from tree mortality is two-fold, risk from upright hazard trees, and risk from downed trees that can create more fuel for the understory. This dead fuel can contribute to the rate of speed of a wildfire.

The dense fuels located near to or adjacent to tribal lands, allotments and fee lands include the U.S. Forest Service and private fee lands. These lands also have dense brush that can contribute to a catastrophic wildfire. The majority of the lands on, near to or adjacent to the tribal community do not have a landscape approach in fuels management and therefore pose a risk to the entire community.

### Future Development

The tribe follows the California State Building Code and strives to ensure that ingress and egress routes are available and maintained for tribal developments. The tribal homes utilize metal roofing and the Tribal Indian Housing Authority is responsible for providing water distribution lines of sufficient size to flow peak hourly domestic flows and fire suppression flows concurrently. The Indian Housing Authority manages the housing program for the tribe and tribal community development projects.

## C.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

**Note:** The Planning Team for the Tribe noted the following:

- The Tribe works with Madera County and the BIA in regulating development in hazard prone areas.
- The Tribe currently does not have any established post-disaster laws, regulations, policies, or programs currently.
- There are no hazard management laws, policies, programs, capabilities, or funding capabilities of the Indian Tribal governments that have changed since approval of the previous plan. In development areas, the Tribe defers to County planning requirements.

These items will be researched more in-depth during the creation of the forthcoming stand-alone plan.

## C.6.1. Regulatory Mitigation Capabilities

Table C-9 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the NFR.

*Table C-9 North Fork Rancheria's Regulatory Mitigation Capabilities*

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan	N	
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	N	Plan in process of being drafted, doesn't identify hazards in an annex (next step in drafting document)
Continuity of Operations Plan	N	Tribal Council member has attended training on COOP, no plan has been drafted as of this time. Tribe recently awarded with FEMA Pre-Disaster Mitigation Planning grant.
Transportation Plan	N	
Stormwater Management Plan/Program	N	There is a GIS layer created for streams and drainages on the 61.5 acres of tribal trust land in North Fork, CA
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		Tribal Forest Management Plan (2005-2020) and Climate Change Adaptation Plan is being draft.
Building Code, Permitting, and Inspections	Y/N	Are codes adequately enforced?
Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	
Land Use Planning and Ordinances	Y/N	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	

Flood insurance rate maps	N
Elevation Certificates	N
Acquisition of land for open space and public recreation uses	N
Erosion or sediment control program	N
Other	N
<b>How can these capabilities be expanded and improved to reduce risk?</b>	
Increase capacity with training, plan development, implementation of mitigation measures and funding.	

Source: North Fork Rancheria

## C.6.2. Administrative/Technical Mitigation Capabilities

Table C-10 identifies the Tribal department(s) responsible for activities related to mitigation and loss prevention in the NFR.

*Table C-10 North Fork Rancheria's Administrative and Technical Mitigation Capabilities*

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	The North Fork Rancheria Indian Housing Authority provides a crew based upon availability to implement the tribes Community Fire Protection program. Coordination is effective and a MOA is developed between the authority and tribe.
Mutual aid agreements	N	
Other		
Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	N/A	
Floodplain Administrator	N/A	
Emergency Manager	N/A	
Community Planner	N/A	
Civil Engineer	N/A	
GIS Coordinator	N/A	Tribal staff has limited GIS experience, but has basic mapping experience using ARC GIS.
Other		Tribal staff has limited training in Hazard Mitigation Planning.
Technical	Y/N	Describe capability Has capability been used to assess/mitigate risk in the past?
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	N	

Grant writing	N
Hazus analysis	N
Other	
<b>How can these capabilities be expanded and improved to reduce risk?</b>	
Increase capacity with training, and funding.	

Source: North Fork Rancheria

### C.6.3. Fiscal Mitigation Capabilities

Financial tools or resources that the Tribe could potentially use to help fund mitigation activities and loss prevention are discussed in this section. During the development of this plan the Tribe conducted an assessment of the funding capabilities for hazard mitigation projects. A list was developed of existing and potential funding sources was developed and analyzed. Those that are currently being used to fund mitigation projects are indicated by an asterisk. The other funding sources could potentially be used in the future to fund mitigation efforts.

- Bureau of Indian Affairs
- U.S. Army Corp of Engineers
- Cal OES
- CAL FIRE
- FEMA Pre-Disaster Mitigation Grants
- Indian Health Service
- U.S. Department of Interior Healthy Forests Restoration Act (HFRA)
- U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)
- U.S. Department of Agriculture Farm Service Agency
- Community Development Block Grants
- Capital improvements project funding
- Tribal funds
- Gaming funds
- Private funds
- Fees for water services, stormwater, or other utility services

BIA funding and technical resources have been used to accomplish various wildfire mitigation efforts. In addition, FEMA’s website provides a page for grant and assistance programs for governments. Catalog of Federal Disaster Assistance (CFDA) numbers are provided to help find additional information on the CFDA website. The following programs expands upon those programs detailed in Chapter 5 of this LHMP Update.

#### Disaster-Specific Assistance Programs

- Community Disaster Loan Program (CDFA Number: 97.03)
  - ✓ Provides funds to any eligible jurisdiction in a designated disaster area that has suffered a substantial loss of tax and other revenue.
- Fire Management Assistance Grant Program (CDFA Number: 97.046)
  - ✓ Assistance for the mitigation, management, and control of fires on publicly or privately-owned forests or grasslands, which threaten such destruction as would constitute a major disaster.

- Hazard Mitigation Grant Program (CDFA Number: 97.039)
  - ✓ Provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. (States, localities and tribal governments; certain private-nonprofit organizations or institutions; authorized tribal organizations; and Alaska native villages or organizations via states)
- Public Assistance Grant Program (CDFA Number: 97.036)
  - ✓ Provides assistance to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President.
- Reimbursement for Firefighting on Federal Property (CDFA Number: 97.016)
  - ✓ Provides reimbursement only for direct costs and losses over and above normal operating costs.

### Hazard-Related Grants and Assistance Programs

- Community Assistance Program, State Support Services Element (CAP-SSSE) (CDFA Number: 97.023)
    - ✓ Provides funding to States to provide technical assistance to communities in the National Flood Insurance Program (NFIP) and to evaluate community performance in implementing NFIP floodplain management activities.
  - Flood Mitigation Assistance Program (CDFA Number: 97.029)
    - ✓ Provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The Tribe would need to become a member of the NFIP to be eligible for this assistance.
  - National Dam Safety Program (CDFA Number: 97.041)
    - ✓ Provides financial assistance to the states for strengthening their dam safety programs.
  - National Earthquake Hazards Reduction Program (NEHRP) (CDFA Number: 97.082)
    - ✓ Provides financial assistance to the states for strengthening their earthquake safety programs.
  - National Flood Insurance Program (CDFA Number: 97.022)
    - ✓ Enables property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages.
  - Pre-Disaster Mitigation Program (CDFA Numbers: 97.017)
    - ✓ Provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.
  - Repetitive Flood Claims Program (CDFA Number: 97.092)
    - ✓ Provides funding to States and communities to reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP. The Tribe would need to become a member of the NFIP and have repetitive flood damages to insured structures to be eligible for this assistance.
- Non-Disaster Programs

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (CDFA Numbers: 97.02, 97.021)
  - ✓ Supports programs designed to improve capabilities associated with oil and hazardous materials emergency planning and exercising.
- Cooperating Technical Partners (CDFA Number: 97.045)
  - ✓ Provides technical assistance, training, and/or data to support flood hazard data development activities.
- Emergency Food and Shelter Program (CDFA Number: 97.024)
  - ✓ Supplements the work of local social service organizations within the United States, both private and governmental, to help people in need of emergency assistance.
- Map Modernization Management Support (CDFA Number: 97.070)
  - ✓ Provides funding to supplement, not supplant, ongoing flood hazard mapping management efforts by the local, regional, or State agencies.
- Superfund Amendments and Reauthorization Act
  - ✓ Provides funding for training in emergency planning, preparedness, mitigation, response, and recovery capabilities associated with hazardous chemicals.

Table C-11 identifies other financial tools or resources that the NFR could potentially use to help fund mitigation activities.

*Table C-11 North Fork Rancheria's Fiscal Mitigation Capabilities*

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	N	
Community Development Block Grant	Y	Tribe has been awarded several Indian Community Development Block Grants from the U.S. Department of Housing and Urban Development. Projects include: Fire Station, Tribal TANF building, Tribal Transportation building, and Indian Housing Authority building.
Other federal funding programs	Y	FEMA Pre-Disaster Mitigation Planning Grant-awarded in 2017

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
State funding programs	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Plan development, and funding.		

Source: North Fork Rancheria

### C.6.4. Mitigation Education, Outreach, and Partnerships

Table C-12 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information. More information can be found below the table.

*Table C-12 North Fork Rancheria's Mitigation Education, Outreach, and Partnerships*

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	The tribe has an environmental program that is funded by US EPA. Training on emergency management is an allowable cost that must be identified in a workplan and budget that is approved by EPA. The environmental program may assist in future mitigation activities with other funding sources that identify activities in the workplan from funder.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	The tribe receives funding from the BIA for Community Fire Protection activities and education and outreach material is made available by environmental staff. Brochures and other reading material from Ready.gov and Madera County Public Health Department has been utilized as well as material received from partner organizations like the Red Cross, US Forest Service, and Yosemite Resources Conservation and Development Council booklet 'Living in the foothills'.
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Other	Y	The tribe has an environmental program that is funded by US EPA. Training on emergency management is an allowable cost that must be identified in a workplan and budget that is approved by EPA. The environmental program may assist in future mitigation activities with other funding sources that identify activities in the workplan from funder.
<b>How can these capabilities be expanded and improved to reduce risk?</b>		
Increase capacity with training, and funding.		

Source: North Fork Rancheria

### C.6.5. Other Mitigation Efforts

The NFR has other ongoing mitigation efforts that include the following:

- The Tribe has contracted with a firm to complete a stand-alone hazard mitigation plan for the NFR.

## C.7 Mitigation Strategy

The NFR will search for areas to incorporate the mitigation strategy of this plan into other planning mechanism. This will be fleshed out in greater detail during the creation of the stand-alone plan.

### C.7.1. Mitigation Goals and Objectives

The NFR adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

### C.7.2. NFIP Mitigation Strategy

The North Fork Rancheria does not participate in the NFIP.

### C.7.3. Mitigation Actions

The planning team for the NFR identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

#### *Action 1. Prescription Burning Projects*

---

**Hazards Addressed:** Wildfire



**Goals Addressed:** 1, 3, 4, 7

**Issue/Background:** Tribal Traditional Cultural Resource burning

**Project Description:** Develop community fuel reduction program that supports and implements tribal traditional cultural resource burning methods.

**Other Alternatives:** Instead of community wide, would be tribal focused, which isn't a landscaped approach.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Tribe currently working on MOU revision with US Forest Service (USFS), have partnerships with local resource development councils, non-profits, and tribal volunteer policy.

**Responsible Office/Partners:** Tribal Administration, USFS, Non-Profits, local resource conservation districts.

**Project Priority:** Medium

**Cost Estimate:** \$40,000

**Benefits (Losses Avoided):** Property, resources and life

**Potential Funding:** Grants

**Timeline:** Five plus years

***Action 2. Defensible Space Projects***

---

**Hazards Addressed:** Wildfire

**Goals Addressed:** 1, 3, 4, 7

**Issue/Background:** Current conditions have heavy fuel loads-tribal community at risk, located in the wildland urban interface

**Project Description:** Create defensible space for Tribal Elders, and vulnerable tribal community members.

**Other Alternatives:** No other alternatives (fuels become denser and risk increases)

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** Tribal Community Fire Protection Implementation policy, tribal supplies and equipment available.

**Responsible Office/Partners:** Tribal Administration, non-profit organization

**Project Priority:** High.

**Cost Estimate:** \$64,000

**Benefits (Losses Avoided):** Property, cultural and natural resources, and life.

**Potential Funding:** Grants, and tribal funds.

**Timeline:** 1-3 years.

***Action 3. Community Emergency Preparedness Meeting***

---

**Hazards Addressed:** Wildfire and Severe Weather

**Goals Addressed:** 1, 3, 4, 7

**Issue/Background:** Tribe has experienced wildfire and severe weather conditions and feels the need for education and outreach for the entire North Fork community.

**Project Description:** The tribe would coordinate a North Fork Community Preparedness Meeting twice per year regarding specific hazards community members will need to be prepared for.

**Other Alternatives:** Education and outreach booths at community events.

**Existing Planning Mechanism(s) through which Action Will Be Implemented:** The tribe has a tribal facility that could be used to host a meeting, existing staff support, existing education and outreach material, Community Emergency Response Training (CERT), and FEMA online course training curriculum.

**Responsible Office/Partners:** Tribal Administration, Red Cross, US Forest Service, Pacific Gas and Electric, Southern California Edison, and non-profit organizations.

**Project Priority:** High.

**Cost Estimate:** \$1,500

**Benefits (Losses Avoided):** Property, cultural and natural resources, and life.

**Potential Funding:** Grants, and tribal funds.

**Timeline:** 1-3 years.



## Appendix A Planning Process

### A.1 Lists of HMPC Invites/Stakeholders

*Table A-1 Initial LHMP Invite List*

Name	Jurisdiction	Title	Email
Adam Wimberly	CAL-TRANS	Area Supervisor	ada.wimberly@dot.ca.gov
Adrienne Calip	Human Resources		acalip@co.madera.ca.gov
Ahmad Alkhayyat	RMA		ahmad@co.madera.ca.gov
Alyssa Castaneda	County of Madera, Assessor	Assistant	Alyssa.Castaneda@co.madera.ca.gov
Ann Kloose	PG&E	Government Rep	ADK9@pge.com
Annette Gunter	Central Garage		annette.gunter@madera.ca.gov
Annette Presley	Behavioral Health		annette.presley@co.madera.ca.gov
Anthony Garcia	CAL-FIRE	Captain	anthony.garcia@fire.ca.gov
Ashley Ave	Valley Children's Hospital	Nurse	aave@valleychildrens.org
Becky Beavers	County Of Madera, Planning	Assistant	bbeavers@co.madera.ca.gov
Bonnie Hill	Animal Services		bonnie.hill@co.madera.ca.gov
Bonnie Thomas	Courts		bonnie.thomas@madera.courts.ca.gov
Brett Frazier	BOS - District 1	Board of Supervisor	brett.frazier@co.madera.ca.gov
Brian Esteves	City	Lieutenant	besteves@cityofmaderapd.org
Brittany Dyer	BOS - District 5	Aide	Brittany.dyer@co.madera.ca.gov
Bruce Lorimer	IT		bruce.lorimer@co.madera.ca.gov
Bryant Torres	Building Maintenance		btorres@co.madera.ca.gov
Cassandra Gray	City of Chowchilla, Public Works	Assistant	cgray@cityofchowchilla.org
Cecilia Massetti	Madera County Office of Education		cmassetti@maderacoe.us
Charles Contreras	Madera Irrigation District		ccontreras@madera-id.org
Chris Childers	Probation		cchilders@co.madera.ca.gov
Christina McDonald	North Fork Rancheria		cmcdonald@northforkrancheria-nsf.gov
Christopher Ferbrache	Sierra Ambulance	Paramedic	ferb@sierraambulance.org
Cindy Avila	Animal Services		cavila@co.madera.ca.gov
Cody Wheeler	Sierra National Forest	Captain	ccwheeler@fs.fed.us

Name	Jurisdiction	Title	Email
Cooper Foust	Sierra National Forest	Officer	cfouch@fs.fed.us
Craig Hinch	Oakhurst CHP		chinch@chp.ca.gov
Curtis Jack	Fresno EMS	Paramedic	cjack@co.fresno.ca.us
Dale E. Bacigalupi	County Council		dbacigalupi@lozanosmith.com
Dan Lynch	Fresno EMS	Paramedic	dlynch@co.fresno.ca.us
Daniel Stevenson	CA Department of Fish and Wildlife	Captain	daniel.stevenson@wildlife.ca.gov
Daniel Tune	Sierra National Forest	Battalion Chief	dtune@fs.fed.us
Danny Morris	Social Services		dan.morris@co.madera.ca.gov
Darin Cline			darin.cline@co.madera.ca.gov
Darin McCandless	Deputy CAO		darin.mccandless@co.madera.ca.gov
Dario Dominguez	RMA		dario.dominguez@co.madera.ca.gov
Dario Dominguez	County Of Madera, Flood Manager		dario.dominguez@co.madera.ca.gov
Darren Long	Madera CHP		dlong@chp.ca.gov
Dave Randall	City of Madera		drandall@cityofmadera.org
David Allen	Madera County Fire	Division Chief	david.allen@co.madera.ca.gov
David Linn	District Attorney's Office	District Attorney	david.lynn@co.madera.ca.gov
David Rogers	BOS - District 2	Board of Supervisor	david.rogers@co.madera.ca.gov
Deborah Mahler	Fire Marshal		deborah.mahler@co.madera.ca.gov
Dennis Koch	Behaviorial Health		dennis.koch@co.madera.ca.gov
Dennis Smithson	Governors Office Cal OES Region V		dennis.smithson@caloes.ca.gov
Dexter Marr	Environmental Health		dmarr@co.madera.ca.gov
Edward Guzman	Sierra Ambulance	Paramedic	edwardg@sierraambulance.org
Eric Fleming	Adminstrative Officer		eric.fleming@co.madera.ca.gov
Ethan Jackson	Oakhurst CHP		ejackson@chp.ca.gov
Gary Svanda	Assessor	Elected	gary.svanda@co.madera.ca.gov
Glenna Jarvis	BOS - District 2	Aide	glenna.jarvis@co.madera.ca.gov
Harry Hinton	Building Department	Building Offical	harry.hinton@co.madera.ca.gov
Harry Turner	City of Chowchilla Fire Department	Chief	hturner@cityofchowchilla.gov
Heidi Sonzena	Social Services		heidi.sonzena@co.madera.gov
Heidi Wong	Ag Commissioner		heidi.wong@co.madera.ca.gov
James Followill	Madera County Jail	Sergeant	jfollowill@co.madera.ca.gov
James Forga	Madera County Fire	Battalion Chief	james.Forga@co.madera.ca.gov
Jay Varney	Sheriff/OES	Sheriff	jvarney@co.madera.ca.gov
Jeff McCarroll	CAL-FIRE	Battalion Chief	jeff.mccarroll@fire.ca.gov

Name	Jurisdiction	Title	Email
Jerry King	Corrections		gking@co.madera.ca.gov
Jerry Salinas	Courts		jerry.salinas@madera.court.ca.gov
Jess Wishan	American Red Cross		jess.wishan@redcross.org
Joel Bugay	Deputy CAO		joel.bugay@co.madera.ca.gov
Jose Pantoja	Probation		jpantoja@co.madera.ca.gov
Julia Berry	Water And Natural Resouces Department	Director	julia.berry@co.madera.ca.gov
Julie Morgan	Behaviorial Health		julie.morgan@co.madera.ca.gov
Katie Parra	North Fork Rancheria		kparra@nfs-nsn.gov
Katrina Poitras	American Red Cross		katrina.poitras@redcross.org
Keith Helmuth			khelmuth@cityofmadera.org
Kelly Woodard	Social Services		kwoodard@co.madera.ca.gov
Ken Vang	Environmental Health		ken.vang@co.madera.ca.gov
Kevin Packard	Mariposa County Sheriff's Office	Sergeant	kpackard@mariposacounty.org
Kim Linderholm	Madera County Office of Education		klinderholm@maderacoe.us
Kristen Gross	Animal Services		kgross@co.madera.ca.gov
Lance Hoffrage	Pistoresi Ambulance	Paramedic	lance@pistoresiambulance.com
Leonard Williams			leonard.williams@co.madera.ca.gov
Leticia Gonzalez	BOS - District 3	Aide	leticia.gonzalez@co.madera.ca.gov
Lincoln McKenna	Madera CHP		lmckenna@chp.ca.gov
Lloyd Prat	Madera CHP		lprat@chp.ca.gov
Margie Hernandez	Auditor/Controller		margie.hernandez@co.madera.ca.gov
Maria Miranda	General Services		maria.miranda@co.madera.ca.gov
Maria Miranda	Assessor	Staff	Maria.Miranda@co.madera.ca.gov
Marisol Torres	Public Health		marisol.torres@co.madera.ca.gov
Mark Smith	Sierra National Forest	Battalion Chief	mssmith@fs.fed.us
Mark Taylor	Central Garage		mataylor@co.madera.ca.gov
Mary Jo Quintero	Valley Children's Hospital	Nurse	mquintero@valleychildrens.org
Matthew Sharper	Governors Office Cal OES Region V		matthew.scharper@caloes.ca.gov
Matthew Treber	Planning Department		matthew.treber@co.madera.ca.gov
Matthew Watson	Madera County Fire	Battalion Chief	matt.watson@co.madera.ca.gov
Mattie Mendez	Community Action Partnership of Madera County	Department Head	Mattie.Mendez2@co.madera.ca.gov
Maunel Perez	Corrections		maperez@co.madera.ca.gov

Name	Jurisdiction	Title	Email
Max Rodriguez	BOS - District 4	Board of Supervisor	maxr@co.madera.ca.gov
Michael Chiusano	IT		michael.chiusano@co.madera.ca.us
Michael Gonzalez	Corrections		mgonzalez@co.madera.ca.gov
Michele May	Human Resources		michele.may@co.madera.ca.gov
Mike Motz	Civil Division		mmotz@co.madera.ca.gov
Mike Suber	Madera County Fire	Battalion Chief	mike.suber@co.madera.ca.gov
Monica Roath	Environmental Health		monica.roath@co.madera.ca.gov
Myriam Alvarez	Public Health		myriam.alvarez@co.madera.ca.gov
Nancy Koerperich	CAL-FIRE	Unit Chief	nancy.koerperich@fire.ca.gov
Naomi Flam	Central Valley Animal Evacuation Team	Owner	naomiflam@ccadt.org
Neal Pearson	Valley Children's Hospital	Nurse	npearson@valleychildrens.org
Nick Lidgett	RDMHS Region 5	Paramedic	lidgett@co.kern.ca.us
Norm Allinder	Community & Economic Development		norm.allinder@co.madera.ca.gov
Pat Clark	CA Department of Water Resources		patricia.clark@water.ca.gov
Patrick Fitzgerald			Patrick.Fitzgerald@co.madera.ca.gov
Patti Tran	Governors Office Cal OES Region V		patti.tran@caloes.gov
Philip Toler	RMA		philip.toler@co.madera.ca.gov
Raymond Huerta	Building Maintenance		rhuerta@co.madera.ca.gov
Rebecca Martinez	Recorder-Clerk		rmartinez@co.madera.ca.gov
Regina A. Garza	County Council		rgarza@lozanosmith.com
Rhonda Cargill	BOS - District 1	Aide	rhonda.cargill@co.madera.ca.gov
Rick Dupree	Probation		rdupree@madera-county.com
Robert Carranza	Pistoresi Ambulance	Paramedic	rcarranza@pistoresiambulance.com
Robert Pitts	Sierra Ambulance	Paramedic	rpitts@sierraambulance.org
Robert Poythress	BOS - District 3	Board of Supervisor	robert.poythress@co.madera.ca.gov
Robin Bravo	City of Madera		rbravo@cityofmadera.org
Roseann Ruiz	Human Resources		rruiz@co.madera.ca.gov
Sandy Morehouse	American Red Cross		sandy.morehouse@redcross.org
Scott G. Cross	County Council		scross@lozanosmith.com
Sean Smith	Madera Irrigation District		ssmith@madera-id.org
Shannon Muller			scmueller@ucanr.edu
Stephanie McNeill	Ag Commissioner		stephanie.mcneill@co.madera.ca.gov

Name	Jurisdiction	Title	Email
Steve Carney	Madera County Office of Education		scarney@maderacoe.us
Steve Fraizer	City of Madera, Police Department	Chief	sfrazier@cityofmaderapd.org
Steve Monk	Ag Commissioner		steven.monk@co.madera.ca.gov
Steven Vonflue	Central Garage		steve.vonflu@co.madera.ca.gov
Tania Say	IT		tania.say@co.madera.ca.gov
Ted Pistoresi	Pistoresi Ambulance	Paramedic	ted@pistoresiambulance.com
Terrance Carter	County of Madera, Public Health	Assistant	Terrance.carter@co.madera.ca.gov
Todd Miller	Auditor/Controller		todd.miller@co.madera.ca.gov
Tom Wheeler	BOS - District 5	Board of Supervisor	tom.wheeler@co.madera.ca.gov
Tracy Kennedy	Treasurer		tkennedy@co.madera.ca.gov
Troy Cheek	CAL-FIRE	Battalion Chief	troy.cheek@fire.ca.gov
Tyson Pogue	Sheriff/OES	Commander	tpogue@co.madera.ca.gov
Van Do-Reynoso	Public Health		van.doreynoso@co.madera.ca.gov
Vance Killion	CAL-FIRE	Captain	vance.killion@fire.ca.gov
Vicki West			v.est@csa20ca.org
Victoria Cantu	Auditor/Controller		victoria.cantu@co.madera.ca.gov
Wendy Silva	City of Madera, Department of Human Resources	Director	wsilva@cityofmadera.com
	Assessor's Office		Assessor@co.madera.ca.gov
	Library		libraryglobaldistro@co.madera.ca.gov
	Public Guardian		public.guardian@co.madera.ca.gov

**Table A-2 HMPC Participant List**

Name	Jurisdiction	Title	Email
Ahmad Alkhayyat	RMA		ahmad@co.madera.ca.gov
Alyssa Castaneda	County of Madera, Assessor	Assistant	Alyssa.Castaneda@co.madera.ca.gov
Becky Beavers	County Of Madera, Planning	Assistant	bbeavers@co.madera.ca.gov
Brian Esteves	City	Lieutenant	besteves@cityofmaderapd.org
Celeste Gray	Chowchilla Public Works		cgray@cityofchowchilla.org
Chris Boyle	City of Madera		cboyle@cityofmadera.com
Cindy Avila	Animal Services		cavila@co.madera.ca.gov

Name	Jurisdiction	Title	Email
Cynthia Jones	Madera County	Treasurer/Tax Collection	cynthia.jones@co.madera.ca.gov
Daniel Stevenson	CA Department of Fish and Wildlife	Captain	daniel.stevenson@wildlife.ca.gov
Dario Dominguez	County of Madera	Flood Manager	dario.dominguez@co.madera.ca.gov
Dave Randall	City of Madera		drandall@cityofmadera.com
David Allen	Madera County Fire	Division Chief	david.allen@co.madera.ca.gov
David Hall	AENG		david.1.hall143.mil@mail.mil
David Riviero	Chowchilla Police		driviero@cityofchowchilla.org
Dennis Koch	Behavioral Health		dennis.koch@co.madera.ca.gov
Dino Lawson	Madera Police Dept.		dlawson@cityofmaderapd.org
Dexter Marr	Environmental Health		dmarr@co.madera.ca.gov
Eugene Haynes	City of Madera		ehaynes@cityofmadera.com
Gary Svanda	Assessor	Elected	gary.svanda@co.madera.ca.gov
Harry Turner	City of Chowchilla Fire Department	Chief	hturner@cityofchowchilla.gov
James Followill	Madera County Jail	Sergeant	jfollowill@co.madera.ca.gov
Jay Varney	Sheriff/OES	Sheriff	jvarney@co.madera.ca.gov
Katie Parra	North Fork Rancheria		kparra@nfs-nsn.gov
Katrina Poitras	American Red Cross		katrina.poitras@redcross.org
Keith Helmuth			khelmuth@cityofmadera.org
Kim Linderholm	Madera County Office of Education		klinderholm@maderacoe.us
Kristen Gross	Animal Services		kgross@co.madera.ca.gov
Marisol Torres	Public Health		marisol.torres@co.madera.ca.gov
Mary Church	City of Madera	Public Works	mchurch@cityofmadera.com
Matthew Watson	Madera County Fire	Battalion Chief	matt.watson@co.madera.ca.gov
Mike Suber	Madera County Fire	Battalion Chief	mike.suber@co.madera.ca.gov
Myriam Alvarez	Public Health		myriam.alvarez@co.madera.ca.gov
Nancy Koerperich	CAL-FIRE	Unit Chief	nancy.koerperich@fire.ca.gov
Patrick Fitzgerald			Patrick.Fitzgerald@co.madera.ca.gov
Patti Tran	Governors Office Cal OES Region V		patti.tran@caloes.gov
Paula Nunez	City of Madera		pnunez@cityofmadera.com
Philip Toler	RMA		philip.toler@co.madera.ca.gov
Rick Dupree	Probation		rdupree@madera-county.com
Robin Bravo	City of Madera		rbravo@cityofmadera.org
Sandy Morehouse	American Red Cross		sandy.morehouse@redcross.org
Scott G. Cross	County Counsel		scross@lozanosmith.com



Name	Jurisdiction	Title	Email
Stephanie McNeill	Ag Commissioner		stephanie.mcneill@co.madera.ca.gov
Stephanie Stoecked	Madera County	Probation	sstoecked@co.madera.ca.gov
Steve Fraizer	City of Madera, Police Department	Chief	sfrazier@cityofmaderapd.org
Tania Say	IT		tania.say@co.madera.ca.gov
Terrance Carter	County of Madera, Public Health	Assistant	Terrance.carter@co.madera.ca.gov
Tyson Pogue	Sheriff/OES	Commander	tpogue@co.madera.ca.gov
Walt Kent	Cal OES		walt.kent@caloes.ca.gov

## A.2 Website for Hazard Mitigation Plan

HOME | I WANT TO: | ONLINE SERVICES | COUNTY FORMS | BOARD OF SUPERVISORS | DEPARTMENTS | JOBS | VISITORS

**County of Madera**  
California

MONDAY, OCT 02, 2017

Adjust Font Size

**County News**

- Animal Services Making Great Progress
- NEW RED CROSS EMERGENCY SHELTER LOCATIONS FOR DETWILER FIRE
- Cooling Centers 2017
- Recent Newsletter

**Site Navigation**

- Home
- Contacts
- County Calendar
- Employment Opportunities
- About Madera County
- Press Releases
- County Facilities Map
- Bid Opportunities
- Property Search & County Maps Online
- Building Permits
- County News
- County Code
- Enterprise System Catalog
- Government Compensation in California
- Staff Spotlights

**Madera County 2017 Local Hazard Mitigation Plan Update**

FEMA defines Hazard Mitigation as any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Hazard mitigation planning is a process for state and local governments to identify community-level policies and actions to mitigate and thus reduce the impacts of natural hazards

Madera County is partnering with the cities of Chowchilla and Madera and several special districts to update their 2011 Local Hazard Mitigation Plan (LHMP). Flood, drought, earthquake, and wildfire are just a few of the hazards to the Madera communities. While natural hazards such as these cannot be prevented, an LHMP forms the foundation for a community's long-term strategy to reduce disaster losses by breaking the repeated cycle of disaster damage and reconstruction. Communities with a FEMA- approved LHMP are eligible for FEMA pre- and post-disaster grant funding and are better positioned to respond and recover when disasters occur.

**2011 MADERA COUNTY AND CITY OF CHOWCHILLA LHMPs**

**Link to Madera County LHMP** <http://www.madera-county.com/index.php/county-forms/category/396-oes-documents>

**Link to Chowchilla LHMP** [http://hazardmitigation.calema.ca.gov/docs/approved\\_lhmps\\_under\\_2008\\_fema\\_guidance/Chowchilla\\_%20LHMP\\_2011.pdf](http://hazardmitigation.calema.ca.gov/docs/approved_lhmps_under_2008_fema_guidance/Chowchilla_%20LHMP_2011.pdf)

**OPPORTUNITIES FOR INPUT**

\*Public Review Document. The files below are the draft of the 2017 Local Hazard Mitigation Plan. Those wanting to provide comment on this

## A.3 Kickoff Meeting

### A.3.1. Kickoff Meeting Invite to Stakeholders

**Joseph Wilder**

---

**From:** Joseph Wilder  
**Sent:** Friday, March 10, 2017 3:40 PM  
**Subject:** Local Hazard Mitigation Plan Meeting  
**Attachments:** LHMP E-Mail Invite.pdf

Hello,

The Sheriff's Office of Emergency Services (Sheriff's OES) is kicking off efforts to develop a Local Hazard Mitigation Plan (LHMP) Update for the County, City of Madera, City of Chowchilla and participating jurisdictions. The purpose of the LHMP Update process is to help reduce the impacts of natural hazards to the citizens, property, and critical infrastructure in the County. The Disaster Mitigation Act of 2000 (DMA 2000) requires that local governments have a FEMA-approved LHMP in place in order to be eligible for certain pre- and post-disaster mitigation funding utilized to protect communities from future disaster-related losses. You are receiving this notice because we would like to invite you to take part in this plan update as a member of the Hazard Mitigation Planning Committee (HMPC).

County, city, district and other agency participation and coordination is a requirement of an approved plan, as is the inclusion of any hazard data, information, and mitigation projects your department or agency may want to see included in the plan. Thus, your participation in this process is important and encouraged. Your input will be critical to the success of this project. Participation includes:

- Attending and participating in the HMPC meetings (4 anticipated over the next 6 months)
- Providing available data/information requested of the HMPC
- Reviewing and providing comments on the plan drafts

Sheriff's OES is taking the lead on coordinating this planning project. A project kickoff meeting will be held at the following location and time:

**Thursday, March 16, 2017, 9:00am to 11:30am**  
Madera County Emergency Operations Center at Sheriff's Headquarters  
2725 Falcon Drive  
Madera, CA 93637

The kickoff meeting will explain the process and how you can be involved. An earlier kick off meeting was held with local stakeholders last year. This meeting will be held with the Contractor selected to complete the plan for the county. A public stakeholder meeting will also be held the evening before the kickoff meeting.

Please RSVP and/or request additional information, please contact OES Sergeant Joseph Wilder at (559)-675-7770 Extension 231 or email at [jwilder@co.madera.ca.gov](mailto:jwilder@co.madera.ca.gov).

Thanks,

Joseph Wilder  
Sergeant

### **A.3.2. Kickoff Meeting Agenda**

**MADERA COUNTY  
LOCAL HAZARD MITIGATION PLAN (LHMP) UPDATE  
HMPC (KICKOFF) MEETING #1  
March 16, 2017**

1. Introductions
2. Hazard Mitigation & the Disaster Mitigation Act Planning Requirements
3. The Role of the Hazard Mitigation Planning Committee (HMPC)
4. Planning for Public Input
5. Coordinating with other Agencies
6. Hazard Identification
7. Schedule
8. Data Needs
9. Questions and Answers

A.3.3. Kickoff Meeting Sign-in Sheets

SIGN-IN SHEET  
Madera County  
LOCAL HAZARD MITIGATION PLANNING PROJECT  
County Meeting #1  
March 16, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Jeanine Foster	jeanine.foster@foster-morrison.com	303 717-7171	Foster Morrison
Mike Sorber	Mike.Sorber@fire.ca.gov	559-232-9254	Madera County Fire
Mansol Torres	mansol.torres@madera.sage1.com	675-7893	MCPHD
Tyson Pogue	tpogue@co.madera.ca.gov	559-675-7770	Slonith
Myriam Alvarez	myriam.alvarez@co.madera.ca.gov	559-675-7893	MCPHD
Cynthia Jones	cynthia.jones@co.madera.org	559-675-7773	Treasurer-Tax Collection
GARY Svarida	Gary.Svarida@Co.Madera.Ca.gov	559-675-7770	Madera Assessor's Office County
Wendy Silva	w.silva@cityofmadera.com	461-5481	City of Madera
Eugene Hayes	e.hayes@cityofmadera.com	461-5477	" "
Kirsten Gross/Director	kgross@madera-county.com	675-7891	Animal Services
Denise Koch/Print	denise.koch@co.madera.ca.gov	675-3805	Behavioral Health
Lance Say	Lance.Say@co.madera.ca.gov	461-5267	IT
Sandy Morehouse	Sandra.Morehouse@redcross.org	209 769 6693	Red Cross

SIGN-IN SHEET  
Madera County  
LOCAL HAZARD MITIGATION PLANNING PROJECT  
County Meeting #1  
March 16, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Patrick Fitzgerald / Librarian	patrick.fitzgerald@madera countylibrary.org	551-675-7871	Library
Matt Watson	Matt.Watson@fire.ca.gov	559-232-9257	Fire
Rick Dupree	rdupree@madera-county	675-7739	Prob
Stephanie Stoedek	sstoedek@madera-county	675-7739	Prob
Agnes Turner, Fire Chief	firechief@madera-county	675-7739	Fire
Philip Todd, District Mgr	philip.todd@madera-county.ca.gov	675-7811	Madera County Public works
Steve Frazier	sfrazier@cityofmadera.gov	675-4201	City
Stavis McNeil	stavis.mcneil@madera-county	675-7876	County
Scott Cross	scross@lozanesmith.com	431-5600	County Counsel
Patti Tran	patti.tran@caloes.ca.gov	916-709-3497	Cal OES
Chris Boyle	cboyle@cityofmadera.com	661-5433	City of Madera
D. STEVENSON, CAPT	PAWEL.STEVENSON@CA.GOV	967-4511	CDFW
DAVE REVERE, CAPT	driviere@cityofchowchilla.org	(559) 605-8600 (559) 479-0058	CHOWCHILLA P.O.

**SIGN-IN SHEET**  
**Madera County**  
**LOCAL HAZARD MITIGATION PLANNING PROJECT**  
**County Meeting #1**  
**March 16, 2017**

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Keith Helmuth Jay Varney	City Engineer kheilmu@cityofmadera.com jvarney@co.madera.ca.gov	661-5418 675-7777	City of Madera MCSO
DAVID HALL	david.l.hall143.mil@mail.mil	997-1797	AENG
Katie M Parra	kparra@NRE-NSN.gov	877-2461x321	NORTH FORK Kancheria-of-Mono-Indians
Mary Church	mchurch@cityofmadera.com	661-5466	City of Madera - Public Works

## A.4 Risk Assessment & Mitigation Strategy Meetings

### A.4.1. Email Invites to Risk Assessment and Mitigation Strategy Meetings

**Joseph Wilder**

---

**From:** Joseph Wilder  
**Sent:** Tuesday, May 23, 2017 2:59 PM  
**Subject:** LHMP - Planning Meeting

Madera County Local Hazard Mitigation Plan (LHMP) Update- Risk Assessment and Mitigation Strategy Meetings Invite:

You are invited to the second set of planning team meetings for the development of Madera County's LHMP Update. In March of 2017 the Madera County kicked-off its hazard mitigation planning effort with consultants Foster Morrison. Over the past few months, Foster Morrison have been working to collect data to inform Chapter 4 of our LHMP, the Risk Assessment and to develop the jurisdictional annexes for participating jurisdictions.

These upcoming meetings will be held on June 1 & 2, and will begin the most important phase of our LHMP planning process – the Mitigation Strategy. During the first meeting, we will be reviewing the risk assessment data developed to date and will be looking for your feedback in refining and adding to this in-process Risk Assessment Chapter. During the second meeting, the planning team will be working to identify and evaluate potential mitigation actions for reducing the community's risk and vulnerability to natural hazards and disasters.

The meetings will be held as follows:

Thursday, June 1 at the Madera County Emergency Operations Center at Sheriff's Headquarters (2725 Falcon Drive, Madera, CA 93637) from 9am to 12pm.

Friday, June 2 at the Madera County Emergency Operations Center at Sheriff's Headquarters (2725 Falcon Drive, Madera, CA 93637) from 9am to 12pm.

Please RSVP and plan on attending or delegating attendance to these important meetings. Everyone with mitigation project ideas should attend. County, city and agency participation and coordination is a requirement of an approved plan, as is the inclusion of any hazard data, information, and mitigation projects your department or agency may want to see included in the plan. Thus, your participation in this process is important and encouraged. Your input will be critical to the success of this project.

If you have any questions please feel free to contact me.

Thanks,

JW

**Joseph Wilder**  
**Sergeant**

**Office of the Sheriff**  
**County of Madera**

**Madera Headquarters**  
**2725 Falcon Drive | Madera, CA 93637 | Phone: (559)-675-7770**

**Oakhurst Substation**  
**48267 Liberty Drive | Oakhurst, CA 93644 | Phone: (559)-642-3201**

**Dispatch Center: 1-800-560-4911**





## **A.4.2. Mitigation Strategy Meeting Agenda**

### **Madera County Local Hazard Mitigation Plan (LHMP) Update Mitigation Strategy Meetings June 1 & 2, 2017**

#### **HMPC Meeting #2:**

1. Introductions
2. Status of the DMA Planning Process
3. Risk Assessment Update
4. Outstanding Items
5. Develop Updated Plan Goals and Objectives
6. Identify and Review Mitigation Alternatives/Projects

#### **HMPC Meeting #3:**

7. Introductions
8. Identify and discuss Mitigation Alternatives/Projects
9. Review Mitigation Selection Criteria
10. Prioritize Mitigation Projects
11. Mitigation Action Worksheet
12. Review of Schedule/Next Steps

A.4.3. Mitigation Strategy Meeting Sign in Sheets

**SIGN-IN SHEET**  
**Madera County**  
**LOCAL HAZARD MITIGATION PLANNING PROJECT**  
**HMPC Mitigation Strategy Meeting #2**  
**June 1, 2017**

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Jeanine Foster, PM	jeanine.foster@foster-morrison.com	303 717-7171	Foster Morrison
Kim Kinderholm	Kinderholm@madera.ca.us	662-6295	Madera Co. Office of Ed.
Paati Tran	paati.tran@caloes.ca.gov	9167093497	Cal OES
Katie Parra-EPD	kparra@nr-nsn.gov	559-877-2461	NORTH FORK Branch of Mono Indians of CA
Buck Beavers, Jan Plummer	bbeavers@madera-county.com	675-7821	Planning
Alyssa Costureda OAD	alyssa.costureda@ca.gov	675-7710	Assessor
Anna Turner Fire Chief	aturner@cityofhachabog	647-5069	Chow Fire
MARISOL TORRES, HES	marisol.torres@madera.ca.gov	675-7893	Madera Co. Public Health
KATRINA ROIBERS	Katrina.Roibers@wellness.org	907-2111	Red Cross
Myriam Alvarez	myriam.alvarez@ca.gov	675-7893	MC PHD
Terrance Carter	terrance.carter@co.madera.ca.gov	675-7893	MCPHD
Steve Frazier	sfrazier@cityofmadera-plor	675-4101	city of medra
Dave Raudell	draudell@cityofmadera.com	661-5461	"

SIGN-IN SHEET  
Madera County  
**LOCAL HAZARD MITIGATION PLANNING PROJECT**  
**HMPC Mitigation Strategy Meeting #2**  
June 1, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Keith Helmoth	khelmoth@cityofmadera.com	559-661-5418	City of Madera
Wendy Silva	w.silva@cityofmadera.com	661-5481	City of Madera
Paula Nunez	pnunez@cityofmadera.com	661-5412	City of Madera
Jim Fowowile	5fowowile@ccn	827-2249	MADERA SOC
Dario Dominguez	dario.dominguez@madera.ca.gov		MAD. CO. FIRE CONTROL
Gary Suzuki		3603-9210	MAD. CO. ASSESSOR
Jay Varney	jvarney@co.madera.ca.gov	675-7777	MCSO
Ahmad Alkhatib	ahmad@co.madera-county.ca.gov	675-7811	MCPW
Dexter Mann	dmanr@co.madera.ca.gov	675-823	E HFD



SIGN-IN SHEET  
Madera County  
LOCAL HAZARD MITIGATION PLANNING PROJECT  
HMPC Mitigation Strategy Meeting #3  
June 2, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Terrance Carter	terrance.carter@co.madera.ca.gov	675-7893	MCPHD
Jim Followill	JFollowill@co.madera.ca.gov	675-7955	DOC
BRIAN ESTEVES/L.T.	BESTAVES@CITYOFMADRIDCA.ORG	675-41234	MADERA P.D.
DARIO DOMINGUEZ		675-7811	MADERA FLOOD
Dexter Mcwr	dmarc@co.madera.ca.gov	675-7823	EMD

SIGN-IN SHEET  
Madera County  
LOCAL HAZARD MITIGATION PLANNING PROJECT  
HMPC Mitigation Strategy Meeting #3  
June 2, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Jeanine Foster / PM	jeanine.foster@fostermorrison.com	303 717-7171	Foster Morrison
Celeste Gray	C.Gray@cityofmadera.org	559.667.8015	Public Works
Harry Turner / Fire Chief	hturner@cityofmadera.org	559.617-5009	Fire
Paula Nunez / HR Technician	Pnunez@cityofmadera.com	559-661-5412	City of Madera
Kim Linderholm	klinderholm@mglanorae.us	662-6295	Madera Co. Affected
Gary Susunda		363-9210	Madera Co. Assessor
Robin Bravo	rbravo@cityofmadera.com	559-662-4936	City of Madera
Keith Helms	keith@cityofmadera.com	661-5418	"
Alyssa Castaneda	alyssa.castaneda@ca.gov	675-7110	Assessor
Katie Parra	kparra@ca.gov	877-2461	NORTH FORK PACIFIC
Patricia Tran	ptran@caloes.ca.gov	916 907 3497	Cal OES
Munisol Torres	munisol.torres@cityofmadera.org	675-7893	MCPHD
Myriam Alvarez	myriam.alvarez@cityofmadera.ca.gov	675-7893	MCPHD

## A.5 Final Team Meeting

### A.5.1 Final Team Meeting Invite

From: Joseph Wilder [mailto:jwilder@co.madera.ca.gov]  
Sent: Thursday, September 14, 2017 4:47 PM  
To: Joseph Wilder <jwilder@co.madera.ca.gov>  
Cc: Jeanine Foster <jeanine.foster@fostermorrison.com>; Adrienne Calip <acalip@co.madera.ca.gov>; Ahmad Alkhayyat <ahmad@co.madera.ca.gov>; Darin McCandless <darin.mccandless@co.madera.ca.gov>; Darrin Cline <Darrin.Cline@co.madera.ca.gov>; David Allen <david.allen@co.madera.ca.gov>; David Linn <david.linn@co.madera.ca.gov>; Deborah Mahler <deborah.mahler@co.madera.ca.gov>; Dennis Koch <dennis.koch@co.madera.ca.gov>; Dexter Marr <DMarr@co.madera.ca.gov>; Eric Fleming <eric.fleming@co.madera.ca.gov>; Gary Svanda <gary.svanda@co.madera.ca.gov>; Harry Hinton <Harry.Hinton@co.madera.ca.gov>; Jay Varney <JVarney@co.madera.ca.gov>; Joel Bugay <Joel.Bugay@co.madera.ca.gov>; Julia Berry <Julia.Berry@co.madera.ca.gov>; Kelly Woodard <kwoodard@co.madera.ca.us>; Kirsten Gross <KGross@co.madera.ca.gov>; Leonard Williams <leonard.williams@co.madera.ca.gov>; Manuel Perez <maperez@co.madera.ca.gov>; Maria Miranda <maria.miranda@co.madera.ca.gov>; Matt Watson <matt.watson@co.madera.ca.gov>; Matthew Treber <matthew.treber@co.madera.ca.gov>; Mattie Mendez <mattie.mendez2@co.madera.ca.gov>; Nancy Koerperich <nancy.koerperich@fire.ca.gov>; Norman Allinder <norm.allinder@co.madera.ca.gov>; Patrick Fitzgerald <Patrick.Fitzgerald@co.madera.ca.gov>; Rebecca Martinez <martinez@co.madera.ca.gov>; Regina Garza <Regina.Garza@co.madera.ca.gov>; Rhonda Cargill <rhonda.cargill@co.madera.ca.gov>; Rick Dupree <RDupree@madera-county.com>; Shannon Mueller <scmueller@ucanr.edu>; Stephanie McNeill <stephanie.mcneill@co.madera.ca.gov>; Steve VonFlue <steve.vonflue@co.madera.ca.gov>; Tania Say <tania.say@co.madera.ca.gov>; Todd Miller <Todd.Miller@co.madera.ca.gov>; Tracy Kennedy <TKennedy@co.madera.ca.gov>; Van Do-Reynoso <van.doreynoso@co.madera.ca.gov>; Vicki West <v.west@csa20ca.org>; Myriam Alvarez <myriam.alvarez@co.madera.ca.gov>; Kevin Packard <kpackard@mariposacounty.org>; Adam Wimberly <adam.wimberly@dot.ca.gov>; Ann Kloose <ADK9@pge.com>; Anthony Garcia (Out) <Anthony.garcia@fire.ca.gov>; Brittany Dyer <Brittany.Dyer@co.madera.ca.gov>; Charles Contreras <ccontreras@madera-id.org>; Chris Ferbrache <ferb@sierraambulance.org>; Cody Wheeler <ccwheeler@fs.fed.us>; Cooper Foust <cfouch@fs.fed.us>; Curtis Jack, EMTP <cjack@co.fiesno.ca.us>; Daniel Tune <dtune@fs.fed.us>; Danny Stevenson <Daniel.Stevenson@wildlife.ca.gov>; David Allen (Out) <david.allen@fire.ca.gov>; Dennis Smithson <dennis.smithson@caloes.ca.gov>; Ed Guzman <edwardg@sierraambulance.org>; Jeff McCarroll <Jeff.McCarroll@fire.ca.gov>; Poitras, Katrina <Katrina.Poitras@redcross.org>; Kim Linderholm <klinderholm@maderacoe.us>; Mark Smith <mssmith@fs.fed.us>; Naomi Flam <naomiflam@ccadt.org>; Pat Clark <Patricia.Clark@water.ca.gov>; Patti Tran <Patti.Tran@CalOES.ca.gov>; Sean Smith <ssmith@madera-id.org>; Troy Cheek <Troy.Cheek@fire.ca.gov>; Christina McDonald <cmcdonald@northforkrancheria-nsn.gov>; Harry Turner <HTURNER@cityofchowchilla.org>; Wendy Silva <wsilva@cityofmadera.com>; Tyson Pogue <tpogue@co.madera.ca.gov>; DepartmentHeadDistro <DepartmentHeadDistro@co.madera.ca.gov>; Dario Dominguez <dario.dominguez@co.madera.ca.gov>; kparra@nfs-nsn.gov; Becky Beavers <BBeavers@co.madera.ca.gov>; Alyssa Castaneda <Alyssa.Castaneda@co.madera.ca.gov>; Terrance Carter <terrance.carter@co.madera.ca.gov>; sfrazier@cityofmaderapd.org; drandall@cityofmadera.org; khelmuth@cityofmadera.com; pnunez@cityofmadera.com; James Followill <jfollowill@co.madera.ca.gov>; besteves@cityofmaderapd.org; cgray@cityofchowchilla.org; rbravo@cityofmadera.com; Vance.Killion@fire.ca.gov  
Subject: LHMP Final Meeting

Hello Everyone,

Please see below information on the final steps for our LHMP Update:

Please see below information on the final steps for our LHMP Update:

**LHMP Public Review Draft and Public Meeting.** The LHMP Public Review Draft is up on the County website for public review and comment at: <http://www.madera-county.com/index.php/lhmp>. Copy have also being placed at county library for review as well. A public meeting on the Draft LHMP Update will be held Thursday, September 21 from 6-7:30 pm at the Madera County Emergency Operations Center at Sheriff's Headquarters 2725 Falcon Drive in Madera. A press release is being issued by the County. Please help get the word out to the public in your area.

**Final HMPC Meeting.** Also, our final planning team meeting is scheduled for Friday September 22 from 9 – 11 am, also at the Madera County Emergency Operations Center at the Sheriff's Headquarters. See attached agenda. It is important that everyone attend this final meeting to address any public comments received and to finalize all input to the plan.

**Final LHMP Input.** All final planning team input to the Draft LHMP needs to be provided no later than September 22, by the date of our final meeting. Please take this time to review your document and the items to complete document provided by the consultant in order to complete these final items. This is critical to ensure our plan will be approved by Cal OES and FEMA.

If you have any questions, please contact myself or Jeanine Foster at [Jeanine.foster@fostermorrison.com](mailto:Jeanine.foster@fostermorrison.com) or 303.717.7171.

Thank you for your continued engagement in the process.

Joseph Wilder  
Sergeant

Office of the Sheriff  
County of Madera



## **A.5.2. Final Team Meeting Agenda**

### **AGENDA Madera County Local Hazard Mitigation Plan (LHMP) Update Final Meeting September 22, 2017**

1. Introductions
2. Status of the LHMP Update Process
3. Addressing Public Comments
4. Summary of Changes in Madera County Planning Area Vulnerabilities/ Mitigation Priorities
5. Public Input: Data/Projects
6. Next Steps

A.5.3. Final Team Meeting Sign in Sheet

**SIGN-IN SHEET**  
**Madera County**  
**LOCAL HAZARD MITIGATION PLANNING PROJECT**  
**HMPC Final Meeting #5**  
**September 22, 2017**

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Jeanine Foster	jeanine.foster@foster-morrison.com	303 717 7171	Foster Morrison
Alley Darr	darr.alley@fire.ca.gov	559-206-8805	Cal Fire/Madera
Robin Bravo	rbravo@cityofmadera.com	559-662-4936	City of Madera Public Works
MARISA JONES	marisa.jones@madera.ca.gov	559-675-7893	Madera Co Public Health
Terrance Carter	terrance.carter@co.madera.ca.gov	559-675-7093	Madera Co Public Health
Alyssa Castaneda	alyssa.castaneda@co.madera.ca.gov	559-675-7110	Assessor
Wendy Silva / HR/Risk Director	wsilva@cityofmadera.com	559-660-5481	City of Madera
Nancy Koepf / Fire Chief	nancy.koepf@fire.ca.gov	559-706-8800	Co / City of Madera
Patti Tran	patti.tran@caloes.ca.gov	916-7093497	Cal OES
GARY SUANDA	Gary.Suanda@Co.Madera.Ca.gov	559-675-7710	Assessor County Madera
Celeste Szym	Cjray@cityofmadera.ca.gov	559-660-8015	PW
Tyson Ponce	tyson@co.madera.ca.gov	559-675-4712	Sheriff
Honey Turner	HTurner@cityofmadera.ca.gov	559-660-8626	Chowchilla Fire

SIGN-IN SHEET  
Madera County  
LOCAL HAZARD MITIGATION PLANNING PROJECT  
HMPC Final Meeting #5  
September 22, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Walt Kent	walt.kent@cabes.ca.gov	916-396-9292	Cal OES
Keith Helmuth	khelmuth@cityofmadera.ca.gov	559-661-5418	City of Madera
Cindy Avila		559-675-7892	Animal Services
DEBO HANWSON	dhanwson@cityofmadera.plans.madera.ca.gov	559-675-4212	M.P.D
Myriam Alvarez	myriam.alvarez@ca.gov	675-7893	MCPHD
JOSEPH WILDER	JWILDER@CO.MADERA.CA.GOV	675-7770	MADERA S.D

## A.6 Public Involvement

### A.6.1. Press Release for Public Meeting



SHERIFF'S OFFICE OF EMERGENCY SERVICES  
COUNTY OF MADERA

*Sheriff Jay A. Varney*

#### **LOCAL HAZARD MITIGATION PLAN UPDATE**

#### **Get Involved! HELP YOUR COMMUNITY BE HAZARD-READY!**

Madera County Sheriff's Office of Emergency Services (Sheriff's OES) is partnering with the City of Madera, City of Chowchilla and special districts to develop an update to their 2011 Local Hazard Mitigation Plan. Floods, drought, wildfires, earthquakes, and severe weather are just a few of the hazards of concern to Madera County. While natural hazards such as these cannot be prevented, a Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses by breaking the repeated cycle of disaster damage and reconstruction. Additionally, only communities with a FEMA-approved Hazard Mitigation Plan are eligible to apply for both pre- and post-disaster mitigation grant funding.

Nationwide, taxpayers pay billions of dollars annually helping communities, organizations, businesses, and individuals recover from disasters. Some disasters are predictable and, in many cases, much of the damage can be reduced or even eliminated through hazard mitigation planning.

The people most aware of potential hazards are the people that live and work in the affected community. In addition to plan participation by local, state and federal agencies, the community is seeking enthusiastic, community-minded residents to be part of our Local Hazard Mitigation Planning project. We encourage attendance and participation from the general public at our upcoming public meeting to kick off the project:

**Wednesday, March 15, 2017, 6:00pm to 7:30pm**

Madera County Emergency Operations Center at Sheriff's Headquarters  
2725 Falcon Drive  
Madera, CA 93637

For additional information, please contact OES Sergeant Joseph Wilder at (559)-675-7770 Extension 231 or email at [jwilder@co.madera.ca.gov](mailto:jwilder@co.madera.ca.gov).

---

*Madera County Sheriff's Office of Emergency Services*

## A.6.2. Kickoff Meeting Articles

The screenshot shows the Facebook profile of the Madera County Sheriff's Office. The profile picture is the official badge. The page name is "Madera County Sheriff's Office" with the handle "@Madera Sheriff". A navigation menu on the left includes Home, About, Photos, Videos, Likes, Welcome, Events, Notes, Reviews, and Posts, along with a "Create a Page" button.

The main post is from the Madera County Sheriff's Office, dated March 9 at 2:53pm. The text of the post reads: "Madera County Sheriff's Office of Emergency Services would like to extend an invitation to community members to be a part of our Local Hazard Mitigation Planning project. We encourage interested parties to attend a kick off meeting on March 15 at 6pm. Please see the following press release for further details." Below the text is a document titled "LOCAL HAZARD MITIGATION PLAN UPDATE" with the following content:

**Get Involved! HELP YOUR COMMUNITY BE HAZARD-READY!**

Madera County Sheriff's Office of Emergency Services (Sheriff's OES) is partnering with the City of Madera, City of Chowchilla and several districts to develop an update to their 2011 Local Hazard Mitigation Plan. Floods, drought, wildfires, earthquakes, and severe weather are just a few of the hazards of concern to Madera County. While natural hazards such as these cannot be prevented, a Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses by breaking the repeated cycle of disaster damage and reconstruction. Additionally, only communities with a FEMA-approved Hazard Mitigation Plan are eligible to apply for both pre- and post-disaster mitigation grant funding.

Nationwide, taxpayers pay billions of dollars annually helping communities, organizations, businesses, and individuals recover from disasters. Some disasters are predictable and, in many cases, much of the damage can be reduced or even eliminated through hazard mitigation planning.

The people most aware of potential hazards are the people that live and work in the affected community. In addition to plan participation by local, state and federal agencies, the community is seeking enthusiastic, community-minded residents to be part of our Local Hazard Mitigation Planning project. We encourage attendance and participation from the general public at our upcoming public meeting to kick off the project.

**Wednesday, March 15, 2017, 6:00pm to 7:30pm**  
 Madera County Emergency Operations Center at Sheriff's Headquarters  
 2725 Falcon Drive  
 Madera, CA 93637

For additional information, please contact OES Sergeant Joseph Wicker at (559) 675-7770 Extension 231 or email at jwicker@madera.ca.gov.

The post has 4 shares and is liked by AJ Bodiford, Isaac LeRoy Hare, Jennifer Van Alen and 2 others. Below the post, it says "Madera County Sheriff's Office added 9 new photos." dated March 9 at 11:23am. The text of this post reads: "#MCSO recently attended Fire Station 19's annual Open House event along with other partnering agencies in the community. #MCSOK9 Deputies, #MCSOSWAT, and #MCSOExplorers met with community members and gave demonstrations for enthusiastic #JuniorDeputies to enjoy. A great time was had by all! Thank you to Fire Station 19 for your support and for including us in the festivities... See More". Below this text is a photo of a building roof.

On the right side of the page, there is a "Call Now" and "Message" button. Below that, it says "Government Organization in Madera, California" with a 4.4 star rating. A search bar is present with the text "Search for posts on this Page". Under "People", it shows a star rating and "13,406 likes" and "137 visits". The "About" section shows a map and the address "2725 Falcon Dr, Madera, CA 93637", phone number "(559) 675-7770", and website "http://www.Madera-County.com/Sheriff". The "Liked by This Page" section lists "Madera County", "Fresno County Sheriff's Office", and "Cal OES". The "People Also Like" section lists "Fresno County Sheriff's Office Law Enforcement Agency" and "City of Madera Police Department Government Organization".

Source; Madera OES Facebook page

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LOCAL MARCH 9, 2017 2:18 PM

# Public invited to help update county's emergency hazard plan



The Madera County Sheriff's Office of Emergency Services is inviting the community to be a part of its Local Hazard Mitigation Planning project to reduce losses in times of floods, droughts, wildfires, and other disasters through a plan that hasn't been updated since 2011.

The people most aware of potential hazards are those who live and work in affected communities. As such, the public is encouraged to attend a meeting on Wednesday, March 15, from 6 p.m. to 7:30 p.m. at the sheriff's headquarters on 2725 Falcon Drive in Madera in order to help update the plan.

While natural hazards cannot be prevented, a Hazard Mitigation Plan forms a foundation for a community's long-term strategy to reduce any losses, officials said. Additionally, only

Source: Sierra Star

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Home » Headlines » County » Sheriff Seeks Civic-Minded Residents For Hazard Plan Update

### Sheriff Seeks Civic-Minded Residents For Hazard Plan Update

Posted by: Gina Clugston | March 9, 2017 - 3:13 pm | 1,233 Views

MADERA COUNTY — The Madera County Sheriff's Office of Emergency Services (Sheriff's OES) invites the public to get involved in helping your community be hazard-ready.

Your participation is requested in updating the Sheriff's OES 2011 Local Hazard Mitigation Plan on Wednesday, Mar. 15.

Floods, drought, wildfires, earthquakes, and severe weather are just a few of the hazards of concern to Madera County. While natural hazards such as these cannot be prevented, a Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses by breaking the repeated cycle of disaster damage and reconstruction.

Additionally, only communities with a FEMA-approved Hazard Mitigation Plan are eligible to apply for both pre- and post-disaster mitigation grant funding.

The people most aware of potential hazards are the people who live and work in the affected community. In addition to plan participation by local, state and federal agencies, the Sheriff's Office is seeking enthusiastic, community-minded residents to be part of the OES's Local Hazard Mitigation Planning project.

Nationwide, taxpayers pay billions of dollars annually helping communities, organizations, businesses, and individuals recover from disasters. Some disasters are predictable and, in many cases, much of the damage can be reduced or even eliminated through hazard mitigation planning.

The Sheriff OES is partnering with the City of Madera, City of Chowchilla and special districts to develop an update to the Plan.

The Sheriff's Office encourages attendance and participation of the general public at their upcoming public meeting to kick off the project on Wednesday, Mar. 15, from 6 to 7:30 p.m. at the Madera County Emergency Operations Center at Sheriff's Headquarters, 2725 Falcon Drive in Madera.

For additional information, please contact OES Sergeant Joseph Wilder at (559)-675-7770 ext. 231 or email at [jwilder@co.madera.ca.gov](mailto:jwilder@co.madera.ca.gov).



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**A.6.3. Kickoff Meeting – Public Agenda**

**MADERA COUNTY  
LOCAL HAZARD MITIGATION PLAN (LHMP)  
PUBLIC MEETING #1  
MARCH 16, 2017**

1. Introductions
2. Hazard Mitigation & the Disaster Mitigation Act Planning Requirements
3. Hazard Identification and Profiles
4. Opportunities for Public Participation and Input
5. Schedule
6. Questions and Answers



A.6.4. Kickoff Meeting – Public Sign in Sheets

SIGN-IN SHEET  
Madera County  
LOCAL HAZARD MITIGATION PLANNING PROJECT  
Public Meeting #1  
March 15, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Cmdr Tyson Pogue Matt Watson	tpogue@co.madera.ca.gov Matt.Watson@fire.ca.gov	559-675-7770 559-232-9257	Madera Sheriff County Fire
JOSEPH WIJEN	JWIJEN@CO.MADERA.CA.GOV	559-675-7770	MADERA SHERIFF
Erica Hefner	erica.hfner@co.madera.ca.gov	559-232-9932	madera Sheriff
Jeanine Foster	jeanine.foster@fostermorrisson.com	303 717-7171	foster Morrison Ret Fire/Police Public
Steven M Bradley	ZAKATH14606@gmail.com	559-395-2653	
DAVID L HALL	DAVID.L.HALL143.MIL@MAIL.MIL	559 977 1797	ARMY NATIONAL GUARD
Kenny Thome	kct@sti.net	559/641-8045	

## A.6.5. Press Release for Final Review of Plan – Public



*Jay A Varney, Sheriff-Coroner*

# Office of the Sheriff

Madera County

2725 Falcon Dr.  
Madera, CA 93637  
Phone: (559) 675-7770  
Fax: (559) 675-8413  
E-Mail: [sheriff@madera-county.com](mailto:sheriff@madera-county.com)

**DATE: September 15, 2017**  
**RE: Madera County Invites Comments on their Hazard Mitigation Plan**

Madera County is partnering with incorporated communities, districts, and others to develop an update to their 2011 Local Hazard Mitigation Plan. Flood, drought, wildfire, earthquakes, and severe weather are just a few of the hazards to Madera County. While natural hazards such as these cannot be prevented, a Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses by breaking the repeated cycle of disaster damage and reconstruction. Additionally, only communities with a FEMA-approved Hazard Mitigation Plan are eligible to apply for both pre- and post-disaster mitigation grant funding.

The process began in March 2017 with an initial public and planning meeting and the establishment of a planning committee comprised of representatives from the County, Cities, special districts, and other key stakeholders. The plan is scheduled to be finalized and submitted to Cal OES and FEMA in September 2017.

### Public Review Draft

The Public Review Draft of the LHMP Update is available online (pdf format) at: <http://www.madera-county.com/index.php/lhmp>. It is also available (in printed copy) at the following Madera County locations:

Madera County Library  
121 N. G Street  
Madera, CA 93637  
(559)675-7871

Chowchilla Branch Library  
300 Kings Avenue  
Chowchilla, CA 93610  
(559)665-2630

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37167 Avenue 12, Suite 4C  
Madera, CA 93636  
(559)645-1214

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(559)877-2387

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49044 Civic Circle Drive  
Oakhurst, CA 93644  
(559)683-4838

### **Open Public Meeting**

A final public meeting to review and provide comments on the Public Review draft LHMP is scheduled as follows:

Thursday, September 21, 2017 at 6pm  
Sheriff's Headquarters – Emergency Operations Center  
2725 Falcon Drive  
Madera, CA 93637

We encourage attendance and input from the public and other interested stakeholders at this upcoming meeting.

### **Comments on the Public Review Draft**

There are several options for providing comments on the LHMP Update Public Review Draft:

- Email comments to [Jeanine.foster@fostermorrison.com](mailto:Jeanine.foster@fostermorrison.com) or [jwilder@co.madera.ca.gov](mailto:jwilder@co.madera.ca.gov)
- Drop off written comments or send by mail to: Madera County Sheriff's Office, Emergency Services, Attention Sergeant Joseph Wilder, 2725 Falcon Drive, Madera, CA 93637
- Bring comments to the meeting

**For More Information**

Contact Sergeant Joseph Wilder at (559) 675-7770 or email at [jwilder@co.madera.ca.gov](mailto:jwilder@co.madera.ca.gov)


---

Commander Tyson Pogue | Desk: (559) 675-7772 | Cellular: (559) 395-5347  
Email: [tpogue@co.madera.ca.gov](mailto:tpogue@co.madera.ca.gov) | Twitter: [@TysonPogue](https://twitter.com/TysonPogue)

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## A.6.6. Advertisement for Public Meeting on Madera County Website



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Jay Varney - Madera County Sheriff

### Sheriff

**Cooling Centers 2017**

 Cooling Centers 2017

**Madera County 2017 Local Hazard Mitigation Plan Update**

FEMA defines Hazard Mitigation as any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Hazard mitigation planning is a process for state and local governments to identify community-level policies and actions to mitigate and thus reduce the impacts of natural hazards

Madera County is partnering with the cities of Chowchilla and Madera and several special districts to update their 2011 Local Hazard Mitigation Plan (LHMP). Flood, drought, earthquake, and wildfire are just a few of the hazards to the Madera communities. While natural hazards such as these cannot be prevented, an LHMP forms the foundation for a community's long-term strategy to reduce disaster losses by breaking the repeated cycle of disaster damage and reconstruction. Communities with a FEMA- approved LHMP are eligible for FEMA pre- and post-disaster grant funding and are better positioned to respond and recover when disasters occur.

**2011 MADERA COUNTY AND CITY OF CHOWCHILLA LHMPs**

Link to Madera County LHMP  
<http://www.madera-county.com/index.php/county-forms/category/396-oes-documents>


Link to Chowchilla LHMP [http://hazardmitigation.calema.ca.gov/docs/approved\\_lhmps\\_under\\_2008\\_fema\\_guidance/Chowchilla\\_%20LHMP\\_2011.pdf](http://hazardmitigation.calema.ca.gov/docs/approved_lhmps_under_2008_fema_guidance/Chowchilla_%20LHMP_2011.pdf)

**Latest Sheriff's News**

- Cooling Centers 2017
- Madera County 2017 Local Hazard Mitigation Plan Update
- Coroner Division
- Live Scan Fingerprinting
- Statement of Values

**Upcoming Events**

Nov 11th, 12:00am -12:00am
: VETERANS' DAY
Nov 23rd, 12:00am -12:00am
: THANKSGIVING DAY
Nov 24th, 12:00am -12:00am
: DAY AFTER THANKSGIVING

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## A.6.7. Distribution of Press Release for Public for Early and Final Plan Review

**From:** Tyson Pogue  
**Sent:** Thursday, March 09, 2017 2:04 PM  
**To:** Joseph Wilder  
**Subject:** FW: Madera Sheriff's Office of Emergency Services - Local Hazard Mitigation Plan Update


This was sent to the following agencies/persons.

Aaron Abeytia KMJ <[aaron.abeytia@cumulus.com](mailto:aaron.abeytia@cumulus.com)>; abc30 desk <[kfsndesk@abc30.com](mailto:kfsndesk@abc30.com)>; Al Griswold <[algriswold@fresnobee.com](mailto:algriswold@fresnobee.com)>; Andrea Castillo <[acastillo@fresnobee.com](mailto:acastillo@fresnobee.com)>; Betty Linn <[blinn@sierrastar.com](mailto:blinn@sierrastar.com)>; Bill Ward ([bward@madera-county.com](mailto:bward@madera-county.com)); Blake Taylor KMJ ([blake.taylor@cumulus.com](mailto:blake.taylor@cumulus.com)); Brandon Chase <[Brandon.c.chase@abc.com](mailto:Brandon.c.chase@abc.com)>; [bwilkinson@sierrastar.com](mailto:bwilkinson@sierrastar.com); [Carlos.B.Saucedo@abc.com](mailto:Carlos.B.Saucedo@abc.com); Carmen George <[cgeorge@fresnobee.com](mailto:cgeorge@fresnobee.com)>; [cdoud@maderatribune.net](mailto:cdoud@maderatribune.net); Chad McCollum <[chadmccollum@cbsfresno.com](mailto:chadmccollum@cbsfresno.com)>; Channel 21 <[kftv@univision.net](mailto:kftv@univision.net)>; Channel 21 <[kftvnews@univision.net](mailto:kftvnews@univision.net)>; 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A.6.8. Advertisement for Final Public Meeting




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### Madera County Invites Input On Hazard Mitigation Plan

Posted by: gina clapperton | September 15, 2017 - 5:14 pm | 0 | 1,169 Views

**MADERA COUNTY** — The public is invited to participate in updating the plan to deal with the next disaster in Madera County.

The County is partnering with incorporated communities, districts and others to develop an update to their 2011 Local Hazard Mitigation Plan.

Floods, drought, wildfires, earthquakes and severe weather are just a few of the natural hazards we face, and though they cannot be prevented, a Hazard Mitigation Plan forms the foundation for a long-term strategy, at the community level, to reduce disaster losses by breaking the repeated cycle of damage and reconstruction.

FEMA (Federal Emergency Management Agency) defines Hazard Mitigation as any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.


Importantly, only communities with a FEMA-approved Hazard Mitigation Plan are eligible to apply for both pre- and post-disaster mitigation grant funding.

The process began in March with an initial public and planning meeting and the establishment of a planning committee comprised of representatives from the County, cities, special districts, and other key stakeholders. The plan is scheduled to be finalized and submitted to Cal OES and FEMA in September.

Public Review Draft –


The Public Review Draft of the LHM Update is available online (pdf format) at <http://www.madera-county.com/index.php/lhmp>. It is also available (in printed copy) at the following Madera County locations:

- Madera County Library  
121 N. G Street In Madera  
(559)675-7871
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300 Kings Avenue in Chowchilla  
(559)665-2630
- Madera Ranchos Branch Library  
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## **A.6.9. Final Review of Plan – Public Agenda**

**AGENDA**  
**Madera County**  
**Local Hazard Mitigation Plan (LHMP) Update**  
**Final Public Meeting**  
**September 22, 2017**

1. Introductions
2. Status of the LHMP Update Process
3. Addressing Public Comments
4. Summary of Changes in Madera County Planning Area Vulnerabilities/ Mitigation Priorities
5. Final HMPC Input: Data/Projects
6. Next Steps



A.6.10. Final Review of Plan – Public Sign in Sheets

SIGN-IN SHEET  
 Madera County  
 LOCAL HAZARD MITIGATION PLANNING PROJECT  
 Public Meeting #2  
 September 21, 2017

Name/Title	Email Address	Phone	Department/Organization/ Affiliation
Tyson Poirve	tpoirve@co.madera.ca.gov	675-7772	Madera SD
JOSEPH WILDER	JWILDER@CO.MADERA.CA.GOV	675-7770	MADERA S.O.
Jeanine Foster	jeanine.foster@foster-morrison.com	303 717-2171	Foster Morrison

## A.6.11. Final Review of Plan Email Comments – with Responses

**From:** Jim Rich [<mailto:mtclimber492@sti.net>]

**Sent:** Thursday, September 21, 2017 11:08 AM

**To:** [jwilder@co.madera.ca.gov](mailto:jwilder@co.madera.ca.gov); Jeanine Foster <[jeanine.foster@fostermorrison.com](mailto:jeanine.foster@fostermorrison.com)>

**Subject:** Comments on the Public Review Draft of the 2017 Madera County LHMP Update

Sgt. Joseph Wilder, Madera County; and Jeanine Foster, Foster Morrison:

I would like to provide a few comments on the Public Review Draft of the 2017 Madera County Local Hazard Mitigation Plan Update. From 1987 to 2015, while working full-time as a government economist, I also served as a disaster service worker for various government and private agencies, on both a paid and volunteer basis. I prepared for and responded to natural disasters and terrorist incidents, including floods, earthquakes, wildland fires, hurricanes, droughts, and the September 11 attacks. I spent 12 years as a reserve member of the National Disaster Medical System, part of our nation's Uniformed Medical Service. In 2015, I retired from DWR and moved with my wife from Sacramento to Oakhurst. I hope my disaster response experiences have informed the following comments on your draft LHMP Update:

Overall, based on what I have read, this is a fine draft Plan. Much work has been done to update, expand and improve the 2011 LHMP. The new plan should be quite helpful to those in Madera County who prepare for and respond to natural disasters. It should also enable Madera County to apply for federal aid to help us reduce hazards and better prepare for disasters.

Concerning Table ES-2, on Page iii, which is one of the most important tables in the document:

1. The far right column, entitled "Climate Change Influence," correctly notes that climate change has a "high" or "moderate" influence on the severity of nine different hazards, including floods, severe weather, and wildfires. However, climate change is shown in ES-2 to have "low" influence on the risk or severity of dam failures and levee failures. However, during my last ten years at the California Dept. of Water Resources, I learned that most climate scientists and hydrologists who study California believe that for the rest of this century, global climate change will mean more severe storms in California, with significantly more of the precipitation falling as rain, and not as snow. This will put more pressure on our dams and levees, and increase, to at least a significant extent, the risk that some of the more vulnerable of those dams and levees will fail. **The HMPC agrees that over the long term, climate change that contributes to more, high-intensity storms, will stress all water systems. However, this LHMP Update covers only a 5-year period. Based on this, the HMPC agreed that the climate change influence on the levee failure hazard should be moved to medium, as full rivers do increase stress on area levees, but the ranking will remain low at this time for the dam failure. This will again be evaluated at the next 5-year LHMP Update.**
2. All types of floods are divided in Table ES-2 into two categories, referred to as "Flood: 100/500-year" and "Flood: Localized/Stormwater." I served at DWR's Joint Flood Operations Center during flood events in 1995, 1997, 2005, and 2006. During those activations we did not deal with any floods as serious as a "100-year flood" – the most serious was known as a "70-year flood." However, the floods we dealt with were far more serious than localized stormwater floods – some of them involved levee failures and extensive flooding with significant damage over broad areas. I suggest changing the name of the second type of flood in ES-2 to "Flood: Less Serious." **These two flood hazard categories capture everything from the small nuisance flooding issues to the 500-year and greater floods. In fact, the data relied on in developing these sections does not categorize each flood event into specific categories. The intent was to divide**

1. these sections into the flood events based on regulated floodplains and lesser floods. To be consistent with other plans, the HMPC determined that they will keep the headings the same and make sure the language to the problem descriptions clarifies that these hazards capture all levels of flood events.

Concerning the County's hazard "Mitigation Strategy" and the seven goals listed to implement that strategy (pp. iv & v):

1. This is a good summary of seven worthy goals to reduce our vulnerability to hazards. However, I could not find any mention of the National Incident Management System (NIMS) nor one of its major components, the Incident Command System (ICS). All those responding to disasters for Madera County need a working knowledge of NIMS, to ensure a coordinated and effective emergency response. Compliance with NIMS is also required for the State and County to receive federal reimbursement for certain disaster response expenses. Training in NIMS and ICS was an important part of my disaster response training with DWR, CDF&FP and the NDMS. Somewhere in these two pages there should be a mention of NIMS. **The focus of the LHMP is on Mitigation, and is not intended to be a response plan, thus these programs are not usually mentioned. However, the HMPC determined that they would add an objective recognizing the importance of coordination with NIMS and ICS.**
2. There is no mention in any of these goals of involving more trained, registered volunteer disaster responders in preparations for and responses to disasters. The recent experiences in Texas following Hurricane Harvey show the value of using hundreds of citizen volunteers to augment and support the efforts of the paid professionals responding to a major natural disaster. That disaster response also showed that citizen volunteers can operate more safely and effectively if they are registered, trained, and organized before the disaster. **Again, these mitigation plans do not generally include goals and objectives focused on response, the HMPC determined that this was outside the purview of this plan. The HMPC further noted that they do have a local CERT team, but that citizen volunteers are not usually brought in to play until a disaster occurs.**
3. Concerning Goal 5, "Improve community resiliency to drought conditions ...": The five points listed are excellent ideas and objectives. I suggest adding one more point: "Promote the conjunctive use of groundwater and surface water supplies, including the use of groundwater banking." **The HMPC agreed that this important objective is ongoing within the Planning Area and will make sure it is included in the LHMP.**

Concerning the part of Table ES-3 (on pp. vi – viii), which deals with "Mitigation Actions" for Madera County:

1. Action 3 is the same as Action 2. **As part of final review and edits of the LHMP Update, this is being reviewed and will be combined as necessary.**
2. With respect to Action 17, "Relocation of Government Facilities in the Floodplain": This is often a good idea. However, in some situations it may be more feasible or cost effective to instead raise those facilities up above the level of, say, a 100-year flood. **The HMPC agreed that this is another viable option that should be included in this mitigation action.**
3. I suggest adding one more item to the list of Flood Actions: "Build set-back levees." **This type of mitigation action has not been evaluated by the County. The County will further review the use of this type of action in specific areas for consideration in the next LHMP Update.**
4. With respect to Action 32: I suggest that you mention Madera County will work with CAL FIRE to educate the public on fire hazard reduction, including the use of "defensible space." **The HMPC indicated that this is already an ongoing effort between Cal FIRE**

1. and Madera County – they work closely in public outreach efforts including the value of defensible space. We will revisit this project and determine if this is the appropriate place to include this language.

Concerning Sections 2.3.1 and 2.3.2 (pp. 2-3 to 2-14): These sections are not yet complete. I agree with the editor of this draft that these sections need to be completed with “SOME SUCCESS STORIES FROM THE 2011 MITIGATION ACTIONS.” The City of Chowchilla appears to have done the most to complete these sections, while the County has done a good job describing the progress made in completing two important mitigation actions called for by the 2011 LHMP. This is currently in process; All past projects will be updated as to their current status and success stories are being added.

I wish I had learned about the public review draft of the LHMP Update earlier, so I would have had more time to read and comment upon this draft report. I wish you well as you work to help finalize this important document. Please feel free to contact me if you have any questions about my comments, or if I can be of further service to our County. Thank you very much for reviewing the LHMP Update and for your thoughtful input to the plan. It is appreciated and will help make this a better document.

Take care, Jim Rich, 559-641-5506, [mtclimber492@sti.net](mailto:mtclimber492@sti.net).

From: <debra@debra.realtor<mailto:debra@debra.realtor>>  
Subject: LHMP  
Date: September 16, 2017 at 9:39:36 AM PDT  
To: <jwilder@co.madera.ca.gov<mailto:jwilder@co.madera.ca.gov>>

Hello:

Spent a half-hour or so on the document, so obviously it was a ' cursory glance' rather than a thorough review but did notice a few items:

Typos:

San Andreas Fault, not San Andreus **This has been corrected.**

Oak Creek Intermediate School in Oakhurst, not Oakcreek Elementary School **This has been corrected.**

Oddity:

The only cooling center in Oakhurst is the Senior Center, which is open 9:30 a.m. to 1:30 p.m.; our heat doesn't get intolerable until noon/1 p.m. and it at its worst 3-5 p.m., cooling off by 7 p.m. Strange that the mountain area with the largest population has no official cooling center available in the afternoon! **Cooling centers in the County often rely on existing facilities conveniently located and operating throughout the County. As such, the hours of these facilities are often limited by their own operating hours and are not under the control of the County. The Oakhurst Senior Center is one of these facilities.**

Note that Bass Lake Elementary School has been closed for several years and sold Sept. 2016 to a private party; it should be removed from the list. **This has been corrected.**

Thank you for your work to keep us safe, Debra Debra Kroon, ABR, GRI, RSPS Broker-Associate, Realtor Yosemite West Real Estate, Inc. **Thank you for your review and input to this LHMP Update. It is appreciated.**

## A.6.12. Tribal Involvement

### *Letter Seeking Input on Mitigation Plan*



To whom it may concern:

The North Fork Rancheria of Mono Indians of California is a participating jurisdiction to the Madera County Local Hazard Mitigation Plan Update. The previous plan, completed in 2011, is being updated in its entirety. The purpose of this Plan Update is to guide hazard mitigation planning to better protect the people and property of the County and participating jurisdictions from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This LHMP Update was also developed, among other things, to ensure Madera County and participating jurisdictions' continued eligibility for certain federal disaster assistance: specifically, the FEMA Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA).

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The Madera County Planning Area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and maintaining eligibility for mitigation-related federal funding.

The North Fork Rancheria will be completing a stand-alone plan soon, but in the interim is included in the Madera County Plan. We encourage you to review the plan, especially the sections that deal with tribal issues, and forward any comments to us. You can find the plan at:

➤ <https://www.dropbox.com/sh/pyi9k3m6ujeeh4c/AADv5Wz5r8LYZsc5u8c25Scza?dl=0>

Sincerely,

Christina McDonald, Environmental Director

Sent to the BIA, Big Sandy Rancheria (in Fresno County), and the Cold Spring Rancheria (in Fresno County)

## A.7 Meeting Handouts

Below are the handouts for each meeting. Handouts specific to the Risk Assessment Meeting can be found in Appendix C.

### Madera County Hazard Identification and Profiles – 2017

#### *Madera County Hazard Identification and Profiles – 2017*

*Table A-3 Hazards Comparison List*

Madera County 2011 LHMP	2013 State of California Plan Applicable Hazards	Madera County LHMP Update Proposed 2017 Hazards
----	Agriculture Pests and Diseases	Ag Hazards: Severe Weather/Insect Pests
----	Avalanche	Avalanche
----	Climate Change & Related Hazards	Climate Change
Dam Failure	Dam Failure	Dam Failure
Drought	Drought and Water Shortage	Drought and Water Shortage
Earthquake (ground shaking, earthquake induced landslide)	Earthquake	Earthquake: All hazards
Flood	Flood	Flood: (100/200/500 year)
----	----	Flood: Localized/Stormwater
Hazardous Materials Event	Hazardous Materials Release/Oil Spills	Hazardous Materials Transportation
Landslides (earthquake induced)	Landslide and Other Earth Movements	Landslides and Debris Flows
Levee Failure	Levee Failure	Levee Failure
Heat	Extreme Heat	Severe Weather: Extreme Heat
----	Severe Weather and Storms	Severe Weather: Extreme Cold and Freeze (or combine with winter storms?)
Fog	Severe Weather and Storms	Severe Weather: Fog
Severe wind and tornado	Severe Weather and Storms	Severe Weather: Wind and Tornado
----	Severe Weather and Storms	Severe Weather: Heavy Rains and Storms (winds, hail, and lightning??)
Winter Storm	Severe Weather and Storms	Severe Weather: Winter Storms/Snow (freeze and cold??)
----	Volcano	Volcano
Wildfire	Wildfire	Wildfire (smoke, tree mortality)

*Table A-4 Madera County Hazard Identification Table*

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests					
Avalanche					
Climate Change					
Dam Failure					
Drought and Water Shortage					
Earthquake					
Flood: 100/200/500-year					
Flood: Localized/Stormwater					
Hazardous Materials Transportation					
Landslide and Debris Flows					
Levee Failure					
Severe Weather: Extreme Heat					
Severe Weather: Extreme Cold and Freeze (or combine with winter storms?)					
Severe Weather: Fog					
Severe Weather: Wind and Tornado					
Severe Weather: Heavy Rains and Storms (winds, hail, and lightning??)					
Severe Weather: Winter Storms/Snow					
Volcano					
Wildfire (smoke, tree mortality)					
<b>Geographic Extent</b> Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		<b>Magnitude/Severity</b> Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid			
<b>Probability of Future Occurrences</b> Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		<b>Significance</b> Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact			
		<b>Climate Change Impact:</b> Low: Climate change is not likely to increase the probability of this hazard. Medium: Climate change is likely to increase the probability of this hazard. High: Climate change is very likely to increase the probability of this hazard.			





## Earthquake Vulnerability

1. Number of unreinforced masonry buildings. If available, please provide an inventory of URM buildings specific to your jurisdiction. Include any tables and/or maps. Is this a layer available in GIS?

## Special Populations

1. Describe any hazard-related concerns or issues regarding the vulnerability of special needs populations, such as the elderly, disabled, low-income, or migrant farm workers.

## Development Trends

1. Describe development trends and expected growth areas and how they relate to hazard areas and vulnerability concerns/issues. Please provide zoning maps and maps and tables detailing areas targeted for future development within your jurisdiction.

## CAPABILITY ASSESSMENT

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.

### Planning and Regulatory

The following planning and land management tools are typically used by local jurisdictions to implement hazard mitigation activities. Please indicate which of the following your jurisdiction has in place. If your jurisdiction does not have this capability or authority, please indicate in the comments column if a higher level of government has the authority.

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy?
		Can the plan be used to implement mitigation actions?
General Plan		
Capital Improvements Plan		
Economic Development Plan		
Local Emergency Operations Plan		
Continuity of Operations Plan		
Transportation Plan		
Stormwater Management Plan/Program		
Engineering Studies for Streams		
Community Wildfire Protection Plan		
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
<b>Building Code, Permitting, and Inspections</b>	<b>Y/N</b>	<b>Are codes adequately enforced?</b>
Building Code		
Building Code Effectiveness Grading Schedule (BCEGS) Score		
Fire department ISO rating:		
Site plan review requirements		
<b>Land Use Planning and Ordinances</b>	<b>Y/N</b>	<b>Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?</b>
Zoning ordinance		
Subdivision ordinance		

Floodplain ordinance
Natural hazard specific ordinance (stormwater, steep slope, wildfire)
Flood insurance rate maps
Elevation Certificates
Acquisition of land for open space and public recreation uses
Erosion or sediment control program
Other
<b>How can these capabilities be expanded and improved to reduce risk?</b>

### Administrative/Technical

Identify the technical and personnel resources responsible for activities related to hazard mitigation/loss prevention within your jurisdiction. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, please indicate so in the comments column.

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission		
Mitigation Planning Committee		
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)		
Mutual aid agreements		
Other		
Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official		
Floodplain Administrator		
Emergency Manager		
Community Planner		
Civil Engineer		
GIS Coordinator		
Other		

Technical	Y/N	Describe capability Has capability been used to assess/mitigate risk in the past?
Warning systems/services (Reverse 911, outdoor warning signals)		
Hazard data and information		
Grant writing		
Hazus analysis		
Other		
How can these capabilities be expanded and improved to reduce risk?		

### Fiscal

Identify whether your jurisdiction has access to or is eligible to use the following financial resources for hazard mitigation

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding		
Authority to levy taxes for specific purposes		
Fees for water, sewer, gas, or electric services		
Impact fees for new development		
Storm water utility fee		
Incur debt through general obligation bonds and/or special tax bonds		
Incur debt through private activities		
Community Development Block Grant		
Other federal funding programs		
State funding programs		
Other		
How can these capabilities be expanded and improved to reduce risk?		

## Education and Outreach

Identify education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.		
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)		
Natural disaster or safety related school programs		
StormReady certification		
Firewise Communities certification		
Public-private partnership initiatives addressing disaster-related issues		
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		

## National Flood Insurance Program (NFIP) Worksheet

Use this worksheet to collect information on your community's participation in and continued compliance with the NFIP, as well as identify areas for improvement that could be potential mitigation actions.

NFIP Topic	Comments
<b>Insurance Summary</b>	
How many NFIP policies are in the community? What is the total premium and coverage?	FM to complete
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	FM to complete
How many structures are exposed to flood risk within the community?	FM to complete
Describe any areas of flood risk with limited NFIP policy coverage	
<b>Staff Resources</b>	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	
What are the barriers to running an effective NFIP program in the community, if any?	
<b>Compliance History</b>	
Is the community in good standing with the NFIP?	
Are there any outstanding compliance issues (i.e., current violations)?	
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	
Is a CAV or CAC scheduled or needed?	
<b>Regulation</b>	
When did the community enter the NFIP?	FM to complete
Are the FIRMs digital or paper?	FM to complete
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	
Provide an explanation of the permitting process.	
<b>Community Rating System</b>	
Does the community participate in CRS?	
What is the community's CRS Class Ranking?	
What categories and activities provide CRS points and how can the class be improved?	
Does the plan include CRS planning requirements?	

Prepared by:	Date	Email	Phone

## ***HISTORIC HAZARD EVENTS WORKSHEET***

Please fill out one sheet for each significant hazard event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

<b>Type of event</b>	
<b>Nature and magnitude of event</b>	
<b>Location</b>	
<b>Date of event</b>	
<b>Injuries</b>	
<b>Deaths</b>	
<b>Property damage</b>	
<b>Infrastructure damage</b>	
<b>Crop damage</b>	
<b>Business/economic impacts</b>	
<b>Road/school/other closures</b>	
<b>Other damage</b>	
<b>Insured losses</b>	
<b>Federal/state disaster relief funding</b>	
<b>Opinion on likelihood of occurring again</b>	
<b>Source of information</b>	
<b>Comments</b>	
	Please return worksheets by mail, email, or fax to: Jeanine Foster, Foster Morrison 5628 West Long Place Littleton, CO 80123 fax: (720) 893-0863 email: jeanine.foster@fostermorrison.com
Prepared by:	
Phone:	
Email:	
Date:	





## Appendix B References

2013 State of California Multi-Hazard Mitigation Plan

2014-2023 Chowchilla Housing Element

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California Adaptation Planning Guide

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National Integrated Drought Information System

National Oceanic and Atmospheric Administration Storm Prediction Center

National Oceanic and Atmospheric Administration’s National Climatic Data Center

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Western Regional Climate Center



## Appendix C Mitigation Strategy

### Madera County Local Hazard Mitigation Plan Update Mitigation Strategy Meetings April 25 & 26, 2017

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*Jeanine Foster (jeanine.foster@fostermorrison.com)*

*Foster Morrison Consulting, Ltd.*

# AGENDA

Madera County  
Local Hazard Mitigation Plan (LHMP) Update  
Mitigation Strategy Meetings  
April 25 & 26, 2017

## *HMPC Meeting #2*

1. Introductions
2. Status of the DMA Planning Process
3. Risk Assessment Update
4. Develop Updated Plan Goals and Objectives
5. Identify and Review Mitigation Alternatives/Projects

## *HMPC Meeting #3*

1. Introductions
2. Identify and Review Mitigation Alternatives/Projects
3. Review Mitigation Selection Criteria
4. Prioritize Mitigation Projects
5. Review of Schedule/Next Steps

**Risk Assessment & Mitigation Strategy Meetings  
Day 1**



## Hazard Identification & Profiles

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests	Extensive	Highly Likely	Limited	Medium	Medium
Climate Change	Extensive	Likely	Limited	Medium	Low
Dam Failure	Limited	Occasional	Critical	High	Low
Drought and Water Shortage	Extensive	Likely/Occasional	Limited	Medium	Medium
Earthquake	Significant	Occasional	Critical	Medium	Low
Flood: 100/200/500-year	Significant	Occasional/Unlikely	Critical	Medium	Low
Flood: Localized/Stormwater	Limited	Highly Likely	Negligible	Medium	Low
Hazardous Materials Transportation	Limited	Likely	Limited	Medium	Low
Landslides, Rockfalls, and Debris Flows	Limited	Highly Likely	Limited	Low	Low
Levee Failure	Limited	Occasional	Limited	Medium	Low
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Fog	Significant	Highly Likely	Critical	Low	Medium
Severe Weather: Heavy Rains and Storms (winds, hail, and lightning)	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Winter Storms/Snow	Extensive	Highly Likely	Limited	Medium	Medium
Volcano	Limited	Unlikely	Limited	Low	Low
Wildfire (smoke, tree mortality)	Significant	Highly Likely	Catastrophic	High	High
<b>Geographic Extent</b> Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		<b>Magnitude/Severity</b> Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid			
<b>Probability of Future Occurrences</b> Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		<b>Significance</b> Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact			
		<b>Climate Change Impact:</b> Low: Climate change is not likely to increase the probability of this hazard. Medium: Climate change is likely to increase the probability of this hazard. High: Climate change is very likely to increase the probability of this hazard.			

## Risk Assessment Methodology

### *Calculating Likelihood of Future Occurrence*

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

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

### *Calculating Vulnerability*

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

- **Extremely Low:** The occurrence and potential cost of damage to life and property is very minimal to non-existent.
- **Low:** Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium:** Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High:** Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have already occurred in the past.
- **Extremely High:** Very widespread and catastrophic impact.

### *Defining Significance (Priority) of a Hazard*

Defining the significance or priority of a hazard to a community is based on a subjective analysis of several factors. This analysis is used to focus and prioritize hazards and associated mitigation measures for the plan. These factors include the following:

- **Past Occurrences:** Frequency, extent, and magnitude of historic hazard events.
- **Likelihood of Future Occurrences:** Based on past hazard events.
- **Ability to Reduce Losses through Implementation of Mitigation Measures:** This looks at both the ability to mitigate the risk of future occurrences as well as the ability to mitigate the vulnerability of a community to a given hazard event.

## Risk Assessment Summary: Madera County Planning Area

### *Agricultural Hazard*

- According to 2015 Crop Report, Madera County 9<sup>th</sup> most productive county in California
- Most agricultural disasters in Madera County associated with severe weather events, including heavy rains, floods, heat, freeze, and drought; insects and noxious weeds also a concern
- One State Disaster Declaration related to Agricultural Disease in 1982. Numerous USDA events from 2012-2014 all but one related to drought; it was for hailstorm, rain and cold.
- **HMPC – WHAT ARE THE BIGGEST AG ISSUES?**
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard

### *Climate Change*

- The 2013 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year. Climate Change has the potential to alter the nature and frequency of most hazards.
- **CAN THE COUNTY PROVIDE ANY INPUT ON ANY EVIDENCE OF IMPACTS TO THE COUNTY/CITIES FROM CLIMATE CHANGE?**
- Likelihood of Future Occurrence: Likely
- Vulnerability: Medium
- Priority Hazard??

### *Dam failure*

- According to data provided by Madera County, Cal DWR, and Cal OES, there are 20 dams in Madera County constructed for flood control, storage, electrical generation, and recreational purposes. Of the 20 dams, 10 are rated as High Hazard, 2 as Significant Hazard, 1 as Low Hazard, and 7 were not rated. There are another 6 High Hazard dams in Fresno County with the potential to impact the County.
- Failure of any of the High Hazard Dams of Concern to the County would flood downstream areas and could cause loss of life and property.
- No historic dam failures or overtopping?? During the Jan/Feb 2017 storms, a dam was close to overtopping causing local evacuations? **DETAILS? OTHER DAM FAILURE ISSUES/ CONCERNS??**
- Likelihood of Future Occurrence: Occasional
- Vulnerability: High
- Priority Hazard

## *Drought and Water Shortage*

- Historical drought data for the Madera County Planning Area and region indicate there have been 5 significant droughts in the last 84 years.
- Since 2012, snowpack levels in California had dropped dramatically. 2015 estimates place snowpack as 5 percent of normal levels. However, snowpack levels increased in 2016 and in 2017 snowpack levels are the highest they've been in 22 years!
- 1 federal and 3 state disaster declarations (1976 and 2014) for Madera County since 1950. There have been 117 NCDC drought events in Madera County. 105 of these were for the 2014-2016 drought, but no damages, injuries, or losses were reported in the NCDC database.
- **HMPC – CAN YOU PROVIDE DAMAGES OR RESTRICTIONS THAT HAVE OCCURRED IN THE COUNTY RECENTLY DUE TO THE MOST RECENT DROUGHT?**
- **WHAT IS THE PRIMARY WATER SOURCE IN THE COUNTY?**
- Likelihood of Future Occurrence: Likely
- Vulnerability: High
- Priority Hazard

## *Earthquake*

- Madera County is in the Central Valley, Foothill, and Sierra Nevada regions of California, and in an area crossed by very few faults. One fault does cross through the southeastern portion of Madera County; this is an unnamed fault that is part of the Hartley Springs Fault Zone. There are several nearby faults including the San Andreus fault, some 40 miles away.
- The western half of Madera County is in the lowest Earthquake Shaking Potential for California. It is likely that the region will be impacted by future seismic activity and with the exception of the far eastern edge of the County, the magnitude of the incident is not likely to be severe.
- There have been no disaster declarations in the County. No major earthquakes have been recorded within the County; although the County has felt ground shaking from earthquakes with epicenters located elsewhere. **TRUE?**
- Likelihood of Future Occurrence: Unlikely – large, damaging earthquake; Occasional – minor earthquake
- Vulnerability: Medium
- Priority Hazard

## *Flood Hazards*

### **100/500 year**

- Historically, portions of Madera County have always been at risk to flooding because of its annual percentage of rainfall, snowfall in the winter, and the number of watercourses that traverse the County.
- Madera County experienced 15 state and 9 federal declarations from 1950-present for flood related damages. Damaging floods in Madera County occur primarily in the developed areas of the County.
- **HMPC - REVIEW RISK ASSESSMENT AND ADD INFORMATION ON MAJOR FLOOD EVENTS**
- Likelihood of Future Occurrence: 100-Occasional; 500-Unlikely
- Vulnerability: High
- Priority Hazard

## Localized/Stormwater flooding

- Significant localized flood history in the County – occurs annually
- CAN THE HMPC PROVIDE DETAILS ON THESE AREAS? PICTURES/DESCRIPTIONS. NEED COMPLETE LOCALIZED FLOODING TABLE OF LOCATIONS.
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard

## *Hazardous Materials Transport*

- Most of the hazardous materials transported through Madera County is carried by truck on the State Highway or by railway systems. Pipeline Systems also carry hazardous materials.
- The United States Department of Transportation Pipeline and Hazardous Materials Safety Administration's (PHMSA) Office of Hazardous Materials Safety tracks transportation incidents: 15 rail and roadway incidents have occurred (been reported) since 1970.
- ARE THERE NOTABLE INCIDENTS THAT SHOULD BE INCLUDED HERE?
- Likelihood of Future Occurrence: Likely
- Vulnerability: Medium
- Priority Hazard

## *Landslides, Rockfalls, and Debris Flows*

- There have been two federal and three state disaster declarations associated with landslides in Madera County. CAN WE GET SPECIFICS ON THESE OR OTHER EVENTS?
- WHAT AREAS ARE AT RISK TO LANDSLIDES?
- Likelihood of Future Occurrence: Occasional
- Vulnerability: Low
- Non-Priority Hazard??

## *Levee Failure*

- There are both project and non-project levees in the County. No levees are certified as providing 100-year level of protection.
- No past occurrences of levee failures? TRUE? WHAT IS THE NATURE OF DEVELOPMENT BEHIND THE LEVEES AND WHAT ARE THE BIGGEST CONCERNS? IS THE COUNTY CONTEMPLATING CERTIFICATION OF ANY LEVEES?
- Likelihood of Future Occurrence: Unlikely
- Vulnerability: Medium
- Priority Hazard??

## *Severe weather*

### Extreme Cold, Snow and Freeze

- Annual occurrences of winter weather
- 3 state and federal disaster declarations related to freeze events.
- 128 severe winter weather and freeze events (NCDC) since 1993

➤ **HMPC TO REVIEW RISK ASSESSMENT TO PROVIDE DETAILS ON MAJOR COLD and FREEZE EVENTS IN THE COUNTY.**

- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard

### Extreme Heat

- Annual occurrences of hot weather
- 39 extreme heat events (NCDC) from since 1993
- No disaster declarations
- **HMPC TO REVIEW RISK ASSESSMENT TO PROVIDE DETAILS ON EXTREME HEAT EVENTS IN THE COUNTY.**
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium?
- Priority Hazard

### Fog

- Annual occurrences, with little recorded damages
- No disaster declarations or NCDC events related to fog. But past occurrences have resulted in deaths and injuries.
- **HMPC TO REVIEW RISK ASSESSMENT TO PROVIDE DETAILS ON HEAVY RAIN AND STORM EVENTS IN THE COUNTY.**
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Low
- Non-Priority Hazard

### Heavy rains and storms (Thunderstorms, Hail, Lightning)

- Significant County history: annual occurrences
- The NCDC data recorded 76 hail, heavy rain and storm incidents for Madera County since 1950.
- There have been 1 state and federal declarations for storms since 1950.
- **HMPC TO REVIEW RISK ASSESSMENT TO PROVIDE DETAILS ON HEAVY RAIN AND STORM EVENTS IN THE COUNTY.**
- Severe storms/heavy rains are the primary cause of most major flooding
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard

### Wind and Tornadoes

- Significant County history: annual occurrences – primarily with high winds.
- The NCDC data recorded 139 high wind and tornado incidents for Madera County since 1950. No Disaster Declarations.
- **HMPC TO REVIEW RISK ASSESSMENT TO PROVIDE DETAILS ON WIND AND TORNADO EVENTS IN THE COUNTY.**

- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Non-Priority Hazard?

### Winter Storms and Snow

- Significant County history: annual occurrences. East side is where most snow occurs.
- The NCDC data recorded 311 winter storm and snow incidents for Madera County since 1950.
- No disaster declarations for winter storms or snow.
- **HMPC TO REVIEW RISK ASSESSMENT TO PROVIDE DETAILS ON WINTER STORM AND SNOW EVENTS IN THE COUNTY.**
- Winter storms and snow contribute to seasonal flooding in the County
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard

### Volcano

- Of the approximately 20 volcanoes in the State, only a few are active and pose a threat. Long Valley Caldera and Ubehebe Craters are the closest to Madera County.
- In past 1,000 years, there have been at least 12 volcanic eruptions in the Long Valley area; this activity is likely to continue. Probability of such an eruption occurring in any given year is less than 1 percent.
- Given the location of Madera County relative to potentially active volcanoes, ashfall would be the likely concern. The State Plan does consider Madera County to be vulnerable to eruption and/or ashfall.
- Likelihood of Future Occurrence: Unlikely
- Vulnerability: Low
- Non-Priority Hazard

### Wildfire

- Wildfires occur on an annual basis in the Madera County Planning Area
- Numerous named fires causing a variety of damages.
- Any ignition has the potential to become an out of control wildfire.
- 4 state and federal disaster declarations for Wildfire since 1950 in the County
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Extremely High
- Priority Hazard

## Madera County Priority Hazards

- Agricultural Hazards
- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Flood: 100/500-year
- Flood: Localized/Stormwater
- Hazardous Materials Transportation
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy rains and Storms
- Severe Weather: Wind and Tornado
- Wildfire (Smoke, Tree Mortality, Conflagration)

### *Non-Priority Hazards:*

- Landslide, Rockfalls, and Debris Flows
- Severe Weather: Fog
- Volcano



## Mitigation Strategy: Goals

The most important element of the LHMP is the resulting mitigation strategy which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy is comprised of three components:

1. Mitigation Goals
2. Mitigation Actions
3. Action (Implementation) Plan

### *Mitigation Goals*

Up to now, the HMPC has been involved in collecting and providing data for the Modoc County Local Hazard Mitigation Plan Update. From this information, a Risk Assessment has been developed that describes the risk and vulnerability of the Modoc County planning area to identified hazards and includes an assessment of the area's current capabilities for countering these threats through existing policies, regulations, programs, and projects.

This analysis identifies areas where improvements could or should be made. Formulating Goals will lead us to incorporating these improvements into the Mitigation Strategy portion of the plan. Our planning goals should provide direction for what loss reduction activities can be undertaken to make the planning area more disaster resistant.

Mitigation Goals are general guidelines that represent the community's vision for reducing or avoiding losses from identified hazards. Goals are stated without regard for achievement, that is, implementation cost, schedule, and means are not considered. Goals are public policy statements that:

- Represent basic desires of the jurisdiction;
- Encompass all aspects of planning area, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

While goals are not specific (quantitative), they should not be so general as to be meaningless or unachievable.

Goals statements will form the basis for objectives. They should be stated in such a way as to develop one or more objectives related to each goal.

The key point in writing goals is to remember that they must deal with results, not the activities that produce those results.

Finally, before we formulate our goals, we should discuss other planning area goals from other regional/county/city programs and priorities. This keeps us from "reinventing the wheel," as well as being consistent with Multi-Objective Management --- or "MOM" --- where communities strive for efficiency by combining projects/needs that are similar in nature or location. Utilizing "MOM" effectively can result in

identifying multiple sources of funding that can be “packaged” and broadening the supporting constituency base by including “outcomes” desired by various stakeholder groups.

Types/Sources of other area mitigation plans and programs include:

- Emergency Operations Plans
- General Plans
- Stormwater Program and Plans
- Flood/Watershed Management Plans and Studies
- Drought Plans
- Community Wildfire Protection Plans
- Dam Failure Plans
- Other?

## Sample Goals from other Plans

### *Goals from the 2013 California State Hazard Mitigation Plan*

4. Significantly reduce life loss and injuries
5. Minimize damage to structures and property, as well as minimizing interruption of essential services and activities
6. Protect the environment
7. Promote hazard mitigation as an integrated public policy and as a standard business practice

### *Goals from the Madera County and City of Chowchilla 2011 LHMPs*

- Reduce the possibility of damages and losses due to seismic hazards, including ground shaking and earthquake-induced landslide
- Reduce the possibility of damages and losses due to weather-related hazards, including drought, flood, fog, heat, severe wind and tornado, and winter storm
- Reduce the possibility of damages and losses due to other hazards, including wildfire, dam failure, levee break, and hazardous material event

### *Goals from the Madera County General Plan, Safety Element, 1995*

Goal 6a. To minimize the loss of life, injury, and property damage due to seismic and geological hazards.

Goal 6b. To minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.

Goal 6c. To minimize the risk of loss of life, injury, and damage to property and watershed resources resulting from unwanted fires.

Goal 6e. To ensure the maintenance of an emergency action plan to effectively prepare for, respond to, recover from, and mitigate the effects of natural or technological disasters.

Goal 6F. To protect public health and safety through safe location of structures necessary for the protection of public safety and/or the provision of emergency services.

Goal 6g. To minimize the risk of loss of life, injury, serious illness, damage to property, and economic and social dislocations resulting from the use, transport, treatment, and disposal of hazardous materials and hazardous materials wastes.

### ***Goals from the Madera County Community Wildfire Protection Plan (2008) – Mission Statement***

The mission of the Madera County Community Wildfire Protection Plan (MCCWPP) is to protect natural and human-made resources from the effects of wildfire as cost effectively as possible by mobilizing all who govern, live, work, and visit Eastern Madera County to make their homes, businesses, neighborhoods, communities, and recreational areas fire safe.

### ***Goals from the Cal Fire Strategic Fire Plan (Madera-Mariposa-Merced Unit), 2016***

**Goal Statement:** The Madera-Mariposa-Merced Unit has developed its fire plan to align with the CAL FIRE “Strategic Plan” and the “California Fire Plan”. The Unit’s specific goals target anticipation and reduction of wildfires within the boundaries of the three counties and are as follows:

- Improve operational effectiveness
- Scale to budgetary and fiscal circumstances
- Foster a healthy ecosystem
- Improve firefighter safety

**Objectives:** Utilizing Battalion project planning, the Unit’s goals will be supported by the following objectives:

- Collect, analyze and prepare data to assess communities at risk and in need of fuel reduction or other projects.
- Work with grant writers and stakeholders to secure funds to implement projects.
- Utilize CAL FIRE personnel and resources in cooperation with other public and private efforts to assist with work projects on the ground.

Educate the public on fire prevention practices that would incorporate fire landscaping and construction to reduce their threat from wildfire along with hazardous fuels reduction projects to keep lives, homes, property and natural resources safe from catastrophic wildfires.

## *Goals Development*

You will each be given 3 sticky notes. On each note you will write what you think the goals for this mitigation planning effort should be. To get you started, provided below are possible goals for this mitigation plan. You may reword these or develop your own. These goal statements should serve as examples. It is vital that our Hazard Mitigation Planning Committee establish its own goals. Use one note for each goal. The purpose of the goal development is to reach a consensus on plan goals.

- Minimize risk and vulnerability from natural hazards
- Increase communities' awareness of vulnerability to hazards
- Increase the use of shared resources
- Improve communities' capabilities to mitigate losses
- Maintain coordination of disaster plans with changing DHS/FEMA needs
- Maintain FEMA eligibility/position jurisdictions for grant funding
- Maintain/enhance the flood mitigation program to provide 200/500-year flood protection
- Maintain current service levels
- Provide protection for existing buildings from hazards
- Provide protection for future development from hazards
- Provide protection for natural and cultural resources from hazard impacts
- Provide protection for people's lives from hazards
- Provide protection for public health
- Provide protection for critical services (fire, police, etc.) from hazard impacts
- Provide protection for critical lifeline utilities from hazard impacts
- Reduce exposure to hazard related losses
- Reduce the number of emergency incidents
- Make better use of technology

When done, we will:

- Pin/tape them to the wall/easel-chart and arrange them by category
- Combine and reword them into 3-4 goals for the plan.

**Risk Assessment and Mitigation Strategy Meetings  
Day 2**

## Mitigation Strategy: Actions

Mitigation actions are specific projects and activities that help achieve the goals and accomplish risk reduction in the community.

### *Categories of Mitigation Measures*

**PREVENTION:** Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- Planning
- Zoning
- Open Space Preservation
- Land Development Regulations
  - ✓ Subdivision regulations
  - ✓ Building Codes
    - Fire-Wise Construction
  - ✓ Floodplain development regulations
  - ✓ Geologic Hazard Areas development regulations (for roads too!)
- Storm Water Management
- Fuels Management, Fire-Breaks

**EMERGENCY SERVICES:** protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- Warning (flooding, tornadoes, winter storms, geologic hazards, fire)
  - ✓ NOAA Weather Radio
  - ✓ Sirens
  - ✓ “Reverse 911” (Emergency Notification System)
- Emergency Response
  - ✓ Evacuation & Sheltering
  - ✓ Communications
  - ✓ Emergency Planning
    - Activating the EOC (emergency management)
    - Closing streets or bridges (police or public works)
    - Shutting off power to threatened areas (utility company)
    - Holding/releasing children at school (school district)
    - Ordering an evacuation (mayor)
    - Opening emergency shelters (Red Cross)
    - Monitoring water levels (engineering)
    - Security and other protection measures (police)
- Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)

- ✓ Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
- ✓ Lifeline Utilities Protection
- Post-Disaster Mitigation
- Building Inspections
  - ✓ ID mitigation opportunities & funding before reconstruction

**PROPERTY PROTECTION:** Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- Retrofitting/disaster proofing
  - ✓ Floods
    - Wet/Dry floodproofing (barriers, shields, backflow valves)
    - Relocation/Elevation
    - Acquisition
    - Retrofitting
  - ✓ High Winds/Tornadoes
    - Safe Rooms
    - Securing roofs and foundations with fasteners and tie-downs
    - Strengthening garage doors and other large openings
  - ✓ Winter Storms
    - Immediate snow/ice removal from roofs, tree limbs
    - “Living” snow fences
  - ✓ Geologic Hazards (Landslides, earthquakes, sinkholes)
    - Anchoring, bracing, shear walls
    - Dewatering sites, agricultural practices
    - Catch basins
  - ✓ Drought
    - Improve water supply (transport/storage/conservation)
    - Remove moisture competitive plants (Tamarisk/Salt Cedar)
    - Water Restrictions/Water Saver Sprinklers/Appliances
    - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
    - Create incentives to consolidate/connect water services
    - Recycled wastewater on golf courses
  - ✓ Wildfire, Grassfires
    - Replacing building components with fireproof materials
    - Roofing, screening
    - Create “Defensible Space”
    - Installing spark arrestors
    - Fuels Modification

- ✓ Noxious Weeds/Insects
  - Mowing
  - Spraying
  - Replacement planting
  - Stop overgrazing
  - Introduce natural predators

➤ Insurance

**NATURAL RESOURCE PROTECTION:** Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- Wetlands Protection
- Riparian Area/Habitat Protection/Threatened-Endangered Species
- Erosion & Sediment Control
- Best Management Practices

Best management practices (“BMPs”) are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground’s surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project’s design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

8. Avoidance: setting construction projects back from the stream.
9. Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
10. Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained

- Dumping Regulations
- Set-back regulations/buffers



- Fuels Management
- Water Use Restrictions
- Landscape Management
- Weather Modification

**STRUCTURAL:** Projects that have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they “stop” flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats or requiring Environmental Assessments.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- Detention/Retention structures
- Erosion and Sediment Control
- Basins/Low-head Weirs
- Channel Modifications
- Culvert resizing/replacement/Maintenance
- Levees and Floodwalls
- Anchoring, grading, debris basins (for landslides)
- Fencing (for snow, sand, wind)
- Drainage System Maintenance
- Reservoirs (for flood control, water storage, recreation, agriculture)
- Diversions
- Storm Sewers

**PUBLIC INFORMATION:** A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- Hazard Maps and Data
- Outreach Projects (mailings, media, web, speakers, displays)
- Library Resources
- Real Estate Disclosure
- Environmental Education

## Mitigation Strategy: Action Plan

The mitigation action plan describes how the mitigation actions will be implemented, including how those actions will be prioritized, administered, and incorporated into the community's existing planning mechanism. Each participating jurisdiction must have a mitigation actions and an action plan specific to that jurisdiction and its priority hazards and vulnerabilities.

### *Mitigation Criteria*

For use in selecting and prioritizing Proposed Mitigation Measures

#### 1. STAPLEE

**Social: Does the measure treat people fairly? (different groups, different generations)**

- Community Acceptance
- Effect on Segment of Population
- Social Benefits

**Technical: Will it work? (Does it solve the problem? Is it feasible?)**

- Technical Feasibility
- Reduce Community Risk
- Long Tem Solution/Sustainable
- Secondary Impacts

**Administrative: Do you have the capacity to implement & manage project?**

- Staffing
- Funding Allocated
- Maintenance/Operations

**Political: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?**

- Political Support
- Local Champion
- Public Support
- Achieves Multiple Objectives
- Supported by a broad array of Stakeholders

**Legal: Does your organization have the authority to implement? Is it legal? Are there liability implications?**

- Existing Local Authority
- State Authority
- Potential Legal Challenges

**Economic: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?**

- Benefit of Action
- Cost of Action
- Cost Effective/Economic Benefits
- Economically Viable
- Outside Funding Required

**Environmental: Does it comply with Environmental regulations?**

- Effect on Land/Water
- Effect on Endangered Species
- Effect on Cultural Resources
- Effect on Hazmat sites
- Consistent with Community Environmental Goals
- Consistent with Environmental Laws
- Environmental Benefits

## 2. SUSTAINABLE DISASTER RECOVERY

- Quality of Life
- Social Equity
- Hazard Mitigation
- Economic Development
- Environmental Protection/Enhancement
- Community Participation

## 3. SMART GROWTH PRINCIPLES

- Infill versus Sprawl
- Efficient Use of Land Resources
- Full Use of Urban Resources
- Mixed Uses of Land
- Transportation Options
- Detailed, Human-Scale Design

## 4. OTHER

- Does measure address area with highest risk?
- Does measure protect ...
  - ✓ The largest # of people exposed to risk?
  - ✓ The largest # of buildings?
  - ✓ The largest # of jobs?
  - ✓ The largest tax income?
  - ✓ The largest average annual loss potential?
  - ✓ The area impacted most frequently?

- ✓ Critical Infrastructure (access, power, water, gas, telecommunications)
- Timing of Available funding
- Visibility of Project
- Community Credibility

## Mitigation Action Prioritization Instructions

Our Team recommendations are listed on flip-chart paper around the room.

You each have 3 sets of colored dots:

- 3 red dots
- 3 blue dots
- 3 green dots

The red dots are for high priority (5 points each)

The blue dots are for medium priority (3 points each)

The green dots are for low priority (1 point each)

Place your dots on the recommendations, using the different colors to indicate your priority. You may use as many of your dots, of any color, on any recommendation --- or you may spread them out using as few of your dots as you wish. The dots will indicate the consensus of the team.

Use your list of criteria to help you make your determinations.

After the totals are counted, we will discuss them further to confirm or change any of the results as we see fit.

## Mitigation Action Worksheet

<b>Mitigation Action/Project Title:</b>	
<b>Hazards Addressed:</b>	
<b>Issue/Background:</b>	
<b>Project Description:</b>	
<b>Other Alternatives:</b>	
<b>Existing Planning Mechanism(s) through which Action Will Be Implemented:</b>	
<b>Responsible Office/Partners:</b>	
<b>Cost Estimate:</b>	
<b>Benefits (Losses Avoided):</b>	
<b>Potential Funding:</b>	
<b>Timeline:</b>	
<b>Project Priority:</b>	

<b>Worksheet completed by:</b>	
<b>Name and Title:</b>	
<b>Phone:</b>	

**Madera County**  
**Local Hazard Mitigation Plan Update**  
**Mitigation Strategy Meeting: Mitigation Actions v/1**  
**June 1 & 2, 2017**

*Initial Goals*

- **Goal 1: Minimize risk and vulnerability of Madera County to hazards and protect lives and prevent losses to property, public health and safety, economy, and the environment.**
  - ✓ Identify strategies for mitigating hazards to reduce adverse impacts and hazard related losses.
  - ✓ Provide protection for existing and future development.
  - ✓ Provide protection for critical facilities, utilities, and services and minimize disruption.
  - ✓ Provide protection for the environment and natural and cultural resources.
  - ✓ Prevent repetitive losses and reoccurring damages from happening.
  - ✓ Minimize hazard related losses through master planning of communities.
  
- **Goal 2: Increase community outreach, education, and awareness of risk and vulnerability to hazards and promote preparedness and engagement to reduce hazard-related losses.**
  - ✓ Inform and educate residents and businesses about all hazards they are exposed to, where they occur, what they can do to mitigate exposure or damages.
  - ✓ Emphasize preparedness and self-responsibility to residents.
  
- **Goal 3: Improve communities' capabilities to prevent/mitigate hazard-related losses and to be prepared for, respond to, and recover from a disaster event.**
  - ✓ Continued improvements to emergency services and public safety capabilities.
  - ✓ Maintain coordination of disaster/emergency response plans and exercises with changing Department of Homeland Security/FEMA needs and with all agencies operating in Madera County.
  - ✓ Develop/improve warning, evacuation, and sheltering procedures and information for residents, businesses, visitors, individuals with access and functional needs, and animals, with a focus on high risk areas.
  - ✓ Improve/Maintain interagency communications. Ensure functionality and redundancy of communications, information technology, and other critical systems.
  - ✓ Increase interoperability and use of shared resources and mutual aid among agencies operating in Madera County.
  - ✓ Establish enhanced data collection and retention practices.
  - ✓ Minimize the over dependence on governmental regulation and allow the public and markets to implement reasonable measures.
  - ✓ Encourage more stable conditions that facilitate public and private stewardship.
  
- **Goal 4: Increase and maintain wildfire prevention and protection in Madera County.**
  - ✓ Reduce the wildfire risk and vulnerability in Madera County
  - ✓ Reduce life safety issues, property loss, and damages associated with wildfires.
  - ✓ Develop a countywide fuels reduction implementation strategy.
  - ✓ Promote tree mortality mitigation activities.

- Promote and enhance fire-fighting capabilities (e.g., access roads, water supply, etc.)
- **Goal 5: Improve community resiliency to drought conditions including establishing a sustainable water supply in Madera County.**
  - ✓ Reduce the drought/water shortage risk and vulnerability in Madera County.
  - ✓ Develop a comprehensive, countywide water plan to provide for existing development, to foster preservation of economic base, and to guide future development opportunities.
  - ✓ Promote continued groundwater conservation.
  - ✓ Increase water storage facilities to provide for consistent water supply and to mitigate flooding.
  - ✓ Address drought impacts related to tree mortality to include dead tree removal that contributes to wildfire risk (i.e., increased fuel loads) and flood risk (i.e., downed trees blocking flood control facilities).
- **Goal 6: Improve community resiliency to flooding in Madera County**
  - ✓ Reduce the flood risk and vulnerability in Madera County.
  - ✓ Reduce life safety issues, property loss, and damages associated with flooding.
  - ✓ Review appropriate flood protection infrastructure improvements in both urban and non-urban areas to provide 100-year level of protection where feasible.
- **Goal 7: Maintain FEMA eligibility for grant funding**
  - ✓ Assure conformance to federal and state hazard mitigation initiatives and maximize potential for mitigation implementation.
  - ✓ Position jurisdictions for grant funding through monitoring and communicating available grant programs, timelines, and processes to all communities.
  - ✓ Reduce exposure to hazard-related losses through realistic mitigation project planning and implementation, ensuring that actions can be undertaken and sustained without excessive depletion of economic resources.



## Initial Mitigation Action Ratings

Responsible Department/ Staff	Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
All	Public awareness, education, outreach, and preparedness program enhancements for all hazards (simplify, multi-media, educate and clarify various emergency systems, messaging and training; promote self-responsibility)	Multi-hazard	20
All	Incorporate LHMP Update by reference through board adoptions into the safety element of the General Plan Update	Multi-hazard	7
Agriculture	Get Ag projects for ag commissioner	Agriculture	5
	Emergency Operations Plan Update	Emergency Services/Multi-hazard	5
	Conduct evacuation and shelter planning for all communities and populations (to include all critical hazards, at risk populations, medical, ADA, animals, and with outreach and security components)	Emergency Services/Multi-hazard	8
	Countywide, multi-agency training & exercises	Emergency Services/Multi-hazard	15
	Recovery Planning	Emergency Services/Multi-hazard	0
	Enhance and maintain GIS mapping of County assets and critical facilities	Emergency Services/Multi-hazard	33
	Address access issues for fire-fighting, emergency response	Emergency Services/Wildfire	17
	Better monitoring and real-time surveillance of high hazard dams	Dam Failure	6
	Consult with DWR for Countywide water supply solutions	Drought & Water Supply	1
	Update and maintain emergency drinking water plan	Drought & Water Supply	0

Responsible Department/ Staff	Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
	Implement well rehab program	Drought & Water Supply	7
	Installation of variable frequency drives onto wells to increase capacity	Drought & Water Supply	0
	Install backup motors for wells (see master plan), with an emphasis on critical facilities	Drought & Water Supply	3
	Consolidation of water systems	Drought & Water Supply	20
	Explore additional surface water resources for County	Drought & Water Supply	3
	Conduct Bridge retrofits	Earthquake	0
	Seismic retrofitting of tanks and water systems	Earthquake	0
	Provide backup generators for wells	Earthquake	11
	Develop Climate Adaptation Plan and implement resulting climate adaptation strategies	Climate Change	N/A*
	Relocate/elevate critical facilities (e.g., Alview, Dairyland, and Lincoln Schools)	Flood/ Levee Failure	5
	Erosion repair	Flood/ Levee Failure	11
	Eradicate Arrundo (bamboo) from waterways (Chowchilla, Berenda, Ash)	Flood/ Levee Failure	0
	Flood Insurance Promotion	Flood	0
All	Implement stormwater master plans	Flood	48
	Bridge replacement projects	Flood	4
	4th street flooding improvements	Flood	0
	New studies/modeling for Fresno River to modify flood maps	Flood	0
	Structure elevation projects	Flood	0
	Consider joining the CRS program/continued enhancements to the CRS program	Flood	0

Responsible Department/ Staff	Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
City of Madera	Purchase land and create drainage basin for SE Madera Specific Plan	Flood	0
	Implement Oakhurst flood projects	Flood	1
	Stream bank erosion and restoration projects (e.g., church St., tribal properties, others)	Flood	5
City of Chowchilla	Chowchilla – undergrounding of stormwater system – downtown area	Flood	10
	Madera Ranchos study to identify best alternative to prevent flooding	Flood	5
	Madera Acres flood improvement projects	Flood	1
	Relocate County fire station out of floodplain	Flood	0
	Implement transportation program to cooling centers	Extreme Heat	2
	Tree maintenance and removal	Heavy Rains and Storms	0
	Continue mutual aid agreements	Hazardous Materials Transportation	0
	Identify/fulfill needs related to haz mat response (equipment, trailers, training, exercises, etc.)	Hazardous Materials Transportation	20
	Develop Haz Mat Area Plan	Hazardous Materials Transportation	1
	Tree Mortality Mitigation & Management	Drought & Water Supply/ Flood Wildfire	49
	Fuel break projects	Wildfire	N/A*
	Fuel modification projects	Wildfire	10
	Promote additional Firewise Communities	Wildfire	0
	CWPP project implementation	Wildfire	N/A*
	Promote wildfire public information & engagement	Wildfire	N/A*
	Infrastructure and water source establishment projects	Wildfire	1

Responsible Department/ Staff	Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
	Defensible space projects (30' to 100')	Wildfire	0
	Increase fire-fighting equipment, water tenders, etc.	Wildfire	0
	Maintain Chipper Program	Wildfire	0
	Reforestation projects	Wildfire	N/A*

\*N/A – scoring is not applicable; project added after mitigation strategy meetings



## Appendix D Adoption Resolution

**Note to Reviewers:** When this plan has been reviewed and approved pending adoption by FEMA Region IX, the adoption resolutions will be signed by the participating jurisdictions and added to this appendix. A model resolution is provided below.

### *Sample Resolution: Madera County and incorporated communities*

Resolution # \_\_\_\_\_

#### Adopting the Madera County Local Hazard Mitigation Plan

**Whereas**, (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

**Whereas**, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

**Whereas**, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

**Whereas**, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

**Whereas**, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**Whereas**, (Name of Government/District/Organization) fully participated in the FEMA-prescribed mitigation planning process to prepare this local hazard mitigation plan; and

**Whereas**, the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials have reviewed the Madera County Local Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body;

**Whereas**, the (Name of Government/District/Organization) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Madera County Local Hazard Mitigation Plan;

**Whereas**, adoption by the governing body for the (Name of Government/District/Organization), demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Local Hazard Mitigation Plan.

**Whereas**, adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

**Now, therefore, be it resolved,** that the (Name of Government/District/Organization) adopts the Madera County Local Hazard Mitigation Plan as an official plan; and

**Be it resolved,** that the (Name of Government/District/Organization) adopts the Madera County Local Hazard Mitigation Plan by reference into the safety element of their general plan in accordance with the requirements of AB 2140, and

**Be it further resolved,** (Name of Government/District/Organization) will submit this adoption resolution to the California Office of Emergency Services and FEMA Region IX officials to enable the plan's final approval in accordance with the requirements of the Disaster Mitigation Act of 2000 and to establish conformance with the requirements of AB 2140.

Passed: \_\_\_\_\_  
(date)

\_\_\_\_\_  
Certifying Official

## *Sample Tribal Resolution*

Resolution # \_\_\_\_\_

### **Adopting the Madera County Local Hazard Mitigation Plan**

**WHEREAS** the North Fork Rancheria of Mono Indians of California has historically experienced severe damage from natural and human-caused hazards such as flooding, wildfire, earthquake, drought, thunderstorms/high winds, and hazardous materials incidents on many occasions in the past century, resulting in loss of property and life, economic hardship, and threats to public health and safety;

**WHEREAS** the North Fork Rancheria of Mono Indians of California has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) as a participant in the Madera County Hazard Mitigation Plan under the requirements of 44 CFR 201.7;

**WHEREAS** the Plan specifically addresses hazard mitigation strategies and plan maintenance procedures for North Fork Rancheria of Mono Indians of California;

**WHEREAS** the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural and human caused hazards that impact the North Fork Rancheria of Mono Indians of California, with the effect of protecting people and property from loss associated with those hazards;

**WHEREAS**, adoption of this plan will make the North Fork Rancheria of Mono Indians of California eligible for funding to alleviate the impacts of future hazards on the Reservation,

**NOW THEREFORE BE IT RESOLVED** by the Tribal Council of the North Fork Rancheria of Mono Indians of California that:

1. The Plan is hereby adopted as an official plan of North Fork Rancheria of Mono Indians of California.
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them.
3. Future revisions and Plan maintenance required by 44 CFR 201.7 and FEMA, are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Tribal Council by [insert date] of each calendar year.
5. The North Fork Rancheria of Mono Indians of California will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11 (c); and will amend our Plan whenever necessary to reflect applicable changes in Tribe, State or Federal laws and statutes as required in 44 CFR 13.11. (d).

**Be it also resolved**, that the North Fork Rancheria of Mono Indians of California adopts the Madera County Local Hazard Mitigation Plan by reference into the safety element of their general plan in accordance with the requirements of AB 2140, and

**Be it further resolved,** North Fork Rancheria of Mono Indians of California will submit this adoption resolution to the California Office of Emergency Services and FEMA Region IX officials to enable the plan’s final approval in accordance with the requirements of the Disaster Mitigation Act of 2000 and to establish conformance with the requirements of AB 2140.

Passed: \_\_\_\_\_  
(date)

\_\_\_\_\_  
Certifying Official





## Appendix E Madera County Wildfire History (CAL FIRE)

Year	Fire Name	Cause	Acres Burned
1911		Unknown / Unidentified	113.6
1911		Unknown / Unidentified	104.4
1911		Unknown / Unidentified	11238.8
1911		Miscellaneous	337.3
1911		Miscellaneous	1171.6
1911		Unknown / Unidentified	3294.7
1911		Unknown / Unidentified	63.4
1911		Lightning	77.4
1916		Unknown / Unidentified	1334.7
1916		Miscellaneous	569.4
1916		Unknown / Unidentified	6239.9
1916		Miscellaneous	74.4
1917		Unknown / Unidentified	1155.0
1917		Miscellaneous	188.9
1917		Miscellaneous	398.8
1917		Unknown / Unidentified	1748.4
1917		Unknown / Unidentified	241.4
1917		Unknown / Unidentified	101.1
1917		Unknown / Unidentified	138.6
1918		Lightning	361.9
1918		Lightning	156.1
1919		Lightning	144.3
1919		Unknown / Unidentified	1089.5
1919		Unknown / Unidentified	360.1
1920		Lightning	990.5
1920		Unknown / Unidentified	508.1
1920		Unknown / Unidentified	703.2
1920		Unknown / Unidentified	99.1
1920		Unknown / Unidentified	71.3
1920		Miscellaneous	93.4
1921		Unknown / Unidentified	86.3
1921		Unknown / Unidentified	161.6
1921		Unknown / Unidentified	6348.8

Year	Fire Name	Cause	Acres Burned
1921		Unknown / Unidentified	59.4
1922		Unknown / Unidentified	1491.8
1922		Unknown / Unidentified	1180.8
1922		Unknown / Unidentified	25016.9
1922		Unknown / Unidentified	2432.3
1923		Unknown / Unidentified	415.3
1923		Unknown / Unidentified	24116.0
1924		Unknown / Unidentified	800.5
1924		Unknown / Unidentified	10310.1
1924		Unknown / Unidentified	1055.9
1924		Miscellaneous	5202.7
1924		Unknown / Unidentified	159.5
1924		Unknown / Unidentified	105.7
1925		Unknown / Unidentified	4972.6
1926		Unknown / Unidentified	4926.6
1926		Unknown / Unidentified	91.9
1926		Miscellaneous	540.5
1926		Lightning	604.1
1926		Unknown / Unidentified	4395.2
1926		Lightning	423.7
1928		Unknown / Unidentified	21194.1
1928		Unknown / Unidentified	302.1
1928		Unknown / Unidentified	1204.9
1928		Unknown / Unidentified	2264.3
1928		Unknown / Unidentified	65.0
1928		Unknown / Unidentified	159.2
1930		Unknown / Unidentified	701.0
1931		Unknown / Unidentified	780.5
1931		Unknown / Unidentified	2978.2
1931		Unknown / Unidentified	640.9
1933		Unknown / Unidentified	984.5
1933		Unknown / Unidentified	2416.2
1933		Unknown / Unidentified	77.3
1934		Unknown / Unidentified	414.3
1934		Unknown / Unidentified	8313.2
1936		Unknown / Unidentified	10673.6
1937		Lightning	537.3

Year	Fire Name	Cause	Acres Burned
1939		Unknown / Unidentified	15312.9
1939		Unknown / Unidentified	35335.2
1940		Lightning	360.5
1940		Miscellaneous	131.8
1942		Unknown / Unidentified	359.2
1944		Unknown / Unidentified	157.0
1945		Miscellaneous	530.0
1946		Miscellaneous	232.3
1947		Lightning	53.9
1950	Curran	Unknown / Unidentified	455.7
1950	Thomas Gregory	Unknown / Unidentified	522.8
1951	Bates	Unknown / Unidentified	140.1
1951	C.C. Cook	Unknown / Unidentified	356.2
1951	Arnold Sallaberry	Unknown / Unidentified	367.5
1951	Oakhurst	Unknown / Unidentified	1366.2
1951	Mocchi	Unknown / Unidentified	473.9
1951		Unknown / Unidentified	201.0
1951		Unknown / Unidentified	634.5
1951		Miscellaneous	53.8
1951		Miscellaneous	78.9
1951		Miscellaneous	187.1
1952	Strathearn	Unknown / Unidentified	1504.3
1952		Lightning	114.9
1953	O'Neal	Unknown / Unidentified	649.3
1953	Lambertson	Unknown / Unidentified	1102.4
1953	Rivas	Unknown / Unidentified	362.6
1954	Coarsegold Creek	Unknown / Unidentified	476.8
1954	Black Hawk Mt.	Escaped Prescribed Burn	483.4
1954	Bufford Mtn	Escaped Prescribed Burn	4938.6
1957	Bissett	Unknown / Unidentified	647.1
1957		Miscellaneous	65.8
1958	Urruttia #2	Unknown / Unidentified	172.9
1958	Jamison	Unknown / Unidentified	282.4
1958		Unknown / Unidentified	836.5
1959	Urruttia #2	Unknown / Unidentified	1556.5
1959	Desmond	Unknown / Unidentified	413.4
1959		Lightning	164.9

Year	Fire Name	Cause	Acres Burned
1959	Nelson Cove Fire	Equipment Use	11076.3
1961	Harlow	Miscellaneous	43330.8
1961	Eucalyptus Resort	Unknown / Unidentified	326.4
1961	Mcalister Fire	Unknown / Unidentified	590.0
1962	Roadside #5	Unknown / Unidentified	901.0
1962	Bowers	Unknown / Unidentified	7738.2
1962	Lightning #2	Unknown / Unidentified	312.8
1962		Miscellaneous	228.8
1964	Wood-Schaubach	Escaped Prescribed Burn	492.4
1964		Unknown / Unidentified	105.6
1966	Desmond-Gill	Unknown / Unidentified	616.1
1967	Mckinney	Unknown / Unidentified	794.3
1968	Thornberry #2	Unknown / Unidentified	3130.6
1968	Nelson Cove	Unknown / Unidentified	356.2
1969	Lightning #36	Unknown / Unidentified	4662.0
1970	Long Ridge	Miscellaneous	597.8
1970	Martin	Unknown / Unidentified	682.1
1970	Wylie	Miscellaneous	340.3
1971	Mariani	Unknown / Unidentified	363.0
1971	Marquerite	Unknown / Unidentified	731.6
1973	Browncone	Lightning	59.7
1973	Lightning #2	Unknown / Unidentified	618.8
1973	Lightning #58	Unknown / Unidentified	471.9
1973	Horseshoe	Lightning	834.6
1974	Junction	Lightning	69.8
1975	Pole Line	Unknown / Unidentified	2948.6
1976	Willow Glen	Unknown / Unidentified	408.8
1977	Mammoth	Debris	98.1
1977	Manzanita	Campfire	103.7
1978	J.L.	Lightning	248.1
1978	Lightning #1	Unknown / Unidentified	333.4
1980	Randall	Unknown / Unidentified	227.6
1980	Randall	Unknown / Unidentified	277.4
1980	Stevenson	Equipment Use	457.1
1980	Kingsman	Equipment Use	254.1
1981	Yosemite Lakes	Unknown / Unidentified	455.1
1981	Rabbit Hill	Unknown / Unidentified	821.1

Year	Fire Name	Cause	Acres Burned
1982	Brown	Unknown / Unidentified	262.7
1982	Temperance Flat	Unknown / Unidentified	7801.8
1983	Johnson	Lightning	1363.3
1985	Mammoth	Arson	764.3
1985	Buck	Lightning	348.1
1986	Chow	Unknown / Unidentified	538.4
1986	Daulton	Unknown / Unidentified	243.3
1987	Chawanakee	Miscellaneous	1487.0
1988	Ridge	Lightning	63.4
1989	Powerhouse	Arson	11800.0
1990	Lilly	Campfire	100.7
1990	Hoover	Lightning	76.1
1990		Lightning	76.1
1992	Rainbow	Lightning	8358.4
1992	Urrutia	Unknown / Unidentified	232.3
1993	Table	Unknown / Unidentified	522.8
1993	Table	Unknown / Unidentified	573.0
1995	Urrutia	Unknown / Unidentified	251.1
1996	Adam	Lightning	248.3
1996	Canal	Unknown / Unidentified	753.2
1996	Daulton	Unknown / Unidentified	723.7
1996	Daulton	Unknown / Unidentified	507.2
1997	Mile	Unknown / Unidentified	1058.8
1998	Canal	Arson	659.6
2000	Ranch	Unknown / Unidentified	284.1
2000	Ranch	Unknown / Unidentified	146.8
2001	North Fork	Equipment Use	4130.5
2001	Hoover	Lightning	7230.6
2002	Ottoway	Lightning	62.6
2002	Rock Creek 2	Debris	402.5
2003	Rd_26	Miscellaneous	525.6
2003	Northfork	Equipment Use	471.8
2003	200fire	Lightning	72.3
2003	Snake/Cargyle2	Lightning	825.7
2004	210	Vehicle	56.5
2004	Olivia	Equipment Use	60.6
2004	Source	Miscellaneous	384.5

Year	Fire Name	Cause	Acres Burned
2004	Rd 400	Equipment Use	90.2
2004	Walker	Unknown / Unidentified	84.3
2004	Nehouse	Miscellaneous	254.4
2005	810 Fire	Equipment Use	52.1
2005	Bailey	Unknown / Unidentified	1024.5
2005	Noble	Lightning	155.6
2005	Quartz	Unknown / Unidentified	547.4
2005	Corral Wfu	Lightning	256.3
2005	Urrotia	Unknown / Unidentified	420.4
2006	Raymond	Smoking	475.1
2006	Rube	Lightning	233.0
2007	Highway 41/ Rd 209 3	Unknown / Unidentified	329.1
2007	Rock	Lightning	85.7
2008	41 Fire	Vehicle	2592.3
2008	Millerton	Unknown / Unidentified	175.1
2008	Chiquito	Lightning	145.4
2008	Star	Lightning	234.7
2008	Fuller	Lightning	67.5
2008	Cascadel	Miscellaneous	277.3
2010	Fine	Unknown / Unidentified	236.7
2010	Buckhorn	Lightning	471.0
2013	Gold	Unknown / Unidentified	183.6
2013	Rolling	Vehicle	482.0
2013	Aspen	Lightning	22937.5
2014	French	Campfire	13831.6
2014	Junction Fire	Unknown / Unidentified	612.2
2014	Courtney Fire	Debris	290.9
2015	Corrine	Powerline	921.6
2015	Sky	Equipment Use	498.9
2015	Red	Debris	134.0
2015	Willow	Playing With Fire	5701.3

Source: CAL FIRE, Madera County GIS



## Appendix F Critical Facilities Inventory

*Table F-1 Madera County Critical Facilities and Flood, Fire, Landslide, Hazardous Materials, and Dam Inundation*

Critical Facility Name	Function	Address	City	Critical Facility Type	Critical Facility Category	Flood Zone	Fire Severity Zone	Landslide Zone	Haz Mat Roads	Haz Mat Rail	Dam Inundation
Madera County Telecommunications	Telecom towers and infrastructure	42001 Radio Lane (Approximated)	Auberry	Telecommunications Infrastructure	Essential Services	N/A	Very High	Low	N/A	N/A	No Dam Inundation
Chowchilla (AT&T)	Switching Station for Chowchilla Area	513 Kings Avenue	City of Chowchilla	Central Switching Station / Communications	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
Chowchilla Avalon Care Center	24 Hour Health Care	1010 Ventura Avenue	City of Chowchilla	Convalescent Hospital	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
Chowchilla High School			City of Chowchilla	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
Chowchilla Skilled Nursing	24 Hour Health Care	1104 Ventura Avenue	City of Chowchilla	Convalescent Hospital	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
City of Chowchilla / Police HQ / Dispatch	Police Dispatch Center / Fire / EMS	122 Trinity Avenue	City of Chowchilla	Public Safety Facility / 911 PSAP	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
City of Chowchilla Fire Department	Main Fire Station	240 North 1st Street	City of Chowchilla	Fire Station	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
Fuller Elementary School			City of Chowchilla	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam

Critical Facility Name	Function	Address	City	Critical Facility Type	Critical Facility Category	Flood Zone	Fire Severity Zone	Landslide Zone	Haz Mat Roads	Haz Mat Rail	Dam Inundation
Ronald Reagan Elementary School			City of Chowchilla	School	At Risk Populations	Zone X (unshaded)	Non-Wildland/Non-Urban	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
Stephens Elementary School			City of Chowchilla	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
Wilson Middle School			City of Chowchilla	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 233	Union Pacific Railroad	Buchanan Dam
Adams Elementary School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 99	Union Pacific Railroad	Hidden Dam
Alpha Elementary School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Non-Wildland/Non-Urban	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Jefferson Middle School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Lincoln Elementary School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low			Hidden Dam
Madera City / Police HQ / Dispatch	Police HQ and 911 Dispatch Center	330 South "C" Street	City of Madera	Police Dispatch Communication Center	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Madera City Hall	Critical LMR transceivers and related infrastructure	203 West 4th Street	City of Madera	City Hall Admin Critical Infrastructure	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Madera Community Hospital	General Hospital, Emergency Room / City Southeast LMR repeater is sited here	1250 East Almond Avenue	City of Madera	Medical Center	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam



Critical Facility Name	Function	Address	City	Critical Facility Type	Critical Facility Category	Flood Zone	Fire Severity Zone	Landslide Zone	Haz Mat Roads	Haz Mat Rail	Dam Inundation
Madera County Administration Office	IT Communications Facilities, Roads, Engineering, Surveying, Environmental and Departments	200 West 4th Street	City of Madera	Community Services / Engineering and Infrastructure Services / IT Communications	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Madera County Fire Department HQ	Fire Command Center	14225 Road 28	City of Madera	Fire Command Center	Essential Services	Zone X (shaded)	Urban Unzoned	Low	Highway 99	BNSF Railway	Hidden Dam
Madera County Sheriff Center HQ / OES / Sheriff's Dispatch	Emergency Operations Center, HQ / OES, Dispatch, Evidence Lock up	2725 Falcon Drive	City of Madera	Emergency Dispatch Center	Essential Services	Zone X (unshaded)	Non-Wildland/Non-Urban	Low	Highway 99	Union Pacific Railroad	Hidden Dam
Madera High School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Madera Municipal Airport	The City's northwest LMR repeater is sited at this location	4020 Aviation Drive	City of Madera	Airport and Radio Tower	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 99	Union Pacific Railroad	Hidden Dam
Madera South High School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Non-Wildland/Non-Urban	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Madera Water Tower	City's primary internet connection is relayed through microwave antennas FÇô critical for MDT communications	100 E South Street	City of Madera	Critical Communications	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam

Critical Facility Name	Function	Address	City	Critical Facility Type	Critical Facility Category	Flood Zone	Fire Severity Zone	Landslide Zone	Haz Mat Roads	Haz Mat Rail	Dam Inundation
Madison Elementary School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Millview Elementary School			City of Madera	School	At Risk Populations	Zone X (shaded)	Urban Unzoned	Low	Highway 145	BNSF Railway	Hidden Dam
Monroe Elementary School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 145		Hidden Dam
Norman M. Gould School School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Parkwood Elementary School			City of Madera	School	At Risk Populations	Zone AO	Non-Wildland/Non-Urban	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Saint Joachim School School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Sherman Thomas Charter School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 99	Union Pacific Railroad	Hidden Dam
Sierra Vista Elementary School			City of Madera	School	At Risk Populations	Zone X (shaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam
Valley Children's Hospital	General Hospital, Emergency Room, Trauma Unit	9300 Valley Children's Place	City of Madera	Medical Center	Essential Services	Zone X (unshaded)	Urban Unzoned	Low	Highway 41		No Dam Inundation
Washington Elementary School			City of Madera	School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low	Highway 145	Union Pacific Railroad	Hidden Dam

Critical Facility Name	Function	Address	City	Critical Facility Type	Critical Facility Category	Flood Zone	Fire Severity Zone	Landslide Zone	Haz Mat Roads	Haz Mat Rail	Dam Inundation
Madera / Mariposa / Merced Unit - Cal Fire - State of California	Joint Emergency Operations / Dispatch Center	5366 State Highway 49 North	Mariposa	Fire Command Center / Dispatch Center	Essential Services	N/A	Moderate	Low	N/A	N/A	No Dam Inundation
Madera County Sheriff / Oakhurst OEC	Emergency Operations and Command Center	48267 Liberty Drive	Oakhurst	Rural Emergency Operations	Essential Services	Zone X (unshaded)	Moderate	Low	Highway 41		No Dam Inundation
Alview Elementary School				School	At Risk Populations	Zone A	Non-Wildland/Non-Urban	Low			No Dam Inundation
Bailey Flat Elementary School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low			No Dam Inundation
Berenda Elementary School				School	At Risk Populations	Zone X (unshaded)	Urban Unzoned	Low		BNSF Railway	No Dam Inundation
Cesar Chavez Elementary School				School	At Risk Populations	Zone AO	Non-Wildland/Non-Urban	Low	Avenue 12	Union Pacific Railroad	Hidden Dam
Coarsegold Elementary School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low	Highway 41		No Dam Inundation
Dairyland Elementary				School	At Risk Populations	Zone A	Urban Unzoned	Low			No Dam Inundation
Desmond Middle School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low			Hidden Dam
Dixieland Elementary School				School	At Risk Populations	Zone A	Non-Wildland/Non-Urban	Low			No Dam Inundation
Eastin-Arcola School				School	At Risk Populations	Zone X (unshaded)	Non-Wildland/Non-Urban	Low			Friant Dam

Critical Facility Name	Function	Address	City	Critical Facility Type	Critical Facility Category	Flood Zone	Fire Severity Zone	Landslide Zone	Haz Mat Roads	Haz Mat Rail	Dam Inundation
Fairmead Elementary School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low	Highway 152	Union Pacific Railroad	No Dam Inundation
Howard Elementary School				School	At Risk Populations	Zone X (unshaded)	Non-Wildland/Non-Urban	Low			Hidden Dam
La Vina Elementary School				School	At Risk Populations	Zone AO	Non-Wildland/Non-Urban	Low			Hidden Dam
Liberty High School				School	At Risk Populations	Zone X (unshaded)	Non-Wildland/Non-Urban	Low	Avenue 12		No Dam Inundation
Lincoln Elementary School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low	Highway 49		No Dam Inundation
Minarets High School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low	Highway 41		No Dam Inundation
Mountain Oaks High School				School	At Risk Populations	Zone D (unmapped)	Moderate	Low			No Dam Inundation
Nishimoto Elementary School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low			Hidden Dam
North Fork Elementary School				School	At Risk Populations	Zone D (unmapped)	Moderate	Low			No Dam Inundation
Oak Creek Intermediate School				School	At Risk Populations	Zone X (unshaded)	Moderate	Low	Highway 41		No Dam Inundation

Source: Nevada County GIS

*Table F-2 Nearby County – Critical Facilities and Flood, Fire, Landslide, and Haz-Mat*

Critical Facility Name	Function	Address	City	County	Critical Facility Type	Critical Facility Category	Flood Zone	Fire Severity Zone	Landslide Zone	Haz Mat Roads	Haz Mat Rail
Madera / Mariposa / Merced Unit - Cal Fire - State of California	Joint Emergency Operations / Dispatch Center	5366 State Highway 49 North	Mariposa	Mariposa County	Fire Command Center / Dispatch Center	Essential Services	N/A	Moderate	Low	N/A	N/A
Madera County Telecommunications	Telecom towers and infrastructure	42001 Radio Lane (Approximated)	Auberry	Fresno County	Telecommunications Infrastructure	Essential Services	N/A	Very High	Low	N/A	N/A

Source: Nevada County GIS