

Appendix D

Adaptation Strategies and Actions



Appendix D. Adaptation Strategies and Actions

D.1 Adaptation Concepts Received from Watershed Network

This appendix provides a listing of the adaptation concepts that were provided by Watershed Network participants. Network members were provided with a summary of the climate-related vulnerabilities for water resource sectors throughout the watershed and were asked to provide input through an online GIS mapping tool. Table D-1 lists the raw input provided by the Network participants which formed the basis for the development of adaptation strategies and actions.

Appendix H describes recent modeling evaluating Lake Mendocino and Lake Sonoma FIRO under future climate projections.

Table D-1. Adaptation Concepts Received from the Watershed Network

ID	Water Resource Category	Adaptation Strategy Type	Component or Location	Adaptation Concept	Concept Description
1	Ecosystems	Watershed and Floodplain Management	Hanson Pits	Hanson Pits Floodplain Restoration	restore floodplain by removing levees and filling pits. Many other ecosystem and water quality benefits
2	Ecosystems	Watershed and Floodplain Management	Russian River near Syar Pits	Remove or Setback Levees at Syar Pits	Remove levees and restore floodplain. Many other benefits for ecosystem and water quality.
3	Ecosystems	Watershed and Floodplain Management	Jenner	Adapting Estuary Resilience to Future Conditions	Need for planning for increased flooding related to sea level rise, river flows, and estuary bar management
4	Ecosystems	Watershed and Floodplain Management	Mark West Creek	Protect Instream Flows in Critical Coho Watersheds	Need for land use policy that is protective of instream flows in critical Coho rearing habitat subwatersheds
5	Ecosystems	Watershed and Floodplain Management		Atascadero Creek Stream Channel Sediment Removal	A wetland study and concept design impacts assessment is currently underway to determine strategies for improving water quality, fish passage, and wetland habitat enhancement opportunities through sediment removal from the adjacent Atascadero Creek stream channel and strategic removal of berms.
6	Ecosystems	Watershed and Floodplain Management	Mark West Creek	Mark West Project Concept	Fund implementation of the restoration project concepts in the Laguna Restoration Plan. Shown here: Mark West Project Concept - realign Mark West Creek, expand riparian/forested wetland habitat

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7	Ecosystems	Ecosystem Management	Laguna de Santa Rosa	Ballard Lake Project Concept	Fund implementation of the restoration project concepts in the Laguna Restoration Plan. Shown here: Ballard Lake Project Concept - restore Ballard Lake and valley freshwater marsh habitat
12	Ecosystems	Watershed and Floodplain Management	Laguna de Santa Rosa	Occidental-Guerneville Road Project Concept	Fund implementation of the restoration project concepts in the Laguna Restoration Plan. Shown here: Occidental-Guerneville Road Project Concept - reconfigure the Laguna mainstem and reintroduce valley freshwater marsh habitat
14	Ecosystems	Ecosystem Management	Laguna de Santa Rosa	Lake Jonive Project Concept	Fund implementation of the restoration project concepts in the Laguna Restoration Plan. Shown here: Lake Jonive Project Concept - dredge Lake Jonive to historical depths, expand forested riparian buffer, expand wet meadow
15	Ecosystems	Ecosystem Management	Laguna de Santa Rosa	Hwy 12 - WWTP Project Concept	Fund implementation of the restoration project concepts in the Laguna Restoration Plan. Shown here: Hwy 12 - WWTP Project Concept - expand wet meadow habitat, enhance existing habitats
16	Ecosystems	Ecosystem Management	Laguna de Santa Rosa	Bellevue-Wildred Project Concept	Fund implementation of the restoration project concepts in the Laguna Restoration Plan. Shown here: Bellevue-Wildred Project Concept - expand wet meadow habitat, restore historical water features
17	Ecosystems	Watershed and Floodplain Management	Green Valley, Atascadero, and Dutch Bill Creeks	Restoration Projects in Green Valley, Atascadero, and Dutch Bill Creeks	Fund implementation of high priority in-stream, flow augmentation, and water quality projects identified in the Flow Availability Analysis for Restoration Planning, Green Valley, Atascadero, and Dutch Bill Creeks

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18	Ecosystems	Ecosystem Management	East Austin, Pena, Mill, and Redwood Creek Watersheds	Restoration Projects in East Austin, Pena, Mill, and Redwood Creek Watersheds	Fund implementation of high priority in-stream and off-channel projects in the Salmonid Rearing Habitat Delineation and Restoration Prioritization: East Austin, Pena, Mill, and Redwood Creek Watersheds
19	Ecosystems	Ecosystem Management	Mark West Creek middle to upper watershed	Middle to Upper Mark West Watershed Processes Enhancement	Upper watershed process based restoration to slow and spread stormwater in tributaries to Mark West Creek. Reduce well water usage in the summer to increase instream flows.
23	Ecosystems	Reservoir and River System Operations	Mirabel Dam, Russian River	Alternatives to Mirabel Inflatable Dam	Since data collected during multiple years of the acoustic telemetry survival study show outmigrating Coho Salmon are negatively affected by Mirabel Dam, especially during drought years, we recommend Sonoma Water explore and develop alternative methods for meeting water supply responsibilities that don't impact flows during smolt outmigration.
25	Ecosystems	Ecosystem Management	Dutch Bill Creek	Create Secondary Channels on Dutch Bill Creek	Create secondary channels to improve fishery habitat
26	Ecosystems	Ecosystem Management	Dutch Bill Creek	Restore Incised Tributary Streams to Dutch Bill Creek	Restore incised tributary streams to Dutch Bill Creek to improve water quantity and quality

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28	Ecosystems	Watershed and Floodplain Management	Crane Creek Regional Park	Crane Creek Restoration	Creek restoration and floodplain reconnection to slow and spread high flow stormwater.
29	Ecosystems	Watershed and Floodplain Management	Multiple locations within Laguna de Santa Rosa floodplain	Laguna de Santa Rosa Restoration	Implement the Restoration project concepts in the Laguna's 100-year floodplain described in the Restoration Plan for the Laguna de Santa Rosa. These restoration projects address multiple water resource categories in addition to ecosystems, including flood management, groundwater supply, and water quality. See: https://www.sfei.org/documents/restoration-plan-laguna-de-santa-rosa
30	Ecosystems	Policy and Regulations	Applies to entire Russian River watershed.	Implement the North Coast Water Board's Policy in Support of Restoration	Implement the North Coast Water Board's Policy in Support of Restoration. Addresses multiple adaptation strategy types including ecosystem management. See: https://waterboards.ca.gov/northcoast/water_issues/programs/Restoration/
31	Ecosystems	Science and Technology	Applies to entire watershed	Identify Locations of Russian River Thermal Refugia	Conduct geospatial and field monitoring assessment to identify locations within the Russian River watershed that provide thermal refugia (e.g. deep pools, tributary mouths, etc) to salmonids and other aquatic life. Subsequently establish protections of these locations using tools such as conservation easements and/or designating the waterbody as an Outstanding National Resource Water.

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32	Ecosystems	Land Management	Applies watershed wide	Watershed Fuels Management (CA Wildfire and Forest Resilience Action Plan)	Fuels management to minimize catastrophic wildfire; implement CA Wildfire and Forest Resilience Action Plan. Fuels management also has a role in managing watershed hydrology (e.g. younger age class stands tend to have higher ET compared to older age class of vegetation). Addresses multiple water resource categories, including water quality. See: https://wildfiretaskforce.org/the-plan/
33	Ecosystems	Watershed and Floodplain Management	Could apply watershed wide	Develop Land/Waterways Acquisition Program	Develop a land/waterways acquisition and protection program to provide the space/area needed for ecosystems to adjust in response to changed watershed conditions. This strategy could include zoning modifications to accommodate the space needed for waterways to migrate in response to changed hydrology. The program would focus on places subject to environmental degradation and lost productivity; and the acquisition and management would allow for recovery in response to climatic impacts.
34	Ecosystems	Watershed and Floodplain Management	Hillside/Upper watershed locations	Low-Tech Process-Based Restoration Techniques	Implement low-tech process-based restoration techniques such as "gully stuffing", designed to arrest erosion, recharge groundwater, and protect/restore ecosystem functions. See: https://oaec.org/our-work/wildlands/fuels-to-flows/what-is-process-based-restoration/
35	Ecosystems	Watershed and Floodplain Management	Lower Alexander Valley reach of RR	Conceptual Restoration Design for the Lower Alexander Valley Reach of the Russian River	Implement channel / floodplain restoration projects presented in the report Conceptual Restoration Design for the Lower Alexander Valley Reach of the Russian River prepared by FlowWest for Dry Creek Rancheria. The restoration designs address multiple resource categories and adaptation strategy types.

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36	Ecosystems	Reservoir and River System Operations	Ukiah Valley to Knights Valley reach	Evaluate Upper Russian River Flow Impacts on Upper Russian River Channel Degradation	Ameliorate effects of channel degradation in upper Russian River from reservoir operations. Impacts include loss of groundwater storage, which affects dry season baseline flow (requires additional reservoir releases), and bank instability which affects riparian health, ag land, and creates excess sedimentation. Solutions may include may involve use of winter flows for groundwater recharge, BDAs to slow flow, increase recharge, and reduce erosion.
37	Ecosystems	Emergency Management	Watershed wide	Post-Fire Remediation Actions	Develop coordinated plan/strategy for post-fire remediation actions necessary to minimize water quality impacts from fire suppression activities; e.g. establishing a mechanism to track where fire suppression activities (such as fire breaks) that could impact water quality were implemented and a program with funding to remediate those sites to prevent erosion or pollutant discharge; applies to wildland and urban fires. Arguably such a program/strategy is needed throughout the state. There are likely examples of such a program in place in certain areas. CNRA and CalEPA agencies could co-create such a program.
38	Ecosystems	Ecosystem Management	Russian River mouth and estuary	Estuary Management under Future Conditions	Breaching of the Russian River sand bar can negatively affect fisheries, we recommend alternative methods be explored, developed, and implemented for estuary management, including the relocation of infrastructure (buildings and sections of Highway 1) to allow greater flexibility in estuary management. This will also provide greater community resilience in the face of sea level rise.

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39	Ecosystems	Policy and Regulations	Watershed Wide	Develop Water Policies to Account for all Water Uses	Work with government agencies, especially the State Water Resources Control Board, Tribal interests, and other stakeholders to develop binding water management policies that comprehensively address all water sources (i.e. surface and groundwater) and all water uses to establish firm accountability between water users and ecological needs, regardless of their basis in right. Lower RR tribs often dry in the summer, stranding and killing endangered coho.
40	Ecosystems	Reservoir and River System Operations	Dry Creek	Continue to Evaluate Dam Releases on Dry Creek Restoration Structures	Continue to evaluate dam releases and existing restoration structures in Dry Creek to provide better rearing habitat and establish process-based restoration.
41	Ecosystems	Reservoir and River System Operations	Russian River mainstem	Continue to Evaluate Minimum Instream Flows on Russian River	Continue to evaluate minimum flow requirements (eg. D1610) in the mainstem river to better address contemporary understanding of salmonid flow-dependent habitat requirements and the influence of elevated summer flows on predator populations.
42	Ecosystems	Ecosystem Management	Russian River jetty at mouth	Estuary Management under Future Conditions	Continue to explore jetty removal options at the mouth of the river given the broader concerns associated with climate change adaptation (as opposed to the more limited scope of earlier feasibility analyses). May increase the resiliency of river processes to a changing climate by restoring natural processes and reducing the need for artificial breaching of the estuary mouth.

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43	Ecosystems	Watershed and Floodplain Management	Russian River mainstem and tributaries banks	Managed Retreat for Floodplain Restoration (Riparian Conservation Program)	The expression of biodiversity in stream systems depends on the underlying habitat conditions and the interaction of hydrology and both geomorphic and riparian elements. This natural process requires space to operate. Most stream channels in the basin are constrained to some degree by various forms of land development (e.g. agricultural, rural residential, etc.). A managed retreat of existing developments from stream reaches that are critical to the recovery of essential processes should be developed and implemented. SC Ag + Open Space Riparian Conservation Program is available for interested landowners.
44	Ecosystems	Operations, Maintenance, Repair, Rehabilitation	Green Valley Rd crossing	Elevate Green Valley Road Crossing	Address flooding and restore overwinter rearing habitat for juvenile salmonids by exploring alternatives such as replacing the existing bridge at Green Valley Road with an elevated causeway that allows for lateral movement of flood flows and sediment, and remove downstream levees and pursue multi-use of adjacent vineyard, i.e. seasonal flooding of vineyards to allow fish to access the floodplain. Also address Atascadero sediment plug and "Lake Graton" issues.
45	Ecosystems	Ecosystem Management	Green Valley and other incised streams	Reverse Incision on Green Valley Creek and other Incised Tributaries	Arrest then reverse incision in Green Valley Creek and other incised tributaries by building habitat structures that promote channel aggradation (without impairing fish passage), creating inset floodplains, allowing stream to meander.
46	Ecosystems	Ecosystem Management	Willow Creek	Reintroduce Beaver on Willow Creek	Explore reintroducing beaver

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47	Ecosystems	Watershed and Floodplain Management	Hansons Pits and Syer Pits	Implement Hanson Pits and Sya Pits Project	Implement the Hanson Pits Project and apply similar methods to other gravel mining pits (Sya Pits) to restore flood plain and wetland habitat by filling the pits with levee and overburden material thus restoring the floodplain
48	Ecosystems	Ecosystem Management	RR watershed wide especially riparian areas	Develop BMPs including Cultural Spot Burns for Using Fire to Improve Habitat in Riparian Zones	Encourage more frequent, low intensity fires and progressive forest management. Develop best management practices for using fire to improve habitat in riparian zones. Work with Tribes to promote cultural "spot" burns.
49	Ecosystems	Ecosystem Management	RR watershed wide	Integrated Existing Planning Documents into Adaptation Strategies	Search, review, synthesize, and integrate existing planning documents into adaptation strategies.
50	Ecosystems	Operations, Maintenance, Repair, Rehabilitation	RR watershed wide non-Caltrans roads and facilities	Incentives for Fish Passage at Government-Owned Facilities	Provide county and city incentives or directives for local agencies to systematically evaluate fish passage at government owned facilities, primarily roads, and then implement barrier removal projects at these sites. Providing access to more and better habitat increases resilience.
51	Ecosystems	Watershed and Floodplain Management	RR watershed wide	Broad-scale Floodplain Connectivity and Restoration Projects	Encourage broad scale floodplain connectivity and restoration projects throughout the watershed similar to the projects implemented in Green Valley Creek and Atascadero Creek by Gold Ridge RCD.

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52	Ecosystems	Watershed and Floodplain Management	Various places in the RR watershed	Landscape-scale Floodplain Habitat Restoration Hanson Ponds, Laguna de Santa Rosa, Mill Creek-Dry Creek, Mirabel-Wohler	Implement landscape scale flood plain habitat restoration at Hanson Ponds (River Park), Laguna de Santa Rosa, Mill Creek – Dry Creek confluence terrace pits, Mirabel – Wohler facility terrace pits.
53	Ecosystems	Ecosystem Management	RR watershed wide	Outreach to Support Preservation of Riparian Vegetation Buffer	Elevate outreach and clever marketing campaigns that support importance of the preservation of riparian vegetation buffer to keep development and intensive vegetation management at least 100 feet away from the stream channel.
54	Ecosystems	Ecosystem Management	RR watershed wide	Reintroduce Large Wood Recruitment Processes	Reintroduce the large wood recruitment process in streams by encouraging range- wide large wood habitat projects and tree planting.
55	Ecosystems	Science and Technology		Continue Research and Training for Vegetation Management Practices	Continued research into and training for implementing vegetation management practices aimed at achieving multiple ecosystem benefits (increasing forest health and resilience, reducing wildfire risk, increasing water supply through lower ET); Partners include Pepperwood Preserve, Occidental Arts & Ecology Center

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56	Ecosystems	Policy and Regulations	Russian River Tributaries	Holistic Consideration of Tributaries and River	all tribs need to be considered holistically and not in isolation of the rest of the river. the watershed is interconnected and it is detrimental to our ecosystems and communities to treat otherwise.
57	Ecosystems	Land Management	The entire City of Santa Rosa	Implement City of Santa Rosa City-wide Creek Master Plan	The City of Santa Rosa has a City-wide Creek Masterplan that outlines restoration actions, enhancement activities, fish passage projects, and recreation opportunities. The plan is located: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.srcity.org/DocumentCenter/View/13792/Santa-Rosa-Citywide-Creek-Master-Plan-PDF
58	Ecosystems	Water Management Infrastructure	Streamflow Augmentation	Augment Streamflow of Green Valley Creek	Explore potential to augment streamflow of Green Valley Creek with water from Russian River (similar to DBC augmentation). Consider installation of pipelines for this purpose when installing other recycled water, wastewater, or recycled water lines for cost savings and future use.
59	Ecosystems	Watershed and Floodplain Management	Green Valley Creek	Widen Green Valley Road Bridge	wider bridge, managed retreat or buyout of vineyard to restore channel capacity lost of ag development
60	Ecosystems	Watershed and Floodplain Management	Russian River at River Road	Relocate River Road near Geyserville	River being blamed for eroding road but far less expensive to move road and stop impacting river and habitat. Road location is the problem not the river

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61	Ecosystems	Ecosystem Management	Dutch Bill, Green Valley, Mill, and Mark West Creeks (SLT Conservation priority subwatersheds)	Conserve and Increase Upland and Riparian Habitat in Dutch Bill, Green Valley, Mill, and Mark West Creeks	Conserve and increase the amount of water that travels to priority stream reaches by protecting high-quality instream, riparian and upland habitat, including zones of high groundwater recharge through conservation actions identified in Sonoma Land Trust's Russian River Subwatershed Conservation Assessment.
62	Ecosystems	Ecosystem Management	Dutch Bill, Green Valley, Mill, and Mark West Creeks (SLT Conservation priority subwatersheds)	Acquire and Protect Properties in Key Locations for Fish Habitat	Acquire and protect properties to remove high water uses (eg agriculture) in key locations for fish and flow.
63	Ecosystems	Ecosystem Management	Dutch Bill, Green Valley, Mill, and Mark West Creeks (SLT Conservation priority subwatersheds)	Protect Undeveloped Floodplains	Protect undeveloped floodplains, terraces and areas of high groundwater recharge with easements to prevent conversion to water-intensive uses.

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64	Ecosystems	Ecosystem Management	Dutch Bill, Green Valley, Mill, and Mark West Creeks (SLT Conservation priority subwatersheds)	Restore Floodplains for Habitat	Restore floodplains to connect with the stream and create off-channel habitat. Provide space for waterways to migrate and minimize damage to human infrastructure through fee acquisition, conservation/riparian easements, restoration, and/or zoning changes
65	Ecosystems	Ecosystem Management	Dutch Bill, Green Valley, Mill, and Mark West Creeks (SLT Conservation priority subwatersheds)	Enhance Water Flows in Key Stream Systems by Securing Water Rights	Enhance water flows in stream systems by securing water rights and developing off stream storage of winter water.
66	Ecosystems	Ecosystem Management	Dutch Bill, Green Valley, Mill, and Mark West Creeks (SLT Conservation priority subwatersheds)	Wider Restoration of Hydrologic Function and Ecosystem Processes	Wider implementation of processed based restoration to restore hydrologic function and ecosystem processes.

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67	Ecosystems	Ecosystem Management	Tributary mouths	Address Disconnection of Tributary Mouths from Mainstem Russian River	Address the disconnection of tributary mouths from the mainstem Russian River. Thinking about mainstem incision and history of gravel mining in the mainstem. Restoration projects to allow for a more suitable tributary mouth? And address incision in the higher tributaries.
68	Ecosystems	Watershed and Floodplain Management	Uplands	Advanced Planning of Wildfire Resilience and Post-Fire Management	Include CDFW in advanced planning for wildfire restoration and resilience. Post-fire management concerns (eg. environmental cleanup, values at risk and environmental impacts in regard to salvage logging. Also, invasive plants and forest succession.
69	Ecosystems	Ecosystem Management	Copeland Creek at SSU's Fairfield Osborn Preserve	Copeland Creek Restoration	Creek restoration through woody debris management to remove problematic woody debris and encourage presence of beneficial woody debris, replacement of invasive species with natives that will stabilize banks
70	Ecosystems	Watershed and Floodplain Management	Full watershed	Establish Cross-Sector Watershed Visioning Process	Establish a cross-sector (including the broader community and youth) watershed visioning process and holistic watershed-scale planning. This should help support trust-building, prioritize alignment for more focus given limited resource dollars, and attract greater funding to the watershed.
71	Ecosystems	Watershed and Floodplain Management	Full watershed	Encourage Collaboration and Organization Alignment	Encourage collaboration and organizational alignment to focus resources on the highest need for conservation and restoration. Synthesize across existing planning documents, fill research gaps where needed, and organize to increase the visibility of the watershed as a model watershed for the state (and seek funding).

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72	Ecosystems	Watershed and Floodplain Management	Mainstem and valley floor tributaries	Explore Opportunities for Multi-Benefit Floodplain Reconnections	Explore opportunities for multi-benefit floodplain reconnections (giving space via various mechanisms - see SLT comment). Consider both the flow and landscape modification management knobs (using modeling, including for habitat suitability) to support physical and ecological processes.
73	Ecosystems	Policy and Regulations	Tributaries	Expand Watershed Models	Expand existing models in the watershed of flow augmentation programs
74	Ecosystems	Ecosystem Management	Tributary confluences	Restoration and Enhancement at Tributary Confluences	Focus on restoration and enhancement at tributary confluences (to address challenges with flow disconnection and create opportunities for nodes of complexity and dynamics)
75	Ecosystems	Ecosystem Management	Freshwater wetlands	Freshwater Wetland Restoration and Conservation	Freshwater wetland restoration and conservation across the watershed
76	Ecosystems	Land Management	Headwaters	Headwater Restoration	Restoration in headwaters - managing for slow release (echo comment regarding low-tech "gully stuffing")
77	Ecosystems	Ecosystem Management	Full watershed	Support Ecological and Habitat Redundancy in Watershed	Support ecological and habitat redundancy in watershed - look for opportunities, including protecting high quality habitats

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78	Ecosystems	Policy and Regulations	Urban areas	Address Water Quality and Riparian Habitat Degradation due to Unhoused Population	Address water quality and riparian habitat degradation due to unhoused population - intertwined with equity concerns and requires holistic approach
79	Ecosystems	Reservoir and River System Operations	East Fork Russian River (elsewhere too)	Channel Geomorphology and Process Restoration Opportunities	Like elsewhere on mainstem and valley reaches of tributaries, address channel incision affecting groundwater levels, bank instability, and stream and riparian ecosystem health. Consider channel geomorphology and process restoration opportunities. Involve landowners. This also relates to other water resource categories.
80	Ecosystems	Watershed and Floodplain Management	Full watershed	Monitoring for Big Questions and Status and Trends	Monitoring: Develop the hypothesis and needed data to address big questions and assess status and trends. Align and standardize to leverage existing resources. (Agree with other recommendation to fund the Russian River Regional Monitoring Program). Relates to other water resource categories.
81	Ecosystems	Science and Technology	full watershed	Improve Understanding of Factors Affecting Water Temperature	Better understand spatial and temporal variability of and factors (e.g., shading, groundwater, water use, flow augmentation, geomorphology) affecting water temperature
82	Ecosystems	Water Quality Management	Urban reaches	Expand Testing for Current Water Quality Stressors	Expand testing for and understanding current stressors such as toxins, including CECs like 6PPD-quinone

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83	Ecosystems	Science and Technology	Full watershed	Advanced Monitoring Techniques to Inform Modeling and Drought/Flood Responses	Data/information advances: Real-time and high-freq data to inform modeling and drought/flood response. Advance monitoring techniques (e.g., remote sensing condition assessments, streamflow gaging, eDNA). Apply open and FAIR (Findable, Accessible, Interoperable and Reusable) software and data principles.
84	Ecosystems	Watershed and Floodplain Management	Full watershed	Improve Modeling of Riparian, Floodplain, and Flood Dynamics	Improve modeling (informed by monitoring): e.g., shading/riparian, wet/dry (statistical), and hydrodynamic (for river-floodplain and flooding dynamics). This addresses multiple water resource categories.
85	Ecosystems	Watershed and Floodplain Management	full watershed	Understand and Document Legacy of Change on the River and Watershed	Understand and document (synthesizing across the existing research) the legacy of change on the river and across the watershed that affects overall resilience to current and future change. This could include conducting historical ecology and land use history research to fill gaps.
86	Ecosystems	Policy and Regulations	full watershed	Establish Resources and Education for Landowners for Grants and Permitting	Establish resources and education for landowners, ideally with financial incentives. Support landowners and under resourced entities in grants and permitting. This could be through existing information channels (e.g., RCDs, UC Cooperative Extension), as well as watershed networking and subwatershed collaboratives.

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87	Ecosystems	Watershed and Floodplain Management	full watershed	Improve Science Communication	Dedicate efforts toward science communication
88	Ecosystems	Watershed and Floodplain Management	Potter Valley	Create Supportive Processes for Potter Valley To Transition with Changing PVP	Create supportive processes for Potter Valley to transition effectively with changing Potter Valley Project with minimal environmental degradation and financial losses, and encouraging adaptation measures to address reliability (e.g., community & landowner involvement, off-stream storage and upstream slowing and spreading opportunities, foresight via modeling of altered practices, cutting the green tape permitting, etc.). This addresses other water resource categories.
89	Ecosystems	Policy and Regulations	Riparian areas	Map and Protect Riparian Corridors	Riparian corridor protections and improved mapping, coupled with education, engagement and incentives for landowners
90	Ecosystems	Watershed and Floodplain Management	full watershed	Work with Tribes and Build in Traditional Ecological Knowledge	Work with Tribes and build in Traditional Ecological Knowledge
91	Ecosystems	Ecosystem Management	Dutch Bill Creek	Improve Fish Passage on Dutch Bill Creek	Improve fish passage by removing/repairing aging infrastructure like fish ladder

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92	Ecosystems	Ecosystem Management	Dutch Bill Creek	Install More Large Wood Instream Habitat in Dutch Bill Creek	Install more large wood instream habitat structures
93	Ecosystems	Ecosystem Management	Green Valley Creek and Purrington Creek	Mapping and Treatment of Japanese Knotweed in Purrington and Green Valley Creeks	Highly invasive noxious weed Japanese knotweed is spreading rapidly in Purrington Creek and Green Valley Creek. It can reduce riparian habitat quality, exacerbate bank erosion, and damage infrastructure - kick off outreach, mapping, and treatment effort to prevent further spread in critical coho salmon habitat
94	Ecosystems	Watershed and Floodplain Management	Watershed wide	Wildfire Resilience	Since the 2017 fires, Sonoma Water has completed several key activities related to wildfire resilience. Those activities include: installing fire cameras at strategic locations in the watershed and transferring ownership and maintenance to Pacific Gas & Electric (PG&E); establishing a consistent maintenance protocol for defensible space at critical facilities; expanding a long-standing research partnership with Lawrence Berkeley National Labs (LBNL) to study the downstream impacts of wildfires on water quality in the Russian River and the riverbank filtration system; and creating the Sonoma County Wildfire Resilience Planner which leverages recent advances in spatial data products and decision science to support landscape-scale prioritization of vegetation management activities to protect valued assets. Sonoma Water continues to play a key role in the development of regional and County partnerships to improve wildfire resilience for the community. Additional work is needed to identify critical watersheds and lands that present a high fire risk and a high likelihood to impact Sonoma Water's

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					operations through post-fire degradation of water quality (sediment, carbon, contaminants) and potential geohazards. This prioritization framework would then be used to focus Sonoma Water's resources on management in high priority locations that would reduce fire risk, improve the health of watersheds, and reduce risk to the region's water supply or flood management systems.
95	Ecosystems	Watershed and Floodplain Management		Adaptive Estuary Management and Structure Protection (Zone 5A)	The management of the Russian River Estuary is sensitive to climate change, as sea level rise will increase wave energy at the beach and change flood risk to low-lying properties along the estuary and lower Russian River. Evaluate opportunities to respond to flood risk from sea level rise in Jenner and the Russian River estuary with and without a barrier beach in place (river mouth closed). Develop focused study to determine a set of beach management, structure protection and salmonid habitat protection actions to adaptively and effectively manage the Russian River Estuary. Low lying areas, including State Parks visitor's center and public boat launch, USPS office, California Hwy 1, and homes and businesses are at risk to flooding when the river mouth is closed and forecasting shows that these areas are subject to a combined flood risk from sea level rise, coastal storms, and open or closed river mouth conditions. Increased Russian River flood flows are also anticipated to increase leading to inland stressors. Sonoma Water should anticipate the inland migration of the ocean-riverine influence and subsequent inland movement of region of sediment deposition, barrier beach, and lagoon.

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96	Ecosystems	Watershed and Floodplain Management	Atascader Creek	Widen Atascadero Creek to Improve Habitat and Sediment Transport	widen creek to improve habitat and sediment transport efficiency
97	Ecosystems	Watershed and Floodplain Management	Copeland Creek on SSU Campus	Copeland Creek Streambed Revitalization Project	Stream bed revitalization project increase groundwater recharge, manage sediment, increase flood protection, increase ecological function, create refugia for listed species; Main components could include stream bed widening and creation of plunge pools
98	Ecosystems	Water Management Infrastructure	Watershed wide	Watershed Actions to Optimize Instream Flows	Suite of actions aimed at optimizing instream flows; e.g. flow augmentation projects, off-stream storage, rooftop capture / rain gardens, as well as water-sharing programs.
99	Ecosystems	Policy and Regulations	RR watershed wide	Incentives to Transition Off Riparian Diversions or Near-Stream Wells	In order to improve surface flows and instream habitat conditions, implement incentives and regulations to transition water supplies off riparian diversions or near stream wells. Example regulations could require new development, reconstruction, or remodeling to use municipal or other water sources that are not onstream diversions or near stream wells.

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100	Ecosystems	Ecosystem Management	RR watershed wide	Evaluation Criteria for Prioritizing Purchases of Lands for Open Space or Habitat Connectivity	Develop evaluation criteria for prioritizing purchase of lands for open space or habitat connectivity. Identify, then prioritize individual parcels that use surface water diversions or near stream wells for a water source. Prioritization will allow organizations or agencies to move quickly and work with owners to voluntarily purchase lands expressly for improving instream flow by eliminating the diversions or development that relies on diversions or near stream wells.
101	Ecosystems	Watershed and Floodplain Management	Watershed wide	Upland Meadow Creation and Restoration	Upland Meadow creation and restoration, Process Based Restoration (PBR) of Beaver Dam Analog, (BDA) for upland ground water infiltration.
102	Ecosystems	Watershed and Floodplain Management	Watershed wide	Technical and Financial Assistance for Regenerative Programs	The scaling of climate-smart practices as a sustained investment in regenerative programs that offer both technical and financial assistance to producers, publicly held lands, tribes, forest and water managers, and our broader community.
103	Ecosystems	Programmatic, or Project-Specific Permitting	Watershed wide	Regional Permitting and Regulatory Reforms to Simplify and Accelerate Approvals	Advocate and provide resources for regional permitting and regulatory reforms that simplify and accelerate the approval process, enabling timely and efficient implementation of on-the-ground conservation projects.

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104	Ecosystems	Watershed and Floodplain Management	Watershed wide	Community Wildfire Protection Plan Development and Implementation	Community Wildfire Protection Plan (CWPP) development and implementation
105	Ecosystems	Watershed and Floodplain Management	Watershed wide	Landscape Scale CEQA-Certified Vegetation Treatment Programs for Wildfire Resilience	Landscape scale CEQA certified VTP for fire safety throughout the watershed and watersheds that impact the Russian River Watershed.
107	Ecosystems	Watershed and Floodplain Management	Watershed wide	Post Fire Watershed-Recovery vegetation Treatment Programs sediment Wildfire Resilience	Post fire watershed recovery and sediment reduction
108	Ecosystems	Watershed and Floodplain Management	Watershed wide	Invasive Weed Management for Fire Affected Communities	Invasive weed management for fire affected properties

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109	Ecosystems	Watershed and Floodplain Management	Watershed wide	Management and Recognition of Russian River BioRegion and Forest Management	The bioregion extends beyond the Russian River watershed to the coast where the existence of vibrant forest effect the transportation of water via evapotranspiration of water to the Russian River Bioregion,
110	Ecosystems	Watershed and Floodplain Management	Watershed wide	Forest Rehabilitation and Carbon Sequestration	Rehabilitation, carbon sequestration,
111	Ecosystems	Watershed and Floodplain Management	Watershed wide	Support Emerging Industries based on Forest Management and Materials	Forest slag, thinning and fuel reduction material used for construction of building materials. Support emerging industries to use materials from forest management for building materials.
112	Ecosystems	Capacity Building	Watershed wide	Build Regional Capacity	Collaborate at the regional level to build collective capacity, identify shared opportunities and challenges, and develop solutions tailored to the unique needs of the region through collaboration with all tribes, agencies, non-profits, educational institutions, foundations, trusts and communities.

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113	Ecosystems	Funding and Finance	Watershed wide	Provide Technical and Financial Assistance to Farmers, Ranchers, and Practicioners	Provide technical and financial assistance to emerging farmers, ranchers, land and forest care practitioners, support high-needs communities, and focus efforts on key watersheds and ecological corridors to advance equitable and effective conservation outcomes
114	Ecosystems	Capacity Building	Watershed wide	Create Russian River Bioregional Hub	Create a Russian River Bioregional Hub that educates and trains the conservation leaders of the future through an on-site center that incorporates hands-on learning through conservation work with the regions lands and water to support the ecosystem required for a resilient Russian River Bioregion.
115	Ecosystems	Capacity Building	Watershed wide	Curriculum for Bioregional Regenerative Education	Develop and implement a tailored curriculum for bioregional regenerative education, based on existing programs such as the Sonoma RCD's Farm Leadership model, Sonoma Water primary school education and Geyserville HS's Land program.
116	Ecosystems	Water Management Infrastructure	Alexander Valley	Gravel Managemet in Alexander Valley and Ukiah	Gravel management of Alexander Valley, Ukiah, reaches to create connectivity with tributaries disconnected from historical river incision from gravel mining.
117	Ecosystems	Programmatic, or Project-Specific Permitting	Watershed wide	Programmatic Permit for Reconnecting Tributaries	Programmatic permit for continual work for reconnecting tributaries.

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118	Ecosystems	Programmatic, or Project-Specific Permitting	Watershed wide	Programmatic, Landscape-Scale CEQA for Gravel Management Plans	Programmatic, Landscape scale CEQA certified mainstem gravel management plans. Specific to infrastructure protection, in situ habitat creation and reconnecting tributaries from river incision
119	Ecosystems	Programmatic, or Project-Specific Permitting	Watershed wide	Riparian Easement Program	Use riparian easement Program and funding to secure land within the riparian zone for restoration work.
120	Ecosystems	Ecosystem Management	Watershed wide	Manage Arundo and Other Invasive Vegetation	Implement a river wide arundo and invasive plant removal programmatic permit to facilitate removal of this water using invasive plant. Removal of consumptive use from invasive plants.
121	Ecosystems	Programmatic, or Project-Specific Permitting	Watershed wide	Programmatic Permit for Creating and Maintaining In-Situ Rearing Pools in River Gravel Beds	Programmatic permit for creating and maintaining seasonal in-situ rearing pools in the river gravel beds to support hatchery brood stock distribution of salmoids.
122	Ecosystems	Ecosystem Management	Watershed wide	Off-Stream Groundwater-Fed Cold-Water Pools in Floodplain	Off-stream, groundwater-fed cool-water ponds in the floodplain for longer-term juvenile rearing, thermal refuge, and hatchery acclimation.

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123	Ecosystems	Ecosystem Management	Watershed wide	Manage Connections that Facilitate Aquative Species Movement	Managed connections (engineered side channels, culverts with fish-friendly hydraulics, riffle sills) that let fish move among habitats as flows and life stages change.
124	Ecosystems	Ecosystem Management	Laguna-Mark West watershed	Laguna-Mark West Creek Watershed Planning Scoping Study	Laguna-Mark West Creek Watershed Planning Scoping Study
125	Equity	Funding and Finance	full watershed	Address Watershed Management Inequities between Mendocino and Sonoma Counties	Address watershed management inequities between Mendocino and Sonoma Counties.

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126	Equity	Policy and Regulations		Climate Equity Strategy	As articulated in Sonoma Water's Board-adopted Energy & Climate Resiliency Policy, Sonoma Water recognizes that climate resilient communities are the result of equitable practices and processes. Climate change disproportionately impacts low-income and communities of color globally and within Sonoma Water's service area. The Climate Equity Strategy will clarify and articulate Sonoma Water's responsibilities and goals for serving historically underrepresented groups in the provision of core services under climate change. Sonoma Water is committed to collaborating with communities of color to develop infrastructure planning processes that result in better outcomes for all members of our community.
127	Flood Management	Operations, Maintenance, Repair, Rehabilitation	Example of critical road infrastructure impacted by bank erosion and flooding	Comprehensive Flood Planning at Infrastructure Hardening, Retreat, or Other Strategies	Need for comprehensive planning for infrastructure hardening/retreat/or other adaptation strategies
129	Flood Management	Watershed and Floodplain Management	Narrow riparian corridor	Floodplain Restoration on Russian River near Cloverdale	Example of area along Russian River that is confined by roads and levees. Potential for floodplain restoration.
130	Flood Management	Watershed and Floodplain Management	Green Valley Creek bridge on Green Valley Rd	Atascadero Creek Flood Resilience	concept designs are currently being developed to address annual flooding of Green Valley Rd and the adjacent vineyard, causing safety hazards and exacerbating sediment deposition into the lower Atascadero channel.

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131	Flood Management	Watershed and Floodplain Management	Lower Russian River	Ukiah Area Floodplain Restoration	floodplain restoration and larger riparian vegetated setbacks to help increase capacity of river during flood events, reduce sediment erosion and improve ecological functions which has multi-benefit for water quality and fishery recovery
132	Flood Management	Ecosystem Management	Lower Russian River	Increase Flood Resilience in Lower Russian River	LRR generally has flooding issues that increased climate change is going to negatively impact; need to increase treatment capacity, raise/move critical infrastructure; restore and expand estuary habitat
133	Flood Management	Policy and Regulations	Guerneville	Acquire Conservation Easements over Existing Floodplain	Acquire conservation easements over exisiting undeveloped floodplains and promote floodplain restoration and enhancement to improve flood storage capacity, habitat quality, and water quality; evaluate river access and recreational opportunities
134	Flood Management	Policy and Regulations	Rio Nido	Policy for Elevating Homes in Flood Zones Paired with Conservation	In addition to policy for elevating homes, policy for managed retreat in high-risk flood zones (paired with conservation easement or other deed restriction and restoration)
135	Flood Management	Watershed and Floodplain Management	Lower Mark West Creek	Lower Mark West Creek Floodplain Restoration	Flood plain restoration

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136	Flood Management	Policy and Regulations	Flood prone areas	Acquire Properties Subjected to Repeated Flooding	Develop a program comparable to New Jersey Department of Environmental Protection's Blue Acres which protects public safety and the environment by relocating New Jersey families whose homes are subject to repeated flooding and acquiring property for use as natural flood storage, parks, and community open space. See: https://dep.nj.gov/blueacres/
137	Flood Management	Watershed and Floodplain Management	Laguna-Mark West watershed	Flood Management and Groundwater Recharge Projects in Laguna-Mark West Watershed	Further design, permit, and implement the stormwater capture/ groundwater recharge/ flood management projects scoped in the Laguna-Mark West Watershed Planning Scoping Study developed by Winzler & Kelly-GHD for Sonoma Water in 2012; see: https://evogov.s3.amazonaws.com/185/media/165584.pdf
138	Flood Management	Watershed and Floodplain Management	Numerous locations within the RR watershed	Stormwater Projects Included in Storm Water Resources Plan for Russian River	Further design, permit, and implement prioritized multi-benefit stormwater/ flood management/ groundwater recharge projects included in the Storm Water Resources Plan for the Russian River watershed developed by Russian River Watershed Association; see: https://rrwatershed.org/project/stormwater-resource-plan/
139	Flood Management	Watershed and Floodplain Management	Setback levees along the Santa Rosa Flood Control Channel	Expand Santa Rosa Creek Floodplain	Expanding the Santa Rosa Creek floodplain into pastureland adjacent to the flood control channel. Expanding the flood plain in this area would decrease water velocities during high-flow storm events. This reduction in velocities would allow additional sediment to be deposit in the Santa Rosa Flood Control Channel instead of in the Laguna de Santa Rosa. Sediment in this channel can be removed as part of Sonoma Water's Stream Maintenance Plan and beneficially reused.

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140	Flood Management	Watershed and Floodplain Management	Slowing and Sinking Stormwater	Slow and Sink Flows on Watershed	Prior to European settlement, streams starting in the hills east of what is now Petaluma Hill Rd would flow into season lakes and vernal pools in this area between southern Santa Rosa and the Cotati Grade. Some of this ecological function could be restored by creating areas to slow and sink water from the many small to medium size streams in this area.
141	Flood Management	Operations, Maintenance, Repair, Rehabilitation	Geyserville Bridge	Widen Geyserville Bridge	Widen bridge on west side to improve sediment transport and allow river process
142	Flood Management	Watershed and Floodplain Management	Reach between Geyserville and Hwy 128 Bridge	Reduce Channel-Flooding Near Geyserville	Aggrading gravel is causing the river to jump out of the channel and flood homes between the town of Geyserville and the Russian River Hwy 128 bridge.
143	Flood Management	Operations, Maintenance, Repair, Rehabilitation	North Marin Water District	Expand ALERT Weather Gage Network	Expand the County's ALERT weather gage network in the upper Novato Creek watershed (above Stafford Dam), including stream and rainfall gages
144	Flood Management	Science and Technology	Stafford Dam	Incorporate Proven Technology in Dam Safety Programs	Incorporate proven technology in the District's Stafford Dam Safety program –real-time data automation of instrumentation (piezometers, drains, seismographs, security).

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145	Flood Management	Science and Technology	Alexander Valley	Alexander Valley Reach Feasibility Study	Sonoma Water is assessing the existing conditions and identifying enhancement opportunities in the Alexander Valley Russian River area and conducting hydrologic-hydraulic modeling, geomorphic analysis, and ecological analysis to inform future updates to the USACE Russian River Channel Improvement Operations and Maintenance Manual. Sonoma Water is also evaluating broader actions as part of the Alexander Valley feasibility study for management and restoration actions outside of the O&M Manual update, including identifying other funding and governance options.
146	Flood Management	Watershed and Floodplain Management	Watershed wide	Stormwater Capture and Reuse	Explore stormwater capture and reuse projects, building off the existing Storm Drain Master Planning effort for Santa Rosa. Conduct a study to understand the feasibility, scope and cost of a potential project(s) that have multi-benefit outcomes for flood control and water supply augmentation
147	Flood Management	Water Management Infrastructure	Matanzas Creek	Improve Spillway at Matanzas	Improve spillway at Matanzas Creek reservoir in partnership with federal project sponsor, U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). This facility upgrade project identifies improvements needed to the reservoir's outlet structure to meet NRCS dam design guidelines set forth in Technical Release NO. 60. TR-60 requires that the principal spillway be designed to pass the 100-year rainfall without causing the auxiliary spillway to activate. A dam assessment performed by California NRCS found the current reservoir does not meet the TR-60 standard, and recommendations were made to coordinate with NRCS to explore options for bringing the reservoir into compliance with respect to TR-60, and also investigate downstream flooding impacts from any proposed principal spillway improvements. This project will increase and maximize storage at Matanzas Creek reservoir up to a 100-year level of service under historic rainfall intensities. Storage maximization is constrained by the elevation of nearby major roadways, bridges, and private

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					properties. Final design analyses will evaluate project performance under future climate conditions. External funding figure includes NRCS spending.
148	Flood Management	Water Management Infrastructure	Wohler and Mirabel	Wohler and Mirabel Flood Resilience Project - Collectors and Access Roads	The collector wells at Wohler and Mirabel provide the vast majority of drinking water that enters Sonoma Water's transmission system. Critical infrastructure at Wohler and Mirabel collectors are projected to experience flooding during the future 100-year storm with unknown and potentially catastrophic impacts to water quality and electrical controls. This concept involves a feasibility study to assess the degree of future risk and then design and environmental to mitigate potential flooding to occur concurrent with seismic retrofits. Possible solutions include submarine-type door retrofits for the caissons as well as elevating levee roads at Mirabel collectors by 2 to 3 feet to allow for continued access at higher flows. Increasing frequency and severity of floods along the Russian River would also cut off access to Wohler and Mirabel facilities. This project includes planning and implementation of actions to improve access to critical facilities during flood events: (1) anticipated impact to access roads would be studied in the overall feasibility study of flood resilience for Wohler and Mirabel, (2) pending the results of that analysis, physical improvements to access roads to Wohler and Mirabel facilities (especially in the Ya-Ka-Ama area) would be implemented to ensure agency staff access.

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149	Flood Management	Watershed and Floodplain Management	Central Sonoma Watershed	Central Sonoma Watershed Project (CSWP)	Design and implement rehabilitation program for the Central Sonoma Watershed Project (CSWP) to effectively manage flooding and erosion. Flooding and sediment removal in drainages in Zone 1A represent significant challenges under current climate and hydrologic conditions. Future climate projections indicate substantial increases in flooding occurrence and magnitude that will have nonlinear impacts on sediment loading and stream maintenance. Project elements could include 1) measures to improve operational control of outflows from Spring Lake (including potential FIRO for Spring Lake - Climate Adaptation Plan Phasing Concept F-7) or increasing available storage at Spring Lake. This would be accomplished by first conducting a study of existing reservoir and spillway hydraulics, then implementing modifications of the Spring Lake auxiliary spillway with gated control to provide flexibility in operations of reservoir outflow (throttling control) (cost estimate: \$2M to \$5M) or increasing reservoir storage by raising dam embankments and the auxiliary spillway; and 2) restoration of Santa Rosa Creek in the downtown area by daylighting portions of Matanzas and Santa Rosa Creek that are currently routed through constructed box culverts. Updated Hydrologic Engineering Center River Analysis System (HEC-RAS) modeling under both historical and future precipitation indicates flooding risk at the triple box culvert. Flood flows greater than current 10- to 25-year return period were found to exceed channel capacity upstream of the downtown culverts and breakout into large parts of the City of Santa Rosa. This project concept includes the "daylighting" of the creeks and removal of the culverts in the section between E St and Santa Rosa Ave. Restoration of the natural river pathway would require relocation of properties (government) that currently overlie the culverts and the re-development of

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					a wider channel to carry 100-year flow. The river channel would likely need to be widened to occupy the land currently between 1st St and Sonoma Ave. CAP cost estimate of triple box culvert removal: > \$25M
150	Flood Management	Watershed and Floodplain Management	Watershed wide	Improve Regional Coordination on Flood Risk Management	Develop a Regional Flood Risk Management Action Plan and launch a Countywide Flood Risk Management Partnership to improve coordination around flood risk management in Sonoma County. The 2023-2024 Climate Resilience Fund funded Countywide Flood Risk Management Assessment was motivated by the severity of flooding in Sonoma County, the projected worsening of floods due to climate change, and the disaggregated nature of flood management in the County. The assessment identified the following opportunities for collaborative action: policies and standards, monitoring and modeling, stream maintenance, and communication and community engagement. As funding is available, the Action Plan and Partnership would grow a collaborative flood management group and define goals and actions to address gaps and opportunity areas across the County and its flood management entities.

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151	Flood Management	Policy and Regulations	Watershed wide	Integrate Flood Management and Land Management	Adapting to climate change-driven shifts in the hydrologic regime requires strategic collaboration on the intersection of flood and land management. This project concept includes focused engagement with a range of upper and lower watershed groups, cities and agricultural landholders, county, state, and federal agencies with land management responsibilities, and regulators. The overall objective of this engagement is to positively influence land management practices that increase flood detention/attenuation and to discourage practices that put more people and property in high flood risk areas. Where high flood risk development cannot be reduced, Sonoma Water would encourage project proponents to lower the risk through actions such as flood easements, raising structures, non-critical first floors, and others.
152	Flood Management	Policy and Regulations	Watershed wide	Update Flood Management Design Manual	Update Flood Management Design Manual (FMDM) to account for projected changes in timing, frequency, and duration of extreme precipitation under future climate.
153	Flood Management	Operations, Maintenance, Repair, Rehabilitation	Watershed wide	Improve WWTP Road Access and Emergency Staffing	Recent flooding and wildfire events have exposed access challenges at some facilities. Future climate change is expected to increase both of these risks. This project concept would improve alternate road access to the Russian River, Geyserville, and Occidental treatment plants and lift stations, which can be blocked when extreme river flooding occurs or when wildfires in the wildland urban interface (WUI) occur. The ability to access the plants and operate during peak flows is critical. Additional accommodation should be considered to house staff for a period of days at the Russian River WWTP due to its potential inaccessibility.

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154	Flood Management	Watershed and Floodplain Management	Big Sulphur Creek and Middle Russian River	Channel Expansion and Increase Channel Maintenance (Zone 4A)	Develop focused study for flood and sediment management alternatives in Zone 4A (Russian River). This study would evaluate opportunities for channel expansion through either levee setbacks or raising levee heights along the Russian River near Cloverdale and include a study of sediment management, particularly on Big Sulphur Creek, to reduce downstream flooding risk and more effectively manage the larger sediment loads that are expected to occur more frequently. Levee maintenance or enhancement alternatives (setback or raising) have not yet been evaluated. The Russian River near Cloverdale is expected to exceed its channel capacity during the 100 year event. Federal Emergency Management Agency (FEMA) mapping of the 100- and 500-year floodplains indicate that expected inundation extends over fields on the eastern bank and over light industrial areas, including the All-Coast property, and fields on the western bank. Sediment load from Big Sulphur Creek is high. The deposition of sediment can cover 90% of the channel width bank to bank. The evolution of the main channel through these deposits can focus the river into the levee. Sonoma Water has maintenance responsibilities on certain levees along the Russian River (Zone 4A) as part of their cost share partnership in the Coyote Valley Dam Project. Climate projections indicate the 50-year flow could increase by more than 25%, bringing this flow closer to the existing 100-year flow.
155	Flood Management	Policy and Regulations	Policy in floodzones	Policy to Elevate Homes in Flood Zones	Policy to incentivize and provide resources to elevate homes in the flood zone.

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156	Flood Management	Watershed and Floodplain Management	Riverfront Regional Park	Riverfront Regional Park Floodplain Restoration	Restore floodplain and reduce flooding by lowering floodplain and filling pits. Also beneficial for ecosystem.
157	Flood Management	Water Management Infrastructure	Upper Watersheds	Increase Stormwater Detention and Recharge in Upper Watersheds	Address the need to "slow the flow" in order to protect against growing flood risk, improve aquatic ecosystem health, and/or provide water resilience for agricultural landowners. Watershed-specific studies would identify priority locations for stormwater detention in the upper watershed to enable preliminary outreach to landowners. Following outreach, co-benefits can be explored to maximize opportunities for aquatic ecosystem health and water supply resilience. Elements could be constructed new or managed through easements with existing landholders.
158	Flood Management	Water Management Infrastructure	Middle Russian River	Levee System Management	Levee system management of middle reach levees. Repair or integrate into riparian expansion for habitat and release of flood pressure with flood plain expansion.
159	Flood Management	Operations, Maintenance, Repair, Rehabilitation	Watershed wide	Stormwater Resource Plan	Stormwater Resource Plan
160	Groundwater Supply	Water Management Infrastructure	Transmission System	Transmission System Wells	Installation of new or retrofitted wells along principal segments of the transmission system. These wells could pump into operable portions of the transmission system or provide water directly to affected retail customer.

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161	Groundwater Supply	Groundwater Management	Sonoma Water	Increase Groundwater Production by Rehabilitating Wells (Sonoma Water)	Increase/rehabilitate groundwater production wells in the Santa Rosa Plain including Sebastopol Road Well (2.0 mgd) by June 2025, and Occidental Road Well (1.4 mgd) by December 2025.
162	Groundwater Supply	Groundwater Management	Transmission System	Increase Groundwater Production by Adding New or Rehabilitating Wells (Retail Customers)	Additional new or rehabilitated well production to be considered for Windsor (0.97 mgd), Valley of the Moon (0.5 mgd), City of Sonoma (0.12 mgd), City of Cotati (1.25 mgd), City of Petaluma (0.78 mgd).
163	Groundwater Supply	Groundwater Management	Alexander Valley	Alexander Valley Managed Aquifer Recharge	This project proposes to capture Russian River peak flows for subsequent diversion onto Alexander Valley agriculture land for aquifer recharge. Wells on the Jackson Family Wines (JFW) property will pump Russian River underflows during flood periods into a new pipeline that will convey water to properties throughout Alexander Valley. Existing on-farm irrigation and frost protection infrastructure will be used to apply water to the land. Ultimately, the water will infiltrate to groundwater. This project could reduce summer and fall Russian River depletions and allow for either increased storage or retain more water in the channel for downstream water supply uses. Sonoma Water recently received \$400k from the County of Sonoma to evaluate flood-MAR viability in Alexander Valley and potentially develop a pilot scale system. Assume water delivery can be applied to 2,000 acres with maximum application/recharge rate of 0.5 feet per day.

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164	Groundwater Supply	Groundwater Management	Petaluma Valley	Petaluma Brackish Groundwater Desalter	Brackish groundwater desalter in lower Petaluma Valley. Assumed at capacity of 3.6 mgd. Assume delivery of groundwater supply to Petaluma, NMWD, and MMWD.
165	Groundwater Supply	Groundwater Management	Transmission System	Groundwater Bank	Bank to promote recharge.
166	Groundwater Supply	Groundwater Management	Lower Russian River Tributaries	Expand Groundwater Basin Boundaries to Include Tributaries Important to Salmonids	Expand groundwater basins subject to regulation to include tributary basins important to salmonids (e.g. Green Valley Creek).
167	Groundwater Supply	Science and Technology	Major groundwater basins	Improve Understanding of Groundwater Recharge Dynamics and Sources	Improve understanding of groundwater recharge dynamics and sources (e.g. partitioning of irrigation water, flooding, precipitation)
168	Groundwater Supply	Water Management Infrastructure	Santa Rosa Plain	Integrated Surface and Groundwater Supply Portfolios	The City of Santa Rosa's Water Supply Alternatives Plan identified groundwater as a critical piece of a long-term resiliency portfolio of water supply options.

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169	Groundwater Supply	Water Management Infrastructure	Santa Rosa Plain	New or Expanded Wells	Add new groundwater wells. Well siting study and CEQA process in development now. In combination with conversion of existing emergency wells to seasonal production wells, would yield supplementary local water supplies for resiliency in case of disruption of aqueduct deliveries.
170	Groundwater Supply	Water Management Infrastructure	Santa Rosa Plain	Convert Emergency Wells to Production Wells	Convert existing emergency wells to seasonal or prolonged supply production wells. Existing emergency wells being scoped for conversion to production wells include Leete Well, and Carley Well. Current wells are only permitted for emergency use only for no more than 14 days a year.
171	Groundwater Supply	Water Management Infrastructure	Santa Rosa Plain	Aquifer Storage and Recovery Projects	Explore adding aquifer storage and recovery projects
172	Groundwater Supply	Groundwater Management	Transmission System	Increase Aquifer Storage and Recovery Sources Located Along Aqueduct	Identify and utilize additional aquifer storage and recovery resources located along the existing aqueduct transmission system. Water could be stored in the basin during wetter periods and extracted mainly during periods of high need.
173	Groundwater Supply	Groundwater Management	Alexander Valley	Alexander Valley Flood-MAR	

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174	Groundwater Supply	Groundwater Management	Potter Valley	Implement Production Well Drilling Program to Validate Groundwater Supply	This study identified the potential to produce 3,500 to 5,000 AFY of new groundwater supply through the construction of agricultural production wells throughout Potter Valley. However, most existing wells and the monitoring wells constructed for this current study are shallow and designed for domestic purposes. An appropriate next step would be to implement a production well drilling and aquifer testing program to validate these supply estimates. The program would include up to 12 test wells constructed to maximize production. The results from this program would reduce uncertainty of aquifer properties and potential well yields in the Basin, provide information on potential impacts to existing domestic wells, and identify potential areas of concern for groundwater quality.
175	Groundwater Supply	Watershed and Floodplain Management	Watershed wide	Upland Groundwater Infiltration	Stormwater Management MS4 Stormwater Upland ground water infiltration gallery design and installation.
176	Groundwater Supply	Watershed and Floodplain Management	Groundwater Sustainability Agencies	Support GSAs to Drive Groundwater Recharge and Process-Based Restoration	Increase support for Groundwater Sustainability Agencies to drive groundwater recharge approaches that enhance ecosystem function and recharge groundwater by focusing on MS4 and Processed Based Restoration (PBR) for upland recharge and reestablishing meadow lands.
177	Groundwater Supply	Watershed and Floodplain Management	Santa Rosa Plain	Santa Rosa Plain GSA Stormwater Capture and Recharge	Implementation of Santa Rosa Plain GSA GSP section 6.2.2 Stormwater Capture and Recharge (Group 2)

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178	Hydropower	Water Management Infrastructure	Water for Geothermal Power Generation	Augment Recycled Water Storage for Geysers Geothermal Project	Recycled water is currently used to produce electrical power at the Geysers Geothermal Project. Additional water storage is needed to improve the reliability of the power generation facilities and for agricultural irrigation.
179	Hydropower	Water Management Infrastructure	Lake Sonoma and Lake Mendocino	Pumped Storage Hydroelectric Systems	Site and build pump storage hydroelectric system (PSHE) in the watershed. Specifically on the east ridge of Lakes Sonoma and Mendocino. In addition, use existing ag reservoirs in the water shed for PSHE.
180	Hydropower	Watershed and Floodplain Management	Sonoma County	Implement 2013 Renewable Energy Based Secure Communities - Sonoma County	Implement the 2013 Renewable Energy Based Secure Communities – Sonoma County (RESCO) project
181	Recreation	Land Management	Ukiah	Ukiah Area Recreational Access	increase public access points to RR and remove old ACE steel jacks
183	Recreation	Watershed and Floodplain Management	RR Floodplain Restoration at Hanson pits	New Public Park at Hanson Pits	New public river park proximate to community

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184	Surface Water Supply	Water Management Infrastructure	Lower Russian River and Adjacent Areas	Regional Water Bank	This project concept would create and manage groundwater banks in three areas: Santa Rosa Plain, Sonoma Valley, and Petaluma Valley. Excess winter water would be recharged into available storage in these groundwater basins, stored, and subsequently extracted for dry year use. Winter water extraction would be limited to Sonoma Water Russian River rights and diversion infrastructure. New ASR wells would be constructed for both recharge and extraction. In-lieu recharge with recycled water supply delivery could also be considered. Assume that up to 22,000 acre-feet of storage could be made available in Santa Rosa Plain, Sonoma Valley, and Petaluma Valley groundwater basins. Extraction water would be used for either direct delivery in the overlying service areas (in-lieu) or pumped into the Sonoma Water transmission system for regional delivery.
185	Surface Water Supply	Water Management Infrastructure	Transmission System	Transmission System Interconnections (South)	Interconnections to provide emergency redundancy conveyance to affected areas in South transmission system. (cotati aq)
186	Surface Water Supply	Water Management Infrastructure	Transmission System	Transmission System Interconnections (Petaluma-Sonoma AQ loop)	Interconnections to provide emergency redundancy conveyance to affected areas in Petaluma-Sonoma AQ transmission system. (sonoma water transmission system)

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187	Surface Water Supply	Water Management Infrastructure	Transmission System	Transmission System Interconnections (Kawana-Ralphine connection)	Interconnections to provide emergency redundance conveyance to affected areas in Kawana-Ralphine transmission system. (sonoma water transmission system)
188	Surface Water Supply	Water Management Infrastructure	Transmission System	Transmission System Interconnections (Stafford - North Marin AQ Direction Connection)	Marin reservoirs into Stafford and Stafford deliver excess water. Item number 2 in Tony's email.
189	Surface Water Supply	Water Management Infrastructure	Transmission System	Transmission System Interconnections (Marin-NM connection)	Interconnections to provide emergency redundance conveyance to affected areas in Marin-NM-SW transmission system. Distribution system connection. Includes Ignacio PS connections.
190	Surface Water Supply	Water Management Infrastructure	Lake Stafford	Expand Surface Storage (Lake Stafford weir)	Capacity and rule curve changes to reflect increase in water conservation pool storage due to Lake Stafford Adjustable Weir. Increases in storage capacity at Lake Stafford of 750 AF.

ID	Water Resource Category	Adaptation Strategy Type	Component or Location	Adaptation Concept	Concept Description
191	Surface Water Supply	Reservoir and River System Operations	Marin	Winter Water Diversion (with Kastania Improvements)	Excess winter water would be diverted from Russian River collectors and delivered directly to retail customers. Retail customers would prioritize receiving Sonoma Water supplies during this winter period and preserve (or augment) local supplies (particularly for MMWD and NMWD) in storage for use in subsequent dry season(s). This option utilizes existing infrastructure and within current diversion rights. Work toward developing an annual risk management and operations plan for this operation.
192	Surface Water Supply	Water Management Infrastructure	Sonoma Development Center	Integrate Future Sonoma Developmental Center Water Supply	SDC's main potable water system is served by a conventional surface water treatment plant with a design capacity of 1.8 mgd. Treated water has consistently produced high quality exceeding permit requirements. Current production for SDC use is less than 0.56 mgd. This project concept would increase the production to original design capacity and use the additional supply for either recharge in Sonoma Valley groundwater basin or for direct use in Valley of the Moon or City of Sonoma service areas. Use of existing 2.05 million gallon water storage tanks would allow for temporary regulatory storage.
193	Surface Water Supply	Water Management Infrastructure	North Bay Reuse	Expand Recycled Water Supply	Increase delivery and use of recycled water for non-potable purposes. Assume implementation of North Bay Water Reuse Program Phase 2 Projects which increase retail customers' recycled water availability as: NMWD (Novato Sanitary District, 326 AFY), MMWD (153 AFY), Petaluma (223 AFY). Excludes increases in delivery to wetlands, agriculture, or for uses not in service area. Assume 10% increase in UWMP recycled water delivery estimates for all other retail customers.

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194	Surface Water Supply	Reservoir and River System Operations	Water Conservation	Expanded Water Conservation and Water Use Efficiency (M&I Users)	Expand programs for water conservation in municipal and CII sectors. Assume a 10-30 percent reduction in total water use from 2020 UWMP demands could be achieved in each of these sectors. Reductions limited to ensure that health and safety demands are always satisfied.
195	Surface Water Supply	Reservoir and River System Operations	Water Conservation	Expanded Water Conservation and Water Use Efficiency (Agricultural Users)	Expand programs for water conservation in agricultural. This action includes a 30 percent reduction in Russian River on-river depletions in addition to a 30 percent reduction to the in the municipal and CII sectors.
196	Surface Water Supply	Reservoir and River System Operations	Lake Sonoma	Lake Sonoma Forecast Informed Reservoir Operations	The process for viability assessment at Lake Sonoma is in process. This option involves a larger deviation that includes a 19,000 AF increase in storage in the conservation pool during October 1 through February 28 and 38,000 AF increase during March 1 through September 30.
197	Surface Water Supply	Policy and Regulations	Lake Sonoma and Lake Mendocino	Regulatory Flexibility through Temporary Urgency Change Permits	Reduce minimum instream flow requirements in the Russian River to approximately 50-70 cfs consistent with actions taken in 2021 due to drought conditions.
198	Surface Water Supply	Reservoir and River System Operations	North Marin	Improve and integrate regional storage operations	Winter water diversion with modified storage operations in North Marin

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199	Surface Water Supply	Policy and Regulations	Russian River	Change in Russian River hydrologic index for instream flow setting	Updating the Russian River hydrologic index from the Decision 1610 method to the Biological Opinion method would result in lower instream flow requirements that provide fishery benefits, as well as water conservation.
200	Surface Water Supply	Operations, Maintenance, Repair, Rehabilitation	Wohler and Mirabel	Collector 6 Drainage Repair (CIP #WA23004)	The area around Collector 6 slopes inland. When the Russian River spills over its banks, the area around Collector 6 becomes flooded and accessibility to the Collector becomes difficult for operating and maintaining the site. This project would regrade the area around Collector 6 System to slope toward the Russian River, thereby minimizing the flooding around and near Collector 6 and keeping access to the site open.
201	Surface Water Supply	Water Management Infrastructure	Coyote Valley Dam	Increase Coyote Valley Dam	raise CVD. Increases storage capacity, helps extend water for instream flow, helps improve cold water pool for fisheries, proactive measure to respond to PVP flow changes
202	Surface Water Supply	Reservoir and River System Operations	Potter Valley	Potter Valley Storage and Water Use Efficiency	increased on-site water storage, canal lining, real-time water accounting measures, increased accountability in use, groundwater recharge
203	Surface Water Supply	Water Management Infrastructure	Coyote Valley Dam	Increase Coyote Valley Dam	raising of CVD allows for reworking of outfalls to address ongoing sediment harms
204	Surface Water Supply	Science and Technology	Upper Russian River	Water Use Accounting	require full, real-time accounting for groundwater use for all user types; proactively address increased gw pumping from PVP changes; fulfill public trust duties to protect interconnected surface waters

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205	Surface Water Supply	Science and Technology	Watershed wide	Water Sharing Program During Droughts	expand and implement water sharing program to increase equitable water use and availability and burden during drought years; increase real-time accountability to protect against water waste/abuses
206	Surface Water Supply	Reservoir and River System Operations	Alexander Valley	Real-Time Water Budget and Accounting System	multi-benefit to implement changes necessary to establish a real-time water budget and accounting system; protects instream flows, reduces water waste, protects water rights, proactive measure against droughts, helps extend carryover storage
207	Surface Water Supply	Water Management Infrastructure	Geysers water supply	Feasibility of Replacing Recycled Water Exports with Flood Diversions to Geysers Geothermal Project	Geysers receives large volumes of recycled water which is a benefit to water quality of the Laguna and wastewater system operations. However, recycled water could have other beneficial uses, particularly in drought. Explore options and feasibility of reducing recycled water exports to Geysers when there is a recycled water shortage for irrigators. Consider diversion of flood waters to Geysers as an offset for reduced recycled water supply.
208	Surface Water Supply	Policy and Regulations	urban development	Comprehensive Urban Growth Planning	Comprehensive planning around urban growth - reconcile conflicting mandates and pressures. This affects other water resource categories.
209	Surface Water Supply	Reservoir and River System Operations	Dutch Bill Creek and tributaries	Support Managed Flow Release that Support Instream Flows	Support managed flow releases that support instream flows while protecting ecosystem health and water quality

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210	Surface Water Supply	Water Management Infrastructure	Lake Stafford	Increase Stafford Lake Storage	Increase Stafford Lake Storage via the Stafford Dam Adjustable Spillway Gate Project (also added to category below). Provides additional 726 AFY* of storage (*storage volume could increase if runoff captured more than once, especially with late/end of season storms).
211	Surface Water Supply	Water Management Infrastructure	North Marin Aqueduct	Replace and Upgrade North Marin Aqueduct Segment 4A	Replace and upgrade North Marin Aqueduct (NMA) segment 4A (to 36 or 42-inch diameter) consistent with remaining NMA segments.
212	Surface Water Supply	Operations, Maintenance, Repair, Rehabilitation	Novato	Ramp up Sonoma Water Transmission System O&MRR and CIP Spending	Ramp up O&MRR and CIP spending over the next 20 years inline with 2025 Novato Water System Master Plan with focus on critical backbone pipelines, pump stations and tanks.
213	Surface Water Supply	Water Management Infrastructure	Lake Stafford, Bowman Canyon Creek	Stormwater Capture and Diversion on Bowman Canyon Creek	Divert captured stormwater in the lower watershed (just below Stafford Dam, Bowman Canyon Creek) and store in Stafford Lake, especially in dry years (additional supply ~93 to 629 AFY)
214	Surface Water Supply	Science and Technology	North Marin Water District	Expand Advanced Metering Infrastructure (AMI)	Expand the District's existing Advanced Metering Infrastructure (AMI) by installation of distribution meters at strategic locations to assist with water loss/leak detection.

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215	Surface Water Supply	Policy and Regulations	North Marin Water District	Review and Update Water Conservation	Regularly review District Regulations related to water conservation to stay ahead of or at a minimum in line with state requirements.
216	Surface Water Supply	Water Management Infrastructure	Water Retail Customers	Increase Water Use Efficiency	Enhance Water Use Efficiency program offerings including evaluation of existing programs to determine best use of resources, as well as explore other opportunities for new programs to increase overall water savings.
217	Surface Water Supply	Science and Technology	Russian River Watershed	Climate and Weather Modeling and Forecasting	Sonoma Water continues to lead locally and regionally on climate science and adaptation planning. This project concept focuses on Sonoma Water's continued role in supporting and enhancing collaborations and investments in Subseasonal to Seasonal (S2S) forecasts of precipitation, streamflows, and reservoirs levels. Advanced applications of remote sensing-based products could support Sonoma Water for drought warnings, regional groundwater recharge mapping, improved understanding of groundwater-surface water interactions and soil moisture mapping. Sonoma Water has applied state-of-the art climate model simulations from Phase 3 of the Coupled Model Intercomparison Project (CMIP3), Phase 5 of the Coupled Model Intercomparison Project (CMIP5) and, most recently, Phase 6 of the Coupled Model Intercomparison Project (CMIP6) to perform local planning and analysis. Using downscaled CMIP6 model results (LOCA2), Sonoma Water produced a Future Rainfall Database for study, planning, and design applications and made a commitment to using those data in all projects to the extent feasible and relevant. This commitment is expected to be adaptive and iterative, incorporating lessons learned as our experience grows. Lastly, Sonoma Water will continue to seek partnerships and invest in more innovative and experimental applied climate science. Note: the summed total of SCWA costs to date includes: an agreement with USGS to analyze future hydrology in the Russian River (\$835,400) and an

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					agreement with ESA to develop the Future Rainfall Database (\$50,000). These totals do not include external funding leveraged toward partners, as that would exceed the bounds of this analysis.
218	Surface Water Supply	Water Management Infrastructure	Sonoma Water	Water Resiliency Study and Water Supply Strategies Action Plan Implementation	Continue to invest in regional water resiliency strategies and the Water Supply Action Plan strategies to facilitate diversification of supplies and demands during changed conditions and reduce regional risks.
219	Surface Water Supply	Water Management Infrastructure	Lake Sonoma	Lake Sonoma FIRO	Support U.S. Army Corps of Engineers (USACE) to expand the Forecast Informed Reservoir Operations (FIRO) program from Lake Mendocino to Lake Sonoma operations. Study to evaluate whether FIRO would increase operational flexibility and allow for deviation in flood operations.*
220	Surface Water Supply	Water Management Infrastructure	Lake Mendocino	Lake Mendocino FIRO	Refine and maintain FIRO in Lake Mendocino.*
222	Surface Water Supply	Water Management Infrastructure	Sonoma Water	Sonoma Water Climate Adaptation Plan Implementation	Sonoma Water's Board adopted a Climate Adaptation Plan (CAP) in October 2021. The CAP recommended that it be updated every 5-10 years. Additional climate resilience planning will be pursued over time, e.g. the DWR Russian River Watershed Resiliency Program.

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225	Surface Water Supply	Water Management Infrastructure	Watershed wide	Advanced Quantitative Precipitation Information (AQPI) Operational Support Tool	Develop Advanced Quantitative Precipitation Information (AQPI) Operational Support tool for use in critical relevant programs and operations for Sonoma Water's water supply, flood protection, and sanitation systems. The support tool would make AQPI information accessible for adaptive operations and management. The San Francisco Bay Area AQPI system contains advanced radar throughout the Bay Area, which provides more precise rainfall forecasting for atmospheric rivers. Sonoma Water could integrate the advanced radar information with existing weather measurement and forecasting infrastructure and services (e.g., Real-time Rainfall, River-Stream, Reservoir Data, Weather forecast data and modeling) to support flood planning, model calibration, and emergency response.
226	Surface Water Supply	Water Management Infrastructure	Wohler and Mirabel	Alternative Russian River Water Supply Diversion and Treatment	Sonoma Water's riverbank filtration system has proven to be a safe and effective method for treating water entering the region's water supply. Preliminary results from several years of study indicate a high degree of system resilience to wildfire in the watershed (CAP Phasing Concept CC-3). Current and planned studies will evaluate seismic and flood hazards (CAP Phasing Concept W-1), respectively, and advance mitigation measures. Pending the results of these studies, it may be prudent to investigate the feasibility of alternative methods of water treatment to supplement or replace riverbank filtration should water quality or reliability degrade significantly in the system in the future. This project concept focuses on the study of options for alternative drinking water infrastructure and/or processes that would address risks to water quality identified through the CAP process.

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227	Surface Water Supply	Water Management Infrastructure	Watershed wide	Develop Hydrology/Hydraulics and Hydrogeologic Modeling and Monitoring	Support and develop hydrologic/hydraulics and hydrogeologic modeling for flood and water resource planning scenario development. For flooding, priority watersheds include the Russian River and key subwatersheds, Petaluma River, Santa Rosa Creek, and Sonoma Creek watersheds. Separate flood models have been updated for the Petaluma River, Santa Rosa Creek, and Sonoma Creek watersheds in recent years. These models require periodic maintenance and more substantial updates every 5-10 years. Develop an integrated system-wide flood model for the Russian River inclusive of upstream creeks such as Mark West Creek and Santa Rosa Creek. The integration of these models would allow a better understanding of the flood risks throughout the watershed, especially in the interconnected channels at the Laguna. For water supply, the emphasis is on refining an integrated modeling system of surface water, groundwater and reservoir operations in the Russian River watershed (i.e., the Russian River coupled Ground-Water and Surface-Water Flow Model [GSFLOW]). Sonoma Water and collaborators should work to integrate current and emerging short- and medium-range (i.e. S2S) meteorological forecast tools and remote-sensing products into the modeling workflow to increase the model's utility for real-time operationalization. Other improvements may include high-performance computing support to allow for additional model calibration, ensemble simulations, and uncertainty analyses. Additional refinements could be made to incorporate additional monitoring data, either as discrete monitoring points (e.g surface water flow, groundwater levels, meteorologic data and soil moisture) or remotely sensed data (e.g. evapotranspiration) to better calibrate GSFLOW and other hydrologic models. The model should

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					also be used to help drive the collection of future hydrologic data to help continue improvement of the model.
228	Surface Water Supply	Water Management Infrastructure	Central Sonoma Watershed	Central Sonoma Watershed Project FIRO	Improve flood management operations on Central Sonoma Watershed Project (CSWP) reservoirs through adaptation of FIRO approaches and forecasts. Test the viability of adapting FIRO to CSWP to improve flood management.
230	Surface Water Supply	Funding and Finance	Sonoma Water	Rate Structures to Adapt to Increased Variability and Volatility in Sales	Study and implement alternative rate structures that can adapt to increasing variability or volatility in water sales due to climate- and weather-related events. Potential to shift rate structure to incur more of the water delivery costs into "fixed" portions and reduce the "usage" portions. Ultimately goal is to seek financial stability over multi-year period even under stressed water sales due to drought or sustained outage of facilities. Any changes to the rate structure would require extensive negotiations with water retailers. This concept also includes distinct but related steps to advance financial resilience, such as establishing financial incentives for seasonal source-shifting or regional groundwater banking.
231	Surface Water Supply	Water Management Infrastructure	Sonoma Water	Increase Water Conservation	This project concept seeks to increase water conservation potential for Sonoma Water contractor customers to diversify the region's water supply portfolio and lessen the reliance on Russian River supply during critical periods. Building off of successful programs in the region, this concept would seek to expand or accelerate conservation programs. Specific emphasis may look to leverage additional grant funding to extend the contractors' ability to offer more or increased efficiency incentives to customers and expand use of rainwater capture and greywater reuse opportunities through training of local landscapers as installers. Program

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					may look to expand support to businesses facing near-term bans on potable irrigation of non-functional turf (NFT) and development of new programs to accelerate residential sector outdoor efficiency and lawn removals. Estimate of aggregated water savings to be calculated from completed 2025 Urban Water Management Plan conservation program analyses of contractors.
232	Surface Water Supply	Water Management Infrastructure	Sonoma Water	Increase Use of Recycled Water	Increase the use of recycled water to diversify the region's water supply portfolio and lessen the reliance on Russian River supply during critical periods. Building off of successful reuse programs such as the North Bay Water Reuse Program, this concept would seek to expand or accelerate projects with the long-term goal of providing potential users within Sonoma Water's contractor service areas with recycled water. For evaluation purposes, it is assumed that this project would generate and deliver an additional 500 AFY of recycled water. For the Sonoma Valley WWTP, which currently generates more recycled water than it has demand for, this project would include the expansion of partnerships with wineries and other irrigators, groundwater management entities, and regional entities such as Bay Area Clean Water Agencies, North Bay Water Reuse Authority, and Sonoma Land Trust to increase the service area for recycled water.
233	Surface Water Supply	Operations, Maintenance, Repair, Rehabilitation	Wohler and Mirabel	Protect Mirabel and Wohler Power Lines (relocate/under grounding)	The Mirabel water facilities represent approximately half of Sonoma Water's total water production capacity. Destruction of power lines which serve these facilities would make these critical water supply facilities inoperable, potentially for extended periods, which could impact firefighting capabilities and drinking water supplies in Sonoma Water's service area. Presently, electrical power for the Mirabel facilities is provided from the Wohler 60 kV sub-station through an existing 12 kV power line that spans the Russian River and extends approximately two miles following SW property and right-of-way. The 12kV distribution circuit provides normal

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					utility power and backup generator power for the entire Mirabel complex, which includes collector wells, treatment facilities, and the river diversion structure. The existing overhead power line is susceptible to seismic, flooding, and fire hazards. An analysis and alternatives evaluation has been completed which identified measures to mitigate the natural hazard vulnerabilities by reconfiguring the power system into a loop-feed scheme. The loop-feed scheme requires construction of a redundant power line which would be predominantly underground. The loop-feed scheme would utilize a combination of underground and overhead power lines to maximize the survivability of the system in the event of a natural hazard. Construction implementation is reliant in part on securing grant funding.
234	Surface Water Supply	Water Management Infrastructure	Lake Mendocino	Lake Mendocino Variable Gates	Study, design, and install a gated spillway at the existing uncontrolled emergency spillway at Lake Mendocino. Installing a gated spillway could allow the closure of the spillway gates to impound additional water during wet spring conditions and increase the operational flexibility to meet water management operations. Both actions could increase carry over storage to improve water supply reliability for dry years. This project may be included as an alternative in a USACE-led study to evaluate options for improving water availability for the Upper Russian River.
235	Surface Water Supply	Water Management Infrastructure	Watershed wide	Improve Water Demand Management on Russian River	Develop short-term forecasting and real-time demand management system for the Russian River. Improved observational data and extreme weather forecasts could be ingested via machine learning models to enable Sonoma Water to fine-tune, and therefore reduce, reservoir releases during non-flood (water supply) operations.

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236	Surface Water Supply	Water Management Infrastructure	Potter Valley	Initiate District Scale Water Use Efficiency Program	PVID has been providing periodic investments to increase the efficiency of the district's delivery system. Lining of some canal sections and piping has occurred in areas where seepage losses were estimated to be high. An expansion and acceleration of these efforts will provide significant value and reduce diversion requirements in the canal systems. This action is a no-regret action (an action that provides benefits regardless of future conditions) that can be implemented in the near term and will continue the trajectory toward greater water reliability.
237	Surface Water Supply	Water Management Infrastructure	Potter Valley	Incentivize Expanded Pond Storage throughout the Valley	Several landowners are expanding, or considering expanding, pond storage for their agricultural operations. Greater seasonal storage in Potter Valley is another no-regret action for water supply reliability. At present, incentives provided for landowners would likely increase the rate of in-valley pond storage development. An early incentive, in the form of rebate or cost reductions, would likely lead to a greater number of landowners involved in pond storage expansion. An incentive could be provided through state or locally derived funds, even prior to establishing a Potter Valley water fund or considering new governance.
238	Surface Water Supply	Water Management Infrastructure	Lake Sonoma	Lake Sonoma Secondary Outlet	
239	Surface Water Supply	Water Management Infrastructure	Marin Water	Marin Water Atmospheric River Capture Project	Marin Water's Atmospheric River Capture Project is a strategic use of existing and proposed infrastructure to capture, transport, and store surplus winter water from the Russian River watershed in Marin reservoirs to strengthen regional water supply reliability.

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240	Water Quality	Funding and Finance	Russian River Monitoring Program	Fund Implementation of Russian River Regional Monitoring Program	Fund implementation of the Russian River Regional Monitoring Program
241	Water Quality	Policy and Regulations	Applies to entire Russian River watershed	Implement North Coast Water Board's Policy for the Implementation of the Water Quality Objectives for Temperature.	Implement North Coast Water Board's Policy for the Implementation of the Water Quality Objectives for Temperature. The Policy addresses activities with the potential to affect riparian shade; sediment discharge; in channel impoundments; stream geomorphology; instream flow; and thermal refugia. See: https://waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/temperature_amendment/index.html

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243	Water Quality	Policy and Regulations	Applies to entire Russian River watershed	Policy on Restoring and Maintaining Hydrologic Function; Policy Statement on the Impacts of Vegetation Management on Instream Flow; Policy on Hydromodification and Runoff Management; Policy on Water Conservation	North Coast Water Board is developing an amendment to the Water Quality Control Plan for the North Coast Region that, once developed, will address water quality impacts associated with changes to hydrology. As currently scoped the amendment may include the following new policies: Policy on Restoring and Maintaining Hydrologic Function; Policy Statement on the Impacts of Vegetation Management on Instream Flow; Policy on Hydromodification and Runoff Management; Policy on Water Conservation. See: https://waterboards.ca.gov/northcoast/board_info/board_meetings/12_2025/pdf/4/4-narr-flow-info-item-ssr.pdf
244	Water Quality	Policy and Regulations	Laguna de Santa Rosa watershed	Action Plan to Address Water Quality Impairments in the Laguna de Santa Rosa Watershed	The North Coast Water Board is developing an Action Plan, either a Total Maximum Daily Load Action Plan or an Advance Restoration Plan, to address the water quality impairments (temperature, dissolved oxygen, sediment, nitrogen, phosphorus) of the Laguna watershed. See: https://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/laguna_de_santa_rosa/

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245	Water Quality	Water Management Infrastructure	Lake Mendocino and Lake Sonoma	Infrastructure Updates to Reduce Sediment Discharge from Reservoirs	Protect water quality by building infrastructure upgrades to reduce sediment discharge/turbidity from reservoirs.
246	Water Quality	Land Management	Watershed-wide	Implement Regenerative Agricultural Practices	Implement regenerative agricultural practices on ag lands to reduce soil disturbance, promote continuous veg cover, restore/improve soil health, increase water storage potential
247	Water Quality	Water Quality Management	Failing Septic Systems	Improvements at Monte Rio/Villa Grande Onsite Wastewater Treatment Systems	Monte Rio/Villa Grande contains many onsite wastewater treatment systems that do not meet state standards. The NCRWQB has also adopted a Total Maximum Daily Load for Pathogens in the Russian River. Improvements are needed to address impacts from these OWTS.
248	Water Quality	Water Quality Management	Excessive Inflow During Flood Events	Equalization Basin for Russian River CSD Treatment Plant	During flood conditions, flows into the Russian River CSD treatment plant exceed its wet weather capacity. An equalization basin is needed to attenuate the wastewater/flood water flows into the treatment plant.
249	Water Quality	Water Quality Management	Occidental to Graton Wastewater Pipeline	Pipeline from Occidental CSD Lift Station to Graton CSD Treatment Plant	Construct a pipeline from the Occidental CSD lift station to the Graton CSD treatment plant.

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250	Water Quality	Land Management	right river bank downstream of confluence of east fork	Clean-up and Long-Term Solution of Trash and Debris from Homeless Encampments at WF/EF Confluence	Large homeless encampments with significant amount of trash and debris. Need for cleanup and long term strategy to address potential impact to water quality.
251	Water Quality	Water Quality Management	Developed areas	Implement Green Stormwater Infrastructure	Address increases to impervious surfaces (flood peak and water quality concerns) through green stormwater infrastructure and other stormwater reduction and recharge opportunities.
252	Water Quality	Watershed and Floodplain Management	Reducing summertime flooding in the Laguna De Santa Rosa	Reduce Ludwigia by Pumping Trapped Summer Water in Laguna de Santa Rosa	About 100 MG of water persists in the Laguna de Santa Rosa through the summer months. This trapped and stagnant water has allowed Ludwigia to proliferate, results in poor water quality, and experiences large mosquito production. The Ludwigia infestation makes mosquito abatement activities very different and results in threats to human and birds from the West Nile virus. An adaptation strategy is to pump and filter this stagnant water into the City of Santa Rosa's recycled water system. Once in this system, this water could be put to a beneficial use during the irrigation season.
253	Water Quality	Water Management Infrastructure	Watershed wide	Sediment Source Study for Improved Sediment Management	Develop sediment management plans to improve sediment management for flood protection, water quality, and habitat improvement in light of anticipated impacts from climate change on Sonoma Water's Stream Maintenance Program. Sediment management plans would include: sediment source analysis, sediment modeling and sediment budget, management strategies, permit compliance, and monetization

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					opportunities. Plan will identify major sources of sediment for each watershed, quantify historical and future sediment loads, and recommend strategies for source control and effective management. In addition, the study would quantify the expected changes in frequency and magnitude of sediment removal under climate change. Programmatic permits would be updated for increases in sediment and opportunities to recapture cost through beneficial reuse of sand and gravel would be explored. Future changes in precipitation and flood flows will substantially increase sediment loading in the region's watersheds. A complete understanding of the sources of historical sediment loading and opportunities for management of source areas does not yet exist.
254	Water Quality	Water Management Infrastructure	Watershed wide	Implement Inflow/Infiltration Monitoring and Reduction Program	Many of the Sanitation District and Zone collection systems, but most acutely the Sonoma Valley, Penngrove, and Russian River collection systems, suffer from high infiltration and inflow (I/I) during storm events. Sanitary Sewer Overflows (SSOs) are fairly common in the Sonoma Valley and Russian River system. The relatively poor understanding of these flows and the likelihood that future climate change will increase I/I in these systems requires focused effort. This project concept would establish an I/I Monitoring program that would seek to better understand areas of systems that have large I/I contributions, implement a monitoring system on critical collection system segments in acutely impacted systems, and implement asset management program to upgrade sewer capacity and strategically replace aging sewer lines. For SVCSD, this program would build from sewer replacement projects currently identified in the 2016 Sewer Capacity Assessment and Master Plan. Could be expanded to other collection systems in a similar manner.

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256	Water Quality	Water Management Infrastructure	Watershed wide	Revise Sanitation Design Standards	Design standards for sanitation systems are established by Sonoma Water. The design standards were last updated over 15 years ago and are based on historical I/I estimates and did not take into consideration future climate change projections. Older systems already show high I/I flows even under moderate rainfall events. This project concept includes a review of the design standards and would recommend revisions to further reduce I/I through improved design/construction practices and consideration of higher frequency and magnitude of rainfall during storm events. This project concept would be integrated with revisions to the flood management design criteria to include projected changes in timing, frequency, and duration of extreme precipitation under future climate. Concept would include training of personnel on modified design methods, as applicable.
257	Water Quality	Water Management Infrastructure	Sonoma Valley	Eliminate Sonoma Valley WWTP Hydraulic Constraints due to Sea Level Rise	Sea levels have risen in the past several decades and are projected to rise up to 2 feet by mid-century. Sea level rise will effectively reduce the hydraulic capacity of effluent discharge and recycled water delivery due to more frequent tide gate closure and increasing hydraulic constraint. Project concept focuses on increasing the operational effluent pumping capacity and increasing equalization storage capacity. Project should also consider the flow limitation caused by the tidal gate.

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258	Water Quality	Land Management	Russian River WWTP	Maintain and Explore Acquisition of Additional Land at Russian River WWTP for Summer Irrigation	The Russian River WWTP treats an average dry weather flow of approximately 0.2 mgd and the peak wet weather treatment capacity is 3.5 mgd. Treated wastewater is discharged into the Russian River Oct. 1- May 1 and used for irrigation of adjacent redwoods and Northwood Golf Course May 15- Sept. 30. In some years during shoulder seasons, effluent exceeds the current demand for irrigation, and effluent is discharged to the river. Future lower summertime flows could increase the relative contribution from the WWTP discharge. Save the Redwoods League purchased the Burch Property (2023) and is in the process of transferring ownership to the RRCSD. This project concept would acquire additional land, maintain newly-purchased land, and identify additional irrigation opportunities and/or customers to expand the effluent irrigation during summer.
259	Water Quality	Water Management Infrastructure	Russian River WWTP	Increase Operable Capacity at Russian River WWTP/Collection System	The Russian River WWTP treats an average dry weather flow of approximately 0.2 mgd and the permitted peak wet weather treatment capacity is 3.5 mgd. The climate change threats that will most severely impact the WWTP include increased river flooding and increased extreme precipitation. These changes will exacerbate the capacity limitations of the WWTP which can be exceeded during wet weather events. This project concept seeks to increase effluent storage, increase the capacity of the ultraviolet system, reconstruct a new headworks, explore operational strategies like expanded valving for shutoffs during evacuations, and eliminate other capacity-limiting elements within the treatment plant. Concept includes construction of additional 1 million gallon of effluent storage to store flows that exceed the plant's current effluent storage capacity (1.8 million gallons) and exploration of opportunities to increase

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					shoulder-season irrigation or other supplemental disposal capacity of treated effluent.
260	Water Supply	Operations, Maintenance, Repair, Rehabilitation	Watershed wide	Rainwater Catchment and Storage	Property-level water storage

D.2 References

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