

Annex M Sacramento County Water Agency

M.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Sacramento County Water Agency (SCWA or Agency), a previously participating jurisdiction to the 2021 Sacramento 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 Agency. This Annex provides additional information specific to the Agency, with a focus on providing additional details on the planning process, risk assessment, and mitigation strategy for this jurisdiction.

M.2 Planning Process

As described above, the SCWA followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the Agency formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table M-1. Additional details on Plan participation and District representatives are included in Appendix A.

Table M-1 SCWA – Internal Planning Team

Name	Position/Title	How Participated
Christopher Hunley	Environmental Program Manager	Identify hazards and assets, draft text, attend meetings
Austin Miller	Environmental Specialist	Identify hazards and assets, draft text, attend meetings
Tom Pasterski	Water System Superintendent	Review documents, attend meetings
Aaron Robertson	Water System Manager	Review documents, attend meetings
Randy Lightle	Water System Manager	Review documents, attend meetings
Mitra Im	Senior Engineer	Review documents, attend meetings
Allen Troung	Senior Admin Analyst	Provided financial information

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the Agency integrated the previously FEMA-

approved 2021 LHMP into existing planning mechanisms and programs. Specifically, the Agency incorporated into or implemented the 2021 LHMP through other plans and programs shown in Table M-2.

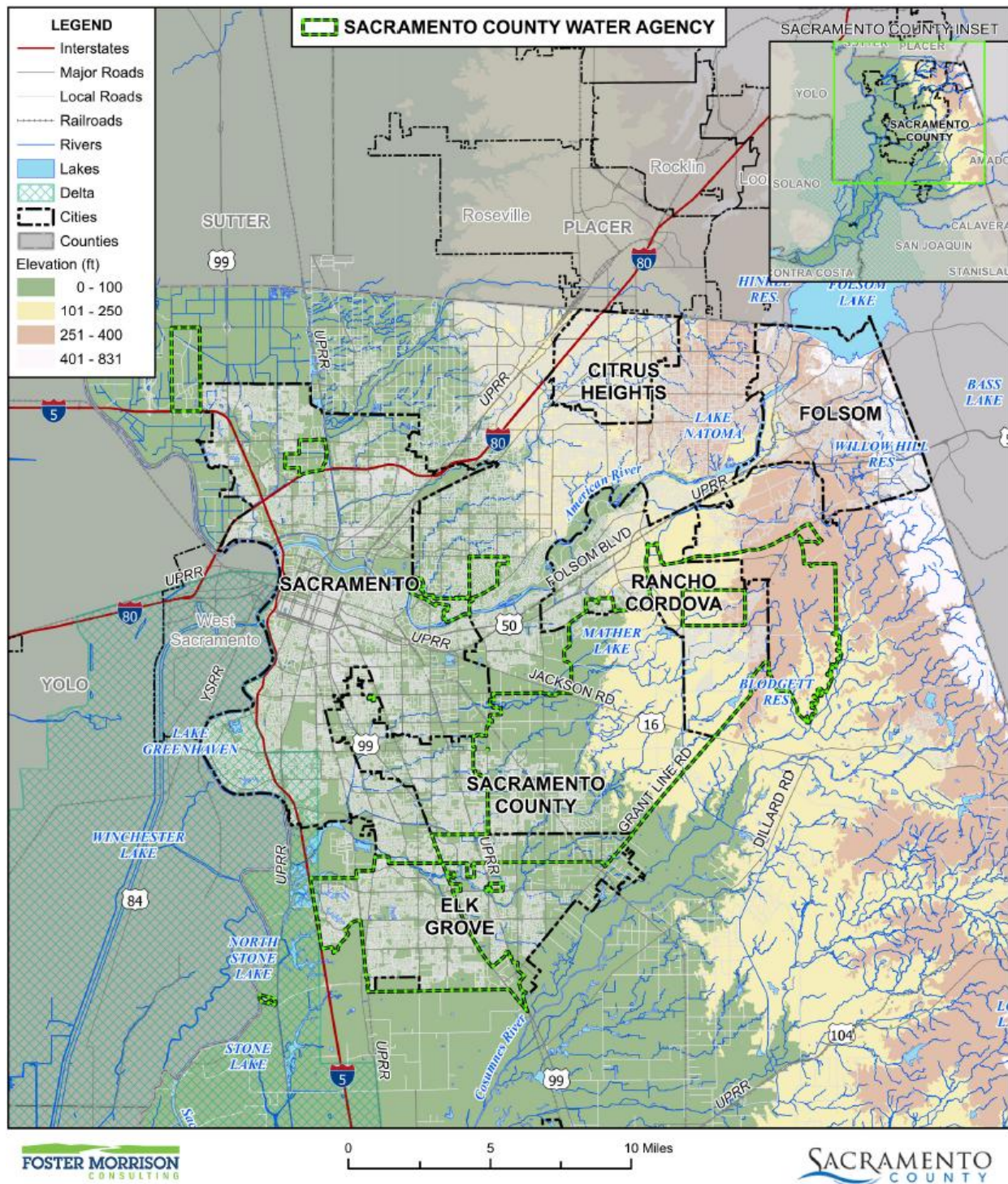
Table M-2 2021 LHMP Incorporation

Planning Mechanism 2021 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Sacramento County Drought Resilience Plan (DRP)	DRP risk assessment content will be integrated into future updates to the LHMP. County staff will participate when the LHMP planning effort is occurring and provide the perspective of domestic well and State Small Water System communities. (DRP 5.3.3.1, Table 5-5, Table 6-3)
SCWA Water Shortage Contingency Plan (WSCP)	The WSCP refers to the LHMP for seismic risk assessment and mitigation. (WSCP 5.9)
SCWA Urban Water Management Plan (UWMP)	The UWMP includes the WSCP, which refers to the LHMP for seismic risk assessment and mitigation. (UWMP Appendix D)
SCWA Zone 41 budget and project planning/scheduling	The Mather Housing Tank Seismic Retrofit and Improvement Project was completed as described in the 2021 LHMP Mitigation Actions (LHMP M.7.2 Action 3)

M.3 Community Profile

The community profile for the SCWA is detailed in the following sections. Figure M-1 displays a District map and the location of SCWA within Sacramento County.

Figure M-1 SCWA



M.3.1. Overview and Background

The Sacramento County Water Agency (SCWA) is dedicated to providing safe and reliable drinking water to over 66,000 homes and businesses in the following areas in Sacramento County:

- Laguna Vineyard (CA3410029)
- Mather-Sunrise (CA3410704)
- Arden Park Vista (CA3410002)
- Hood (CA3400101)
- Northgate (CA3400173)
- Southwest Tract (CA3400156)
- Metro Air Park (CA3400473)
- East Walnut Grove (CA3400106)
- Rio Cosumnes Correction Center (CA3400229)
- Sacramento International Airport (CA3400139)
- Branch Center (CA3400180)
- Jean Harvie School (CA3400364)
- Discovery Park (CA3400117)
- Elkhorn Boat Launch (CA34100123)
- Kiefer Landfill (CA3400342)

Sacramento County Water Agency was formed in 1952 by a special legislative act of the State of California. The Sacramento County Board of Supervisors was designated to act as the ex-officio governing body or Board of Directors for SCWA. The Water Agency Act empowers the Board of Directors to create geographic zones with specific projects and benefits. Currently SCWA has the following zones:

- Zone 40 was created by the Water Agency Board of Directors on May 14, 1985 pursuant to Resolution No. 663 to fund the planning, design, and construction of major water supply facilities that benefit the Zone. Zone 40 revenue is provided from water development fees collected at the time of development and from Special User Fees included in bi-monthly water customer utility charges.
- Zone 13 was created by the Water Agency Board of Directors on May 5, 1987 to fund comprehensive long-range planning and engineering studies of flood control, water resources development, water supply management and water conservation beneficial to the Zone. Zone 13 includes all of Sacramento County excepting the cities of Sacramento, Folsom, Galt and Isleton, and its activities are funded by an annual per-parcel assessment on all real property within the Zone.
- Zone 41 was created by the Water Agency Board of Directors on June 13, 2000 pursuant to Resolution WA-2397, and constituted a reorganization of the Sacramento County Water Maintenance District. Zone 41 funds the operation and maintenance of a public drinking water system that includes water production, treatment, storage and distribution facilities, pursuant to permits issued by the California Department of Health Services. Revenue to fund Zone 41 activities is provided by utility charges, connection permit fees, construction water permits, and grants-all of which fund Water Supply Capital Facilities Design and Water Supply Facilities Operations and Administration. Zone 41 also provides wholesale water supply to the Elk Grove Water Service pursuant to the First Amended And Restated Master Water Agreement Between Sacramento County Water Agency And Florin Resources Conservation District/Elk Grove Water Service, June 28, 2002.

- Zone 50 was created by the Water Agency Board of Directors on June 1, 2004 pursuant to Resolution WA-2542. Zone 50 encompasses the Metro Air Park Special Planning Area, a commercial and industrial development adjacent to the Sacramento International Airport. Zone 50 funds certain capital facilities required to provide water supply to the Zone, as described in the Zone 50 Water Supply Master Plan adopted on October 25, 2005; Zone 50 revenue is provided from water development fees. Water for the Zone is purchased from the City of Sacramento pursuant to an October 12, 2004 Wholesale And/or Wheeling Water Service Agreement.

The climate of the Agency is similar to the County as a whole. An elevation map was included as part of Figure M-1.

M.4 Risk Assessment

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

Building on the Agency Profile above, a risk assessment was performed for the Agency utilizing the existing District boundaries. This includes the following sections:

- M.4.1 Assets Inventory and Growth and Development Trends
- M.4.2 Hazard Identification
- M.4.3 Hazard Profiles and Vulnerability to Specific Hazards

M.4.1. Assets Inventory and Growth and Development Trends

This section provides an inventory of the SCWA’s total assets potentially at risk to hazards and an overview of growth and development trends. This section is broken into two parts:

- **Asset Inventory** – The assets inventory identifies the SCWA’s total assets, including the people and populations; structures; critical facilities and infrastructure; community lifelines; natural, historic, and cultural resources; and economic assets and community activities of value. This data is not hazard specific, but is representative of total assets within the Agency, potentially at risk to identified hazards as discussed in Section M.4.3 Hazard Profiles and Vulnerability to Specific Hazards.
- **Growth and Development Trends** – A discussion of growth and development trends in the Agency, both current and future, is presented.

Assets Inventory

The Agency’s asset inventory is detailed in the following sections:

- People and Populations
- District Assets and Critical Facilities and Infrastructure
- Community Lifelines
- Natural, Historic, and Cultural Resources
- Economic Assets and Community Activities of Value

A discussion of each of these assets follows and serves as the template for the asset discussion for each hazard in Section M.4.3.

People and Populations

The most important asset within any community are the people and populations that reside in the community. People and populations in the Agency include both District staff and workers as well as those populations located within District boundaries and are served by the Agency. This section includes an inventory of past and current populations of the Agency and also discusses vulnerable populations and underserved communities as a subsection of people and populations located within the Agency and potentially at risk to hazards. Information from the Agency and other sources as detailed below form the basis of this discussion.

Historic Population Trends and Current Population

The most important asset within any community are the people and populations that both work and reside in the Agency. For special districts, this generally includes District staff and contractors as well as those populations located within its boundaries and served by the Agency. The Agency has 120 staff that work for the Agency, 23 Finance, Administration, or Safety staff that support the entire department, and 18 staff who are contractors, temporary extra help, or embedded from another agency. The Agency provides services to 66,000 households.

Many types of vulnerable populations are served by the Agency, including the following:

- Low-income households—analyzed in the SCWA’s Urban Water Management Plan and addressed through Water Lifeline assistance
- Disadvantaged communities—occur within the broader SCWA service area
- Older adults—more vulnerable to heat, outages, and certain water-quality risks
- Infants and young children—increased vulnerability to certain waterborne contaminants
- People with compromised immune systems—increased vulnerability to certain waterborne contaminants
- Rural/small-community residents—Hood, Walnut Grove, Northgate, and rural portions of Zone 40 have different infrastructure and emergency vulnerabilities including State Small Water Systems and domestic wells; analyzed in the 2025 Drought Resilience Plan
- People experiencing homelessness/housing instability—Countywide vulnerable population, particularly relevant to emergency water access
- Residents with limited transportation or mobility—may have difficulty accessing alternate water supplies/evacuation resources
- Residents with limited English proficiency—potentially important for emergency communication and conservation outreach
- Renters/multifamily residents—less direct control over plumbing, landscaping, and water infrastructure

District Assets and Critical Facilities and Infrastructure

This section considers the SCWA's assets at risk, with a focus on key District assets such as structures, critical facilities and infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan 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.

Most of the Agency assets are considered Category 1 critical facilities, specifically essential services facilities. Table M-3 lists critical facilities and other District assets identified by the Agency Planning Team as important to protect in the event of a disaster. SCWA's physical assets, valued at over \$565 million, consist of structures, critical facilities and infrastructure, and other District assets to support the Agency's operations.

Table M-3 SCWA Assets: Structures, Critical Facilities and Infrastructure, and Other Facilities.

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
FRWA Surface Water Intake Plant	Essential	\$54,948,984	Flood, Earthquake, Severe Weather
FRWA Raw Water Pipeline	Essential	\$8,336,275	Earthquake
Vineyard Surface Water Treatment Plant	Essential	\$244,140,313	Earthquake, Wildfire, Severe Weather
Water Treatment Plants	Essential	\$80,518,712	Flood (Levee/Dam/100Yr/500Yr), Earthquake, Wildfire, Severe Weather
Water Wells	Essential	\$28,767,926	Flood (Levee/Dam/100Yr/500Yr), Severe Weather, Wildfire
Storage Tank & Booster Stations	Essential	\$10,815,231	Flood (Levee/Dam/100Yr/500Yr), Earthquake, Severe Weather Wildfire
SCADA System	Essential	\$1,136,504	Flood (Levee/Dam), Severe Weather, Wildfire
Water Transmission Mains	Essential (165 miles)	\$98,190,500	Earthquake
Water Distributions Mains	Essential (715 miles)	\$38,975,447	Earthquake
Total		\$565,829,892	

Source: SCWA

Community Lifelines

Assessing the vulnerability of the SCWA to natural hazards and disasters also involves reviewing and inventorying the community lifelines in place that could be affected. It is important to include these items in hazard discussions as the continuous operation of critical government and business functions is essential to human health and safety, property protection, and economic security. The importance of community lifelines is discussed below:

- Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function.
- FEMA has developed a method for objectives-based response that prioritizes the rapid stabilization of Community Lifelines after a disaster.
- The integrated network of assets, services, and capabilities that provide lifeline services are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function.
- When disrupted, decisive intervention (e.g., rapid re-establishment or employment of contingency response solutions) is required to stabilize the incident.

Community lifelines, as defined by FEMA, include the following:

- **Safety and Security** – Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety
- **Food, Hydration, Shelter** – Food, Water, Shelter, Agriculture
- **Health and Medical** – Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management
- **Energy** – Power Grid, Fuel
- **Communications** – Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch
- **Transportation** – Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime
- **Hazardous Material** – Facilities, HAZMAT, Pollutants, Contaminants
- **Water Systems** – Potable Water Infrastructure, Wastewater Management

It should be noted that these community lifelines are all in place and functional as part of regular government operations in the Sacramento County Planning Area serving as a partnership between the cities, local special districts and agencies, and Sacramento County. Most all of the Agency's community lifelines overlap with the Planning Area's and include many of the critical facilities and infrastructure assets inventoried for this LHMP. As such, specific information on these community lifelines in the Agency and how they may be affected by a hazard event or disaster are discussed collectively for all jurisdictions in the Base Plan.

Natural, Historic, and Cultural Resources

Natural Resources

SCWA has a variety of natural resources of value to the Agency. These natural resources parallel that of Sacramento County as a whole. Information can be found in Section 4.2.1 of the Base Plan.

Historic and Cultural Resources

SCWA has a variety of historic and cultural resources of value to the Agency. These historic and cultural resources parallel that of Sacramento County as a whole. Information can be found in Section 4.2.1 of the Base Plan.

Economic Assets and Community Activities of Value

Assessing the vulnerability of the SCWA to natural hazards and disasters also involves inventorying the economic assets and community activities of value in the Agency.

Economic Assets

After a disaster, economic resiliency is one of the major drivers of a speedy recovery. Each community has specific economic drivers. Economic assets for the County were discussed in Section 4.2.1 of the Base Plan and are assumed to be the same or similar for the Agency.

Community Activities of Value

Inventorying economic assets in the Agency and their vulnerability to natural hazards and disasters also involves inventorying activities that have value to the community. This includes activities that are important to a community, like long-standing traditions such as a festival or fair or other activities that bring money into the communities such as sports tournaments and other recreational activities. Community Activities of Value for the County were discussed in Section 4.2.1 of the Base Plan and are assumed to be the same or similar for the Agency.

Growth and Development Trends

As part of the planning process, the Agency looked at changes in growth and development, both current and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. This inventory section details future development/redevelopment projects that are likely to occur over the next five years covered by this 2026 LHMP. For Districts, this generally includes the following:

- Construction/development projects related to adding new District facilities, infrastructure, land acquisition, etc.
- Plans for expansion or build out of the Agency's service area, including new service hookups, and other District functions related to where the Agency will be expanding services.

Population Trends and Projections

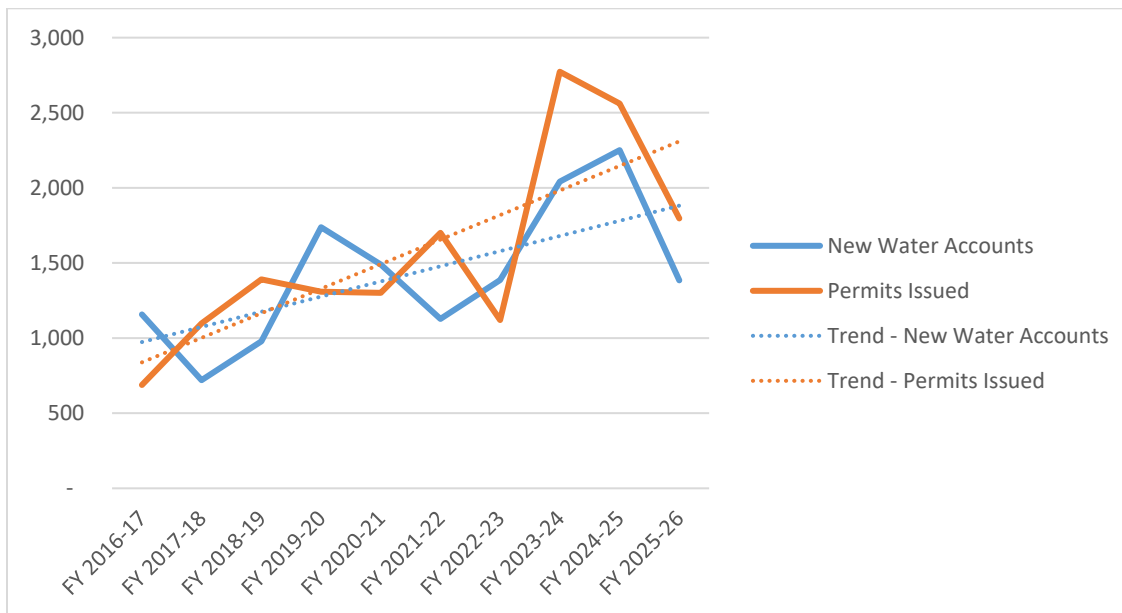
Over the past 10 years, new water accounts and development permits issued per year have fluctuated, but the overall trend has been upward. This can be seen in Table M-4 and Figure M-2

Table M-4 SCWA Growth From 2016-2026

Growth By Year	Indicator	
Fiscal Year	New Water Accounts	Permits Issued
FY 2016-17	1,158	688
FY 2017-18	720	1,098
FY 2018-19	979	1,391
FY 2019-20	1,738	1,309
FY 2020-21	1,490	1,301
FY 2021-22	1,128	1,701
FY 2022-23	1,387	1,120
FY 2023-24	2,041	2,773
FY 2024-25	2,251	2,561
FY 2025-26	1,384	1,797

Source: SCWA

Figure M-2 Recent Water Accounts and Permits Issued



Source: SCWA

Development since 2021 Plan

Since 2020, the following wells were added within the indicated water shed:

- Rhone River Water Well (W135) – Water Shed: Elk Grove Creek – 1500GPM
- Quail Ridge Water Well (W119) – Water Shed: Beach-Stone Lake – 1500GPM (new name is Frank Greg Well)
- Machado Ranch Water Well (W120) - Water Shed: Beach-Stone Lake – 1500GPM
- Stathos Drive Water Well (W121) - Water Shed: Beach-Stone Lake – 1500GPM

- Schuler Ranch Water Well (W116) - Water Shed: Beach-Stone Lake – 1500GPM (new name is Tuzza Well)
- Big Horn On-Site Water Well (W126) - Water Shed: Beach-Stone Lake – 1500GPM

Capacity was increased at the following sites:

- Big Horn Water Treatment Plant (WTP) – Capacity increased to 4500GPM
- East Elk Grove WTP - Capacity increased to 6000GPM
- Poppy Ridge WTP - Capacity increased to 10500GPM
- Metro Air Park – Storage capacity doubled

A problematic backwash tank at Waterman WTP was demoed and reconstructed, which improved operations of the WTP.

Arsenic removal capability was added to Lakeside WTP.

Underground facilities added expansion on transmission main system.

Additional staff have been hired since the 2021 LHMP; however, staffing remains a significant challenge due to recent and anticipated retirements and ongoing vacancies. DWR is actively recruiting to fill vacant positions and maintain the staffing needed to operate and maintain critical water infrastructure and implement mitigation activities.

All of the above development occurred outside of known hazard areas, with the exception of the wastewater treatment plans, which are adjacent to the floodplain.

Future Development Areas

It is important to review future development plans for the Agency. Future development should be sited in areas that are away from known hazard risks. If this is not possible, mitigation should be done to ensure that future development is protected against future hazards.

Over the next five years, SCWA anticipates continued development and improvement of water supply infrastructure, including projects associated with the expansion of groundwater recharge and conjunctive-use opportunities. SCWA also anticipates continued growth and new development within portions of its service area, which may require extensions or improvements to existing water infrastructure. A significant anticipated effort is Harvest Water Phase 2, which is expected to expand opportunities for groundwater recharge and agricultural water management in the Sacramento Valley. The project could provide additional groundwater storage and water-supply resilience benefits while supporting drought resilience and reducing reliance on surface water during dry conditions.

M.4.2. Hazard Identification

The SCWA identified the hazards that affect the Agency and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance (or priority of a hazard) specific to the Agency (see Table M-5). Those hazards identified as a high or medium significance in Table M-5 are considered

District priority hazards for mitigation planning. Those hazards that occur infrequently or have little or no impact in the Agency were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency, extent, and resulting damage, including deaths/injuries and property, natural and cultural resources, and economic damage. The ability of a jurisdiction 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 to prioritize those hazards of greatest significance, enabling the Agency to focus resources where they are most needed.

Table M-5 SCWA—Hazard Identification Assessment

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

M.4.3. Hazard Profiles and Vulnerability to Specific Hazards

This section includes the hazard profiles and vulnerability assessment for the SCWA’s priority hazards (i.e., those ranked of medium or high significance specific to the Agency as identified in the Significance column of Table M-5). This section focuses on where and how the Agency is affected by their priority hazards. Chapter 4 of the Base Plan provides more detailed information about these hazards and their impacts on the Sacramento County Planning Area. Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.2 of the Base Plan.

Hazard Profiles and Vulnerability Assessment

Each hazard is profiled in the following format:

- **Hazard Profile** – A hazard profile is included for each hazard. This includes information on:
 - ✓ **Hazard Overview** – A general discussion of the hazard and related issues is detailed here.
 - ✓ **Location and Extent** – Location is the geographic area within the Agency that is affected by the hazard. Extent is the expected range of intensity for each hazard. These are discussed in specific detail for mapped hazards, and in more general detail for those hazards that do not have discrete mapped hazard areas.
 - ✓ **Past Occurrences** – Past occurrences are discussed for each hazard. A discussion of disaster declarations is included in each hazard section. NCEM events are also discussed. Other past occurrences data specific to the Agency follow the disaster declarations and NCEM events for each hazard.
 - ✓ **Climate Change** – This section contains the effects of climate change (as applicable). The possible influence of climate change on the hazard is discussed.

After the hazard profile, a vulnerability assessment is presented. As part of the vulnerability assessment, an estimate of the vulnerability of the Agency to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections. 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.

After this classification, a general discussion of hazard vulnerabilities occurs. This is done in the following format:

- **Vulnerability Overview** – A general discussion of the hazard vulnerability and related issues is detailed here.
- **Local Concerns** – This includes District provided information on how the Agency is uniquely affected by or vulnerable to each hazard.
- **Assets at Risk** – A discussion of the assets at risk follows, presented in the same order as in Section M.4.1 above, with a few exceptions. This includes sections on: People and Populations; District Assets: and Critical Facilities, and Other Facilities; and Natural, Historic, and Cultural Resources. These are discussed in specific terms for mapped hazards, and in more general terms for those hazards that are unmapped. Sections on Community Lifelines and Economic Assets and Community Activities of Value are not included in the Sections below, as they are common to all jurisdictions and are fully covered in Section M.4.1 above and in Chapter 4 of the Base Plan.
- **Impacts** – A discussion on hazard impacts follows. Impacts describe how each hazard can affect the Agency and its assets. The type and severity of impacts reflect both the potential magnitude of the hazard and the vulnerability of the asset.
- **Future Conditions/Future Development** – A discussion of how future conditions and future development may affect the hazard is also included. This considers both new District assets and improvements as well as any changes with the Agency’s service area.

Power Interruption/Power Failure: A Common Vulnerability of all Hazards

An impact of almost all hazards evaluated as part of this LHMP Update relates to power shortage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the U.S. Department of Energy, major blackouts are on the upswing. Incredibly, according to the US Energy Information Administration, US electricity customers experienced nearly twice as many outage hours in 2024 compared to the annual average in the previous decade. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. Much of the Sacramento County Planning Area is served by Pacific Gas & Electric (PG&E) and Sacramento Municipal Utility District (SMUD). More information on types of power disruptions can be found in Section 4.3 of the Base Plan.

Public Safety Power Shutoff (PSPS)

An intentional disruption type of power shortage/failure event has been implemented in California as a result of wildfires starting as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California’s three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are preparing all Californians for the threat of wildfires and power outages during times of extreme (fire) weather. To help protect customers and communities during extreme fire weather events, electric power may be shut off for public safety in an effort to proactively prevent wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3 of the Base Plan. PG&E noted no PSPS events in the Sacramento County Planning

Area since the 2021 LHMP. SMUD noted that it has had no PSPS events for its service territories since 2021.

Local Concerns

The Agency noted no significant impacts to date. All major water production, treatment, and delivery facilities have fixed emergency standby generators. Most well sites have on site generators or portable emergency generators available. Most facilities have at least a minimum of 24-hours of continuous back up power before fuel or servicing becomes an issue. However, with an increase in climate change related issues (e.g., extreme heat conditions, atmospheric river storms) occurring in the Sacramento County Planning Area, the potential for future hazard related power outages remain a concern.

Hazard Profiles and Vulnerability Assessment by Hazards

The following sections provide the hazard profile and vulnerability assessments for each of the hazards identified in Section M.4.2 Hazard Identification.

Aquatic Nuisance Species (plant/animal)

Likelihood of Future Occurrence—Occasional

Vulnerability—Medium

Hazard Profile

Aquatic nuisance species are organisms that can cause economic or environmental harm. A non-indigenous species is considered an invasive species when it becomes established in a new location, causing impacts. Invasive species may be introduced intentionally or unintentionally as a result of human activity. Once introduced, they can become a permanent part of an ecosystem, creating environmental imbalances, presenting risks to human health, and causing significant economic problems.

Under certain conditions, species that are native to an area or that are found worldwide may become a nuisance. Native species and cosmopolitan species (those found worldwide) may be classified as nuisance species when they become out of balance.

This hazard addresses both aquatic invasive and nuisance species (collectively referred to as aquatic nuisance species). Aquatic nuisance species vary widely, and their impacts can range from clogging water pipes to killing wildlife, from harming crops and forests to posing a human health hazard. The introduction of invasive and nuisance species into California's marine, estuarine, and freshwater environments can cause significant economic, human health, and ecological impacts.

Aquatic invasive species can impact infrastructure throughout the system, including intake structures, raw water conveyance facilities, treatment plants, and distribution system components that provide suitable surfaces for attachment. The SCWA is most concerned with the golden mussel.

Location and Extent

All of the waterways in the County are at risk to aquatic nuisance species. Aquatic invasive species are most likely to occur in surface water bodies, including rivers, reservoirs, and conveyance systems. The Sacramento River watershed, including the Delta and upstream water supply sources, has been identified as suitable habitat for golden mussels based on water quality characteristics such as temperature, calcium levels, and pH.

Conditions in the Sacramento River, particularly near regional water treatment plant intakes, support extended spawning periods, potentially from March through November. These conditions increase the likelihood of establishment and proliferation.

There is no scientific scale to measure aquatic invasive and nuisance species. The speed of onset can be quite short once an aquatic nuisance species is introduced into a river or water body. The duration of the aquatic species infestation can range from short term to long term, until measures are taken to reduce the presence of the offending species.

Past Occurrences

Disaster Declaration History

There have been no past federal or state disaster declarations due to aquatic nuisance species, according to the Base Plan. There have also been no USDA disaster declarations from aquatic nuisance species.

NCDC Events

The NCDC does not track aquatic nuisance species.

SCWA Events

Golden mussels were first detected in California on October 17, 2024, in the Port of Stockton. Subsequent detections occurred throughout the Delta and in connected waterways, including the San Joaquin River and O'Neill Forebay.

As of early 2025, monitoring has identified multiple detections in the Delta region, indicating early-stage establishment. Limited monitoring in the Sacramento River watershed has not yet confirmed presence in upstream areas; however, data is limited and continued monitoring is ongoing.

The rapid spread and early detections suggest a high likelihood of continued expansion into the Sacramento River and associated water supply infrastructure.

Climate Change and Aquatic Nuisance Species

According to the 2024 CAS, addressing climate change will encompass reducing vulnerability through adapting to the ongoing and predicted impacts of climate. Waterways in California are vulnerable to predicted impacts of climate change, including less reliable water supplies, increased temperatures, and increased aquatic nuisance species.

The 2023 California State Hazard Mitigation Plan noted that California farmers, water providers, and those who recreate or use water bodies contend with a wide range of aquatic nuisance pests. Continued climate change is likely to alter the abundance and types of many aquatic invasive species, lengthen aquatic invasive pests' breeding season, and increase pathogen growth rates. It also noted that change in climate can directly impact new temperature patterns and northward shifts of previously unseen aquatic invasive species. Additionally, longer growing seasons may enable invasive species to complete more reproductive cycles, which can increase severity of infestations.

It also noted that climate change, which is warming marine waters, freshwater, and estuarine environments and altering the water chemistry (such as changes to water salinity and pH), can also bolster invasive species populations and range. The changes in marine environment can weaken native species not accustomed to warmer temperatures or altered water chemistry. Non-indigenous species tend to be more tolerant and resilient to changes in their environment; therefore, shifts in species composition due to climate change events can favor invasive non-indigenous species over native species.

Finally, the 2023 State Plan noted that temperature is not the only climatic influence on pests. For example, some aquatic invasives thrive or become more troublesome during periods of extreme drought. Furthermore, while warming speeds up the life cycles of many aquatic invasive species, suggesting that problems could increase, some aquatic invasive species may grow more slowly as elevated carbon dioxide levels decrease the protein content of the leaves on which they feed.

Vulnerability to Aquatic Nuisance Species

According to historical hazard data, aquatic nuisance species are an annual occurrence in the Sacramento County Planning Area. If left unchecked, nuisance species can threaten native species, biodiversity, ecosystem services, recreation, water resources, agricultural production, cultural resources, economies and property values, public safety, and infrastructure.

An assessment of a community's vulnerability to this hazard begins with an understanding of local exposure to the SCWA. This is included in the Local Concerns section below. After that, vulnerability is discussed in multiple sections that detail how this hazard can affect the Agency. These sections include assets at risk, impacts, and how future conditions and development can affect by this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The Agency is concerned with certain aquatic species. A current example of concern in the Sacramento region is the golden mussel (*Limnoperna fortunei*), an invasive freshwater bivalve first detected in October 2024 in the Port of Stockton. Golden mussels are aggressive filter feeders that consume phytoplankton and zooplankton, altering aquatic ecosystems and affecting source water quality. They reproduce rapidly, with a life cycle that includes a microscopic larval stage (veligers) that can disperse through the water column and attach to infrastructure as they mature.

Aquatic invasive species such as golden mussels pose a threat to water systems by clogging intake structures, pipelines, screens, and filters. They can also foul infrastructure, interfere with treatment processes, and degrade recreational water uses. Once established, they are difficult to eradicate and typically require ongoing management and maintenance.

To address this, State and Federal agencies released the Golden Mussel Response Framework in April 2025. The Framework aims to prevent further introductions, contain infestations, and suppress populations to protect the environment, economy, infrastructure, and public health. Recommendations support coordinated action across agencies and jurisdictions.

On June 16, 2026, the Sacramento County Board of Supervisors declared a local emergency resulting from the invasive Golden Mussels migrating into Sacramento Waterways. During construction of the Freeport Regional Water Authority (FRWA) water intake facility in 2010, FRWA made contingency plans for chemical treatment of invasive mussels by installing infrastructure that can be used for the treatment of mussels. Although some chemical treatment has been identified as effective, upgrades will need to be implemented to deal with the golden mussels threat. Research is ongoing regarding the use of specialized coatings, UV Treatment, and alternative ionic solutions.

In addition, the Sacramento County Water Agency is currently monitoring for mussels weekly by conducting inspections and the routine collection of water samples at the FRWA intake. The samples are collected and sent to California Department of Fish and Wildlife to be analyzed for the DNA of golden mussels.

Assets at Risk

Assets at risk from climate change include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

Aquatic nuisance species have a minimal effect on people and populations in the Agency, including vulnerable populations. Damage from aquatic nuisance species can cause economic issues for water companies, who then must pass those costs on to customers. Water price increases could affect populations in the Agency. In addition, those species contributing to increased flooding conditions in the Agency may also affect populations in flood prone areas. Also to note, nuisance animal species can cause damage to area levees further increasing the flood potential.

District Assets and Critical Facilities and Infrastructure

District assets, including structures in the Agency may be indirectly affected by aquatic nuisance species. Some species can impact vegetation and can result in stream bank instability, erosion, and increased sedimentation, impacting ground stabilization and possibly causing foundation issues for nearby structures. If species cause trees and other vegetation to die, there is an increased risk of damage to roadways, powerlines, and buildings, and increased risk to wildfire. Some invasive plants have been shown to destabilize soil due to high densities and shallow root systems, negatively impacting nearby buildings and

septic systems. Other nuisance plant species have been known to clog culverts and streams, increasing flooding risk.

The Agency noted the following assets at risk during major aquatic nuisance species events:

- Freeport Regional Water Authority Intake Structure is at risk of failure due to clogging.
- Water transmission mains and distribution mains could experience pipe joint separation resulting in water leakage, potential obstruction, and reduced hydraulic capacity Water treatment plant facilities – impacts to treatment processes, increased maintenance, and potential operational disruptions
- Pumps, valves, and mechanical equipment – fouling and reduced efficiency
- Regional water supply reliability – potential for reduced production capacity and increased operational costs (increase in groundwater use, drought worse)

Natural, Historic, and Cultural Resources

Natural resources can be affected by aquatic nuisance species hazards. Negative impacts of these species to natural resources include the following:

- Loss of wildlife habitat and reduced wildlife numbers;
- Loss of native plant species;
- Increased soil erosion and topsoil loss;
- Diminished water quality and fish habitat.

Historic and cultural resources have a more limited risk from aquatic nuisance species.

Impacts from Aquatic Nuisance Species

According to the California Invasive Plants Council, California annually suffers over \$3 billion in agricultural losses due to nuisance species. The magnitude of this problem cannot be understated, as both the United States and California Departments of Agriculture are mandated to protect against the invasion of exotic pests and diseases.

The Sacramento County Water Agency is vulnerable to aquatic nuisance species due to reliance on surface water sources and interconnected regional water infrastructure. Aquatic nuisance species introduction pathways include natural water movement and human-mediated transport, such as recreational boating and water transfers.

Impacts from aquatic nuisance species, particularly golden mussels, can be significant and include:

- **Infrastructure impacts:** Mussels attach to submerged surfaces and form dense colonies that clog intake structures, foul screens, obstruct pipelines, and increase corrosion of infrastructure. These impacts can reduce system capacity, increase head loss, and require frequent maintenance or shutdowns.
- **Operational impacts:** Colonization can impair treatment processes, increase maintenance requirements, and require implementation of monitoring and control programs.
- **Water quality impacts:** Filter feeding alters water quality by reducing plankton and increasing water clarity, which can shift nutrient dynamics and promote harmful algal blooms. Waste products

(pseudofeces) can reduce dissolved oxygen and increase pH. Mussel die-offs may result in taste and odor issues at treatment facilities.

- **Economic impacts:** Increased costs associated with monitoring, maintenance, infrastructure repair, and potential treatment modifications.

Due to their rapid reproduction, high colonization density, and broad environmental tolerance, AIS such as golden mussels present a high vulnerability to water supply systems once introduced.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future hazard conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the Agency include the following:

- Climate change is likely to exacerbate future conditions that may impact the waterways and issues associated with aquatic nuisance species in the Agency. This was discussed in greater detail in the Climate Change and Aquatic Nuisance Species section of the Hazard Profile above.
- Future population growth should be considered as having more or less people in a community affects the overall hazard vulnerability to the Agency. Population served is expected to rise slowly. The Agency may add staff, but this number would be small. Population growth in the Agency is expected to continue. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to aquatic nuisance species is unlikely to change.
- Changes in land use and development within District boundaries are expected to be limited in the near future and thus are not likely to affect aquatic nuisance species impacts to the Agency. The Agency noted that it has no control over land use and development within its jurisdictional boundaries. With limited future growth and development occurring, the vulnerability of the Agency to aquatic nuisance species hazards is unlikely to change.

Future Development

Future development in the Agency is not likely to have an impact on aquatic nuisance species in the Agency. The Agency is expected to continue to grow. With additional development in the Agency, there may be additional competition for water resources.

Climate Change

Likelihood of Future Occurrence–Highly Likely

Vulnerability–Medium

Hazard Profile

Climate change adaptation is a key priority of the State of California. The 2023 State of California Multi-Hazard Mitigation Plan noted that climate change is 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.

California’s Adaptation Planning Guide: Understanding Regional Characteristics (from 2017) has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. The Agency falls in the North Central Valley Region. A map and climate projections for this region are shown in Section 4.3.7 of the Base Plan and include an increase in temperatures, moderate changes in rainfall, and increased risk to wildfire.

Location and Extent

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

Past Occurrences

Disaster Declaration History

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

NCDC Events

NCDC does not track climate change events.

SCWA Events

LIST PAST EVENTS AFFECTING THE AGENCY, ESPECIALLY THOSE SINCE THE 2021 LHMP. INCLUDE INFORMATION ON IMPACTS AND DAMAGES AS AVAILABLE? IF NO PAST EVENTS, PLEASE STATE THAT.

Vulnerability to Climate Change

The whole of the Agency is at some measure of vulnerability to climate change. The Agency Planning Team has concerns that the vulnerability of the Agency to climate change will continue to increase in the future. An assessment of a community's vulnerability to climate change begins with an understanding of local exposure to climate change. This is included in the Local Concerns section below followed by a discussion of the Agency's assets at risk and impacts to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The District is concerned about the following issues related to climate change

- Groundwater sustainability
- Water conservation,
- Planning/budgeting for more groundwater production facilities,
- Drought resilience planning

Assets at Risk

Assets at risk from climate change include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

Climate change affects District staff, and those served by the Agency, especially those climate change issues related to increases in temperature over time. While all populations can be affected by temperature extremes, populations particularly vulnerable include the very old and very young, medically fragile people, people without means of shelter (and air conditioning or heat) or transportation, people who are socially isolated and other vulnerable or underserved populations (as shown in the discussion in Section M.4.1). This includes District staff and contractors, especially those who work outdoors as well as those more vulnerable populations within District boundaries, including those who work or recreate outdoors. Acclimatization to extreme temperatures and other weather extremes may help reduce impacts from these extreme events, such as from heat waves, in the healthy general population but may not be sufficient to protect those with underlying medical conditions.

District Assets and Critical Facilities and Infrastructure

Climate change, on its own, does not generally impact structures (like District assets and critical facilities). However, structures in areas of increased flood, drought, extreme heat, or wildfire areas exacerbated by the effects of climate change would be at increased risk, as described throughout this LHMP. Due to the slow onset of climate change, many structures in the Agency are expected to undergo improvements and adapt over time to a new climate normal.

Natural, Historic, and Cultural Resources

The rivers, streams, agricultural areas, and open space areas of the Agency support rich biodiversity, including many special-status species and habitat areas. These are all at risk from the effects of climate change. In addition, if heat continues to contribute to changes in wildfire patterns, most areas (on land) of the Agency are at increased risk from fire – including natural, historic, and cultural resources. Furthermore, as climate change exacerbates the extreme heat and drought hazard, areas of wetlands in the Agency may be reduced or dry up temporarily, which could damage habitat areas for waterfowl and other species that depend on these areas.

Impacts from Climate Change

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Central Valley Region in which the Agency is part of:

- Increased temperatures
- Reduced precipitation
- Public health – heat and air pollution
- Reduced agricultural productivity
- Inland flooding
- Reduced tourism

In addition to these sources, the 2023 State of California Hazard Mitigation Plan noted that according to California’s Fourth Climate Change Assessment, the state will experience the following climate impacts:

- Annual average daily high temperatures are expected to rise by 2.7° F by 2040, 5.8°F by 2070, and 8.8°F by 2100 compared to observed and modeled historical conditions. These changes are statewide averages.
- Heat waves are projected to become longer, more intense, and more frequent.
- Warming temperatures are expected to increase soil moisture loss and lead to drier conditions. Summer dryness may become prolonged, with soil drying beginning earlier in the spring and lasting longer into the fall and winter.
- Droughts are likely to become more frequent and persistent through 2100.
- The strength of the most intense precipitation and storm events affecting California is expected to increase.
- Snowpack levels are projected to decline significantly by 2100 due to reduced snowfall and faster snowmelt.
- Marine layer clouds are projected to decrease.
- Extreme wildfires (i.e., fires larger than 24,710 acres) would occur 50 percent more frequently. The maximum area burned statewide may increase 178 percent by the end of the century.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the Agency include the following:

- As climate change continues to accelerate over time, climate related impacts to the Agency will continue to increase.
- Population projections within the jurisdictional boundaries of the Agency show the population to be slowly increasing. It is unknown how population patterns and demographics will change in the near future. The Agency may add staff, but this number would be small. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.
- Changes in land use and development in the Agency are expected to be limited in the near future and thus are not likely to affect climate change impacts to the Agency. In addition, adherence to protective building codes for new development will also assist in limiting future impacts and associated vulnerabilities of the Agency to this hazard.

Future Development

Future development considerations should be ongoing and proactive. Climate change can influence future development in the Agency over time. The Agency 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. While there are currently no formal studies of specific migration patterns expected to impact the Agency, climate-induced migration was recognized within the 2026 California Fifth Climate Assessment and is expected to be the focus of future studies.

Dam Failure

Likelihood of Future Occurrence—Occasional
Vulnerability— High

Hazard Profile

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 given year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States. In addition, with storms increasing in volume and intensity, as seen with the atmospheric river events of recent

years, controlled releases from dams can also impact downstream levees and flood control structures resulting in increased and widespread flooding.

Dam failures, for purposes of this Plan, can also result from any one or a combination of the following:

- Earthquake
- Overtopping and uncontrolled releases
- Controlled releases
- 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
- Failure of upstream dams on the same waterway

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake.

Location and Extent

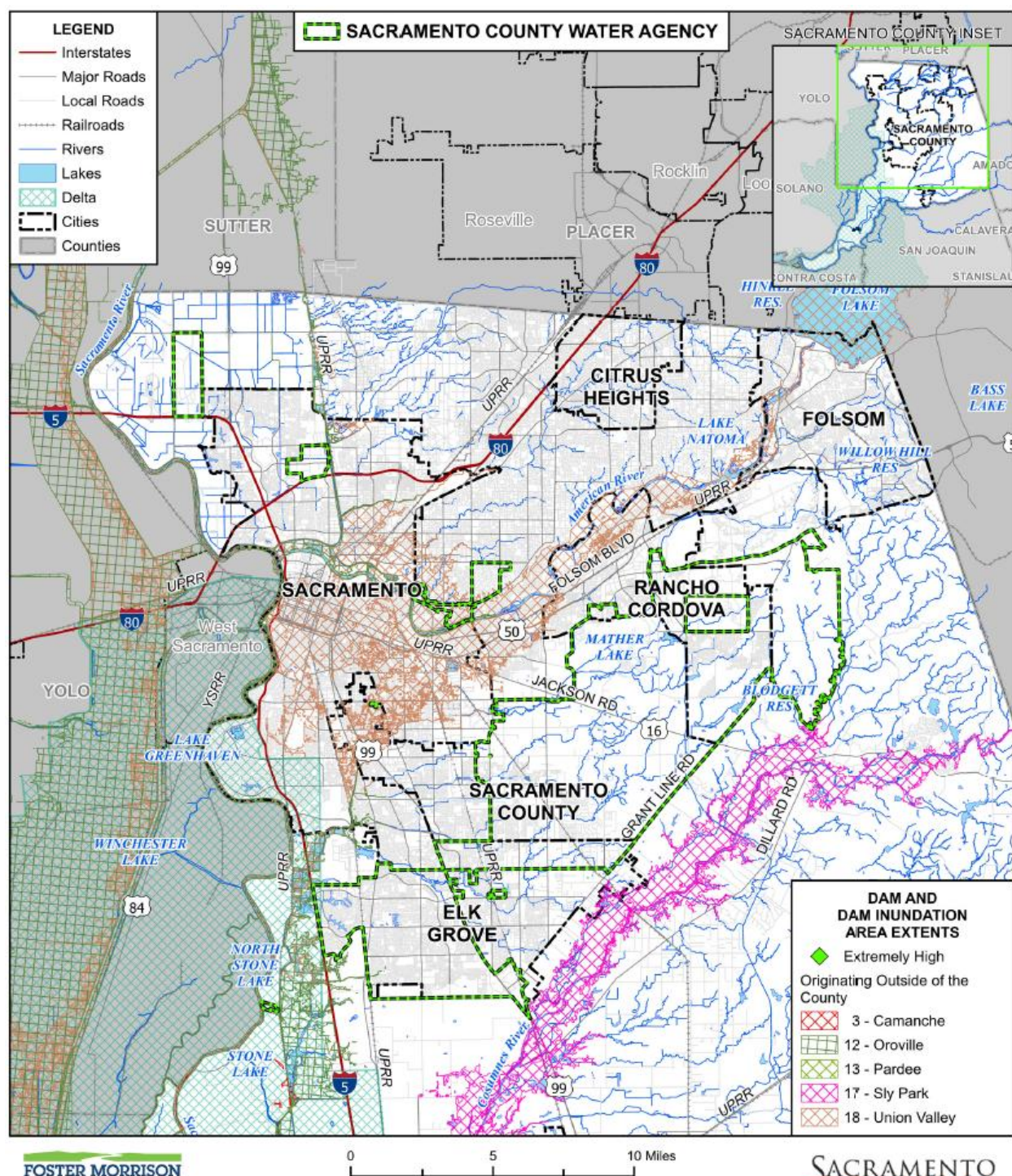
An inventory map of dams located within and around Sacramento County was shown in Section 4.3.8 in the Base Plan. Inundation mapping and analyses were conducted on Extremely High and High Hazard dams with inundation areas located in the Sacramento County Planning Area. Dams with an inundation area within the Agency are shown on Figure M-3 and Figure M-4. Five extremely high hazard dams intersect the Agency – Camanche, Oroville, Pardee, Sly Park, and Union Valley. The Agency is affected by one High Hazard dam – Nimbus.

There is no scale with which to measure dam failure. However, FEMA and CA DWR Division of Safety of Dams (DSOD) assign hazard potential classifications to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. FEMA categorizes the downstream hazard potential into three categories in increasing severity: Low, Significant, and High. DSOD adds a fourth category of Extremely High. Dams are classified in these four categories that identify the potential hazard to life and property. These were discussed in more detail in Section 4.3.8 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. For dam overtopping, the speed of onset is somewhat slower than that of a dam break, and the duration is longer (as evidenced in the 2017 Oroville Dam spillway event). The Agency would be affected for as long as the flood waters from the dam failure took to drain downstream.

Geographic flood extent from the DSOD and Cal OES Extremely High Hazard (outside the County) dam inundation areas is shown on Figure M-3 as well as in Table M-6, and for High Hazard (inside the County) dam inundation areas on Figure M-4 as well as in Table M-7.

Figure M-3 SCWA – Extremely High Hazard (Outside the County) Dam Inundation Areas



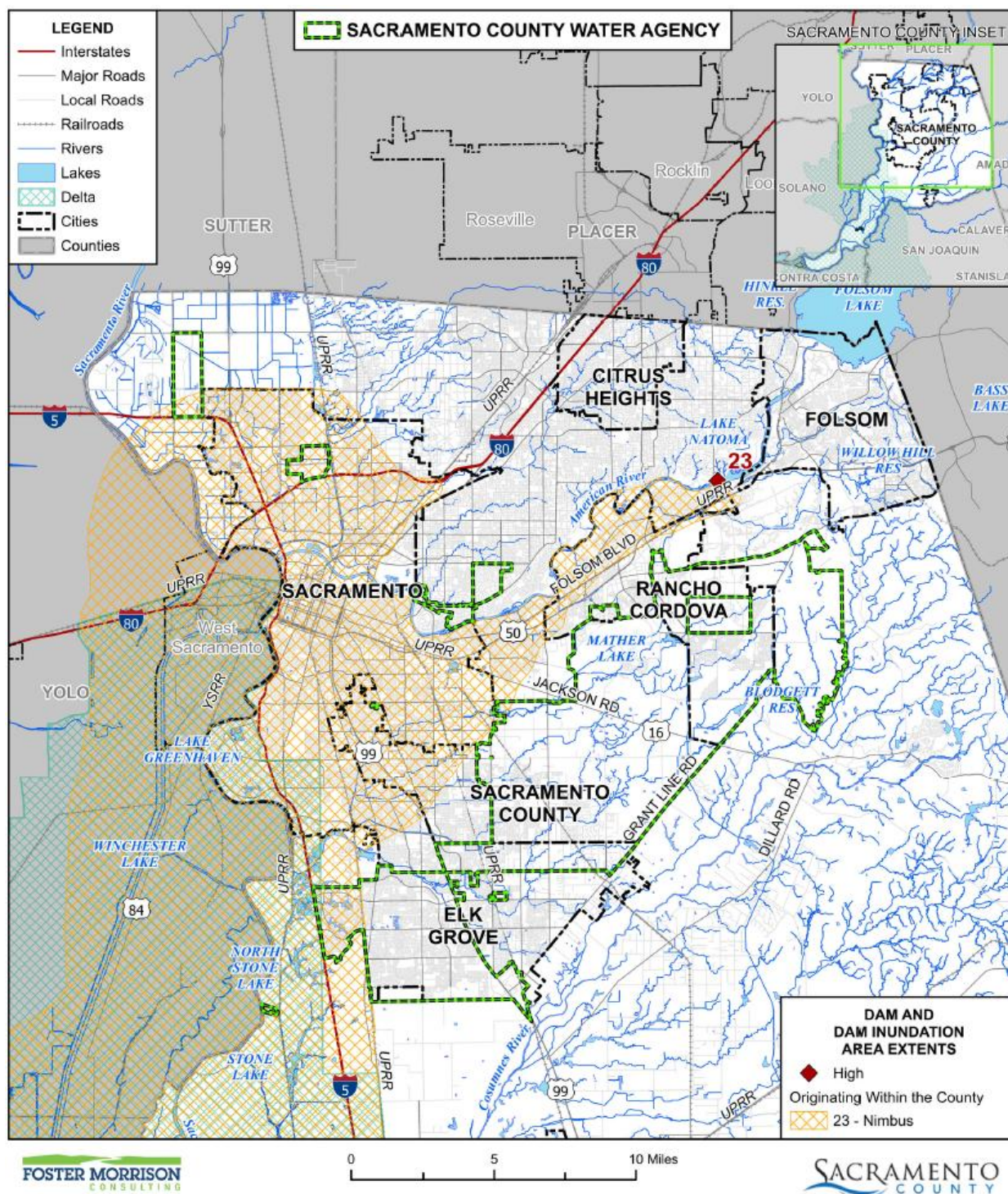
Data Source: DWR DSOD dam inventory and dam inundations (updated 7/2025; data downloaded 10/2025), Sacramento County, Cal-Atlas; Map Date: 6/16/2026.

Table M-6 SCWA – Extremely High Hazard (Outside the County) Dam Inundation Areas Geographical Extents

Dam Inundation Area	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Camanche	0.1	0.0001%	0.03	0.0001%	0.03	0.00007%
Oroville	59	0.1%	3	0.01%	56	0.1%
Pardee	0.04	0.0001%	0.02	0.0001%	0.01	0.00003%
Sly Park	0.1	0.0002%	0.04	0.0002%	0.1	0.0003%
Union Valley	550	1%	406	2%	144	0.4%

Source: DSOD, Cal OES, County GIS

Figure M-4 SCWA– High Hazard (Inside the County) Dam Inundation Areas



Data Source: DWR DSOD dam inventory and dam inundations (updated 7/2025; data downloaded 10/2025),
 CalOES CIP dam inundation data (3/2017),
 Sacramento County, Cal-Atlas; Map Date: 6/16/2026.

Table M-7 SCWA – High Hazard (Inside the County) Dam Inundation Areas Geographical Extents

Dam Inundation Area	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Nimbus	3,380	5%	2,162	8%	1,219	3%

Source: DSOD, Cal OES, County GIS

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations for dam failure in Sacramento County.

NCDC Events

The NCDC does not contain any dam failure events for Sacramento County.

SCWA Events

The Agency Planning Team noted no past occurrences of dam failure of any type to affect the Agency.

Climate Change and Dam Failure

It is likely that climate change will increase the chance of future occurrence as well as future impacts associated with dam failure. More information on future impacts to the Agency can be found below and in the Future Conditions/Future Development section of the Vulnerability Assessment below.

The 2023 California State Hazard Mitigation Plan noted that modeling described in California’s Fourth Climate Change Assessment projects less frequent but more extreme daily precipitation. Year-to-year precipitation will become more volatile, and the number of dry years will increase by mid-century. As the climate continues to warm, atmospheric rivers will carry more moisture, and extreme precipitation may increase. Climate model projections show a tendency for the northern part of the State to become wetter. Increases in both precipitation and heat causing snow melt in areas upstream of dams could increase the potential for dam failure and uncontrolled (and controlled) releases in Sacramento County. The Agency could be affected by these changes, especially in those areas of the Agency located within dam inundation areas.

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events. The County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme precipitation events is four. The average annual precipitation across the County may rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

In general, California exhibits “booms and busts,” which refers to the existence of both very wet years and very dry years. The amount of precipitation that falls in any particular year is largely influenced by occurrences of large, discrete winter storms, also known as atmospheric rivers, which often provide a substantial fraction of the region’s annual precipitation, inclusive of the county. In California, atmospheric rivers vary in intensity; some are beneficial for water supply and replenish snowpack that naturally melts during the summer, serving as the water supply for people and agriculture, while others are responsible for widespread and adverse impacts (NOAA 2023). Extreme precipitation from these atmospheric rivers in the future may prove to be more variable, volatile, and potentially more severe. These extremes are most likely to occur during storm events, leading to more severe damage from waves and floods, thus possibly leading to more dam failure events, including the need for more controlled releases from dams.

Vulnerability to Dam Failure

The vulnerability of the Agency to dam failure flooding would vary depending on which dam fails and the nature and extent of the dam failure and associated 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 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. Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding.

An assessment of a community’s vulnerability to dam failure begins with an understanding of local exposure to dam failure. This is included in the Local Concerns section below followed by a discussion of the Agency’s Assets at Risk to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

All water facilities serving the Metro Air Park and Northgate industrial service areas would be inundated and forced to shut down operations until floodwaters recede – catastrophic impacts. Equipment replacements most likely needed.

Three (3) direct feed water wells in the Arden Park Vista service area would be inundated and forced to shut down operations until floodwaters recede. Equipment replacements most likely needed. Loss of the 3 wells sites would be critical to the operation of the west end of water system, however, provide all of the other water system wells sites are operational sufficient water supply is expected at reduced water pressures. Emergency inter-ties with adjacent water purveyors exist.

Zone 40 North Service Area – Mather main base water facilities are located on the edge of the flood inundation boundary. Insufficient information at this time to determine the extent of flood damage and impacts to the operations of the water facilities. Other nearby water facilities would be operational.

Zone 40 South Service Area - all facilities west of the UPRR tracks would be inundated and forced to shut down operations until floodwaters recede. Insufficient information at this time to determine the extent of flood damage and repairs needed to the water facilities. The Dwight Rd WTP and several well sites are also within the flood inundation boundary. Damage to these facilities is also expected. Other nearby water facilities would be operational to supply water to the area but at reduced water pressures.

The Agency also would be impacted by the loss of access to remote water facilities. Loss of power generation from Folsom Dam would also be a concern. Agency power generating facilities might be affected, and SCWA can only run on backup power for so long. Prolonged power outage would have direct impact to the Agency.

Assets at Risk

Assets at risk from dam failure include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations (including both District staff and the population served by the Agency) located in dam inundation areas are vulnerable to dam failure. Certain vulnerable populations may be at increased risk to dam failure, especially during a large event with minimal advance notice. These vulnerable populations may include: the unhoused, those with limited mobility, and those that lack the resources to leave the area.

District Assets and Critical Facilities and Infrastructure

Most structures and critical facilities and infrastructure in the Agency have some measure of risk to dam failure. Dam failure flooding can affect the built environment of the Agency. Structures in dam inundation areas are at risk and depending on flood depths, can range from slight damage to totally inundated. The Agency noted that certain assets are at risk to dam failure. These are included in Table M-8.

Table M-8 SCWA Assets: Structures, Critical Facilities and Infrastructure, and Other Facilities at Risk from Dam Failure

Name of Asset	Facility Type	Replacement Value
Water Treatment Plants	Essential	\$80,518,712
Water Wells	Essential	\$28,767,926
Storage Tank & Booster Stations	Essential	\$10,815,231
SCADA System	Essential	\$1,136,504

Source: SCWA

Natural, Historic, and Cultural Resources

A major dam failure event and associated flooding could have a devastating impact on the Agency. Large flood events can affect all natural, historic, and cultural resources that lie in the dam inundation areas. There are a number of ways floodwaters associated with a dam failure event can impact natural resources and the environment: Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute rivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levées can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase downstream. Trees can be uprooted by high-velocity water flow. Plants that survive the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to these structures within the inundated areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged, and lost during extreme dam failure flood events.

Impacts from Dam Failure

Impacts to the Agency from dam failure flooding could be extensive and widespread and include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations may be necessary and compounded by impacts to transportation systems and infrastructure. Economic losses to the Agency and Sacramento County Planning Area can also be significant.

Other impacts associated with dam failure include landslides, bank erosion, and destruction of habitat. Dam failures can cause downstream flooding and can transport large volumes of sediment and debris and contaminants from the floodwaters. Other environmental impacts can include contamination from septic system failures and releases of contaminants from hazardous materials facilities, contamination of potable water supplies; changes in configurations of streams; loss of wildlife habitats; and degradation of wetlands. A large dam failure event could have significant and catastrophic impacts.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the Climate Change and Dam Failure discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the Agency include the following:

- Climate change is likely to exacerbate future rain and storm conditions and associated impacts and vulnerability of the Agency to dam failure. This was discussed in greater detail in the Climate Change and Dam Failure section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the Agency show general populations to be slowly increasing. The Agency may add staff, but this number would be relatively small. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.
- Land use planning should be proactive to address future hazard conditions. Changes in land use and development in the Agency are expected to be limited in the near future and thus are not likely to affect dam failure impacts to the Agency. Locating new development, structures, and critical facilities and infrastructure within or near areas of dam failure risk may put additional development at risk.

Future Development

Future dam failure events may occur in the Agency. Although new growth and development may 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.

Drought & Water Shortage (w/Tree Mortality)

Likelihood of Future Occurrence–Likely

Vulnerability–High

Hazard Profile

Drought and water shortage are complex issues involving many factors—it occurs when a normal amount of precipitation is not available to satisfy an area’s usual water-consuming activities. Drought can often be defined regionally based on its effects. 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 supply is the most significant issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. Drought has also affected tree mortality in the area in the past. As the population in the area continues to grow, so will the demand for water.

Tree Mortality and Drought

One of the specific impacts of drought in the SCWA and the Sacramento County Planning Area is the increased risk to trees from insects, pathogens and parasites, and other tree mortality and dieback issues. Drought weakens trees and makes them more susceptible to insect infestation and other pathogens. Insects, such as bark beetles and others, frequently attack trees weakened by drought, disease, injuries, or other factors that may stress the tree. These insects and other pathogens can contribute to the decline and eventual death of trees throughout the Agency. The tree mortality and dieback problems are a high priority because of the issue of hazardous trees and an increased wildfire hazard. In addition to an increase in wildfire fuels, hazardous trees can fall onto structures causing damage and a result in a reduction on the tree canopy within the Agency that provides relief during extreme heat days.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the Agency and County is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme Drought
- D4 – Exceptional Drought

The Sacramento County Planning Area, including the SCWA, has been in and out of drought since 2014. Over the last seven years since the 2021 LHMP, drought conditions have ranged from none to exceptional. Drought conditions are expected to continue to be cyclical in nature depending on the year. Current drought conditions in the Agency are shown in Section 4.3.9 of the Base Plan.

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time (which does not usually affect water shortages) or for longer periods (which may challenge water supplies). Should a drought last for a long period of time, water shortage becomes a larger issue. Surface water is the dominant source due to the number of rivers in the region, but ground water supplements agriculture, which consumes the majority of water in the surrounding County.

Past Occurrences

Disaster Declaration History

There have been 3 state and 1 federal disaster declarations for Sacramento County. This can be seen in Table M-9. Additionally, there have been 26 USDA Secretarial Disaster Declarations from drought in the County, as shown in Past Occurrences in Section 4.3.9 of the Base Plan.

Table M-9 Sacramento County –State and Federal Drought Disaster Declarations 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	4	2008, 2014, 2015	1	1977

Source: Cal OES, FEMA

NCDC Events

There have been 83 NCDC drought events in Sacramento County since 1993. These most likely had some impact on the Agency.

SCWA Events

Based on historical information, the occurrence of drought in California, including the SCWA, is cyclical, driven by weather patterns. Section 4.3.9 of the Base Plan notes that five droughts have occurred in the

past 86 years, which impacted the Agency and Sacramento County Planning Area. The Agency Planning Team noted that the Agency has experienced multiple, consecutive years of drought.

The Agency noted no specific physical damages but impacts (reduced use) to the operations of surface water facilities and reliance on more use of groundwater resources or water transfers. Water restrictions leads to reduced revenue for the Agency.

Climate Change and Drought and Water Shortage

It is likely that climate change will increase the chance of future occurrence as well as future impacts associated with drought and water shortage. More information on future impacts to the Agency can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

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 2024 Climate Adaptation Study (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.

Cal Adapt scenarios for modeled future drought scenarios were shown in Section 4.3.9 of the Base Plan.

The 2024 Sacramento County CAP noted that California, including Sacramento County, has a highly variable climate that is susceptible to prolonged periods of drought, and recent research suggests that extended drought occurrences (or "mega-droughts") could become more pervasive in future decades, which may result in major impacts on local water supplies and other secondary impacts. The County is not located in an area where snow accumulates, however, major water districts and utilities in the County receive and depend on a substantial amount of water from watersheds that rely upon spring and early-summer snowmelt in the Sierra Nevada mountain range. The Sierra Nevada snowpack, which serves as a natural water supply reservoir for California during the dry months, is predicted to decline in area covered and water volume stored as temperatures rise and precipitation falls more frequently as rain instead of snow at mountain elevations. Further, increased temperatures will affect the timing of historical snowmelt such that the snowpack will typically melt earlier in the year, causing more rapid early spring flows in the Sacramento, American, Cosumnes, and Mokelumne Rivers and reduced late spring and summer flows. Approximately 50 percent of the County is served by groundwater supplies. Changes in surface water flow will have a direct impact on groundwater recharge, including decreased periods of recharge when late spring and summer stream flows diminish. Further, groundwater usage is higher in periods of drought, therefore, groundwater supplies may be reduced during and after periods of limited surface water flows.

The 2026 American, Bear, and Cosumnes Watersheds Resilience Plan noted that a key driver of climate vulnerability, adaptive capacity, and implementation readiness in the watershed group is drought. An equity analysis was performed as part of this Plan. An Equity Analysis Technical Appendix demonstrates how social vulnerability aligns with the physical hazard environment across the watershed. It noted that drought

vulnerability intensifies in the upper watersheds, where cumulative annual flow deficits are projected to increase by up to 25%, contributing to downstream water-supply and affordability pressures that disproportionately affect low-income households.

Vulnerability to Drought and Water Shortage

Based on historical information, the occurrence of drought and water shortage in California, including the Agency, 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 can be 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 the SCWA to drought may vary and include reduction in water supply, turf losses, impacts to natural resources, agricultural losses, and an increase in dry fuels and tree dieback.

The whole of the Agency is at some measure of vulnerability to drought and water shortage. An assessment of a community's vulnerability to drought and water shortage begins with an understanding of local exposure to drought. This is included in the Local Concerns section below followed by a discussion of the Agency's Assets at Risk to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The Agency noted no specific physical damages but impacts (reduced use) to the operations of surface water facilities and reliance on more use of groundwater resources or water transfers. Water restrictions leads to reduced revenue for the Agency.

The UWMP, updated every 5 years, demonstrates that available water supplies are sufficient to meet projected growth and demands through a 20-year planning horizon and for different year types. The WSCP addresses potential water supply shortages from drought or other impacts to water supply availability

Assets at Risk

Assets at risk from drought and water shortage include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

The people and populations of the Agency are not directly affected by drought; although, their turfed areas, trees, agricultural lands, and other water dependent resources can all be affected. In extreme drought conditions, however, residents and other populations within the Agency may be vulnerable to drought and water shortage issues. Water quality can be impacted causing health problems, especially to vulnerable populations. Drought and water shortage can lead to an increase in wildfires threatening District residents.

Water shortages can have an effect on all of the population in the Agency, but often have a greater effect on the unhoused and other vulnerable populations that may be unable to access clean drinking water during shortages. During periods of drought, as the costs of water usage may increase, especially during mandated conservation times, those who are economically disadvantaged may be unable to afford the increased costs of potable water.

District Assets and Critical Facilities and Infrastructure

Most District structures, critical facilities, and infrastructure have a limited vulnerability to drought and water shortage. Should drought conditions be severe enough to cause water shortage reliability issues, some facilities and infrastructure may be affected. Water and wastewater systems (like those of the Agency) may be impacted during times of reduced water supply and need to employ contingencies to remain functional and fully operational. Other water dependent systems may also be adversely affected. Further, the secondary hazard of drought (increased potential for spread of urban fires and wildfire) can pose a significant risk to District facilities. Drought can also stress trees, causing die off. These trees may fall on critical infrastructure adjacent to them and impact power lines and other utilities.

The FRWA intake and pipeline facilities and Vineyard surface water treatment plant rely solely on the availability of Sacramento River water. Reduced surface water allocations minimize the use of these major facilities. Additionally, impacted groundwater elevations due to extended drought could impact groundwater wells throughout SCWA service areas.

Natural, Historic, and Cultural Resources

Drought and water shortage can have a significant impact on natural resources. Water levels in reservoirs and lakes may be reduced, and a loss of wetlands and marsh areas may occur. Severe drought conditions can contribute to an increase in erosion of soils and lead to poor soil quality. Further, all of the trees in the Agency are at risk to drought impacts and a reduction in water supply. These trees provide a wealth of social and environmental benefits to District residents and visitors, from shade and beauty to air quality, carbon reduction and stormwater management. Drought can devastate crops and dry out pastures, dry out forests and critical habitat areas, and reduce food and water available for wildlife and livestock. Additionally, drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. It is unlikely that drought and water shortage would have a significant impact on historic and cultural resources in the Agency.

Impacts from Drought and Water Shortage

The vulnerability of the Agency to drought is District-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservation measures during extended droughts. During these times, the costs of water can also increase. Also of concern, the increased dry fuels, fuel loads, and tree mortality events associated with drought conditions can result in an increased fire danger. In areas of extremely dry fuels, the intensity and speed of fires can be significant. Water supply and flows for fire suppression can also be an issue during extended droughts. Drought can also lead to turf losses, cause tree die off, and can significantly impact agricultural lands and crops within the Agency.

Other qualitative impacts associated with drought in the Agency are those related to water intensive activities such as municipal usage, commerce, tourism, and recreation use. With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the hazard profile discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the SCWA include the following:

- Climate change is likely to exacerbate future drought conditions and associated impacts and vulnerability of the Agency to drought and water shortage. This was discussed in greater detail in the Climate Change and Drought and Water Shortage section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the Agency show the population to be slowly increasing. It is unknown how population patterns and demographics will change in the near future. The Agency may add staff, but this number would be small. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.
- Changes in land use and development within the Agency are expected to be limited in the near future and thus are not likely to affect the vulnerability of SCWA to drought and water shortage. Depending on the land use change, the Agency may or may not see an increased vulnerability to this hazard. The Agency conducts water supply planning to ensure a continued water supply to address future drought conditions.

Future Development

As the population in the Agency continues to grow, so will the demand for water. Ongoing planning will be needed by the Agency to account for population growth and increased water demands.

Earthquake (w/Subhazards)

Likelihood of Future Occurrence—Occasional (minor)/Unlikely (major)

Vulnerability—High

Hazard Profile

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes cause ground shaking, possible liquefaction, landslide, settlement, and can cause fires that follow the earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, wastewater, 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.

Location and Extent

Since earthquakes are regional events, the whole of the Agency is at risk to earthquake. The SCWA, Sacramento County, and surrounding areas have some level of risk from seismic and geologic hazards. Regional faults were shown in Section 4.3.10 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface, likely inactive, faults in the Delta, such as the Midland fault. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. To the east, the Bear Mountain fault zone trends northwest-southeast through Sacramento and El Dorado Counties. As noted in the Base Plan, there have been historically active faults outside the County. These include: San Andreas, Vaca, Concord, Greenville, Hayward, Calaveras, Foothill Fault System, Las Positas, Midland, and West Napa. A significant seismic event on any of these major faults could cause damage in the SCWA.

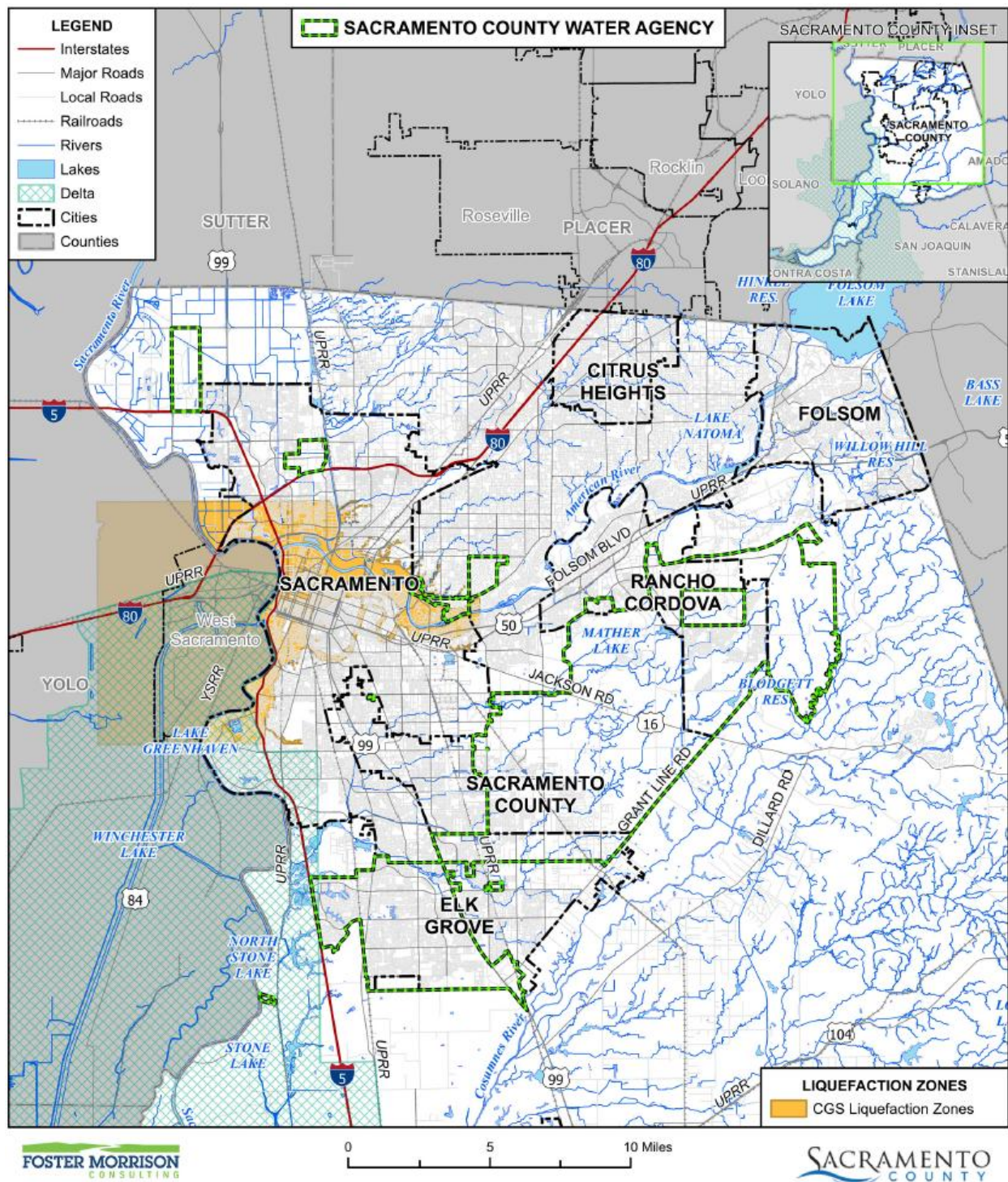
The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.11 of the Base Plan.

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. The Agency is located in an area where earthquakes of some magnitude could occur, so both magnitude and intensity of earthquakes are expected to remain low to moderate. Seismic shaking maps for the area in Section 4.3.10 of the Base Plan show Sacramento County and the Agency fall within a low to moderate shake risk.

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are

rebuilt or leveed areas are dewatered and the levees rebuilt. In Sacramento County, liquefaction zones were mapped by CGS for the first time in 2025. Geographic flood extent from the CGS Liquefaction Zones are shown on Figure M-3 as well as in Table M-6. As shown, only a small area of the Agency is in mapped liquefaction areas.

Figure M-5 SCWA– Liquefaction Zones



Data Source: CGS Liquefaction Zones 2015 (Sacramento West and East Quads updated 11/20/2025), Sacramento County, Cal-Atlas; Map Date: 6/16/2026.

Table M-10 SCWA – Liquefaction Zone Geographical Extents

Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Sacramento	0.003	0.0000044%	0.001	0.000002%	0.002	0.00001%
Unincorporated Sacramento County	263	0.4%	148	0.6%	116	0.3%
Grand Total	263	0.4%	148	0.6%	116	0.3%

Source: DSOD, Cal OES, County GIS

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations in Sacramento County from earthquake.

NCDC Events

The NCDC does not track earthquake events.

SCWA Events

As shown in the Base Plan, no disaster declarations or other significant events causing significant damage have occurred in the County due to earthquake, including its subhazards such as liquefaction. The Agency Planning Team noted no past occurrences of earthquakes that affected the Agency in any meaningful way.

Climate Change and Earthquake

Climate change is unlikely to increase earthquake frequency or strength. More information on future impacts can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

Vulnerability to Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquakes as a result of the periodic release of tectonic stresses. Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while more rural areas are less vulnerable. The primary impacts of concern are life safety and property damage. Although several active faults are near the Sacramento County Planning Area and the Agency, seismic hazard mapping indicates that the Agency has low to moderate seismic hazard potential. There is the potential for the Agency and Sacramento County Planning Area to be subject to some level of moderate seismic shaking during earthquake events occurring on these regional faults depending on the location and magnitude of the event. Some degree of structural damage due to strong seismic shaking could be expected in the Agency.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The SCWA is located within Zone 3.

Earthquake shaking can also cause liquefaction to occur. Areas with loose soil and high water tables are at risk from liquefaction. There are limited areas in and near the Agency prone to liquefaction.

The whole of the Agency is at some measure of vulnerability to earthquake. An assessment of a community's vulnerability to earthquakes begins with an understanding of local exposure to earthquakes. This is included in the Local Concerns section below. After that section, assets at risk are discussed.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The Agency is potentially affected by earthquake events from several active, regional faults as described above. As detailed in Section 4.3.10 of the Base Plan, Hazus deterministic analyses were performed on four different potential earthquake scenarios associated with four regional faults. Hazus is FEMA's loss estimation tool used to model earthquake damages for planning purposes. For deterministic Hazus scenarios, a single scenario event is selected based on a specific fault, the epicenter location, and the potential magnitude of the event. The faults and scenarios included the following: Calaveras (6.86M event), Concord (6.8M event), Hayward (7.58M event), and San Andreas (8.04M event). These scenarios likely affected the Agency in some way. A small portion of the damages from the Hazus analyses may also be attributed to the Agency.

Impacts from earthquake in the Agency will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

There is a limited impact on operations. A majority of the water system facilities are built after year 2000 and designed and construction to the latest seismic standards. Water production/treatment/storage facilities are open space facilities with most process equipment and tanks exposed, not housed in buildings. Most sites are unmanned. There is potential widespread / long-term loss of electrical power may affect the ability to operate all necessary water facilities with back up emergency generators. Access to remote facilities could be hampered.

Assets at Risk

Many assets in the Agency are at risk to ground shaking and other earthquake related impacts. Assets at risk from earthquake include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations are at risk from earthquake events (including both District staff and the population served by the Agency). Those at heightened risk include: the unsheltered, individuals dependent on medical equipment, and individuals with impaired mobility.

The greatest risk to people and populations from earthquake is death and injury. More information on people and populations at risk to earthquake shaking events can be seen in the Hazus scenarios developed for this LHMP. More information on the Hazus scenarios and how the Agency and County is affected is included in Section 4.3.10 of the Base Plan.

District Assets and Critical Facilities and Infrastructure

All District assets and critical facilities and infrastructure in the Agency are vulnerable to earthquakes and its subhazards, depending on the severity and location of the event. The Hazus scenarios conducted for the entire Sacramento County Planning Area show how structures and critical facilities may be affected. Given the nature of earthquake events causing significant ground shaking among other issues, those critical facilities and infrastructure that include underground components such as water and wastewater facilities would be uniquely vulnerable to damaging earthquakes.

The Agency noted that the assets listed in Table M-11 are at risk to earthquake.

Table M-11 SCWA Assets: Structures, Critical Facilities and Infrastructure, and Other Facilities from Earthquake

Name of Asset	Facility Type	Replacement Value
FRWA Surface Water Intake Plant	Essential	\$54,948,984
FRWA Raw Water Pipeline	Essential	\$8,336,275
Vineyard Surface Water Treatment Plant	Essential	\$244,140,313
Water Treatment Plants	Essential	\$80,518,712
Storage Tank & Booster Stations	Essential	\$10,815,231
Water Transmission Mains	Essential (165 miles)	\$98,190,500
Water Distributions Mains	Essential (715 miles)	\$38,975,447

Source: SCWA

Natural, Historic, and Cultural Resources

The 2023 State Hazard Mitigation Plan noted that environmental problems from earthquakes can be numerous. It is possible for earthquakes to reroute streams, which can change the water quality, possibly damaging habitat and feeding areas. Streams fed by groundwater and/or springs may dry up because of changes in underlying geology. Another threat to the environment from earthquakes is the potential release of hazardous materials into the natural environment causing contamination that can be difficult to contain. Historical and cultural resources are at risk, often due to their age and construction types. The Hazus

scenarios in Section 4.3.10 of the Base Plan and included below are relatively silent on the vulnerability to natural, historic, and cultural resources, but impacts to these resources could be long lasting.

Impacts from Earthquake

Earthquakes can strike without warning and cause dramatic changes to the landscape of an area that can result in loss of life and injuries, and have devastating impacts on the built environment. The greatest impact is to life safety of the SCWA staff, residents, and visitors. Other impacts to the Agency could include damages to infrastructure such as roads, bridges, and other transportation system infrastructure; damages and loss of services to utilities and critical infrastructure, including those related to gas, power, water, wastewater and communication systems; damages to structures and other development.

Earthquakes can also cause failure of dams, levees, and reservoirs. Facilities and land downslope from dams or water reservoirs or behind levees might be subject to flooding, if the dams, reservoirs, or levees fail as a result of an earthquake. The Agency has locations with significant flood risk that include facilities downslope from dams or reservoirs, levees, and other flood control structures that could be affected by a significant earthquake event.

Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;
- Structural and property damage;
- Disruption of and damage to public infrastructure, utilities, and services;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community; and

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the Likelihood of Future Occurrence discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the SCWA include the following:

- Climate change is likely to have no effect on future earthquake conditions and associated impacts and vulnerability of the Agency. This was discussed in greater detail in the Climate Change and Earthquake section of the Hazard Profile above.

- Population projections for the area served by the Agency show the population to be slowly increasing. The Agency may add staff, but this number would be small. The Agency noted it has no control over population changes within its District boundaries/service area, it merely reacts to them by providing additional (or reduced) services.
- Changes in land use and development in the Agency are expected to be limited in the near future and thus are not likely to affect earthquake and associated impacts to the Agency. In addition, adherence to protective building codes for new development will also assist in limiting future impacts and associated vulnerabilities of the Agency to this hazard.

Future Development

Although new growth and development corridors would fall in areas affected by earthquake, given the limited chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The County enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the Agency is subject to these building codes and land use planning.

Flood: 1%/0.5%/0.2% Annual Chance

Likelihood of Future Occurrence—Occasional (1%)/Unlikely (0.5/0.2%)

Vulnerability—High

Hazard Profile

This hazard discusses the FEMA DFIRM 1%, 0.5%, and 0.2% annual chance floods. These tend to be the larger floods that can occur in the Agency and have caused damage in the past. Flooding can be a significant problem in the Agency. Historically, the Agency has been at risk to flooding primarily during the winter and spring months when river systems in the Agency swell with heavy rainfall and snowmelt runoff. The Agency has also been at risk during atmospheric river flood events. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures located throughout the Sacramento County Planning Area and the SCWA. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred within the 1% and 0.2% annual chance floodplains and in other localized areas in the Agency.

Location and Extent

The SCWA has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure M-6.

Figure M-6 SCWA – FEMA DFIRM Flood Zones

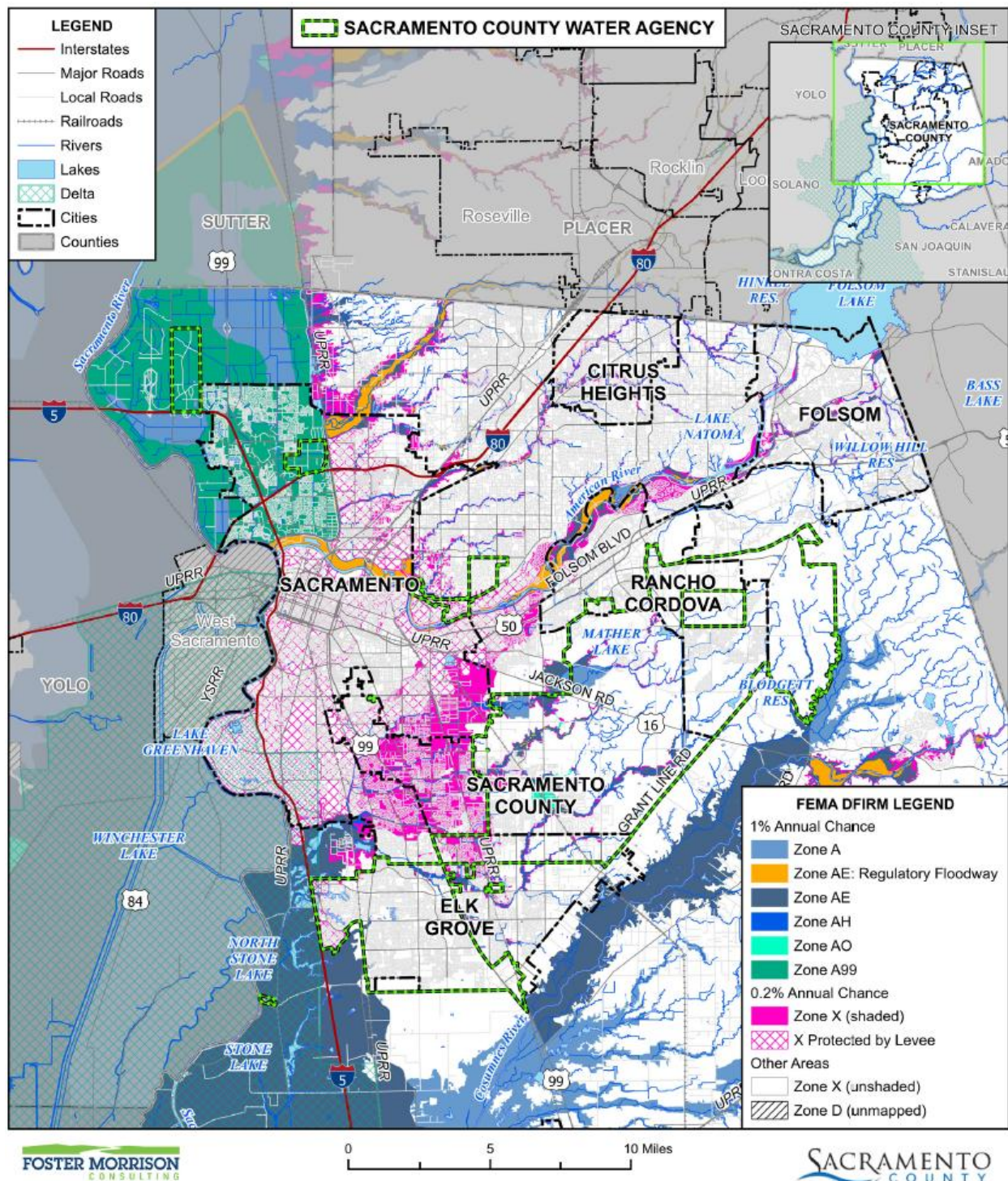


Table M-12 details the DFIRM mapped flood zones located within the Agency.

Table M-12 SCWA– DFIRM Flood Hazard Zones

Flood Zone	Description	Present in District
A	1% annual chance flooding; No base flood elevations provided	X
AE Regulatory Floodway	1% annual chance flood: Regulatory floodway; Base flood elevations provided	X
AE	1% annual chance flooding; Base flood elevations provided	X
AH	1% annual chance flood areas of shallow flooding between one to three feet deep. Regulatory floodway; Base flood elevations provided	X
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone.	X
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system.. No Base Flood Elevations (BFEs) or depths are shown.	X
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	X
X (unshaded)	No flood hazard	X

Source: FEMA DFIRM 02/22/2024

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the Agency vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the Agency tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the Agency tends to have a shorter speed of onset, due to the amount of water that flows through the Agency.

Geographical flood extents for the Agency from the FEMA DFIRMs are shown in Table M-13.

Table M-13 SCWA – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard	7,218	11%	2,360	9%	4,857	12%
0.2% Annual Chance Flood Hazard	2,645	4%	1,743	7%	902	2%
Other Areas	55,904	85%	22,573	85%	33,331	85%
SCWA Total	65,766	100%	26,676	100%	39,090	100%

Source: FEMA DFIRM 02/22/2024

Past Occurrences

Disaster Declaration History

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table M-14. These events also likely affected the Agency to some degree.

Table M-14 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	26	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times), 2022*, 2023 (three), 2024 (twice)	18	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times), 2023 (three times)*, 2024*

Source: Cal OES, FEMA

*included a landslide component.

NCDC Events

The NCDC tracks flood events for the County. Events have been tracked for flooding since 1993. Sacramento County has seen 174 events. These events most likely had some impact on the Agency.

SCWA Events

SCWA noted no past events since 2021 that had effects on the Agency.

Climate Change and Flood

It is likely that climate change will increase the chance of future occurrence as well as future impacts associated with flood. More information on future impacts to the Agency can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

According to the 2024 CAS, climate change may affect flooding in California, the Sacramento County Planning Area, and the Agency. 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.

Cal Adapt future precipitation projections were shown in Section 4.3.4.

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events, such as sustained periods of heavy precipitation, increased rainfall intensity during precipitation events, and increased risk of rain-on-snow events. Further,

more winter-time precipitation that falls as rain instead of snow, and higher temperatures that will cause earlier snowmelt, which could produce substantial surface water flows over a short period of time and may potentially affect dams and spillways and overwhelm levee systems designed for historical precipitation patterns. Historically, the County experienced an average of four extreme precipitation events per year (as shown in Section 4.3.4 of the Base Plan). Under the medium and high emissions scenarios, the County is expected to experience five to six extreme precipitation events per year by mid-century and six to seven extreme precipitation events per year by the late century.

The 2026 American, Bear, and Cosumnes Watersheds Resilience Plan noted that a key driver of climate vulnerability, adaptive capacity, and implementation readiness in the watershed group is flooding. An equity analysis was performed as part of this Plan. An Equity Analysis Technical Appendix demonstrates how social vulnerability aligns with the physical hazard environment across the watershed. It noted that flooding impacts are most severe downstream, where rising flows increasingly stress Sacramento's levee system; a modeled levee-breach scenario affects 12.5% of the watershed population, and 59% of those affected fall into the highest flood-sensitivity category.

Future flooding exacerbated by climate change will result in a range of potential impacts across the County. For populations, there is an array of social vulnerability factors that exacerbate flood-related risks, and those residing in floodplains are especially vulnerable to the direct impacts of flooding. Floodwaters can interact with sources of pollution and distribute hazardous pollutants locally and regionally, which may result in water contamination and a range of human health impacts. Additionally, flooding can disrupt transportation networks, cause economic losses through business and government facility closures, disrupt communications, disrupt the provision of utilities, and cause significant damage to buildings and critical infrastructure. Further, flooding may also threaten ecosystems and agricultural resources; unlike natural flooding regimes that deposit useful sediment resulting in increased soil fertility as well as groundwater recharge, catastrophic flooding from levee overtopping could lead to soil erosion and loss of viable cropland. It could also release sewage and hazardous materials into the environment if wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

Vulnerability to Flood: 1%, 0.5%, and 0.2% Annual Chance

Floods have been a part of the Agency's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damage and potential loss of life and injury. Predominantly, the effects of 1%, 0.5%, and 0.2% annual chance flooding are generally confined to areas near the waterways of the Agency. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat.

The whole of the Agency is at some measure of vulnerability to floods. An assessment of a community's vulnerability to flood begins with an understanding of local exposure to flood. This is included in the Local Concerns section below followed by a discussion of the Agency's Assets at Risk to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

SPECIFIC VULNERABILITIES/CONCERNS/ISSUES/PROBLEM AREAS SPECIFIC TO THE AGENCY? CAN THE AGENCY PROVIDE DETAILS ON THE ROOT CAUSE/PROBLEM DESCRIPTION OF FLOOD ISSUES THAT WILL SUPPORT MITIGATION ACTION DEVELOPMENT?

Assets at Risk

Assets at risk from flood include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations located in the 1% and 0.2% annual chance floodplains within the Agency (including both District staff and the population served by the Agency) are at some risk to flooding. Certain vulnerable populations located within areas prone to flooding may be at increased risk to this hazard, especially during a large event with minimal advance notice. These vulnerable populations include: the unsheltered, those with limited mobility, and those that lack the resources to leave the area.

Populations served by the Agency can be the most vulnerable. Not only are the residents at risk, but their homes and contents are all at risk, compounding the impacts associated with significant hazard events.

District Assets and Critical Facilities and Infrastructure

Certain District structures are at risk of DFIRM flooding and primarily include those structures located within the 1% and 0.2% annual chance floodplains. Flooding presents a threat to both critical facilities and infrastructure, as well as community lifelines. Critical infrastructure plays an immensely important role in District communities. As previously noted, communities rely on roads, rail corridors, and related biking and pedestrian routes for transportation, and on water infrastructure for drinking water, wastewater service, and draining streets of rainwater. Damage to any one of these systems can threaten public safety, wreak havoc on daily life, impact properties far from flood zones, and result in economic impacts that cascade throughout California.

District assets listed in Table M-15 would be at risk to flooding.

Table M-15 SCWA Assets: Structures, Critical Facilities and Infrastructure, and Other Facilities at Risk from Flood

Name of Asset	Facility Type	Replacement Value
FRWA Surface Water Intake Plant	Essential	\$54,948,984
Water Treatment Plants	Essential	\$80,518,712

Name of Asset	Facility Type	Replacement Value
Water Wells	Essential	\$28,767,926
Storage Tank & Booster Stations	Essential	\$10,815,231
SCADA System	Essential	\$1,136,504
Total		\$565,829,892

Source: SCWA

Natural, Historic, and Cultural Resources

Large flood events can affect natural, historic, and cultural resources. There are a number of ways floodwaters can impact natural resources and the environment. Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute rivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levees can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase downstream. Trees can be uprooted by high-velocity water flow. Plants that survived the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures within the flooded areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged and lost during extreme flood events. Any of these that fall in the flood zones shown on Figure M-6 would be vulnerable.

Impacts from Flood: 1%, 0.5%, and 0.2% Annual Chance

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Large flood events, including those associated with 1% and 0.2% annual chance floods, can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. People may be swept away in floodwaters, causing injuries or deaths. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Structures can be damaged directly from floodwaters and can also be damaged from trees falling as a result of water-saturated soils. 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 causing power outages. The interruption of power causes major problems and can result in the closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues.

Standing water can cause damage to crops, roads, foundations, and electrical circuits. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the hazard profile discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the SCWA include the following:

- Climate change is likely to exacerbate future flood conditions and associated impacts and vulnerability of the Agency to 1% and 0.2% annual chance flooding. This was discussed in greater detail in the Climate Change and Flood section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the Agency show the population to be slowly increasing. It is unknown how population patterns and demographics will change in the near future. The Agency may add staff, but this number would be small. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.
- Changes in land use and development in the Agency are expected to be limited in the near future and thus are not likely to affect flooding and associated impacts to the Agency. Additional development traditionally leads to additional flooding. In addition, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the Agency to this hazard.

Future Development

Future development in the Agency may be built in the floodplain, as long as it conforms to the standards of the floodplain ordinance. The County and each City enforce their floodplain management ordinance on areas inside the Agency. More detail on the specifics of the floodplain ordinance can be found in Section 4.4.1 of the Base Plan and in the City of Elk Grove, Rancho Cordova, and Sacramento annexes. New District facilities and assets will be sited in such a way as to reduce the risk from flooding to District structures and assets.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely

Vulnerability–Medium

Hazard Profile

Flooding occurs in areas other than the FEMA mapped 1%, 0.5%, and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the Agency, during the rainy season from November through April. Prolonged heavy rainfall (including that from atmospheric river events) contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The SCWA is subject to localized flooding throughout the Agency. Areas prone to localized flooding are included in the past occurrences section below. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the Agency vary by location. Flood durations in the Agency tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the Agency tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations from localized floods. There would most likely have been localized flood events during the disaster declarations from flood as shown in the previous 1%/0.2% annual chance flood section.

NCDC Events

The NCDC occurrences of localized flooding are included in the 1% and 0.2% annual chance flood hazard profile above where past flood events were noted.

SCWA Events

The Agency noted that localized flooding generally occurs during periods of heavy rain and storms and often occurs in conjunction with the larger, more significant flood events. No events since 2021 where damages occurred were recorded by the Agency.

Climate Change and Localized Flood

It is likely that climate change will increase the chance of future occurrence as well as future impacts from localized flood. More information on future impacts to the Agency can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

Even if average annual rainfall may decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century, increasing the likelihood of overwhelming stormwater systems built to historical rainfall averages. This makes localized flooding more likely.

Vulnerability to Localized Flood

Flood vulnerability and their impacts vary by location and severity of any given flood event and will likely only affect certain areas of the Agency during specific times. Based on the risk assessment, it is evident that floods will continue to have potentially significant impacts to certain areas of the Agency. However, while flooding can cause significant impacts, depending on the duration and volume of precipitation and the drainage in any given area, many of the floods in the Agency are minor, localized flood events that are more of a nuisance than a disaster.

Many areas of the Agency are at some measure of vulnerability to localized flooding. An assessment of a community's vulnerability to localized flooding begins with an understanding of local exposure to localized flooding. This is included in the Local Concerns section below followed by a discussion of the Agency's Assets at Risk to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

Historically, the Agency has been affected by flooding of rivers, streams and creeks occurring during heavy rain and storm (including atmospheric river) events. Additional development in the Agency and in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff and contributes to localized flooding occurring in areas throughout the Agency. The lack of or inadequate drainage infrastructure in the Agency contributes to localized flooding issues.

Assets at Risk

Assets at risk from localized flood include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

People and populations (including both District staff and the population served by the Agency) are traditionally not highly vulnerable to localized flooding, but their structures and contents can be at risk. Likewise, most vulnerable populations are not uniquely vulnerable to localized flooding. Localized flooding may cause transportation issues as roads and bridges are impacted or closed and affect the ability for people to travel throughout the Agency.

District Assets and Critical Facilities and Infrastructure

District assets and critical facilities and infrastructure in areas with localized flooding can be affected if floodwaters intrude into the structure. Structures and critical facilities in low lying areas, can be at greater risk. Buildings with older foundations that are prone to water intrusion are also at greater risk. Once water finds its way into a structure, it tends to continue to do so until the path that brings water into a structure is mitigated. Structures can also be damaged by trees that have become uprooted and fall during rain and storm events. Large trees falling onto structures can cause significant damage.

Natural, Historic, and Cultural Resources

Natural resource assets may have some vulnerabilities to localized flood during major storm events, but can benefit from floodwaters, often by design. Many parks and green spaces are designed to take overflow water and release it into the underlying soils and natural areas. Wetland areas in the Agency actually help reduce the risk of flooding, as they can absorb excess rainfall that would have to be drained away from impervious surfaces. Flooding can provide many benefits to the natural environment, including recharging

wetlands and groundwater, increasing fish production, creating wildlife habitat, and rejuvenating soil fertility. These smaller localized flooding events often provide more benefits to the environment in comparison to negative impacts associated with large flood events. Historic and cultural resources may be at some measure of vulnerability if they are located in areas subject to repeated localized flooding.

Impacts from Localized Flood

Primary concerns associated with localized stormwater flooding include impacts to infrastructure that provide a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Life safety issues from localized flooding would be more limited. The amount and type of damage or flooding that occurs varies from year to year and from storm to storm, depending on the quantity of precipitation and runoff.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the Likelihood of Future Occurrence discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the SCWA include the following:

- Climate change is likely to exacerbate future heavy rain conditions and associated impacts and vulnerability of the Agency to localized flood. This was discussed in greater detail in the Climate Change and Localized Flood section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the Agency show the population to be slowly increasing. It is unknown how population patterns and demographics will change in the near future. The Agency may add staff, but this number would be small. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.
- Changes in land use and development in the Agency are expected to be limited in the near future and thus are not likely to affect flooding and associated impacts to the Agency. Additional development traditionally leads to additional localized flooding. However, adherence to protective building codes

for new development will assist in limiting future impacts and associated vulnerabilities of the Agency to this hazard.

Future Development

The Agency will need to be proactive to ensure that increased development has proper siting and drainage for stormwater. 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 can reduce future flood losses.

Levee Failure

Likelihood of Future Occurrence—Occasional

Vulnerability—High

Hazard Profile

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower stream channel, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the streambank, raising the level of the land around the stream.

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 a release from or failure of a dam. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high-water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Over 518 miles of levees are located throughout the Sacramento County Planning Area. These include both accredited and unaccredited levees, as discussed in Section 4.3.14 of the Base Plan, all which pose a risk to adjacent communities should a levee fail or overtop. While the levee analysis included in this section focuses on the accredited levees and those with improvements in process based on the DFIRM A99 and X-Protected by Levee Flood Zones, there are many older, unaccredited levees located throughout the County Planning Area, including the Agency, that may have a greater potential for overtopping or breaching and pose a significant risk to communities should they fail.

Location and Extent

Certain areas of the Agency are at risk to levee failure flooding. There is not a scientific scale or measurement system in place for levee failure. It is usually measured in area covered and depth of flooding. A map of levees located in the Sacramento County Planning Area is shown in Section 4.3.14 of the Base Plan. The speed of onset is slow as the river rises, but if a levee fails the warning times are short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. Those levees accredited as providing protection against the 1% or

greater annual chance flood and those in levees in the certification process are identified in the FEMA DFIRMs which also include those areas protected by the levees. Geographical DFIRM A99 and X Protected by Levee flood zone extent from the FEMA DFIRMs is shown on Figure M-7 and included in Table M-16.

Note: Many more unaccredited levees are also located throughout the County. It should be noted that these unaccredited levees may have a greater potential for failure or breach and can pose even a greater risk to those communities in which they are located.

Figure M-7 SCWA – FEMA DFIRM A99 and X Protected by Levee Zones

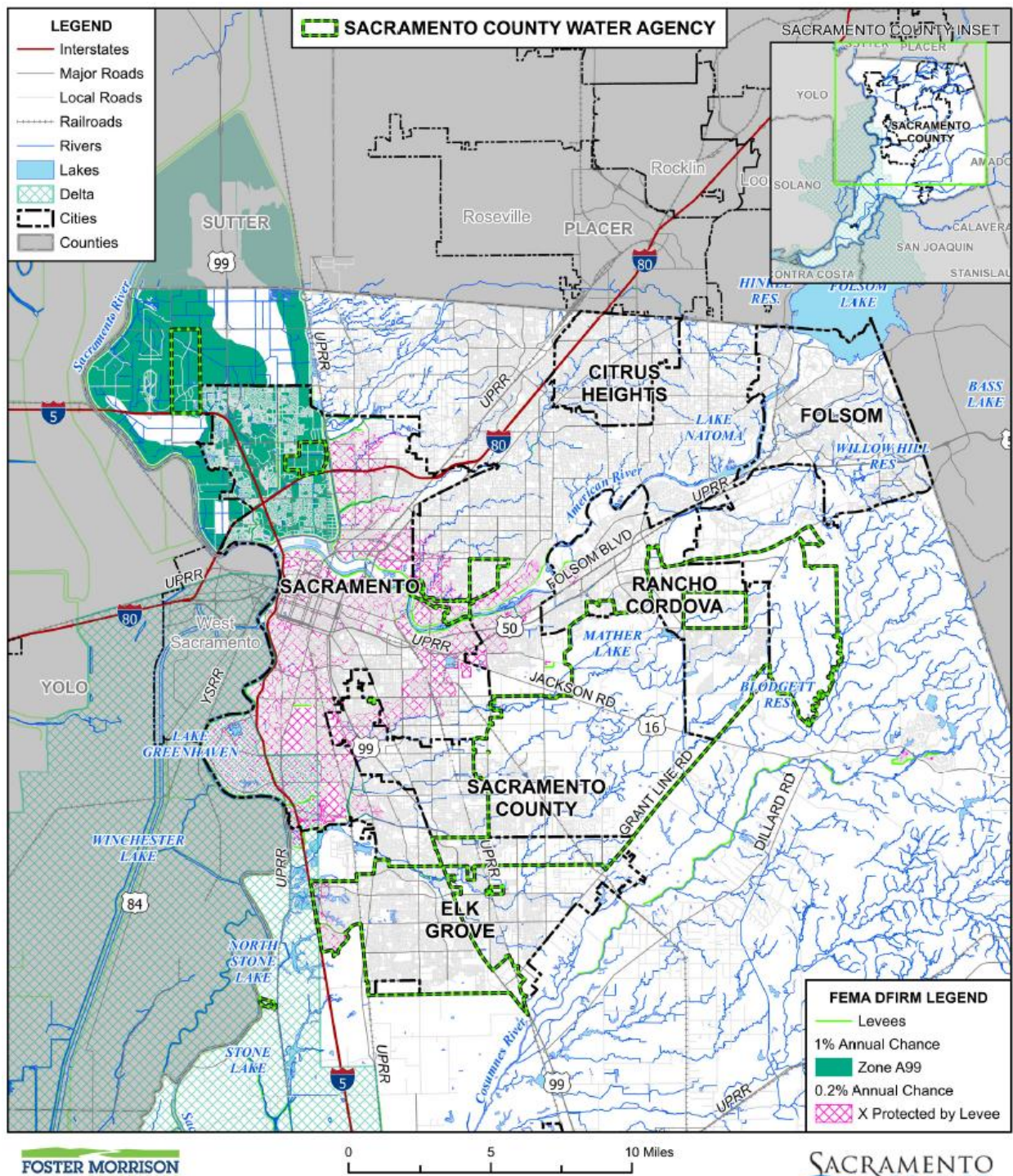


Table M-16 SCWA – Geographical Flood Hazard Extents in FEMA A99 and X Protected by Levee DFIRM Flood Zones

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone A99	2,510	4%	1,304	5%	1,206	3%
0.2% Annual Chance Flood Hazard						
X Protected by Levee	1,050	1.6%	796	3%	255	0.7%

Source: 02/2024 DFIRM

Past Occurrences

Disaster Declaration History

There have been two state and two federal disasters declarations directly related to levee failure in Sacramento County, as shown on Table M-17. Also, it is important to note that many of the flood disaster declarations included in Section 4.3.11 of the Base Plan (like the December 31, 2022 event near Wilton) also may include flooding associated with levee breach or failure events.

Table M-17 Sacramento County – State and Federal Disaster Declarations Summary 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

NCDC Events

There have been no NCDC levee failure events in Sacramento County, as the NCDC does not track levee failure flooding as a stand-alone hazard.

SCWA Events

The Agency Planning Team noted no past occurrences of levee failures.

Climate Change and Levee Failure

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events. The County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme precipitation events is four. The average annual precipitation across the County may

rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

In general, California exhibits “booms and busts,” which refers to the existence of both very wet years and very dry years. The amount of precipitation that falls in any particular year is largely influenced by occurrences of large, discrete winter storms, also known as atmospheric rivers, which often provide a substantial fraction of the region’s annual precipitation, inclusive of the county. In California, atmospheric rivers vary in intensity; some are beneficial for water supply and replenish snowpack that naturally melts during the summer, serving as the water supply for people and agriculture, while others are responsible for widespread and adverse impacts (NOAA 2023). Extreme precipitation from these atmospheric rivers in the future may prove to be more variable, volatile, and potentially more severe. These extremes are most likely to occur during storm events, leading to more severe damage from waves and floods, thus possibly leading to more levee failure events.

Vulnerability to Levee Failure

According to historical hazard data and levee mapping, levee failures can occur in or near the Agency. Portions of the Agency are at some measure of vulnerability to levee failure floods, including failure or breach of accredited levees, those in the certification process, and unaccredited levees. An assessment of a community’s vulnerability to levee failure flooding begins with an understanding of local exposure to levees. This is included in the Local Concerns section below followed by a discussion of the Agency’s Assets at Risk to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The Agency noted that access to remote water facilities may be hampered. The Agency also noted that:

- All water facilities serving the Metro Air Park and Northgate industrial service areas are at risk of potential flood inundation due to levee failure (Zone A99) requiring shut down of all operations until floodwaters recede. Equipment replacements most likely needed.
- Three (3) direct feed water wells in the Arden Park Vista service area are at risk of potential flood inundation due to levee failure (Zone X / Protected by Levee) and force shut down of well operations until floodwaters recede. Equipment replacements most likely needed. Loss of the 3 wells sites would be critical to the operation of the west end of water system, however, provide all of the other water system wells sites are operational sufficient water supply is expected at reduced water pressures. Emergency inter-ties with adjacent water purveyors exist.
- Zone 40 South Service Area – Two (2) raw water wells near I-5 are at risk of potential flood inundation due to levee failure (Zone X / Protected by Levee) and may force shut down of well operations until floodwaters recede.

Assets at Risk

Assets at risk from levee failure include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations (including both District staff and the population served by the Agency) located in leveed areas are at some risk to levee failure flooding. Certain vulnerable populations located within areas prone to levee failure flooding may be at increased risk to this hazard, especially during a large event with minimal advance notice. These vulnerable populations include: the unsheltered, those with limited mobility, and those that lack the resources to leave the area.

District Assets and Critical Facilities and Infrastructure

Certain District assets and critical facilities are at risk of levee failure flooding and primarily include those structures located adjacent to levee protected areas. District assets listed in Table M-18 would be at risk to levee failure flooding.

Table M-18 SCWA Assets: Structures, Critical Facilities and Infrastructure, and Other Facilities at Risk to Levee Failure Flooding

Name of Asset	Facility Type	Replacement Value
Water Treatment Plants	Essential	\$80,518,712
Water Wells	Essential	\$28,767,926
Storage Tank & Booster Stations	Essential	\$10,815,231
SCADA System	Essential	\$1,136,504
Total		\$565,829,892

Source: SCWA

Natural, Historic, and Cultural Resources

Large flood events, such as those occurring as a result of a levee failure, can affect natural, historic, and cultural resources. There are a number of ways floodwaters can impact natural resources and the environment. Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute rivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levees can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase downstream. Trees can be uprooted by high-velocity water flow. Plants that survived the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures within the flooded areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged and lost during extreme flood events. Any of these that fall in the A99 or X Protected by Levee flood zones shown on Figure M-7 as well as those resources located in areas adjacent to or downstream of unaccredited levees would be vulnerable.

Impacts from Levee Failure

Floods and their impacts vary by location, including impacts associated with a levee failure flood event, and will only affect certain areas of the Agency that are in areas protected by levees. Based on the areas of the Agency surrounded by levees, it is evident that levee failure floods could potentially have significant impacts to the Agency, depending on the location, timing, and severity of the event. Impacts that are not quantified, but could be anticipated in large levee failure event, include:

- Injury and loss of life
- Structural and property damage
- Crop damage
- Disruption of and damage to public critical infrastructure and services
- Health hazards associated with mold and mildew, contamination of drinking water, etc.
- Impacts to natural resource areas, including stream bank erosion
- Damage to roads/bridges resulting in loss of mobility

In addition to flood related levee failures, the levees in the Agency are potentially at risk to failure during an earthquake event. Levee failure flooding could accompany an earthquake and could be compounded further if a dam or storage reservoir fails. Channels and water courses with earthen banks and levees are particularly vulnerable and could collapse in a major earthquake resulting in partial or complete blockage of channels causing flooding upstream of the impoundment. Levees are especially susceptible to rapid settlement due to liquefaction or horizontal spreading of underlying soils.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the SCWA include the following:

- Climate change is likely to exacerbate future flood and levee failure conditions and associated impacts and vulnerability of the Agency to levee failure flooding. This was discussed in greater detail in the Climate Change and Levee Failure section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the Agency show the population to be slowly increasing. It is unknown how population patterns and demographics will change in the near future. The Agency may add staff, but this number would be small. The Agency noted that it has no

control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.

- Changes in land use and development in the Agency are expected to be limited in the near future and thus are not likely to affect levee failure flooding and associated impacts to the Agency. Additional development traditionally leads to additional flooding, especially in levee protected areas. However, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the Agency to this hazard.

Future Development

Future development considerations should be ongoing and proactive. Ensuring that comprehensive land use planning is conducted, regulatory requirements, such as building codes and the floodplain ordinance, are followed, and levee improvements, inspections, and maintenance is ongoing will help reduce impacts to future development.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely

Vulnerability–Medium

Hazard Profile

Storms in the Agency occur annually and 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 Agency falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the Agency. In recent years, heavy rain and storms have been compounded by more frequent and higher intensity atmospheric river events.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the Agency. All portions of the Agency are at risk to heavy rains and storms. Most of the severe rains occur during the fall, winter, and spring months in the Agency as discussed below (with problem flooding areas associated with heavy rains and storms shown in the past occurrences section in the Flood: Localized Stormwater section). There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rarer in the Agency and Sacramento County. Duration of severe storms in the Agency can range from minutes to hours to days. According to the WRCC, average annual precipitation in the County is 18.15 inches per year. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

Disaster Declaration History

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the Agency. This contributes to many of the federal disaster declarations related to flooding. Disaster declarations from flooding are shown on Table M-19.

Table M-19 Sacramento County – State and Federal Disaster Declarations from Flood (Heavy Rain and Storms) 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	26	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times), 2022*, 2023 (three), 2024 (twice)	18	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times), 2023 (three times)*, 2024*

Source: Cal OES, FEMA

NCDC Events

The NCDC data recorded 9 hail, 29 heavy rain, 1 lightning, and 2 winter storm weather incidents for Sacramento County since 1950. Winter weather events tend to be rain in the County.

SCWA Events

The Agency noted that heavy rains and storms are an annual occurrence often resulting in flooding. No events where damages occurred in the Agency since 2021 were recorded.

Climate Change and Heavy Rains and Storms

It is likely that climate change will increase the chance of future occurrence as well as future impacts from heavy rains and storms. More information on future impacts to the Agency can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

According to the 2024 CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is unlikely that hail will become more common in Sacramento County and the SCWA. The amount of lightning 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. Cal-Adapt modeled scenarios are shown in Section 4.3.4 of the Base Plan.

According to the 2024 CAP, the County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme

precipitation events is four. As shown in Section 4.3.4 of the Base Plan, the average annual precipitation across the County may rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

Vulnerability to Heavy Rain and Storms

Heavy rain and severe storms are among the most frequent type of severe weather occurrences in the Agency. These events can cause both significant and localized flooding. Flooding can be worse during times where the ground is already saturated. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the Agency, but also can cause damage, with lightning occasionally igniting wildfires.

The whole of the Agency is at some measure of vulnerability to heavy rain and storms. An assessment of a community's vulnerability to heavy rains and storms begins with an understanding of local exposure to heavy rain and storms. This is included in the Local Concerns section below followed by a discussion of the Agency's Assets at Risk to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The Agency noted that heavy rains and storms cause localized flooding in the Agency. In addition, continuous heavy rains can cause flooding on area streams.

OTHER VULNERABILITIES/CONCERNS/ISSUES SPECIFIC TO THE AGENCY? CAN THE AGENCY PROVIDE DETAILS ON THE KEY PROBLEMS ASSOCIATED WITH HEAVY RAINS AND STORMS THAT WILL SUPPORT MITIGATION ACTION DEVELOPMENT?

Assets at Risk

Assets at risk from heavy rain and storms include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All populations (including vulnerable populations) in the Agency (including District staff and those within its service area) have some measure of risk to heavy rains and storms. Those populations that work or recreate outside and unhoused individuals are more vulnerable to impacts from heavy storm events. Heavy rains and storms occur every year and do not generally cause significant adverse impacts to individuals; it is the secondary hazard, flooding, which poses the biggest impact to people. Populations at risk to flooding resulting from heavy rains and storm events include those who live in floodplains (discussed in further detail in the Flood: 1%/0.2% Annual Chance and Levee Failure section above) and those who live in and

near localized flooding areas (discussed in further detail in the Flood: Localized Stormwater Flooding section above).

District Assets and Critical Facilities and Infrastructure

District assets have some risk to heavy rains and storms. Heavy rain and storms can affect critical facilities and infrastructure during large events. District structures built to modern building codes are built to withstand heavy rains and storms (including thunderstorm winds and lightning); older structures may be more vulnerable. During a heavy storm, localized flooding may cause water intrusion into buildings from the outside. Trees can be downed causing impacts to structures. Older homes and buildings may be at increased risk to heavy rains and storms. Power outages during severe storm events can occur, impacting the use of structures until the power is back online. Local roads, streets, and bridges can be impacted resulting in closures restricting traffic flow in the Agency. In certain areas, large storms can cause erosion and localized landslides which can impact affected facilities.

Natural, Historic, and Cultural Resources

Large rain and storm events and associated flooding can affect natural, historic, and cultural resources. Silt and sediment can damage natural areas. Trees can be uprooted and downed by high winds. Extended periods of rainfall can erode natural banks along waterways and degrade soil stability for terrestrial species. While some natural systems can be adversely impacted during these large storms, heavy rain events can also provide benefits. Groundwater and wetland areas can be recharged and water supplies replenished. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures affected by large storm events, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged, and lost during extreme rain and storm and events.

Impacts from Heavy Rain and Storms

Impacts from heavy rains and storms include damage to property, critical facilities and infrastructure, and the natural landscape. This includes: erosion; downed trees; damaged utility structures and infrastructure; power outages; road damage and blockages; and even lightning strikes to critical infrastructure and people. Lightning can also cause wildfires and urban fires to occur. Landsliding and erosion occur when the soil on slopes becomes oversaturated and fails. Climate change may cause these impacts to worsen.

Actual damage associated with the primary effects of severe storms and heavy rains has been somewhat limited. It is the secondary hazards caused by these severe weather events, such as floods, landslides, and erosion that would likely have the greatest impact.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the Agency include the following:

- Climate change is likely to exacerbate future heavy rain and storm conditions and associated impacts and vulnerability of the Agency to flooding. This was discussed in greater detail in the Climate Change and Heavy Rains and Storms section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the Agency show the population to be slowly increasing. It is unknown how population patterns and demographics will change in the near future. The Agency may add staff, but this number would be small. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.
- Changes in land use and development in the Agency are expected to be limited in the near future and thus are not likely to affect heavy rains and storm and associated impacts to the Agency. In addition, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the Agency to this hazard.

Future Development

Building codes in the Agency ensure that new development is built to current building standards, which should reduce the risk to future development in the Agency from heavy rains and storms. New critical facilities such should be built to withstand hail damage, lightning, and thunderstorm winds. New and existing critical facilities and infrastructure should also consider adding backup power systems to limit impacts associated with power outages. With adherence to development standards, future losses to new development should be minimal. Changes in land use may also amplify the impacts of heavy rains and storms, as additional impervious surfaces can cause additional runoff and localized flooding throughout the Agency.

Severe Weather: High Winds and Tornado

Likelihood of Future Occurrence—Highly Likely

Vulnerability—Medium

Hazard Profile

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. High winds can cause significant property damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also lead to power outages and in rare instances when combined with high temperatures

and low humidity can also lead to PSPS events. Winds can cause wave actions near levees, causing erosion to occur. Winds can also drive fires in and near the Agency.

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 form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, can affect areas of the Agency, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the Agency is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the Agency. 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 (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

Disaster Declarations

There have been no federal or state disaster declarations in the County for winds and tornadoes.

NCDC Events

The NCDC data recorded 109 high wind, 7 funnel cloud, and 15 tornado incidents for Sacramento County since 1950. Many of these wind events likely affected the Agency.

SCWA Past Occurrences

LIST PAST EVENTS AFFECTING THE AGENCY, ESPECIALLY THOSE SINCE THE 2021 LHMP. INCLUDE INFORMATION ON IMPACTS AND DAMAGES AS AVAILABLE? IF NO PAST EVENTS, PLEASE STATE THAT.

Climate Change and High Winds and Tornado

According to the 2024 CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual thunderstorm events is likely to increase during the 21st century. This may bring stronger thunderstorm winds. The CAS does not discuss non-thunderstorm winds or tornadoes.

Vulnerability to Severe Weather: High Wind and Tornadoes

The Agency is subject to potentially destructive high winds and tornadoes. High winds are common throughout the area and can happen during most times of the entire year and outside of a severe storm event. Tornadoes are rare. High winds and tornadoes can be a significant public safety and economic concern. The whole of the Agency is at some measure of vulnerability to wind and tornadoes.

An assessment of a community's vulnerability to high winds begins with an understanding of local exposure to wind and tornadoes. This is included in the Local Concerns section below followed by a discussion of the Agency's Assets at Risk to this hazard.

Local Concerns

The Agency has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

SPECIFIC VULNERABILITIES/CONCERNS/ISSUES SPECIFIC TO THE AGENCY? CAN THE AGENCY PROVIDE DETAILS ON THE KEY PROBLEMS ASSOCIATED WITH HIGH WINDS AND TORNADOES THAT WILL SUPPORT MITIGATION ACTION DEVELOPMENT?

Assets at Risk

Assets at risk from winds and tornadoes include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All populations are at some vulnerability to high winds and tornadoes. Certain vulnerable populations are at the greatest risk to the effects of high winds and tornadoes. These include: the unsheltered, those with access and functional needs, the medically fragile experiencing power outages as a result of wind events, and those working or caught outdoors during a wind or tornado event.

District Assets and Critical Facilities and Infrastructure

All structures and critical facilities and infrastructure in the Agency have some measure of risk from high wind and tornadoes. Though rare, a tornado could cause damage to virtually all facilities in the tornado touchdown path. This would affect District structures and critical facilities. During a wind or tornado event, power lines in the Agency can be damaged by falling trees caused by wind. High winds are a cause

for PSPS events to be declared, causing power outages to occur. High winds and tornadoes could cause sparks from electric wires and other sources, which could lead to wildfire ignition. Once ignited, high winds can also cause wildfires to rapidly spread and become out of control. High wind conditions can cause wildfires to move into more urban areas destroying structures and whole communities, as seen in recent wildfire events in the West.

Natural, Historic, and Cultural Resources

Natural resources, such as trees, are vulnerable to winds. Increased levee and streambank erosion can occur during periods of high water and high winds. High wave action during significant wind events can impact marsh lands and habitat areas. Soil erosion can also occur during high winds. Most all natural, historic, or cultural resources are at risk to tornadoes. Tornadoes can tear apart habitats, causing fragmentation across ecosystems and can damage and destroy historic structures and cultural resources.

Impacts from Severe Weather: High Wind and Tornado

Wind and 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. Local industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response. Winds can push automobiles off roads, damage roofs and structures, cause power outages, and cause secondary damage due to flying debris and hazardous trees. High winds can also contribute to the spread and intensity of wildfires. High winds during periods of high water can cause impacts to levees and streambanks from accelerated erosion. Climate change may affect this hazard and cause winds to increase in velocity and more tornadoes to affect the Agency.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the Agency may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the Agency include the following:

- Climate change is likely to exacerbate future wind conditions and associated impacts and vulnerability of the Agency. Climate change is not likely to affect future tornado conditions. This was discussed in greater detail in the Climate Change and Winds and Tornadoes section of the Hazard Profile above.

- Population projections within the jurisdictional boundaries of the Agency show the population to be slightly increasing. It is unknown how population patterns and demographics will change in the near future. The Agency may add staff, but this number would be small. The Agency noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Agency to this hazard is unlikely to change.
- Land use planning should be proactive to address future hazard conditions. Building codes in the County ensure that new development is built to current building standards to withstand high winds, which should reduce the risk to future development in the County from high winds and tornadoes. With adherence to development standards, future losses to new development should be minimal. Changes in land use and increased development may amplify the impacts of high winds and tornadoes, as additional structures in the County increase the number of buildings at risk to high winds and tornadoes.

Future Development

Future development considerations should be ongoing and proactive. The Agency relies on the County to enforce the local building codes which includes standards for new development to minimize damage from windstorms. New District facilities are built to state and local codes. New critical facilities and infrastructure should also consider adding backup power systems to limit impacts associated with power outages.

M.5 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.

M.5.1. Regulatory Mitigation Capabilities

Table M-20 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 SCWA.

Note: The Agency does not have the authority to regulate land use and development within its jurisdiction. Authority for promulgating and enforcing zoning, land use, and development requirements falls to counties and incorporated communities. As such development within the Agency’s jurisdictional boundaries will conform to the zoning and land use development ordinances and building codes of the county or incorporated community in which the Agency is located.

Table M-20 SCWA’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/General Plan	N/A	

Capital Improvements Plan	Y	
Economic Development Plan	N/A	
Local Emergency Operations Plan	N/A	
Continuity of Operations Plan	N/A	
Transportation Plan	N/A	
Stormwater Management Plan/Program	N/A	
Engineering Studies for Streams	N/A	
Community Wildfire Protection Plan	N/A	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	SCWA Urban Water Management Plan. SCWA Water Shortage Contingency Plan SCWA Emergency Response Plans SCWA Risk and Resilience Assessments SCWA Zone 40 Water Supply Master Plan SCWA Zone 40 Water System Infrastructure Plan
Building Code, Permitting, and Inspections	Y/N	Are codes adequately enforced?
Building Code	N/A	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	Score:
Fire department ISO rating:	N/A	Rating:
Site plan review requirements	N/A	
		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	N/A	
Subdivision ordinance	N/A	
Floodplain ordinance	N/A	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N/A	
Flood insurance rate maps	N/A	
Elevation Certificates	N/A	
Acquisition of land for open space and public recreation uses	N/A	
Erosion or sediment control program	N/A	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The Agency will look to expand upon existing plans to reduce hazard risks in the future.		

Source: SCWA

M.5.2. Administrative/Technical Mitigation Capabilities

Table M-21 identifies the Agency department(s) responsible for activities related to mitigation and loss prevention in the SCWA.

Table M-21 SCWA'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	Preventative maintenance program and annual inspections
Mutual aid agreements	Y	Multiple agreements with multiple entities. Coordination is effective.
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	Y	Adequate and trained on mitigation. Coordination is effective.
Community Planner	N/A	
Civil Engineer	Y	Adequate and trained on mitigation. Coordination is effective.
GIS Coordinator	Y	Adequate and trained on mitigation. Coordination is effective.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	SCADA System/Alarm Systems/CCTV Systems
Hazard data and information	Y	Various depending on hazard.
Grant writing	N	
Hazard analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Need technical resources and staff for grant applications. This would increase the Agency's capabilities.		

Source: SCWA

M.5.3. Fiscal Mitigation Capabilities

Table M-22 identifies financial tools or resources that the Agency could potentially use to help fund mitigation activities.

Table M-22 SCWA'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	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	Y	Water service use fees fund O&M projects
Impact fees for new development	Y	Zone 40 development fees fund CIP projects
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	Applied for federal grants
State funding programs	Y	Applied for state grants
Other		
How can these capabilities be expanded and improved to reduce risk?		
Seek all available grant-funding opportunities to cost share on CIP and rehabilitation projects. This includes federal, state, and local grants.		

Source: SCWA

M.5.4. Mitigation Education, Outreach, and Partnerships

Table M-23 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 M-23 SCWA'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/A	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Water conservation program – Water Wise
Natural disaster or safety related school programs	N/A	
StormReady certification	N/A	
Firewise Communities certification	N/A	
Public-private partnership initiatives addressing disaster- related issues	N/A	

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	N/A	
How can these capabilities be expanded and improved to reduce risk?		
SCWA outreaches to service area customers only. This could be improved by web site improvements, additional brochure mailings, and in person site visits. Improve water conservation enforcements – additional staff.		

Source: SCWA

M.5.5. Other Mitigation Efforts

The District noted that Agency growth allows for backup contingency. Regarding earthquake, the Mather Housing elevated tank seismic upgrade was completed recently to reduce risk to earthquake.

M.6 Mitigation Strategy

M.6.1. Mitigation Goals and Objectives

The SCWA adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

M.6.2. NFIP Mitigation Strategy

The Agency does not participate in the NFIP, as it is not an eligible participant. Many of the Agency's projects work to reduce impacts from flooding thus furthering the objectives of the NFIP.

M.6.3. Mitigation Actions

The Planning Team for the SCWA 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, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Aquatic Nuisance Species (plant/animal)
- Climate Change
- Dam Failure
- Drought & Water Shortage (w/tree mortality)
- Earthquake (w/subhazards)
- Flood: 1%/0.5%/0.2% annual chance
- Flood: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms (Hail, Lightning, Wind)
- Severe Weather: High Winds and Tornadoes

Low priority hazards for mitigation planning include:

- Landslide, Mudslide, Debris Flow
- Sea Level Rise
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Subsidence
- Wildfire (with smoke and air quality)

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan 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 countywide public outreach action, as well as many of the emergency services actions, apply to all hazards and jurisdictions regardless of hazard priority. Collectively, this LHMP's multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that each jurisdiction has focused on identifying those mitigation actions and projects to address their priority hazards, which are both realistic and reasonable for them to implement for this 5-year planning process, and would like to preserve their right to modify hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement. The participating jurisdictions are not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the jurisdictions 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 mitigation categories and criteria contained in Appendix C.

Mitigation Actions

The Agency has put forward the actions as shown in Table M-24. Details of the actions can be found below the table.

Table M-24 SCWA Mitigation Actions

Action Title	New Action/ Previous Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 1. Flood Hazard Mitigation	Previous Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 2. Improve Water Supply Portfolio	Previous Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection
Action 3. Seismic Upgrades and Inspections	Previous Action	X	X		Prevention Property Protection Structural Projects
Action 4. Backup Power Generation	New Action	X	X		Prevention Emergency Services

Action Title	New Action/ Previous Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 5. Invasive Mussel Mitigation	New Action	X	X		Prevention Property Protection Natural Resource Protection

Action 1. Flood Hazard Mitigation

Hazards Addressed: Dam Failure, Flood: 1%/0.2% annual chance, Flood: Localized Stormwater, Levee Failure

Goals Addressed: 1, 3, & 4

Issue/Background (Problem Statement): SCWA operates certain water production/distribution facilities (water wells, storage tank & booster stations, and water treatment plants) subjected to potential major flood damage caused by dam or levee failures, and 100-year / 500-year flood events. To date no flooding events have damaged any of these water facilities.

Project Description: To reduce the risk and increase the resiliency of critical water supply infrastructure from major flood damage or complete loss, SCWA is evaluating the following mitigation actions/projects:

1. Construct floodwalls/berms around entire facilities or critical equipment/buildings.
2. Elevate critical equipment, buildings, and hazardous materials/chemicals/fuels above flood elevation.
3. Install tie-downs on tanks and buildings.
4. Flood-proof emergency generator and control buildings.
5. Ensure spare parts and replacement equipment are readily available.

Other Alternatives: Support and participate in county, regional, state and federal flood mitigation projects that will reduce flooding in water service areas affected by the above flood hazard

Existing Planning Mechanisms through which Action will be Implemented:
SCWA Operations and Maintenance engineering planning

Responsible Office/Partners: SCWA Operations and Maintenance Engineering

Potential Funding (Local Budgets, Grant Funds, etc.): FEMA, Cal OES, RWA, and Bureau of Reclamation grants.

Benefits (Losses Avoided): Avoid significant equipment damage and shutdowns of water production facilities due to floodwater inundations. Maintain continuous operation of water systems to supply clean reliable drinking water and fire protection flow.

Schedule: Ongoing.

Project Priority (High, Medium, Low): Low

Action 2. Improve Water Supply Portfolio

Hazards Addressed: Drought & Water Shortage, Climate Change

Goals Addressed: 1, 2, 3, 4

Issue/Background (Problem Statement): Improve water supply reliability and prevent or minimize water supply shortages triggered by water supply operational changes and catastrophic events. Water supply may be reduced by future climate change.

Project Description: Maintain sufficient annual water supplies for domestic, commercial, industrial consumption uses and provide fire protection. Water conservation enforcement actions. Public outreach. Manage conjunctive use of water system. Construct CIP projects that improve water storage capacity, including aquifer storage and recovery, and water distribution, including water quality improvements. Conduct water audits. Seek additional water rights/contracts.

Other Alternatives: No action.

Existing Planning Mechanisms through which Action will be Implemented: Annual Water Supply and Demand Assessments (WSDA). Emergency Response Plan (ERP). Mutual aid agreements with adjacent water purveyors.

Responsible Office/Partners: SCWA Operations and Maintenance Engineering

Potential Funding (Local Budgets, Grant Funds, etc.): FEMA grants, Bureau of Reclamation, RWA funding.

Benefits (Losses Avoided): Increased protection of District facilities from drought and water shortage issues. Ability of the Agency to provide water for both consumption and fire suppression.

Schedule: Ongoing

Project Priority (High, Medium, Low): Medium

Action 3. Seismic Upgrades and Inspections

Hazards Addressed: Earthquake

Goals Addressed: 1, 3, & 4

Issue/Background (Problem Statement): SCWA owns and operates two aged, elevated water storage tanks previous owned by the U.S. Air Force that do not meet current seismic standards. Recent seismic assessments determined insufficient foundation mass and strength capacity, insufficient foundation anchorage, and tension only braced frame braces.

Potential above and below ground pipeline joint separation caused by seismic activity leading to water leaks and forced shutdowns.

Project Description: Design and prepare contract documents to correct elevated storage tank seismic deficiencies. Publicly bid for construction of seismic upgrades to meet current seismic standards. Conduct pipeline leak detection surveys following major seismic events.

Other Alternatives: Reduce the volume of stored water in tanks or remove them from service and lose system storage capacity. Build new ground level storage tanks at a greater expense.

Existing Planning Mechanisms through which Action will be Implemented: SCWA Zone 41 budget and project planning/scheduling.

Responsible Office/Partners: SCWA Operations and Maintenance Engineering

Potential Funding (Local Budgets, Grant Funds, etc.): SCWA Zone 41. Seek FEMA, Bureau of Reclamation, and RWA grants

Benefits (Losses Avoided): Maintain the ability to store and distribute water for drinking and fire protection. Reduce water loss in pipelines and water contamination.

Schedule: Elevated storage tanks: Complete within the next three to five years. Pipeline leak detection surveys: As needed

Project Priority (High, Medium, Low): Medium

Action 4. Backup Power Generation

Hazards Addressed: Severe Weather: Heavy Rains and Storms (Hail, Lightning, Wind), Severe Weather: High Winds and Tornadoes

Goals Addressed: 1, 3, & 4

Issue/Background (Problem Statement): SCWA operates critical water supply and distribution infrastructure that relies on continuous electrical power. Power outages caused by extreme weather events, Public Safety Power Shutoffs (PSPS), wildfires, or grid failures can disrupt water production, treatment, and delivery, potentially impacting public health and fire protection capabilities.

Project Description: To improve system reliability and ensure continuity of operations during power outages, SCWA is evaluating the following actions/projects:

- Install permanent backup generators at critical facilities including wells, booster stations, storage tanks, and treatment plants.
- Expand fuel storage capacity and ensure fuel supply chain reliability for extended outages.
- Implement automated transfer switches and remote monitoring capabilities.
- Evaluate renewable and hybrid energy systems (e.g., solar + battery storage) to supplement backup power.

- Prioritize facilities based on criticality and vulnerability to outages.

Other Alternatives: Rely on portable generators and manual deployment during outages, which may result in delayed response times and limited operational capacity.

Existing Planning Mechanisms through which Action will be Implemented: SCWA Zone 41 budget and project planning/scheduling.

Responsible Office/Partners: SCWA Operations and Maintenance Engineering

Potential Funding (Local Budgets, Grant Funds, etc.): FEMA Hazard Mitigation Assistance (HMA), Cal OES, Bureau of Reclamation, and other state and federal resilience grants.

Benefits (Losses Avoided): Prevent disruption of water supply and maintain system pressure during power outages. Ensure continued delivery of safe drinking water and adequate fire flow for emergency response. Reduce operational risks and emergency response costs.

Schedule: Ongoing

Project Priority (High, Medium, Low): Medium

Action 5. Invasive Mussel Mitigation

Hazards Addressed: Aquatic Nuisance Species

Goals Addressed: 1, 3, & 4

Issue/Background (Problem Statement): Invasive quagga and zebra mussels pose a significant threat to water infrastructure by clogging pipelines, pumps, and treatment facilities. Infestation can lead to reduced system efficiency, increased maintenance costs, and potential service disruptions. Preventative measures are critical to protect SCWA facilities and regional water supplies.

Project Description: To prevent and mitigate the impacts of invasive mussels, SCWA is evaluating the following actions/projects:

- Implement routine monitoring and early detection programs at water intake and storage facilities.
- Install physical and/or chemical treatment systems to prevent mussel colonization in pipelines and equipment.
- Develop and implement rapid response protocols for suspected infestations.
- Coordinate with regional and state agencies on inspection, decontamination, and public education efforts.
- Evaluate infrastructure design modifications to reduce susceptibility to infestation.

Other Alternatives: Reactive maintenance and removal of mussels after infestation occurs, resulting in higher long-term costs and increased risk of system disruption.

Existing Planning Mechanisms through which Action will be Implemented: SCWA Zone 41 budget and project planning/scheduling.

Responsible Office/Partners: SCWA Operations and Maintenance Engineering

Potential Funding (Local Budgets, Grant Funds, etc.): State Water Resources Control Board, Bureau of Reclamation, and other state/federal invasive species or water infrastructure protection grants.

Benefits (Losses Avoided): Avoid costly infrastructure damage, reduced flow capacity, and operational inefficiencies. Maintain reliable water delivery and protect water quality. Reduce long-term maintenance and emergency response costs.

Schedule: Ongoing

Project Priority (High, Medium, Low): Medium