



# APPENDIX C: MITIGATION STRATEGY

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## Categories of Mitigation Measures Considered

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The following categories are based on the Community Rating System. To accommodate other hazards, multi-hazard examples were added:

### Prevention

- Planning and zoning
- Open space preservation
- Land development regulations
- Stormwater management
- Fuels management

### Property Protection

- Firewise construction
- Defensible space/fuels modification
- Water supply
- Flood protection

### Natural Resource Protection

- Erosion and sediment control
- Wetlands protection
- Threatened and endangered species protection
- Fuels management

### Emergency Services

- Warning and evacuation
- Communications
- Critical facilities protection
- Lifeline utilities protection
- Health and safety maintenance

### Structural Projects

- Detention/retention structures
- Sediment basins/low-head weirs
- Channel modifications

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- Culvert resizing/replacement/maintenance
  - Floodwalls

### **Public Information**

- Hazard maps
- Outreach programs (mailings, media, web, speakers bureau)
- Education program (children/adults)

## **Alternative Mitigation Measures per Category**

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### **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
  - Floodplain development regulations
- Stormwater management
- Fuels management, fire breaks
- Building codes
  - Firewise construction
- (also see Property Protection)

### **Emergency Services**

Emergency services protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- Warning (floods, tornadoes, ice storms, hail storms, dam failures)
  - NOAA weather radio all hazards
  - Sirens
  - Reverse 911
- Evacuation and sheltering
- Communications
- Emergency planning
  - Activating the emergency operations room (emergency management)

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- Closing streets or bridges (police or public works)
  - Shutting off power to threatened areas (utility company)
  - Holding children at school/releasing children from school (school district)
  - Passing out sand and sandbags (public works)
  - Ordering an evacuation (mayor)
  - Opening evacuation shelters (red cross)
  - Monitoring water levels (engineering)
  - Security and other protection measures (police)
  - Monitoring of conditions (dams)
  - 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
    - Health and safety maintenance

## 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
    - Acquisition
  - Tornadoes
    - Safe rooms
    - Securing roofs and foundations with fasteners and tie-downs
    - Strengthening garage doors and other large openings
  - 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
  - Earthquakes

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- Removing masonry overhangs, bracing other parts
  - Tying down appliances, water heaters, bookcases and fragile furniture so they will not fall over during a quake.
  - Installing flexible utility connections that will not break during shaking (pipelines, too)
  - Wildland fire
    - Replacing building components with fireproof materials (roofing, screening)
    - Creating “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:

- Erosion and sediment control
- Wetlands protection
- Riparian area/habitat protection
- Threatened and endangered species protection
- Fuels management
- Set-back regulations/buffers

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- 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:
    - Avoidance—Setting construction projects back from the stream.
    - Reduction—Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
    - 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
  - Water use restrictions
  - Weather modification
  - Landscape management

## **Structural Projects**

Structural projects 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.
- 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

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- Basins/low-head weirs
  - Channel modifications
  - Culvert resizing/replacement/maintenance
  - Levees and floodwalls
  - 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 bureau)
- Library resources
- Real estate disclosure
- Environmental education
- Technical assistance

## Mitigation Alternative Selection Criteria

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The following criteria were used to select and prioritize proposed mitigation measures:

### STAPLE/E

- **Social**—Does the measure treat people fairly? (different groups, different generations)
- **Technical**—Will it work? (Does it solve the problem? Is it feasible?)
- **Administrative**—Do you have the capacity to implement and manage project?
- **Political**—Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?
- **Legal**—Does your organization have the authority to implement? Is it legal? Are there liability implications?
- **Economic**—Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?
- **Environmental**—Does it comply with environmental regulations?

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## **Sustainable Disaster Recovery**

- Quality of life
- Social equity
- Hazard mitigation
- Economic development
- Environmental protection/enhancement
- Community participation

## **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

## **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)?
- What is timing of available funding?
- What is visibility of project?
- Community credibility

## **Submitting Mitigation Actions**

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The table on the following page lists mitigation actions identified and prioritized by the Hazard Mitigation Planning Committee. A mitigation action implementation worksheet must be completed for each action the Hazard Mitigation Planning Committee would like to include in the plan. A blank implementation worksheet was attached to the email with this document. Two examples of completed implementation worksheets are attached at the end of this document.

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All of the potential actions listed are important; priority was determined relative to each other by adding up the votes from the final Hazard Mitigation Planning Committee meeting. In addition, items that must be completed to meet FEMA requirements were given a high priority ranking (these are marked with an asterisk\*).

The person or agency most likely to take a lead role in implementing the action in the future should write-up the implementation worksheet, which captures how the agency foresees the action getting done. Our best guesses at the best person to either complete or coordinate the completion of the worksheet are included in the table below. These can be changed/delegated as needed.

If an action has a low priority ranking, but you are already working on it or know that your jurisdiction has the capabilities to get it done, please complete the worksheet. If an action has a low ranking, and you think the feasibility of getting it done in the next five years is not strong, please let me know. It may be better to table this action until the next plan update or until funding or other staff capabilities become available. In this case, we do not need to develop an implementation worksheet.

## **Angels Camp**

Each jurisdiction should complete an implementation worksheet for each of the actions listed in the table below that it would like to submit, but that would require specific implementation by the jurisdiction. I have indicated in the responsibility column which actions these may be.

Each jurisdiction should also identify any other mitigation actions/projects unique to it, such as a public works project or protection of a critical facility, and complete an implementation worksheet for these. Jurisdictions should prioritize their actions into high, medium, or low based on the same criteria used in the last Hazard Mitigation Planning Committee meeting of being socially, technically, administratively, politically, legally, environmentally, and economically feasible and desirable.

The best way for jurisdictions to get implementation worksheets done efficiently and effectively is to organize a meeting (or get on agenda of an existing meeting) with key staff members from different departments to get those unfamiliar with the project on board, finalize and prioritize actions, and assign who will be responsible for writing up each implementation worksheet.

**Table 1: Actions Identified and Prioritized by the Hazard Mitigation Planning Committee**

No.	Action	Priority	Votes	Comments/Ideas for Implementation	Responsibility for Completing Worksheet
1	Coordinate annual review of multi-hazard mitigation plan	High*	n/a		Calaveras OES
2	Adopt multi-hazard mitigation plan in safety element of general plan	High*	n/a		Calaveras Planning Department <b>Angels Camp</b>
3	Develop mitigation page on County's website to host final version of multi-hazard mitigation plan and keep hard copies of final plan available in libraries	High*	n/a		Calaveras Technology Services <b>Angels Camp</b>
4	Create and maintain wildfire defensible space around critical facilities and infrastructure in high fire hazard areas, including schools, evacuation sites, repeater towers, water pumping stations, and electric and phone substations	High	6		Calaveras OES /CalFire/ Fire Districts
5	Replace wooden flume	High	5		Calaveras OES
6	Expand capabilities and potential uses of Reverse 911 system	High	5		Calaveras Technology Services
7	Enhance GIS modeling and analysis of wildfire threat	High	3		Calaveras Technology Services
8	Pursue adoption of defensible space provision for unimproved parcels	High	2		Calaveras Planning Department/CalFire
9	Develop a business continuity plan for county departments	High	1	Consider lowering priority due to current staff time/budget	Administration
10	Pursue adoption of hillside development standards to reduce wildfire risk	High	1		Calaveras Planning Department/ Calaveras OES
11	Reduce future flood losses along Cosgrove Creek	High	1		Calaveras OES
12	Address repetitive loss properties along Cosgrove Creek	High	1		Calaveras OES
13	Work with FEMA on determining areas for detailed floodplain studies	High	1		Calaveras OES Planning Department
14	Join National Flood Insurance Program Community Rating System	High	1		Calaveras OES Planning Department
15	Improve channel maintenance and upkeep to prevent debris buildup at road bridges	High	1		Calaveras Public Works

<b>No.</b>	<b>Action</b>	<b>Priority</b>	<b>Votes</b>	<b>Comments/Ideas for Implementation</b>	<b>Responsibility for Completing Worksheet</b>
16	Promote National Flood Insurance Program to improve awareness of public and other stakeholders including realtors, lenders, insurers	High	1		Calaveras Floodplain Administrator (Community Development) <b>Angels Camp</b>
17	Improve flood warning system through better stream gage data collection	High	n/a		Calaveras OES
18	Coordinate with fire safe council to fund and expand wildfire mitigation activities	Medium			?
19	Ensure implementation of State 4290/4291 regulations	Medium			Calaveras Planning Department/ CalFire/Fire Districts?
20	Replace redwood water storage tanks	Medium		Action already developed by CCWD	CCWD
21	Mail notice to property owners about hazards and risk as part of tax bills.	Medium			?
22	Develop and maintain defensible space around Foothills Village assisted living	Medium			Angels Camp
23	Implement fuel reduction along County right of ways	Medium			Calaveras Public Works?
24	Provide flood protection for Jenny Lind water treatment plant	Medium		Action already developed by CCWD	CCWD
25	Coordinate with State OES and CCWD on new special flood hazard areas near Peachtree Dam, including notification and evacuation planning	Medium		Planning and Development Department would be partner in implementation	Calaveras OES
26	Improve hazard related information available on the County's website including on winter weather traveler information, water conservation, and links to Corps water management site and CDEC site	Medium			Calaveras Technology Services  Angels Camp
27	Identify stormwater flooding projects	Low			Calaveras Public Works Angels Camp Public Works
28	Include police and fire in planning of future development to improve knowledge of hazards	Low			Angels Camp Police Department
29	Use school resource officers to provide education on hazards/risk and preparedness and mitigation measures.	Low			Angels Camp Police Department

<b>No.</b>	<b>Action</b>	<b>Priority</b>	<b>Votes</b>	<b>Comments/Ideas for Implementation</b>	<b>Responsibility for Completing Worksheet</b>
30	Improve building permit inspection process to accurately locate access to properties	Low			Calaveras Technology Services
31	Improve coordination of joint meetings and trainings, including functional exercises	Low			Calaveras OES/ Calaveras Building Department  Angels Camp
32	Develop education and incentives program to encourage responsible water use	Low		CCWD developed action. County's action should discuss how to complement partnership	?
33	Identify needed improvements to vulnerable populations planning	Low			Calaveras Works and Human Services Agency
34	Identify critical facilities/infrastructure needing backup power sources	Low			Calaveras OES and Calaveras Public Works?

## EXAMPLE: Mitigation Action Implementation Worksheet

Jurisdiction:	<b>Multi-jurisdictional</b>	Priority:	<b>High</b>
<b>Action Title:</b>	Enhance existing centralized, interjurisdictional GIS program to improve capabilities in mitigation, preparedness, and response for all hazards.		
<b>Issue/Background:</b>	Access to current and updated GIS information is critical to effective evaluation, mitigation, and response to emergencies by all jurisdictions. This resource is already well-established in the Kings County Planning Agency and should be built upon and extended to more agencies in the county. It could be enhanced for multiple hazards.		
<b>Ideas for Implementation:</b>	The Kings County Planning Agency already maintains countywide GIS data and is sharing information resources with city planning departments. A centralized GIS program would connect first responding agencies with uniform data and would prioritize the development of critical information layers. A web-based mapping application could be developed to provide public information and restricted first responder information.		
<b>Responsible Office:</b>	Kings County Planning Agency – GIS Services Division		
<b>Partners:</b>	Cities of Avenal, Corcoran, Lemoore, and Hanford and special districts		
<b>Potential Funding:</b>			
<b>Cost Estimate:</b>	\$20,000 for all four cities to contract with county GIS services in fiscal year 2007-2008. \$25,000 for web application and \$3,000 annual maintenance. \$50,000-\$100,000 every three years for data resources updates.		
<b>Benefits: (Losses Avoided)</b>	\$1000s in potential losses avoided over the long term through enhanced, more accurate information and improved accessibility and coordination. Saves jurisdictions money by pooling resources.		
<b>Timeline:</b>	Establish GIS support agreement with cities in fiscal year 2007-2008. Aerial imagery update in summer 2007. Web application in fiscal year 2007-2008.		
<b>Completed by:</b>			

## EXAMPLE: Mitigation Action Implementation Worksheet

<b>Jurisdiction:</b>	<b>Multi-jurisdictional</b>	<b>Priority:</b>	<b>High</b>
<b>Action Title:</b>	Replace redwood water storage tanks with steel tanks		
<b>Issue/Background:</b>	<p>The CCWD owns 11 redwood water storage tanks that are approaching 40 years of age. These tanks are made of wood and are vulnerable to fire—the 602 tank in the Jenny Lind service area was destroyed by wildfire in 2004 and had to be replaced with a steel tank. Many of these tanks are also in high wildfire risk areas. There is a strong likelihood one or more redwood tanks will be destroyed by fire in the next few years, depriving a large group of customers their drinking water and depleting water storage available for fire protection. These tanks also release small amounts of organics into the drinking water, leaving behind a taste and odor, as well as creating substrate materials for carcinogen creation</p>		
<b>Ideas for Implementation:</b>	<p>The CCWD plans to replace all redwood tanks due to the vulnerability to fire and to the problems with water quality. Steps will involve procuring funding and prioritizing which tanks to replace first based upon the condition of the tank, population served, and wildfire hazard present.</p>		
<b>Responsible Office:</b>	CCWD Engineering Department		
<b>Partners:</b>	California Department of Forestry and Fire Protection		
<b>Potential Funding:</b>	<p>District revenue from rates, fees, property taxes, interest on investments            FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program            U.S. EPA            State revolving fund grants and/or loans</p>		
<b>Cost Estimate:</b>	<p>The replacement cost for a typically-sized redwood tank is \$600,000. Total capital cost for replacing all redwood tanks is \$6.6 million.</p>		
<b>Benefits: (Losses Avoided)</b>	<p>Reliable water delivery for domestic consumption and fire flow            Reduce risk of property damage            Protect public health and safety</p>		
<b>Timeline:</b>	Replace all 11 tanks within next seven years		
<b>Completed by:</b>			