Annex K Yuba County Water Agency

K.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Yuba County Water Agency (YCWA or District), a previously participating jurisdiction to the 2015 Yuba 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 District. This Annex provides additional information specific to YCWA, with a focus on providing additional details on the risk assessment and mitigation strategy for the Agency.

K.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Yuba County Hazard Mitigation Planning Committee (HMPC), the District 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 K-1. Additional details on plan participation and District representatives are included in Appendix A.

Table K-1 YCWA – Planning Team

Name	Position/Title	How Participated
Ryan McNally	Project Manager	Attended meetings. Provided input for annex regarding impacts, past occurrences, risk, capabilities, and mitigation actions.
Kurtis Crawford	Finance Manager	Provided input for annex regarding impacts, past occurrences, risk, capabilities, and mitigation actions.
Tim Truong	Senior Hydro Engineer	Provided input for annex regarding impacts, past occurrences, risk, capabilities, and mitigation actions.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2015 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2015 LHMP through other plans and programs shown in Table K-2.

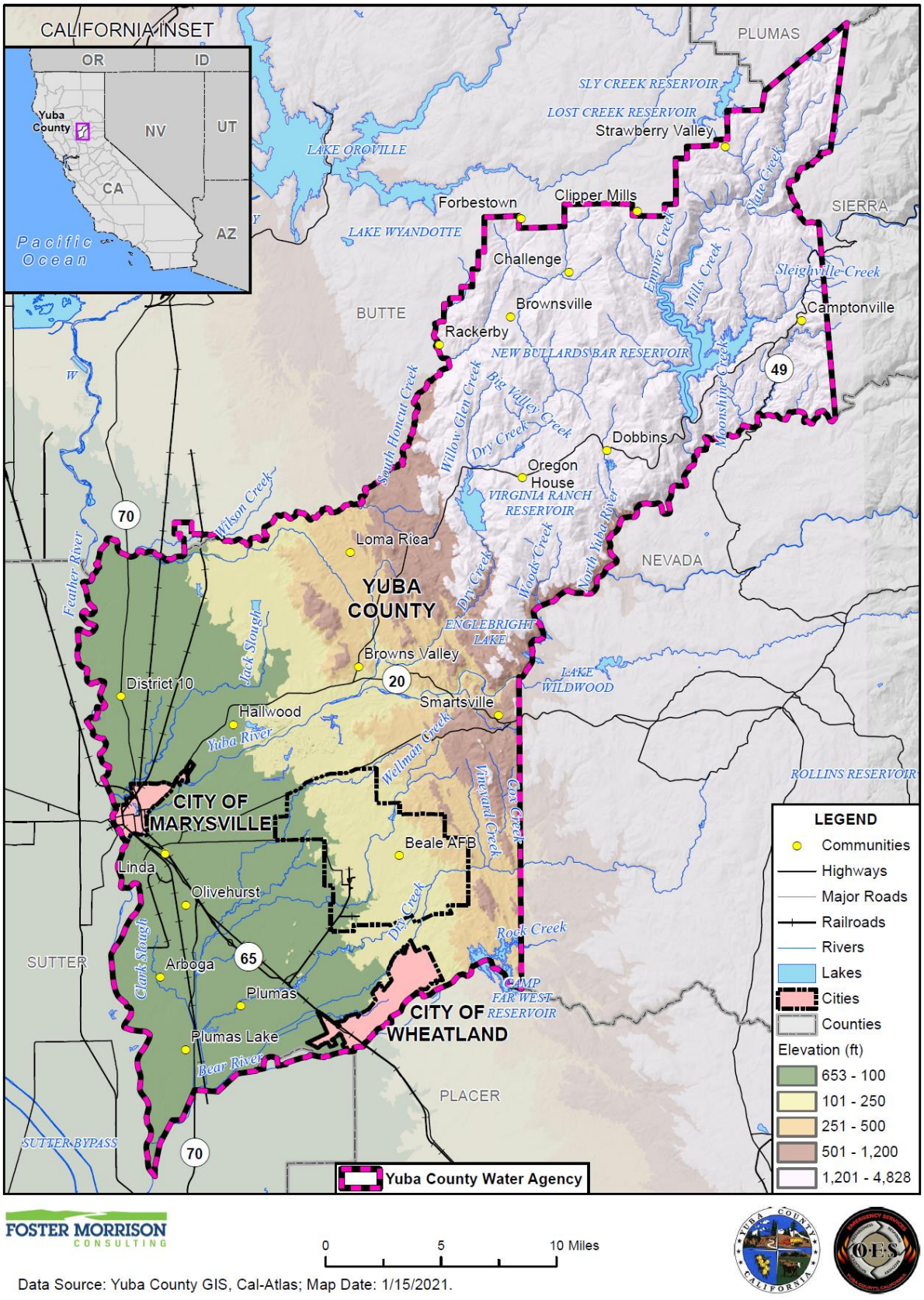
Table K-2 2015 LHMP Incorporation

Planning Mechanism 2015 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
N/A	No mitigation related planning.

K.3 District Profile

The District profile for the YCWA is detailed in the following sections. Figure K-1 displays a map and the location of the District within Yuba County.

Figure K-1 YCWA



K.3.1. Overview and Background

In 1959, the Yuba County Water Agency was created primarily to address two major issues, the need for additional flood protection and for improved water supply to the valley farmers.

YCWA is a standalone government entity, created by the state legislature and codified in the California Water Code. Authorized activities include flood protection improvement, beneficial use of water, power generation, recreation, and fisheries enhancement. The YCWA Board of Directors consists of seven elected board members of which five are the Yuba County Board of Supervisors with the two additional members elected to the Agency by the Yuba County voters.

The climate in Yuba County is considered Mediterranean and cycles through a cool rainy winter season and a dry summer season. Summers are hot and dry, and winters are cool and wet, with most of the year's rain falling from late October through early April. While the higher County elevations receive snow, snowfall is rare at the lower elevations.

Precipitation increases with elevation in Yuba County. The total annual precipitation is 21.04 at Marysville, in the eastern extreme of the county at an elevation of 65 feet. While the majority of precipitation falls in the autumn and winter months, nearly 34 percent usually falls in March through October. Thunderstorms occur on about 5 days each year, and most often occur in April.

The prevailing winds in Marysville are usually from the southwest and the average wind speed is highest (approximately 9.8 miles per hour) in June. The south westerly winds in the valley result from the north–south orientation and heating of the valley floor, which deflect the westerly winds coming through the Carquinez Straits northward. Strong northerly winds occasionally occur.

K.4 Hazard Identification

YCWA identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table K-3).

Table K-3 YCWA—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Significant	Likely	Limited	High	–
Dam Failure	Extensive	Unlikely	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Critical	High	High
Earthquake	Limited	Unlikely	Limited	Low	Low
Floods: 1%/0.5%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Significant	Occasional	Limited	Medium	Medium
Levee Failure	Extensive	Unlikely	Catastrophic	High	Medium
Pandemic	Limited	Unlikely	Negligible	Low	Medium
Severe Weather: Extreme Cold and Freeze	Limited	Likely	Negligible	Low	Medium
Severe Weather: Extreme Heat	Limited	Likely	Negligible	Low	High
Severe Weather: Heavy Rains and Storms	Significant	Likely	Critical	Medium	Medium
Severe Weather: High Winds and Tornadoes	Limited	Occasional	Negligible	Low	Low
Wildfire	Significant	Occasional	Critical	High	High

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

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

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

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

K.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Yuba County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Yuba County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

K.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section K.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table K-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Yuba County Planning Area.

K.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the YCWA's assets at risk, with a focus on key District assets such as critical facilities, 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:

> ***Critical Infrastructure describes the physical and cyber systems and assets that are so vital to the County of Yuba that their incapacity or destruction would have a debilitating impact on our physical or economic security or public health or safety. Critical infrastructure includes any location, facility, or infrastructure that are necessary to maintain normalcy in daily life, and that are essential for the delivery of vital services and for the protection of the community. Critical Facilities are further broken out into three Categories: 1) Essential Services Facilities, 2) Large Group and Vulnerable Populations Facilities, and 3) Infrastructure Facilities.***

Table K-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. YCWA's physical assets, valued at over $807 million, consist of the buildings and infrastructure to support the District's operations.

Table K-4 YCWA Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value
Our House Dam	Essential Services	$100,000,000
Log Cabin Dam	Essential Services	$50,000,000
Bullards Bar Dam and Facilities	Essential Services	$500,000,000
Colgate Power House & Office	Essential Services	$75,000,000
Colgate Tunnel	Essential Services	$5,000,000
Narrows 1 Power House	Essential Services	$10,000,000
Narrows 2 Power House	Essential Services	$30,000,000
Lake Francis Dam	Essential Services	$15,000,000
Cottage Creek Water Treatment Plan and Piping	Essential Services	$1,500,000
Main Irrigation South Canal	Essential Services	$1,000,000
Daguerra Dam Intakes and Roads	Essential Services	$3,000,000
Recreation Facilities	Essential Services	$4,000,000
Project Equipment, Vehicles, Boats	Essential Services	$2,500,000
Project Access Roads	Essential Services	$5,000,000
Mini Hydro at Bullard Bar Dam	Essential Services	$750,000
Marysville Office – F Street	Essential Services	$725,000
Marysville Office – D Street	Essential Services	$600,000
Hallwood Corporation Yard	Essential Services	$500,000
Project Communications	Essential Services	$2,500,000
Project Residence	Essential Services	$100,000
South Fish Screens	Essential Services	$500,000
Total		**$807,675,000**

Source: YCWA

Natural Resources

YCWA has a variety of natural resources of value to the District. These natural resources parallels that of Yuba County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

YCWA has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Yuba County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Populations Served

Also potentially at risk should the District be affected by natural hazard events are the populations served by the District. YCWA provides services to the entirety of Yuba County.

Growth and Development Trends

General growth in the District parallels that of the Yuba County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Development since 2015

No District facilities have been constructed since 2015. As such, it is assumed that there is no change in vulnerability to the District. District changes in structures since 2013 include:

- 2013 – Purchased a corporation yard on State Routh 20, approximately 5 miles east of Marysville
- 2013 – Sold Deadwood Powerhouse and Substation
- 2019 – Purchased an additional office building in Marysville
- 2020 – Purchased Narrows 1 hydroelectric facility

Future Development

Yuba Water Agency plans to add three (3) additional facilities:

- Secondary Spillway- The proposed secondary spillway gates will be 31.5 feet lower than the existing spillway gates, allowing for the release of 35,000 cubic feet of water per second. The lower gate elevation will make it possible to release water from the reservoir before large, threatening storms hit, while there is still plenty of capacity downstream. The improved control of water releases enabled by the secondary spillway could be used to reduce water levels on levees protecting Marysville and unincorporated areas of Yuba County by as much as two to three feet during a storm like the 1997 New Year's flood – the largest on record. The secondary spillway will also be able to independently handle flows like those recorded in 1997, providing a redundant dam release option and enhancing dam safety.
- South Canal Fish Screen – Yuba Water plans to replace. The District has no control over future development in areas the District services. Future development in these areas parallels that of the Yuba County Planning Area. More general information on growth and development in Yuba County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Yuba County Vulnerability and Assets at Risk of the Base Plan.
- Oregon House Corporation Yard – Yuba Water intends to construct a new shop facility near the community of Oregon House, CA. The above new facilities will not increase the areas or customers served.

K.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table K-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the

Yuba County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage 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 Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. 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. More information on types of power disruptions can be found in Section 4.3.3 of the Base Plan.

The Agency can potentially be affected by power supply disruptions at the dam because the spillway gates are operated by electricity. Although there are backup systems in place, a failure of those backups could create a public safety concern during power outages.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This

was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.3 of the Base Plan.

The Agency can potentially be affected by PSPS at the dam because the spillway gates are operated by electricity. Although there are backup systems in place, a failure of those backups could create a public safety concern during power outages.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Yuba County, 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

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Yuba County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter and recognize an increasing likelihood of more frequent drought and flood conditions.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Yuba County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Yuba County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Yuba County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased frequency of droughts and flooding
- Increased wildfire

Assets at Risk

The District noted that its facilities will most likely not be at risk from climate change. However two of the Agency's primary objectives – flood risk reduction and water supply – are put at significant risk with increasing uncertainty over the expected increase in weather patterns conducive to drought and flood conditions.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

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

Location and Extent

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. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings 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. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 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. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

Extremely High Hazard Dams inside the County that can affect the District can be seen on Figure K-2. High Hazard Dams inside the County that can affect the District can be seen on Figure K-3. Extremely High Hazard Dams outside the County that can affect the District can be seen on Figure K-4. High Hazard Dams outside the County that can affect the District can be seen on Figure K-5.

Figure K-2 YCWA – Dam Inundation Areas from Extremely High Hazard Dams Inside the County

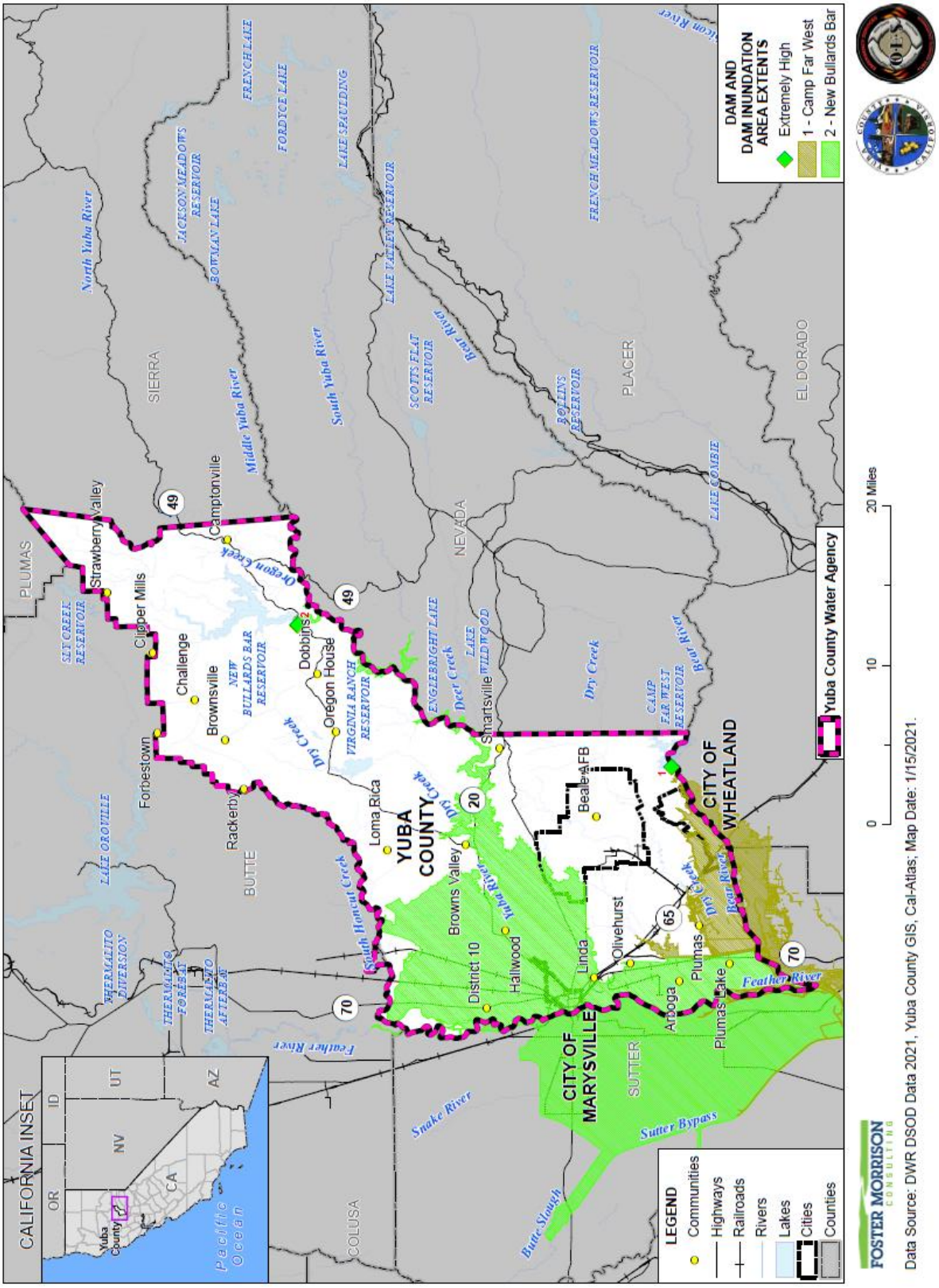


Figure K-3 YCWA – Dam Inundation Areas from High Hazard Dams Inside the County

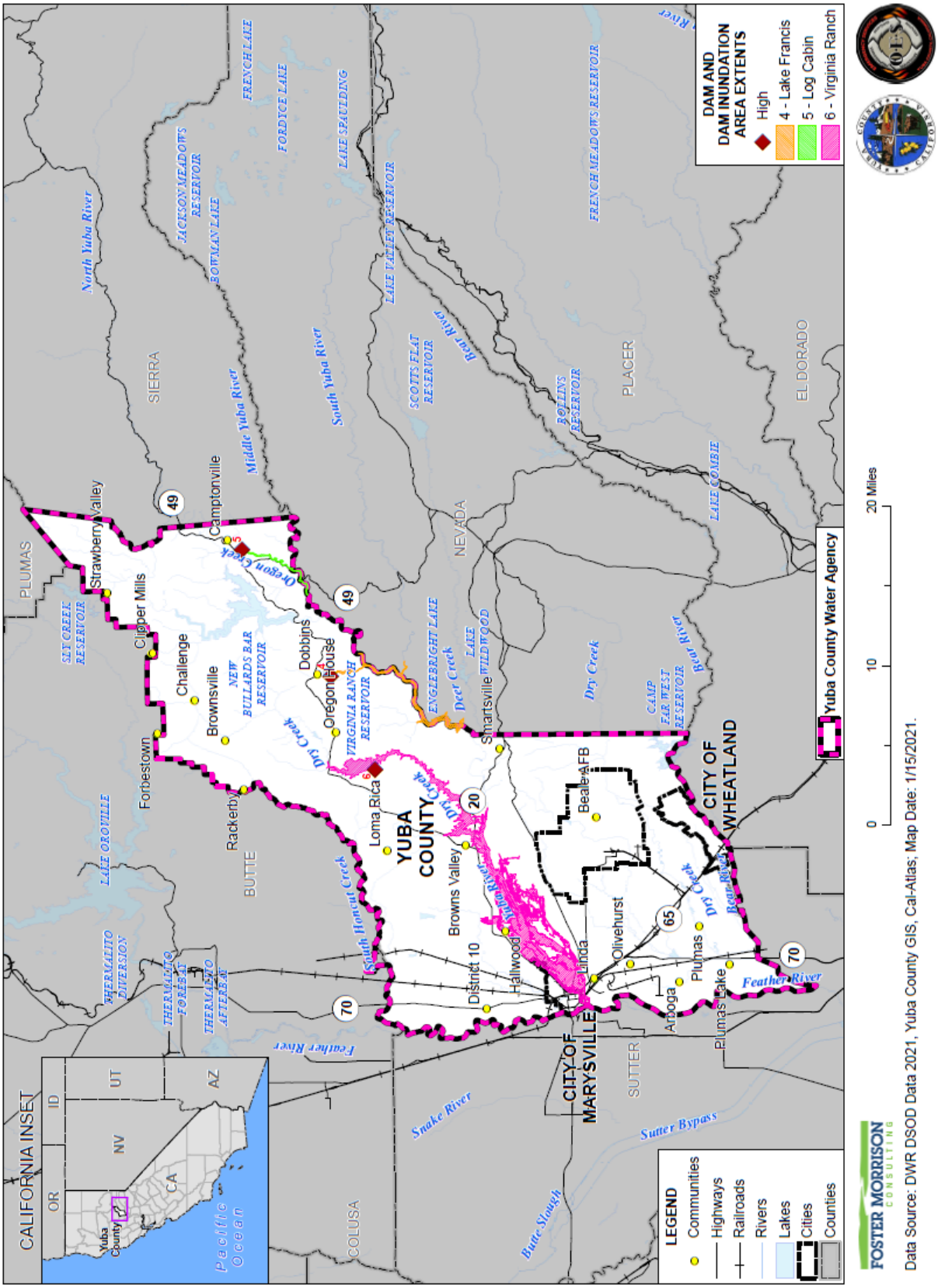


Figure K-4 YCWA – Dam Inundation Areas from Extremely High Hazard Dams Outside the County

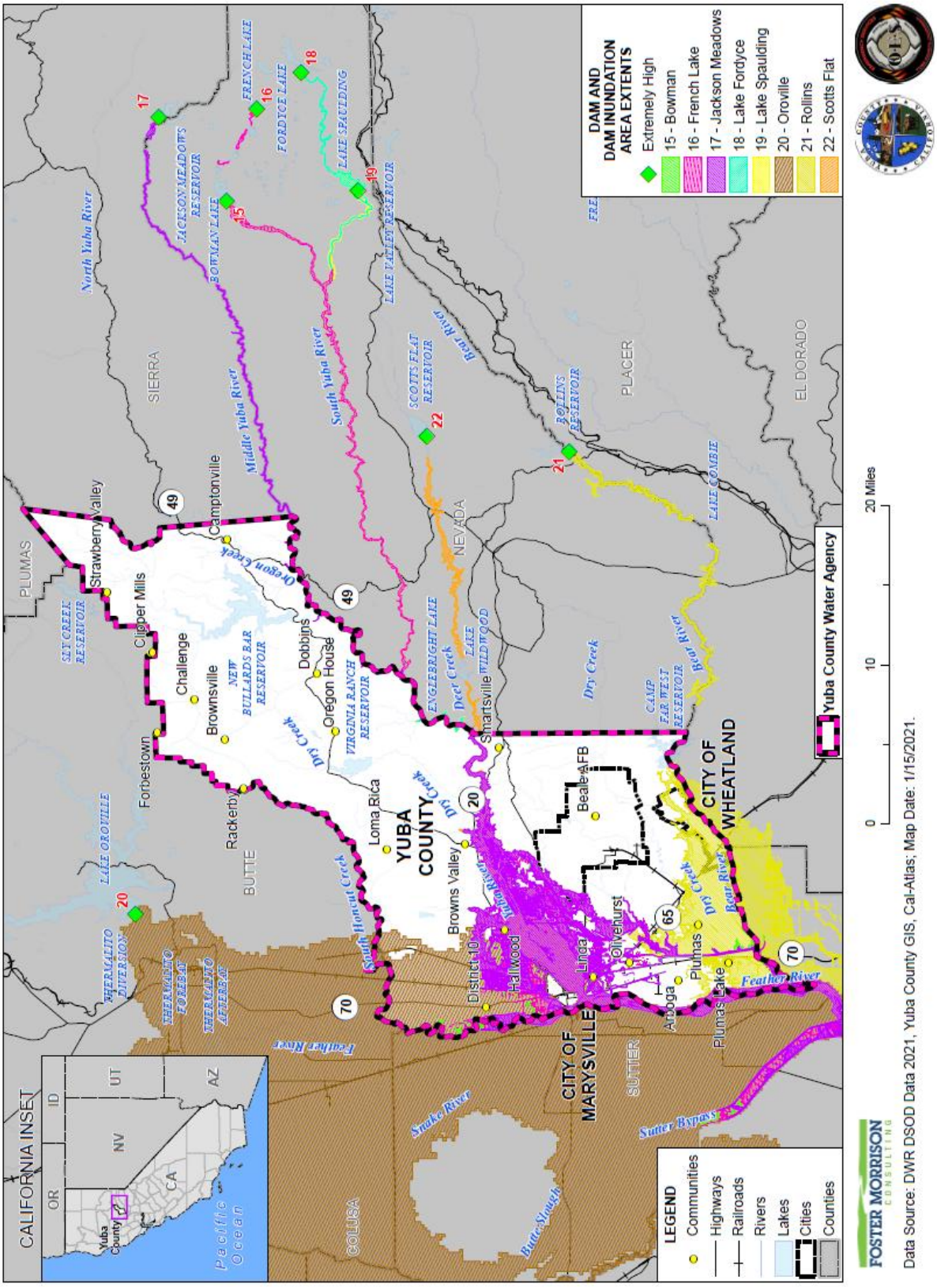
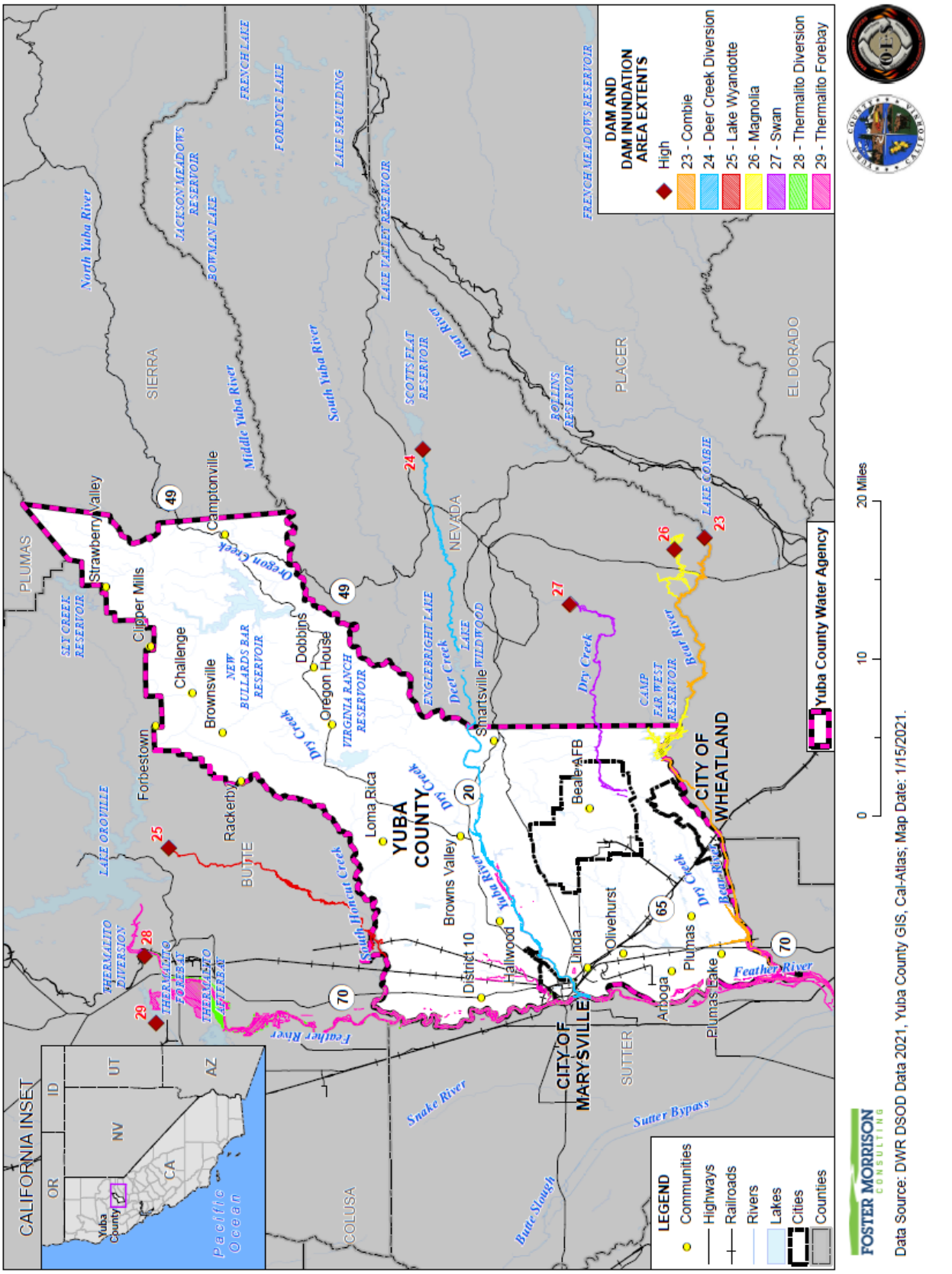


Figure K-5 YCWA – Dam Inundation Areas from High Hazard Dams Outside the County



New Bullards Bar Dam, Our House and Log Cabin Dam

Of specific interest to the YCWA, the New Bullards Bar Dam is owned and operated by the Yuba County Water Agency. The Dam is located on the North Fork of the Yuba River, about 28 miles northeast of Marysville. The New Bullards Bar Dam is located in Yuba, Nevada and Sierra Counties, and consists of New Bullards Bar Dam, Our House Dam and Log Cabin Dam. The dams are located 30 miles northeast of the City of Marysville and 1.5 miles downstream from the original Bullards Bar Dam. Tunnels supply water from the latter two dams to Bullards Bar Dam for power generation and water supply. New Bullards Bar Reservoir has a normal gross storage capacity of 966,103 acre-feet at reservoir elevation of 1,956.

The dams all meet the safety standards set by the Division of Safety of Dams (DSOD) and the Federal Energy Regulatory Commission (FERC) and are inspected annually.

Past Occurrences

There has been on federal or state disaster declarations for dam failure in the County, as shown on Table K-5. This was associated with the Oroville spillway incidence in Butte County. While the dam did not fail, mass evacuations were ordered resulting in significant economic and other impacts to Butte and neighboring counties.

Table K-5 Yuba County – State and Federal Disaster Declarations from Dam Failure 1950-2021

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Dam Failure	0	–	1	2017

Source: Cal OES, FEMA

The Agency was forced to evacuate its two main offices in Marysville during the 2017 Oroville Dam incident. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could 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 and associated economic losses can also be significant.

YCWA has not suffered a dam failure in its history. However, because of the large population living downstream of YCWA dams, and the potential for future development downstream, a failure of any of the YCWA dams would result in significant damage to property and potentially the loss of life.

Should a breach in the dams occur, the water released would flow in a southwesterly direction toward the City of Marysville. Marysville lies within the dam's flood plain/inundation path, in the event of a dam failure, the flood wave would reach the Simpson Lane Bridge in Marysville approximately 90 minutes later

and the confluence with the Feather River in approximately 3 hours. The flood wave would continue to move through Linda and Olivehurst, inundating the western section of the community in approximately 4 hours. It should be noted that the peak inundation stage in Marysville, Linda and Olivehurst would be within 7 hours. The inundated area affected by a breach of the New Bullards Bar Dam is comprised of commercial, industrial, residential property, agricultural lands, schools, and a hospital.

If the New Bullards Bar Reservoir on the North Yuba River together with Lake Oroville Reservoir on the Feather River had been in operation during the 1955-1956 floods, they would have prevented the loss of 40 lives and $73.1 million in damages that occurred on the Feather River. (source: Emergency Action Plan, Yuba River Development Project, FERC Project No. 2246, 2004. Damage values adjusted to February 2021 using the US Bureau of Labor Statistics CPI Inflation Calculator).

New Bullards Bar is located in a low seismic region and a recent analysis indicated the dam would be stable following a magnitude 6.25 earthquake within 12 kilometers. A vulnerability analysis indicated there is a low security threat to the New Bullards Bar Dam resulting from seismic activity.

Assets at Risk

Assets at risk from this hazard include:

- Our House Dam
- Log Cabin Dam
- Bullards Bar Dam and Facilities
- Colgate Powerhouse and Office
- Colgate Tunnel
- Narrows 1 Powerhouse
- Narrows 2 Powerhouse
- Lake Francis Dam
- Cottage Creek Water Treatment Plant and Piping
- Main Irrigation South Canal
- Daguerre Dam Intakes and Roads
- Project Equipment, Vehicles, Boats
- Project Access Roads
- Mini Hydro at Bullards Bar Dam
- Marysville Office – F Street
- Marysville Office – D Street
- Hallwood Corporation Yard
- Project Communications

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined

regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, 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

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 and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been one state and one federal disaster declaration due to drought since 1950. This can be seen in Table K-6.

Table K-6 Yuba County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	1	2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

The most recent drought had an adverse impact on Agency operations due to the inability to fulfill its mission in supplying surface water to its eight (8) Member Units, who rely on the water to satisfy agricultural production throughout a large portion of Yuba County.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the District, 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. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. With a reduction in water, water supply issues based on water rights becomes more evident. Climate change may create additional impacts to drought and water shortage in the County and the District.

One driver in creating YCWA was to supply surface water to agricultural lands in the valley to mitigate groundwater over drafting created by deep well pumping. The last surface water supply project was constructed in 2006. Surface water irrigation has caused significant in-lieu groundwater recharge resulting in as much as 100 feet of water table increase. This is especially important because of the tighter water supplies due to increased usage from growth, and increased environmental water needs through higher in-stream flow requirements. The groundwater supplies will be needed to supply local and statewide water needs during drought periods.

Consistent with the Sustainable Groundwater Management Act (SGMA), the Agency manages the groundwater basin on the valley floor for most of Yuba County (with the exception of the City of Marysville and the Cordua Irrigation District). This is especially important during periods of drought to ensure that over-drafting does not occur.

Water resources and quality in Yuba County are good to excellent, and has improved in recent decades due to control of hydraulic and dredge mining operations and the establishment of minimum in stream flows, except for local degradation as streams pass through urban or agricultural areas. Agriculture is the largest water user in the County jurisdiction, and surface water is generally used for agriculture purposes. In the Yuba and Feather Rivers, variations in overall water quality are usually correlated with fluctuations in flow rates throughout the year. During heavy storm runoff in the winter and spring, the turbidity and debris levels in the rivers are high. In the spring and early summer, the water quality is affected by agricultural drainage and natural runoff. During periods of low flows, specifically the late summer–early fall, water quality decreases due to higher water temperatures and concentrations of pollutants.

During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause Public Safety Power Shutoff (PSPS) events to be declared in the County.

The District's vulnerability from drought is the inability to provide surface water allocations to its eight (8) Member Units.

Assets at Risk

The Main Irrigation South Canal is at risk from this hazard.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Yuba County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. As previously described in Section 4.3.10 of the Base Plan, the Yuba County Planning Area and the YCWA have been subject to historical flooding.

Location and Extent

In the 1960's YCWA's Yuba River Development project was designed and constructed. The Project consists of New Bullards Bar Dam and Reservoir, two diversion dams, a series of tunnels and two major hydroelectric powerhouses. Funding for the Project was primarily provided through a power purchase contract with Pacific Gas and Electric Company (PG& E) and the United State Army Corps of Engineers (Corps). The Corps provided funding of 170,000 acre-feet of dedicated flood storage space in New Bullards Bar Reservoir, to help mitigate the historic flooding in the region. The region continues to have a significant flood threat since New Bullards Bar reservoir is located on the North Yuba and there is no other dedicated flood storage space on the South or Middle Yuba Rivers.

The most important geographic feature for the Yuba County Water Agency is the Yuba River. YCWA was created for developing the Yuba River for flood control, water supply, power generation, and other issues. The Yuba begins as three rivers: North, Middle, and South. It begins at the crest of the Sierra Nevada Mountains, 8,000 ft above sea level and journeys through hundreds of miles of canyons in just 48 hours to join the Feather River at a confluence that stands 67 ft above sea level. In total they gather water from 1,357 square miles of watershed, which is never more than 35 miles wide at one point. Jagged, rocky ridges separate the rivers for much of their journey.

Agreements with local, state, and federal agencies determine how much of the water will stay in the river's natural channels and how much will be diverted for a variety of beneficial uses. Through YCWA, Nevada Irrigation District (NID), and South Feather Water & Power (SFWP) tunnels and canals, Yuba River water

is taken to the Feather, Bear, and American Rivers to provide water to Member Units that have both water rights and water service contracts.

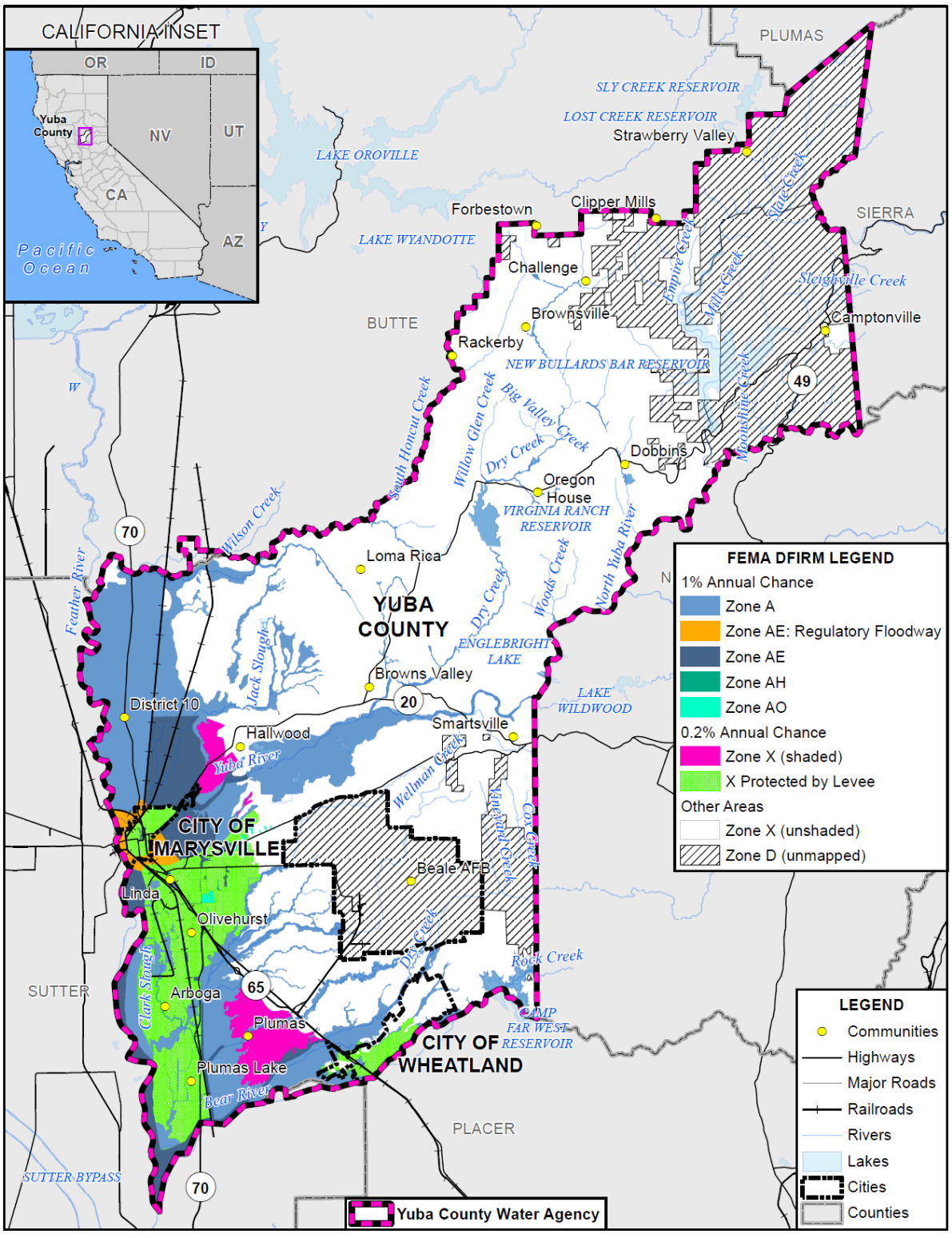
The North Yuba starts its trek to the valley below at Yuba Pass (elevation 6,701 feet) near State Highway 49 in Sierra County. The river journeys in tandem with the highway as far as Downieville, where it leaves the road and flows westward to the New Bullards Bar Reservoir. The Middle Yuba is born from snow runoff and rainwater gathered at Jackson Meadows Reservoir in Sierra County. It meanders and roars, depending on the season of the year, through narrow, steep canyons until it gets to the 75-foot-high Our House Dam, southwest of Camptonville. How much water can be diverted by YCWA is spelled out in agreements with FERC and DFG. Emerging from the 3.8-mile-long tunnel, Middle Yuba water flows into Oregon Creek where it travels a short distance to Long Cabin Dam. Just upstream from the 55 foot high dam, Middle Yuba and Oregon Creek water is diverted unto a 1.2 mile long tunnel that carries it to New Bullards Bar Reservoir where it joins water from the North Yuba. At the New Bullards Bar Dam, water is released into a 4.7 mile long tunnel that carries it to turbines that generate electricity at the New Colgate Powerhouse.

Almost a million acre–feet of water from the North and Middle Yuba River and Oregon Creek are stored behind the 64 story high, 2323 ft. long New Bullards Bar Dan, which is located at the south end of a 16 mile long reservoir. In addition to providing much needed flood control, the reservoir is a prime recreation area and stores water for crop irrigation and energy generation, and influences downstream river temperature for fishery enhancement.

The South Yuba comes to life at 9,000 feet in Placer County near Castle Peak and Donner Lake. This pristine waterway continues on its journey to Englebright Reservoir and the main stem of the Yuba River many miles away. Dozens of creeks large and small flow into the South Yuba as it moves downhill through Placer and Nevada Counties to Yuba County near the old town site of Bridgeport. A few miles from Bridgeport the North Yuba joins the South and Middle forks and flows into Englebright Reservoir at a location 3.3 miles downstream from the New Colgate Power House.

The YCWA has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure K-6.

Figure K-6 YCWA – FEMA DFIRM Flood Zones



FOSTER MORRISON CONSULTING

Data Source: FEMA DFIRM 2/18/2011, Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.

Table K-7 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table K-7 YCWA– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	1% annual chance flooding: No base flood elevations provided	X
AE	1% annual chance flooding: Base flood elevations provided	X
AE Floodway	1% annual chance flood: Regulatory floodway; 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	1% annual chance flooding: sheet flow areas. BFEs derived from detailed hydraulic analyses are shown in this zone.	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.	X
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District 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 District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Yuba County from flooding is shown on Table K-8. These events also likely affected the District to some degree.

Table K-8 Yuba County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	16	1950, 1955, 1958, 1962, 1963 (twice), 1969, 1973, 1982, 1983, 1986, 1995 (twice), 1997, 2008, 2017	15	1955, 1962, 1963, 1964, 1969, 1970, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (twice)

Source: Cal OES, FEMA

Yuba County has a long history of catastrophic flooding events involving both the Yuba and Feather Rivers. Multiple major floods since 1950 have resulted in loss of life, significant property damage, and constrained economic development in the area. Specific events noted by the District include:

In **February of 1986**, Yuba County suffered a devastating flood where 5,000 homes and businesses were damaged by flood waters breaking through south bank Yuba River levee by Linda. Flood lawsuit damages for this flood were recently settled for $450 million. To help prevent future flooding in the county, YCWA initiated the Corps Yuba Basin levee improvement in 1988. This project was formulated to improve the level of protection to 200 years for the populated area of southern Yuba County in the Reclamation District 784 territory and 300 year level of protection for the City of Marysville. Improved levees are the source of the improved flood protection and the Yuba Basin Feasibility Study is due to be completed by the Corps in 2008. YCWA has provided the entire local share funding for this project. Also, YCWA provided the local share of funding for levee improvements constructed in the late 1990's and early 2000's for the federal and state Systems Evaluation levee improvement project.

In **January of 1997**, Yuba County suffered another devastating flood when the east Feather River levee broke due to high flood waters and flooded the southern portion of the RD 784 in the Arboga area. Unfortunately, the section of levee that broke was a section of levee that was scheduled for construction improvements in 1996 that were postponed to 1997. This flood resulted in the loss of three lives and flood damages that were legally settled for approximately $50 million.

After the 1997 flood, YCWA commissioned a $1 million dollar study to identify additional flood protection improvements for protecting Yuba County residents and the region. This effort and other issues led to the creation of the Yuba Feather Flood protection act portion of the Costa Machado Water Act of 2000 providing $90 million in state bond funds for flood protection improvements. The original plan for this money was to make system flood protection improvements such as improved efficiency of the New Bullards Bar dedicated flood storage space and levee setbacks. In May of 2003, a draft DWR flood plain mapping study indicated that the levees were far weaker than previously identified in the Yuba Basin Feasibility study. This resulted in moving from system improvements to levee improvements to mitigate the weaker than expected levees.

2005/2006 Winter Storms – The 2006 Winter Storm event (FEMA 1628-DR-CA) resulted in severe damages to YCWA. The event began in late December 2005 and ran through early January 2006. A breakdown of the damages suffered by the Agency is illustrated in Figure K-7.

Figure K-7 YCWA – 2006 Winter Storm Damage

Project Location	Project Work #	Damage Cost
Pond 17 Access Road	27	3,220.00
Our House Sediment Removal	1808	4,077,880.85
South Diversion Canal Intake Channel	1949	23,949.82
Owl Gulch Diversion	2016	17,096.68
Deadwood Creek Diversion	2797	34,193.32
Prospect Lane erosion	2955	5,000.00
Bullards Bar Hiking Trails	3067	11,570.00
Paving of Burma Road	3386	58,100
Bullards Bar debris removal	3394	892,930.27
Burma Road debris removal	3395	632,585.58
TOTAL		**5,756,527.31**

Source: YWCA

January 2017 - Heavy rains and high stream flows caused issues in the Agency and the County. A disaster declaration was granted for the County (FEMA Event DR4301). As a result, the South Canal Diversion needed repairs, as was the Daguerre Point Dam/South Canal Diversion facility, Marysville, CA. $3,653,980.56 in damage was reported from this event to the Agency. This event also caused a landslide at Lake Francis Road near the Colgate Powerhouse. Damage from the slide was $1,238,537.66. Because of erosion from this event, the Our House Dam had to have sediment removed, at a cost of $3,987,448.99.

February 2017 – Heavy rains and high stream flows caused issues in the Agency and the County. A disaster declaration was granted for the County (FEMA Event DR4308). Bullards Bar Dam needed hazardous floating debris removed at a cost of $720,325.83. This event also caused a landslide at Burma Road near the Bullards Bar Dam, as well as at Cottage Creek Campground on Road 169. Damage from the Burma Road slide was $1,308,318.09, while damages of $1,536,805.19 were sustained at Cottage Creek Campground.

Vulnerability to and Impacts from Flood

Floods have been a part of the District'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 damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

District assets at risk from this hazard include:

- Our House Dam
- Log Cabin Dam
- Bullards Bar Dam and Facilities
- Colgate Powerhouse and Office
- Colgate Tunnel
- Narrows 1 Powerhouse
- Narrows 2 Powerhouse
- Lake Francis Dam
- Cottage Creek Water Treatment Plant and Piping
- Main Irrigation South Canal
- Daguerre Dam Intakes and Roads
- Project Access Roads
- Marysville Office – F Street
- Marysville Office – D Street
- Hallwood Corporation Yard
- South Fish Screens

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% 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 County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The YCWA is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District 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 District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The District tracks localized flooding areas. localized flood areas identified by the YCWA are summarized in Table K-9.

Table K-9 YCWA – List of Localized Flooding Problem Areas

Area Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Colgate Powerhouse	X	X	X	X	X	X	X
Narrows Powerhouse	X	X	X	X	X	X	X
Hallwood Corporation Yard	X	X					

Source: YCWA

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted no past occurrences of localized flooding that caused damages to District facilities.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides 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.

Localized flooding has historically affected the Colgate and Narrows Powerhouses due to increases in river flows, and poor drainage has impeded access to the Hallwood Corporation Yard.

Assets at Risk

Assets at risk from this hazard include:

- Colgate Tunnel
- Narrows 1 Powerhouse
- Narrows 2 Powerhouse
- Hallwood Corporation Yard

Levee Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Extremely High

Hazard Profile and Problem Description

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

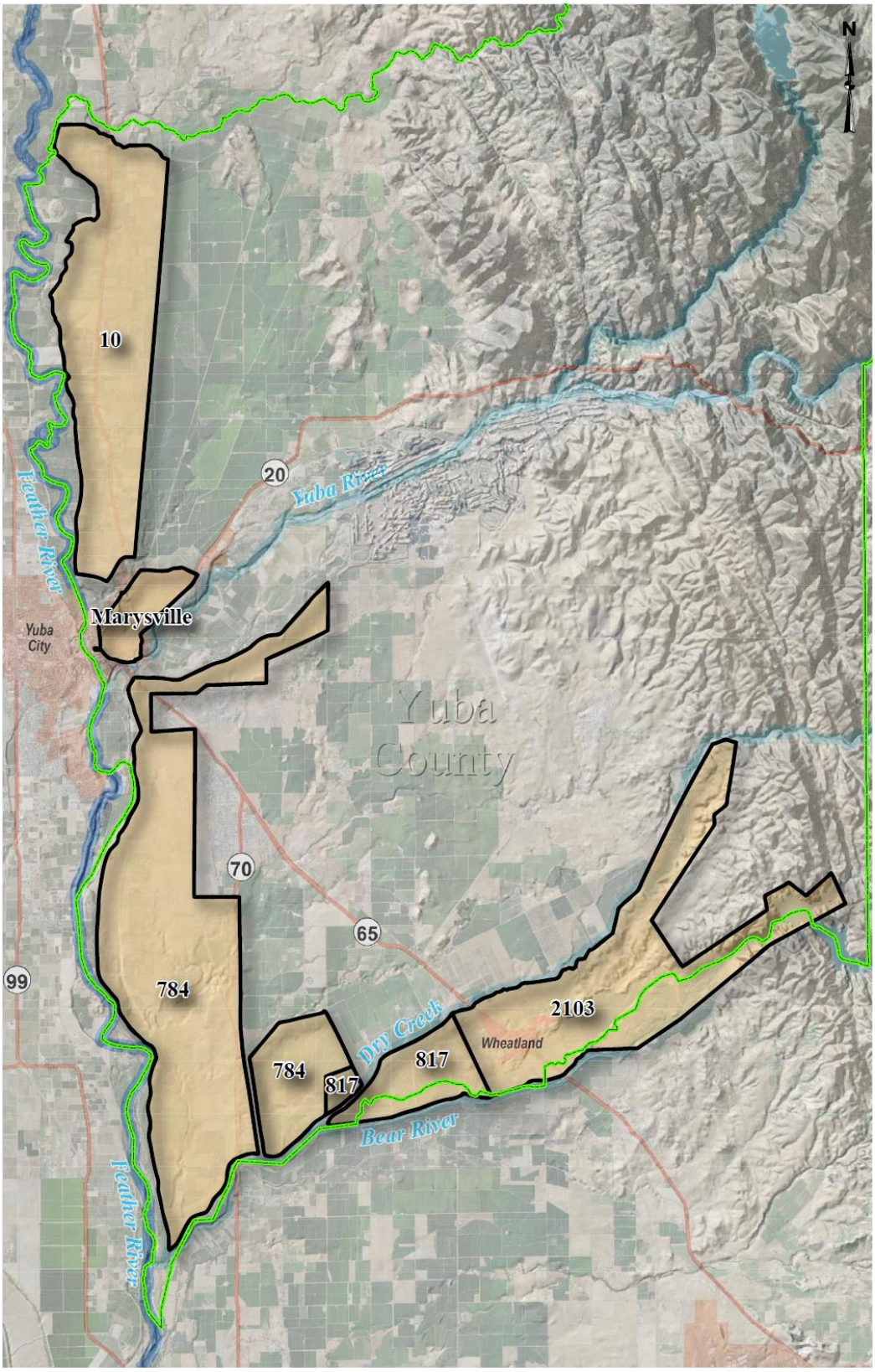
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, 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. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. 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.

The District's two main offices are protected by the Marysville Ring Levee surrounding the City of Marysville.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally 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. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure K-8.

Figure K-8 YCWA – Levees



Source: TRLIA

Past Occurrences

The District Planning Team noted that the 1986 and 1997 levee breaches discussed in Section 4.3.12 of the Base Plan affected the District.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The Agency's two primary offices would be a complete loss if the Marysville Ring Levee failed. While YCWA continues to work with the Corps to develop a project to improve the levees protecting the City of Marysville, the Yuba Basin project will assist in local entity in constructing advanced improvements. This local entity is a Joint Powers Agreement organization between Reclamation District 784 and Yuba County. To date most of a $300 plus million project to improve RD 784 levees has been constructed. This is advanced work on the Corps' Yuba Basin project, and it is being primarily funded by local and state bond funds. Funding is also being provided by a FEMA grant for improvements on the Olivehurst Detention Basin project which has been constructed.

YCWA flood protection future efforts include continuing to pursue levee improvements through the Yuba Basin project, to support TRLIA in their efforts to improve the RD 784 levees, to continue supporting other efforts of additional levee improvements in Yuba County, to continue our Forecast Based Operations project to improve the effectiveness of flood control operations out of Oroville and New Bullards Bar reservoirs, to support levee certification effort to FEMA criteria and then to seek funding to improve the system improvement projects.

Most importantly, YCWA is in the design and engineering phase to construct a secondary spillway at New Bullard Bar Dam 31.5 feet lower than the primary spillway. When operated in conjunction with Forecast Informed Reservoir Operations (FIRO) and Forecast Coordinated Operations (FC-O) with DWR at the Oroville Dam, the risk of downstream flooding will be reduced dramatically by giving the Agency the ability to release water ahead of storm events, creating room in the reservoir to absorb and store much of the flows. When complete, the secondary spillway will reduce downstream river levels by 2-3 feet, reducing the hydraulic loading on the levees protecting Yuba County.

Assets at Risk

The Agency's two primary offices would be a complete loss if the Marysville Ring Levee failed.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District 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 District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. 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. Duration of severe storms in California, Yuba County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding. These events were included in the Past Occurrences section of the Flood discussion above.

The District noted that many of the heaviest winter precipitation seasons are associated with El Niño conditions in the Pacific Ocean and storm tracks that deliver strong winter storms repeatedly across northern California. When these waves of storms occur in late spring, they can hasten snowmelt in the Sierra Nevada; flows in the areas creeks and rivers can raise dramatically filling YCWA reservoirs which can result in flooding and/or loss of dam control. El Nino–Southern Oscillation (ENSO) is a global coupled ocean–atmospheric phenomenon. The Pacific Ocean signatures, El Nino and La Nina are major temperature fluctuations in surface waters of the tropical Eastern Pacific Ocean. The cycle for the ENSO events can take up to 24 months to complete when involving moderate to strong El Niño's. It should also be noted that El Niño events that are very strong to extreme in their intensity can reduce the cycle time to as little as 12 to 18 months. Once the ENSO event ends, the weather pattern will return to a more normal sequence.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outage and failure can be found in the discussion at the beginning of Section K.5.3, as well as in Section 4.3.3 of the Base Plan.

Northern California in general and Yuba County in particular is a region that experiences waves of storms each winter with large amounts of falling or blowing participation that last for several hours. Their impact ranges from accumulations of sediment and debris that affect YCWA facilities to a loss of control of the water passing through/over YCWA facilities. Particular problems for the YCWA arise under the influence of Pineapple Express (Atmospheric River) incidents which can result in catastrophic high water events.

Assets at Risk

District assets at risk to this hazard include:

- Main Irrigation South Canal
- Recreation Facilities
- Project Access Roads
- Project Communications
- South Fish Screens

Wildfire

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

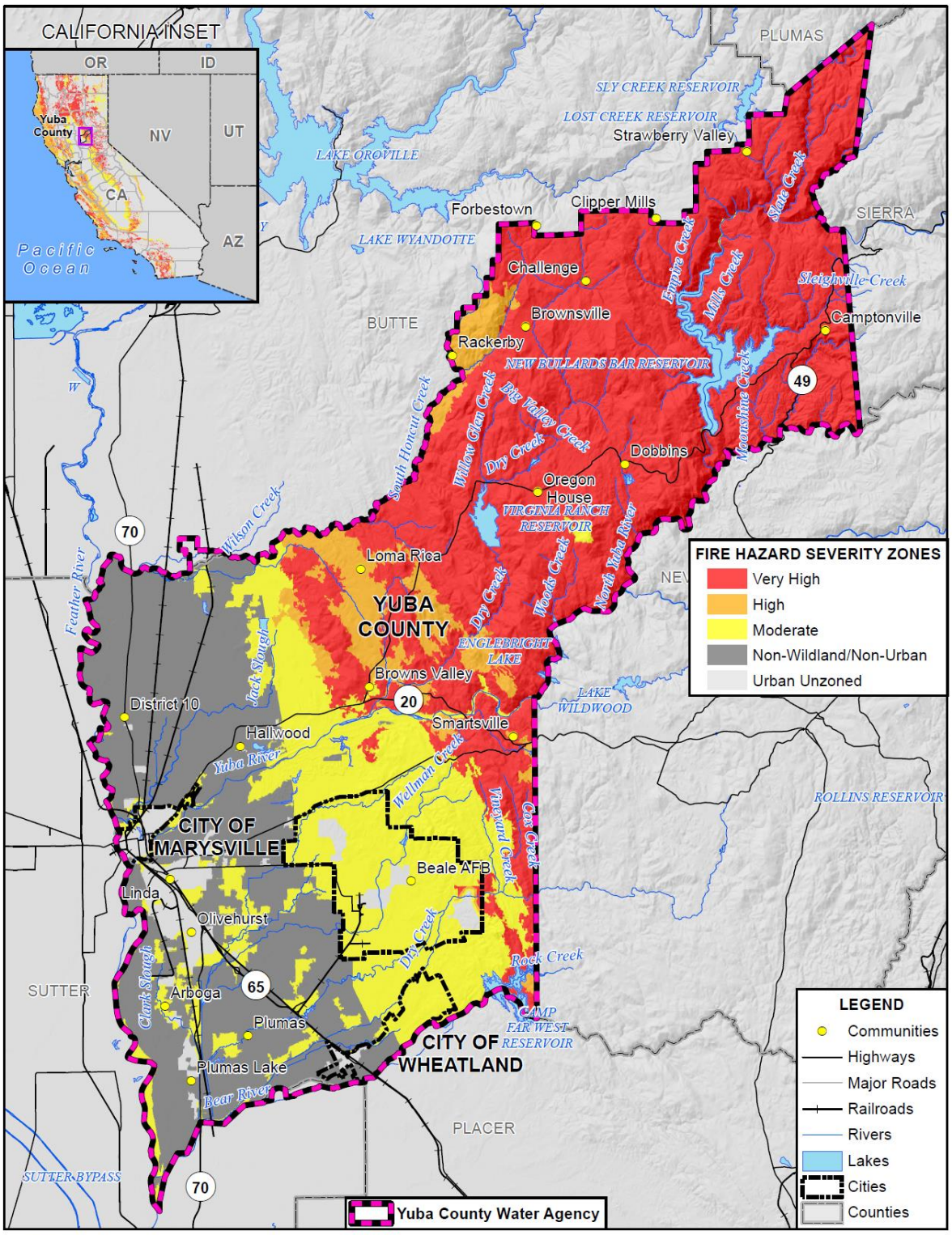
Wildland fire and the risk of a conflagration is an ongoing concern for the YCWA. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early

spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across the District and has created maps showing risk variance. Following the methodology described in Section 4.3.14 of the Base Plan, wildfire maps for the YCWA were created. Figure K-9 shows the CAL FIRE FHSZ in the District. As shown on the maps, fire hazard severity zones within the District range from Urban Unzoned to Very High.

Figure K-9 YCWA – Fire Hazard Severity Zones



Data Source: CAL FIRE (Draft 9/2007 - c58fhszl06_1, Adopted, 11/2007 - fhszs06_3_58), Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Past Occurrences

There have been three state and seven federal disaster declarations due to wildfire in Yuba County. This can be seen in Table K-10.

Table K-10 Yuba County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Wildfire	3	1997, 2010, 2017	7	1988, 1999, 2009, 2017 (twice), 2020 (twice)

Source: Cal OES, FEMA

Two large wildfires occurred in the foothill portion of Yuba County near YCWA assets in the late 1990s. The 1997 Williams Fire and the 1999 Pendola Fire caused extensive damage in the area. Similar large wildfires in the vicinity of YCWA assets could cause damage and restrict access to assets and facilities. No fires have affected the District since 2015.

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Yuba County Planning Area and the District from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic

delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate PSPSs which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

The foothill areas of Yuba County have a long history of wildfire. Several YCWA facilities are in remote areas with high fire hazard severity, placing access to these facilities, and the facilities themselves, at risk. In addition to physical damage to YCWA buildings, fire affects the Agency by producing mud, ash, & debris, which flows into the waterways, causing damage and obstructions. The agency is then responsible for sediment & debris removal, an additional financial burden.

Fire also impacts the occurrence of landslides by destroying the vegetation whose root system hold soils on the slopes, which then cause damage to YCWA assets. Human fire suppression efforts over the past century extinguished lightning–ignited blazes that would otherwise have thinned the forests. As a result the forests are now so overcrowded and diseased that they pose a major fire threat.

The main transportation corridor to YCWA facilities is Marysville Road, a two-lane road traversing the foothills from east to west. Marysville Road begins at State Highway 20 in Browns Valley and terminates in the east at State Highway 49 at Camptonville. Wildfire near Marysville Road can potentially affect travel to and from Yuba Water's facilities by not allowing traffic to pass in either direction.

Assets at Risk

District assets at risk to this hazard include:

- Our House Dam
- Log Cabin Dam
- Bullards Bar Dam and Facilities
- Colgate Powerhouse and Office
- Colgate Tunnel
- Narrows 1 Powerhouse
- Narrows 2 Powerhouse
- Lake Francis Dam
- Cottage Creek Water Treatment Plant and Piping
- Recreation Facilities
- Project Equipment, Vehicles, Boats
- Project Access Roads
- Mini Hydro at Bullards Bar Dam
- Project Communications
- Project Residence

K.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

K.6.1. Regulatory Mitigation Capabilities

Table K-11 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 YCWA.

Table K-11 YCWA 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	Y	The Agency has a Strategic Plan, but it is not as detailed or robust as the District would like.
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	N	
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	The Agency has an Emergency Action Plan (EAP) for emergencies at the New Bullards Bar Dam. The Agency is currently developing a comprehensive flood risk reduction plan that will identify future projects to reduce the risk of flooding to Yuba County.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	

Land Use Planning and Ordinances	Y/N	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
YCWA can work to develop a local emergency operations plan in parallel to the existing Emergency Action Plan (EAP) to address non-dam related emergencies such as wildfire. The Agency is currently developing a comprehensive flood risk reduction plan that will identify future projects to reduce the risk of flooding to Yuba County. Both will reduce risk to the Agency and the County.		

Source: YCWA

K.6.2. Administrative/Technical Mitigation Capabilities

Table K-12 identifies the District department(s) responsible for activities related to mitigation and loss prevention in YCWA.

Table K-12 YCWA'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	Vegetation spraying, spillgate gearbox and monthly penstock inspections.
Mutual aid agreements	N	
Other	N	
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	
Civil Engineer	Y	YCWA has an internal civil engineering team.

GIS Coordinator	N	
Other	Y	YCWA has a project manager (JoAnna Lessard) assigned to grants and she manages a team of consultants to seek out and write grants. District Project Manager also manages another consultant team that is working on a FEMA BRIC grant for the secondary spillway project.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	YCWA coordinates with the Yuba County Sheriff's Office when appropriate to invoke the County's CodeRED automated warning system.
Hazard data and information	Y	Flood data.
Grant writing	Y	YCWA has a project manager, and team of consultants, that specializes in searching for and applying for grant funds.
Hazus analysis	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
YCWA is working to assign an Emergency Manager to better coordinate with Yuba County OES in preparing for emergencies, as well as to provide operations support during emergencies.		

Source: YCWA

K.6.3. Fiscal Mitigation Capabilities

Table K-13 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table K-13 YCWA'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	Local revenues generated from hydroelectricity and water transfers will be used to construct climate resiliency and flood risk reduction projects.
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	N	

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?
Other federal funding programs	Y	YCWA has leveraged local funds with Federal funds to develop levees throughout Yuba County.
State funding programs	Y	YCWA has leveraged local funds with State funds to develop levees throughout Yuba County.
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
The Agency generates revenue from producing electricity at the Colgate and Narrows hydroelectric facilities and through the sale of water transfers. YCWA is working to leverage outside grant funds for significant flood risk reduction projects, including resources from FEMA and the U.S. Army Corps of Engineers.		

Source: YCWA

K.6.4. Mitigation Education, Outreach, and Partnerships

Table K-14 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 K-14 YCWA's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	YCWA has a communications team that emphasizes outreach and education. YCWA is developing a curriculum for local schools to educate about local water supplies.
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
YCWA can further expand its educational program to encompass natural disasters and how they affect the watershed. This would expand capabilities and reduce risk.		

Source: YCWA

K.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

Snowpack Management

The snow that packs the Sierra Nevada Mountains and the rain that falls in the Yuba County foothills are all managed by the Yuba County Water Agency (YCWA). YCWA's current flood protection role is to help plan and fund the local share of flood improvement projects in Yuba County. The Water Agency also manages flood releases from New Bullards Bar Reservoir in coordination with the Corps of Engineers, the California Department of Water Resources Flood Operations and Oroville Reservoir.

Yuba County Water Agency Led the Way on Levee Repairs

Following the 1986 flood, the U.S. Army Corps of Engineers worked with the State of California and the Yuba County Water Agency on the "Levee Systems Evaluation Project," an effort to repair and strengthen levees. Despite another levee failure in 1997, the Corps believed that the repairs being made under the project would provide the much-needed flood protection.

Meanwhile, the California Department of Water Resources and the Corps started a study to determine the ability of the levees to withstand a one hundred year flood event, or a flood that has a one percent chance of happening in any given year. The Federal Emergency Management Agency imposes development restrictions and flood insurance requirements on communities that are protected by levees that do not provide this minimal level of protection.

K.7 Mitigation Strategy

K.7.1. Mitigation Goals and Objectives

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

K.7.2. Mitigation Actions

The planning team for the YCWA identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure

- Severe Weather: Heavy Rains and Storms
- Wildfire

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 regardless of hazard priority. Collectively, this 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 although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. New Bullards Bar Dam Secondary Spillway

Hazards Addressed: Climate Change, Dam Failure, Flood: 1% and 0.2% Annual Chance, Localized Flooding, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: New Bullards Bar Dam spillway is at 1,902 feet of elevation and is able to pass 19,000 cfs at the top of conservation space in the reservoir (1,918 feet) This is 63 feet below the crest of the dam and does not allow the Agency much flexibility to release water ahead of large, forecasted storm events when operating to the current USACE water control manual flood control rules.

Project Description: Yuba Water intends to construct a secondary spillway at New Bullard Bar Dam 31.5 feet lower than the primary spillway, with an ability to pass an additional 35,000 cfs (at top of conservation space). When operated in conjunction with Forecast Informed Reservoir Operations (FIRO) and Forecast Coordinated Operations (F-CO) with DWR at the Oroville Dam, the risk of downstream flooding will be reduced dramatically by giving the Agency the ability to release water ahead of storm events, creating room in the reservoir to absorb and store much of the peak inflows to the reservoir. When complete, the secondary spillway will reduce downstream river levels by as much as 2-3 feet during large events, reducing the hydraulic loading on the levees protecting Yuba County. This will protect levees and downstream properties during time of heavy rains and storms.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: N/A

Responsible Office/Partners: Yuba County Water Agency

Cost Estimate: $225,000,000

Benefits (Losses Avoided): Catastrophic flooding, potentially hundreds of millions of dollars and loss of life.

Potential Funding:

- CalOES/FEMA
- U.S. Army Corps of Engineers
- Local

Timeline: Anticipated completion in 2025

Project Priority (H, M, L): High

Action 2. North Yuba Forest Partnership

Hazards Addressed: Wildfire, Climate Change, Drought and Water Shortage

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The Yuba River watershed is surrounded by forests that are susceptible to catastrophic wildfire. The Forest Partnership seeks to combat climate change and drought and water shortage. Wildfire risk is increased due to these factors.

Project Description: Yuba Water has partnered with various public and non-profit organizations to collaboratively plan, analyze, finance, and implement forest restoration on national forest lands across the entire 275,000-acre watershed. Through ecologically-based thinning and controlled burning, the partnership seeks to reduce the threat of catastrophic wildfire to North Yuba communities and restore the watershed to a healthier and more resilient state. At the same time, the partnership seeks to create a model that can be used to increase the pace and scale of forest and watershed restoration throughout other regions in the Sierra Nevada.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: N/A

Responsible Office/Partners: Yuba County Water Agency is the lead and our partners include the U.S. Forest Service, The Nature Conservancy, South Yuba River Citizens League, Camptonville Community Partnership, Nevada City Rancheria Nisenan Tribe, National Forest Foundation, Sierra County and Blue Forest Conservation.

Cost Estimate: $100,000,000

Benefits (Losses Avoided): Wildfire, potentially millions of dollars and loss of life.

Potential Funding:

- CalOES/FEMA

- CAL FIRE
- Local

Timeline: Ongoing

Project Priority (H, M, L): High