Sonoma Water Climate Adaptation Plan

Sonoma Water Board of Directors Meeting

October 19, 2021

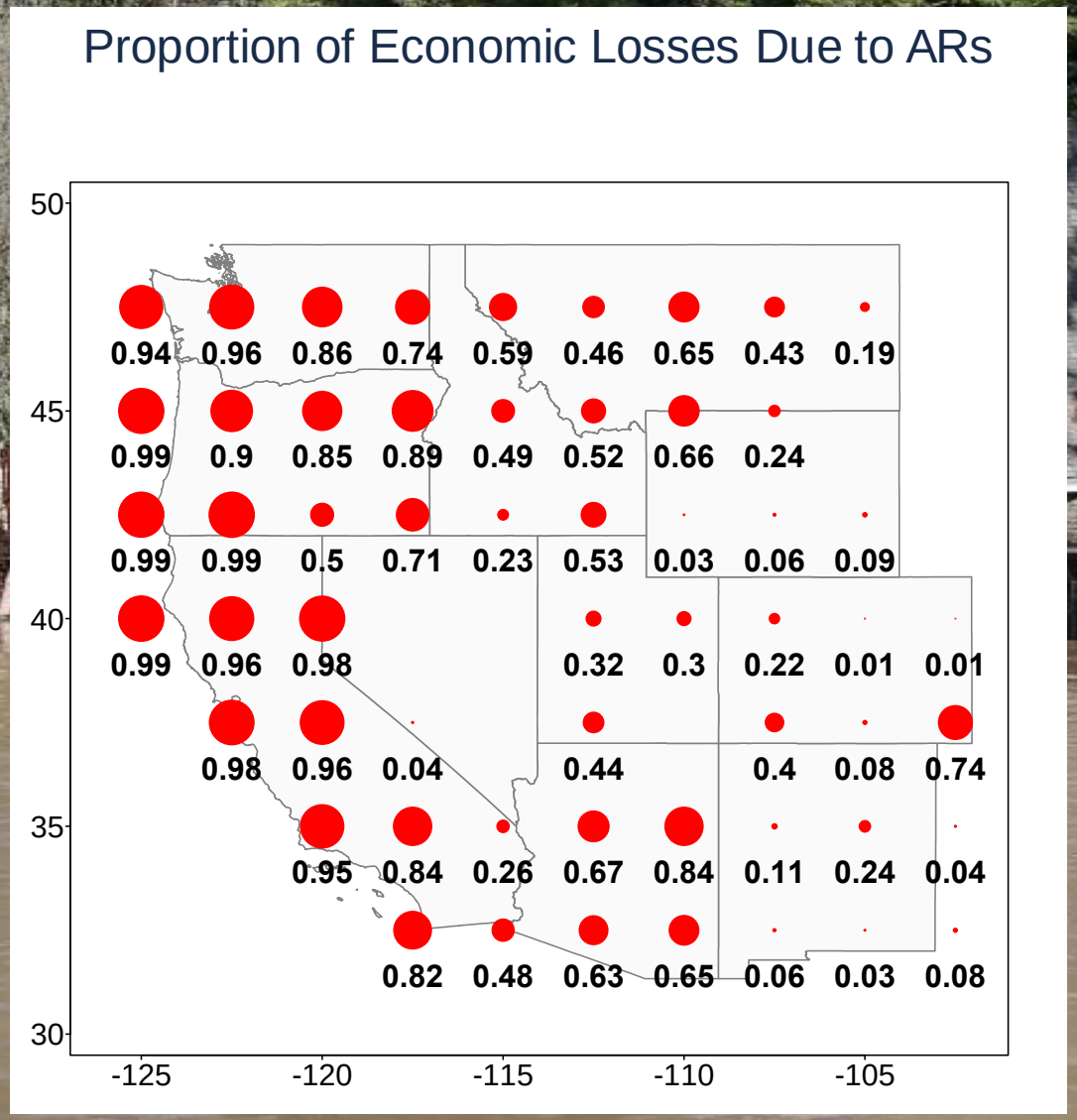
Sonoma Water Climate Adaptation Plan

- Sonoma County has experienced more “natural” system impacts than most regions in the past decade

- Climate variability and climate change will test the resiliency of systems in the region in the future

- *Sonoma Water’s Climate Adaptation Plan is a leading effort to improve understanding of climate change, identify and assess climate-related risks, and develop adaptation strategies to create more resilient systems*

FLOODING – Atmospheric Rivers Drive Flood Damages



County	AR proportion of insured losses	Claims	Insured losses ($m)	Total damages ($b)	AR damages ($b)
Sonoma, CA	**0.998**	**6650**	**172.0**	**5.2**	**5.2**

T. Corringham, 2018

WILDFIRES – North Coast is Highly Vulnerable to Wildfires

Top 20 Largest California Wildfires

	FIRE NAME (CAUSE)	DATE	COUNTY	ACRES	STRUCTURES	DEATHS
1	AUGUST COMPLEX *(Lightning)*	August 2020	Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake, & Colusa	1,032,648	935	1
2	DIXIE *(Under Investigation)**	July 2021	Butte, Plumas, Lassen, Shasta & Tehama	963,309	1,329	1
3	MENDOCINO COMPLEX *(Human Related)*	July 2018	Colusa, Lake, Mendocino & Glenn	459,123	280	1
4	SCU LIGHTNING COMPLEX *(Lightning)*	August 2020	Stanislaus, Santa Clara, Alameda, Contra Costa, & San Joaquin	396,624	222	0
5	CREEK *(Undetermined)*	September 2020	Fresno & Madera	379,895	853	0
6	LNU LIGHTNING COMPLEX *(Lightning/Arson)*	August 2020	Napa, Solano, Sonoma, Yolo, Lake, & Colusa	363,220	1,491	6
7	NORTH COMPLEX *(Lightning)*	August 2020	Butte, Plumas & Yuba	318,935	2,352	15
8	THOMAS *(Powerlines)*	December 2017	Ventura & Santa Barbara	281,893	1,063	2
9	CEDAR *(Human Related)*	October 2003	San Diego	273,246	2,820	15
10	RUSH *(Lightning)*	August 2012	Lassen	271,911 CA / 43,666 NV	0	0
11	RIM *(Human Related)*	August 2013	Tuolumne	257,314	112	0
12	ZACA *(Human Related)*	July 2007	Santa Barbara	240,207	1	0
13	CARR *(Human Related)*	July 2018	Shasta County & Trinity	229,651	1,614	8
14	MONUMENT *(Lightning)**	July 2021	Trinity	223,001	50	0
15	CALDOR *(Under Investigation)**	August 2021	Alpine, Amador, & El Dorado	221,775	1,003	1
16	MATILIJA *(Undetermined)*	September 1932	Ventura	220,000	0	0
17	RIVER COMPLEX *(Lightning)**	July 2021	Siskiyou & Trinity	198,685	122	0
18	WITCH *(Powerlines)*	October 2007	San Diego	197,990	1,650	2
19	KLAMATH THEATER COMPLEX *(Lightning)*	June 2008	Siskiyou	192,038	0	2
20	MARBLE CONE *(Lightning)*	July 1977	Monterey	177,866	0	0

There is no doubt that there were fires with significant acreage burned in years prior to 1932, but those records are less reliable, and this list is meant to give an overview of the large fires in more recent times.
This list does not include fire jurisdiction. These are the Top 20 regardless of whether they were state, federal, or local responsibility.
*Numbers not final.

10/6/2021

Examples of Sonoma Water's On-Going Efforts on Adaptation

- Partnering with Center for Western Weather and Water Extremes (CW3E), USGS, and NOAA for Climate Science
- Forecast Informed Reservoir Operations (FIRO)
- Advanced Quantitative Precipitation Information (AQPI)
- Fire Camera Alert System (AlertWildfire)
- NOAA Habitat Blueprint Adaptive Management and Restoration
- Local Hazard Mitigation Plan (LHMP)
- Climate Adaptation Plan (CAP)
- Water Supply Resiliency Study
- Central Sonoma Watershed Project Vulnerability Assessment
- Sonoma OneRain Network

Projected Climatic and Hydrologic Changes for the Region

Temperature

- Increases up to 1.3 – 3.1°C by mid-century
- Increased frequency of temperature extremes (days > 30°C or 86°F)

Sea Level Rise

- MSL increases by 0.1-0.6 m (0.3-2 ft) by mid-century
- Storm surge will cause additional increases

Precipitation

- Extreme precipitation increases (ARs) by 15%
- Increased winter, decreased summer precipitation (more variability)

Drought

- Increasing intensity of drought conditions
- Increasing frequency and duration of dry weather conditions

Wildfire

- More frequent and intense wildfires due to warmer temperatures and drier conditions
- Increase in probability of wildfires by 15-33%

River Flooding

- Potential increase in AR-driven floods on Russian River
- 100-year flood magnitudes could increase by 10-20%

System-Wide Vulnerability Assessment

Climate Threats

Temperature

Sea Level Rise

Precipitation

Drought

Wildfire

River Flooding

Systems

Water Supply

Flood Control

Sanitation

Vulnerability & Risk Assessment

Vulnerability =
Sensitivity x Adaptive Capacity

Risk =
Consequence x Likelihood

Consequence
- ❑ System Function
- ❑ Social
- ❑ Governance
- ❑ Financial

Likelihood
- ❑ Degree of confidence climate projections

Adaptive Capacity \ Sensitivity	Low = 1	Moderate/Low = 2	Moderate = 3	Moderate/High = 4	High = 5
Low = 1	L	M/L	H	H	H
Moderate/Low = 2	L	M	M/H	H	H
Moderate = 3	L	L	M	M	H
Moderate/High = 4	L	L	L	M	M
High = 5	L	L	L	L	M

Likelihood \ Consequence	Negligible = 1	Minor = 2	Moderate = 3	Major = 4	Severe = 5
Very Likely = 5	L	M	H	H	H
Likely = 4	L	M	M	H	H
Moderate = 3	L	L	M	M	H
Unlikely = 2	L	L	L	M	M
Very Unlikely = 1	L	L	L	L	M

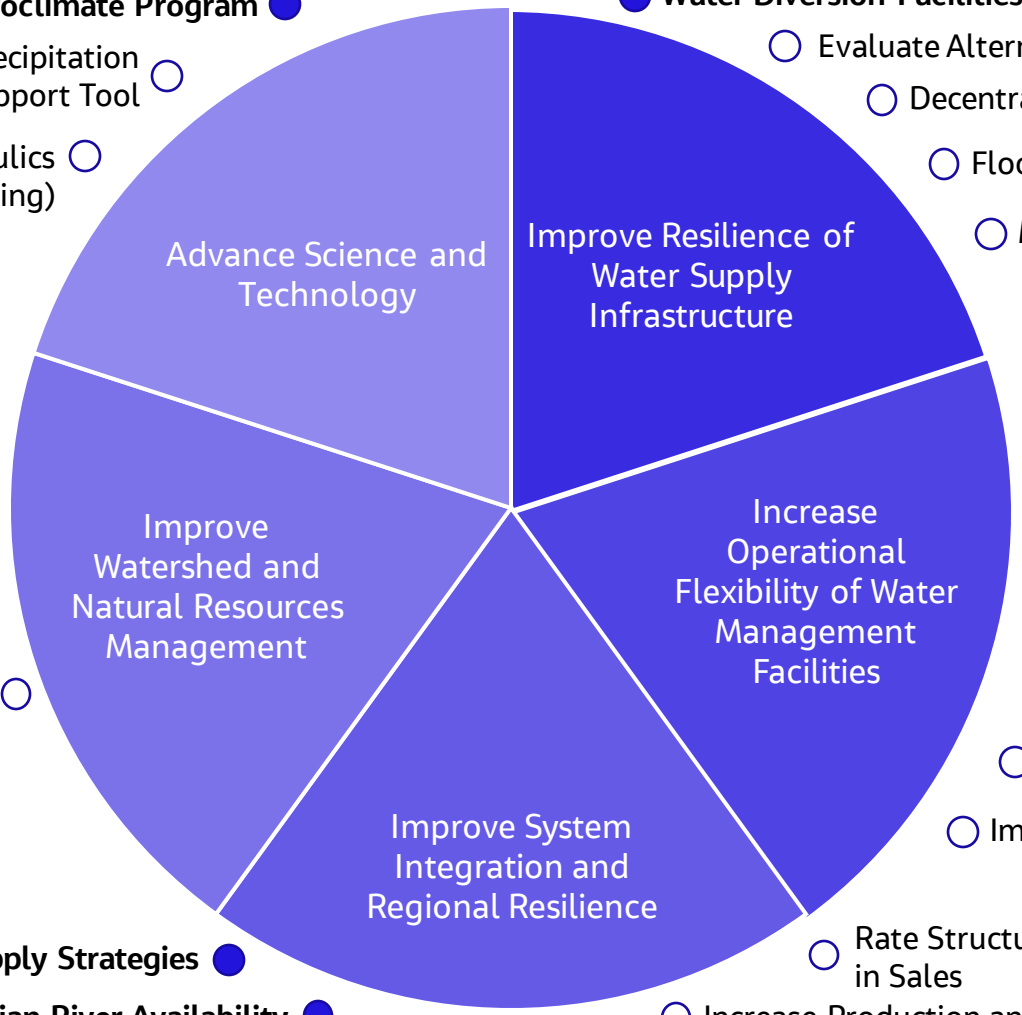
Low Risk
Special Case
Moderate Risk
High Risk

Major Vulnerabilities – Water Supply System

System Component	Temp	Sea Level Rise	Extreme Precip	River Flooding	Drought	Wildfire
Water Supply System						
Upper Russian River Supply (Watershed and Lake Mendocino)	M				H	M
Lake Sonoma	M				M	M
Mirabel Diversion Facilities				H	M	H
Wohler Diversion Facilities				H	M	H
Wohler Chlorination and Corrosion Control			M/H	M/H	M	M/H
Mirabel Chlorination and Corrosion Control			L	L		L
River Road Chlorination			M/H	H		
Ely Booster			H			
Kawana Booster			M			

H = high M = moderate L = low

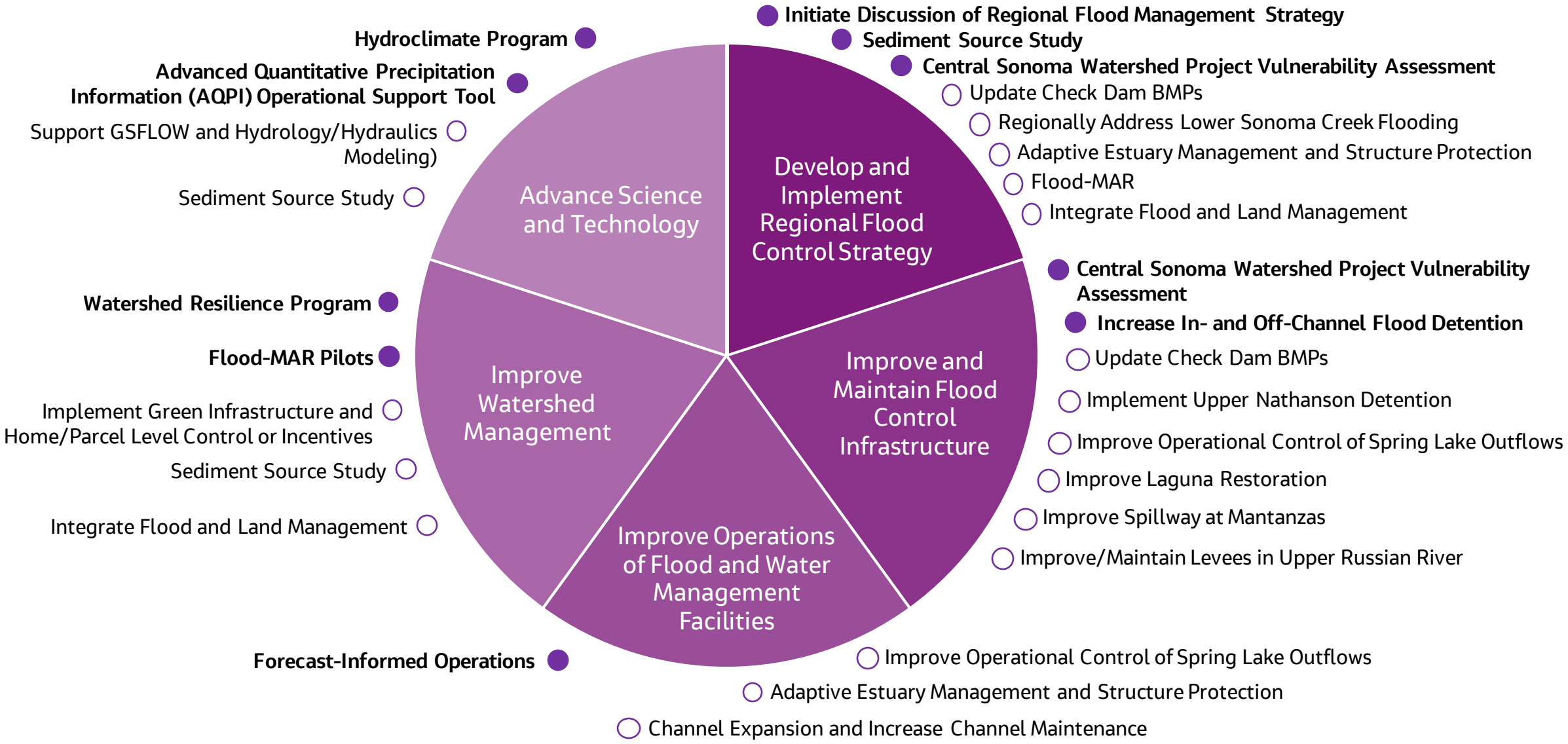
A Water Supply Portfolio to Achieve Adaptation Strategies



- **Hydroclimate Program** ●
- Advanced Quantitative Precipitation Information (AQPI) Operational Support Tool ○
- Support GSFLOW and Hydrology/Hydraulics Modeling) ○
- **Water Diversion Facilities Protection Program** ●
- Evaluate Alternative Russian River Water Treatment ○
- Decentralize Instrumentation and Controls ○
- Floodproof Ely Booster Station ○
- Mobile Supervisory Control Operations System ○
- **Forecast-Informed Reservoir Operations** ●
- Second Storage Tank at Kastania ○
- Increase Seasonal Source-Shifting or Transmission System Storage ○
- Operational Standby Power to Chlorination System ○
- Recommission Wilfred Booster ○
- Improve Lake Mendocino Variable Gates ○
- Improve Water Demand Management on Russian River ○
- **Watershed Resilience Program** ●
- **Increase Stormwater Detention and Recharge** ●
- Fish Flow Project (Modification of Decision 1610) ○
- Flood-MAR on Russian River (Alexander Valley) ○
- **Regional Water Supply Strategies** ●
- **Regional Conjunctive Use Based on Russian River Availability** ●
- Rate Structures to Adapt to Increased Variability and Volatility in Sales ○
- Increase Production and Use of Recycled Water ○
- Increase System Storage at Lake Stafford-Soulajule Reservoir ○
- Increase Groundwater Sources Along Aqueduct ○

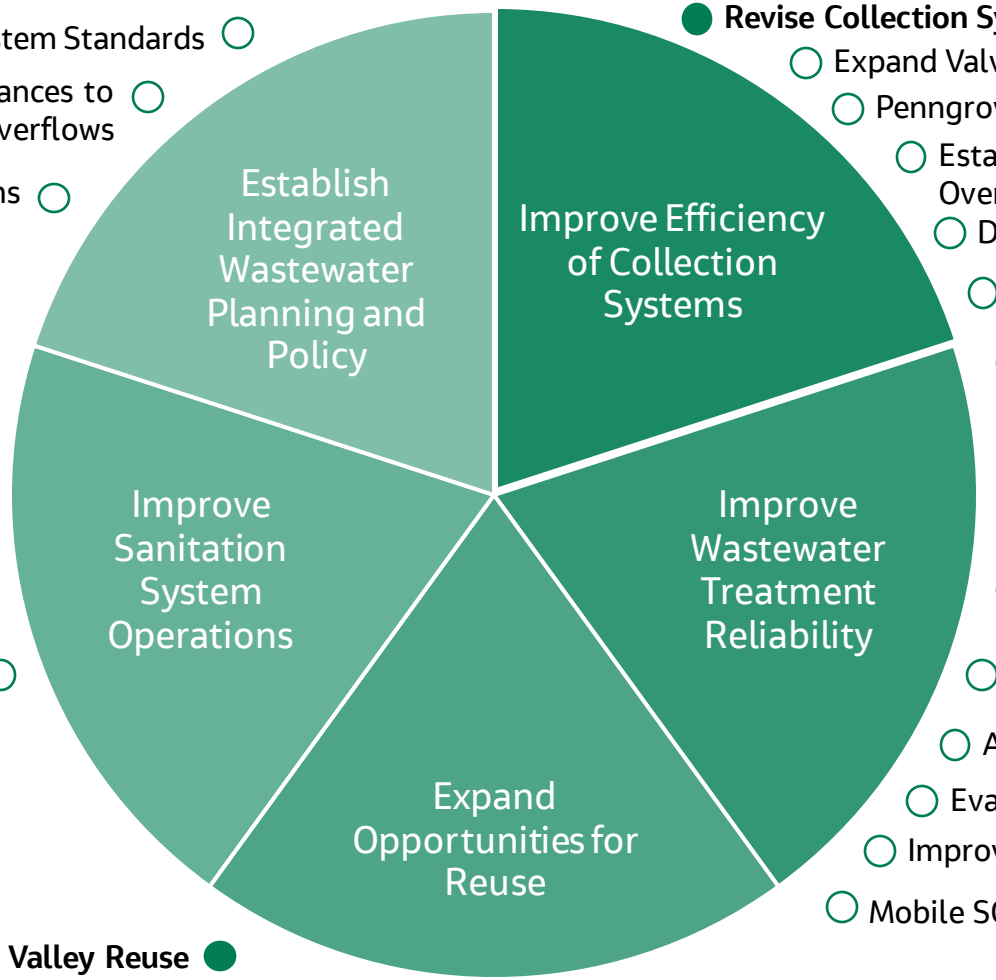
● **Anchor Project/Program**
○ Supporting Project

A Flood Management Portfolio to Achieve Adaptation Strategies



● **Anchor Project/Program**
○ Supporting Project

A Sanitation Portfolio to Achieve Adaptation Strategies



Establish Sanitation Level Planning ●
Revise Collection System Standards ○
Establish Property Partnerships and Ordinances to Reduce Overflows ○
Evaluate Post-Fire Impacts to Collection Systems ○

Inflow/Infiltration Monitoring and Reduction Program ●
Revise Collection System Design Standards ●
Expand Valving of Russian River Collection System ○
Penngrove Lift Station Flood Protection ○
Establish Property Partnerships and Ordinances to Reduce Overflows ○
Develop In- and Off-Line Collection System Storage ○
Evaluate Post-Fire Impacts on Collection Systems ○

Dynamic and Resilient SCADA ●
Improve Standard Operating Procedures (SOP) Development and Training ●
Inflow/Infiltration Reduction Program ○
Long-Term Solution for Occidental WWTP ○

Eliminate Sonoma Valley WWTP Constraints due to SLR ●
Increase Operable Capacity at Russian R WWTP ●
Improve or Adapt Operations of Reuse Supply Delivery to Water Management Units ○
Purchase Additional Land at RR WWTP for Summer Irrigation ○
Increase Flood Protection at Sonoma Valley WWTP ○
Address Localized Flooding at Airport WWTP ○
Evaluate Post-Fire Impacts on Collection Systems ○
Improve WWTP Road Access and Emergency Staffing ○
Mobile SCADA System ○

Expand Sonoma Valley Reuse ●
Identify Reuse Opportunities for all Districts ●
Improve or Adapt Operations of Reuse Supply Delivery to Water Management Units ○
Purchase Additional Land at RR WWTP for Summer Irrigation ○

● **Anchor Project/Program**
○ Supporting Project

Concepts Across Core Functions and/or External Agencies

- **Watershed Resilience Program**
  - Integrate multiple concepts that focus on healthy headwaters, hydrologic and sediment management, and land and vegetation management for flood attenuation, water quality benefits during extreme hydrologic and wildfire events
- **Water Diversion Facilities Protection Program**
  - Merge multiple Wohler and Mirabel concepts that seek to protect infrastructure and access during flood and wildfire risks
- **Regional Water Supply Strategies**
  - Utilize Resiliency Study to develop integrated water supply strategies that develop seasonal, annual, or interannual storage program (groundwater banking, source-shifting, transmission storage, etc)
- **Regional Flood Management Strategy**
  - Initiate discussions with appropriate responsible local and regional agencies for coordinated approach to create a regional flood management strategy
- **Hydroclimate Program**
  - Integrate efforts of climate, weather and hydrological measurement, data assimilation, prediction and modeling
- **Dynamic and Resilient Supervisory Control and Data Acquisition (SCADA) System**
  - Link various SCADA concepts together and identify opportunities to continue to build redundancy into master plan
- **Forecast-Informed Reservoir Operations**
  - Consolidate Lake Mendocino, Lake Sonoma, and Flood Control structures FIRO efforts into a combined program
- **Integrated Sanitation Level Planning**
  - Develop holistic multi-district level planning

Next Steps

- Obtain Board approval and support for recommendations in the Climate Adaptation Plan
- Prioritize and map the implementation pathway for each project within the recommended portfolios, including target program and enabling conditions
- Actively identify and pursue available funding sources and explore innovative resilience funds
- Build internal Sonoma Water structure to mainstream climate resilience within the organization
- Develop, engage, build, and expand partnerships with federal, state, regional, local entities, Tribes, and community groups
- Establish a robust monitoring plan and timeline for updating the Climate Adaptation Plan

Questions?

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