

Russian River Watershed Resilience Pilot

Water Resource Vulnerability Indicators and Metrics

Working Draft - July 9, 2025 – **Please Provide Your Comments In the Column on the Right in the Table Below by Thursday, July 31st.**

Please provide your member info below in the event we need clarification on your comments.

Network Member:

Name: _____

Organization: _____

Email Address: _____

Indicators and metrics serve multiple purposes in watershed management. For the Russian River Watershed Resilience Pilot, indicators and metrics have been categorized according to their potential use:

- Primary (PR) - “primary” in that the indicators and metrics can be used to measure “vital signs” or “move the needle” related to resilience
- Secondary (SC) - “secondary” in that they are more specific measures that “peel the onion” further,
- Performance (PE) – “performance” in that the metrics can be useful to measure the performance of strategies during their development and selection, and
- Trend (TR) – “trend” in that the indicators and metrics can demonstrate trend over years and decades.

Draft metrics in this table are indicated with one or more of the codes to correspond with their potential use in the resilience plan. The overall objective of the vulnerability assessment component of the Plan (through the use of these indicators and metrics) is to evaluate climate-related vulnerabilities and help focus the development and assessment of adaptation strategies. Metrics that are more suitable for long-term monitoring and trend analysis will be recommended at the conclusion of the Plan.

Also please note that the order of indicators and metrics shown in the Table is in no way indicative of priority. We also understand that the metrics are inter-related – for instance ecosystem factors may influence groundwater and water supply, and vice versa. A future version of the indicators and metrics will reflect this.

If you have general comments, we have provided a space below the table.

Thank you for your time and in interest in the Watershed Resilience Plan.

Category	N o.	Condition or Outcome	Indicator	Metric	Potential Analysis Method	Network Member Comments
Surface Water Supply	1	Hydrology	River and Tributary Flows	Monthly and annual flow distribution for Upper Russian River, Lower Russian River, Dry Creek, and tributaries [SC, TR]	BCM, Russian River ResSim, GoldSim-based Decision Support Model outputs	
	2	Reliability of Surface Water Supply for Agricultural and Municipal Beneficial Uses	Water Supply Reliability	Delivery as percentage of demand [PR, PE] Sonoma Water delivery reliability [PR, PE]	BCM, Russian River ResSim, GoldSim-based Decision Support Model outputs	
	3	Reservoir Condition	Lake Mendocino Condition Lake Sonoma Condition	Reservoir storage and frequency [PR, PE] - High and low point water conservation pool storage (June 1 and Oct 1 storage) - Number of years below storage threshold at any time during the year Monthly and annual inflow to reservoirs [SC, TR] Annual maximum Lake Mendocino total reservoir release frequency [SC, PE] Annual maximum Lake Sonoma total reservoir release frequency [SC, PE]	BCM, Russian River ResSim, GoldSim-based Decision Support Model outputs	
Groundwater Supply	4	Groundwater Levels	Groundwater Level Trends	Groundwater elevation [PR, PE, TR]	Integrated Groundwater-Surface Water Model, Potter Valley Integrated Groundwater-Surface Water Model, GSFLOW over Russian River	
	5	Groundwater Storage	Total Volume of in Storage	Groundwater Storage [PR, PE]		
	6	Groundwater Sustainability	GSP Sustainable Management Criteria	GSP Sustainable Management Criteria or historical reference thresholds for Ukiah Valley, Santa Rosa Plain, Petaluma Valley, and Sonoma Valley (emphasis on groundwater level, storage, seawater intrusion, and depletion of interconnected surface water criteria) [PR, TR]		
	7	Groundwater Quality	Groundwater Quality Trends	Groundwater Quality [SC, TR]	Qualitative	

Flood Management	8	Hydrology	Flood Stage	<p>Flow and Stage Frequency (50-500-yr) for Russian River and Tributaries [PR, PE]</p> <ul style="list-style-type: none"> • Russian River (Hopland, Healdsburg, Guerneville) • Tributaries (Austin Creek, Mark West Creek, Dry Creek, Geyserville, Big Sulphur Creek, East Fork) • Santa Rosa Creek and Tributaries (Brush Creek, Matanzas Creek, Triple Box Culvert, Spring Creek) • Laguna and backwater in Sebastopol area, Colgan Creek, Copeland Creek, Lichau Creek • Russian River estuary 	<p>Russian River ResSim, HEC-HMS, HEC-RAS, HEC-ResSim (HEC-WAT) modeling</p> <p>Continuous analysis</p> <p>Event-based on precipitation-duration-intensity database</p>	
	9	Reservoir Condition	Lake Mendocino Lake Sonoma	<p>Annual Maximum Pool Elevation Frequency Function [SC, PE]</p> <p>Annual Maximum Uncontrolled Spill Frequency Function [SC, PE]</p>	<p>Russian River ResSim, HEC-HMS, HEC-RAS, HEC-ResSim (HEC-WAT) modeling</p>	
	10	Flood Risk to People in the Floodplain	Population Exposure to 100- and 500-yr Flood Events	Population at Risk in 100-yr and 500-yr Floodplain [PR, PE]	<p>HEC-RAS over Santa Rosa Cr and Russian River</p>	
	11	Flood Risk to Assets in the Floodplain	Asset Exposure to 100- and 500-yr Flood Events	Value of Assets Impacted in 100- and 500-yr Floodplain [PR, PE]		
Ecosystem	12	Hydrology	Natural/Ecological Flows	<p>Distribution of hydrological conditions for minimum flows [SC, PE]</p> <p>Distribution of natural flows on tributaries (wet/dry mapping) [SC, PE]</p> <p>Instream flows to support threatened and endangered fish [PR, PE]</p> <ul style="list-style-type: none"> • Summer: exceedance of the number of days June through September flows exceeding 125 cfs • Fall spawning migration: exceedance of the number of days October 15 to January 1 flows exceeding 105 cfs <p>Streamflow in the upper Russian River benefiting Salmonid Populations [SC, PE]</p>	<p>Russian River ResSim/GoldSim-based Decision Support Model outputs</p>	

				High Flow Events that Trigger Adult Chinook Salmon to Migrate Upstream [SC, PE]		
	13	Landscape Condition	Wildfires Threat	Wildfire Burn Probability and Burn Area [SC, TR]	Using wildfires scenarios under CMIP5 from Cal-Adapt over available areas over the Watershed	
	14	Environmental Water Quality	Water Quality Impairments	Summer and Fall Stream Temperature (°F) and Dissolved Oxygen (mg/L) [SC, PE, TR]	Russian River HEC-5Q (RR HEC-5Q) model Russian River ResSim WQ Model (was recently completed, hoping to use this instead HEC-5Q)	
	15	Fisheries		Summertime Water Temperatures at Selected Location along the Russian River (°F) [SC, PE, TR] Estimated Habitat (weighted usable area, WUA) [SC, PE, TR]	Russian River ResSim Russian River River2D	
	16	Vegetation and Wildlife		Water Surface Elevations – Impacts to sensitive natural areas and wildlife movement [SC, PE, TR] Minimum Instream Flows – Impacts to federal and state jurisdictional waters and special-status [PR, PE] plant/wildlife species Wetlands [SC, TR]	Russian River ResSim	
	17	Russian River Estuary		Estuary water levels [SC, PE, TR] Need for artificial breaching of beach berm [SC, PE, TR]		
	18	Laguna de Santa Rosa		Flow Regime [SC, TR] Floodplain Inundation Regime [SC, PE, TR] Vegetation Productivity [SC] Species Populations [SC, TR] Sediment Regime [SC, TR] Temperature Regime [PR, PE, TR] Turbidity [SC, TR] Dissolved Oxygen [PR, PE, TR]		
Water Quality	19	Drinking water quality	Water Systems Not in Compliance	Populations Affected by Drinking Water System Violations [PR, TR]		

			with Drinking Water Standards			
	20	Environmental Water Quality	Water Quality Impairments	<p>Natural Receiving Water Temperature (°F) [SC, PE, TR]</p> <p>Dissolved Oxygen (mg/L) [SC, PE, TR]</p> <p>Presence of Biostimulatory Substances [SC, PE, TR]</p> <p>Bacteria Concentrations (ml) [SC, PE, TR]</p> <p>Specific Conductance [SC, PE, TR]</p> <p>Concentration of Chemical Constituents (Aluminum) [SC, TR]</p> <p>Conditions leading to algal blooms [SC, TR]</p>	<p>Russian River HEC5Q (RR HEC5Q) model</p> <p>Russian River ResSim WQ Model (was recently completed, hoping to use this instead HEC-5Q)</p>	
Recreation	21	Recreational Benefits	Recreational Uses	<p>Lake Mendocino water levels (range) benefiting recreational opportunities (camping, boating and fishing, and general recreation) [PR, PE]</p> <p>Lake Sonoma water levels (range) benefiting recreational opportunities (camping, boating and fishing, and general recreation) [PR, PE]</p> <p>River flows suitable for river recreational access and boating [PR, PE]</p> <p>Cyanotoxins conditions [SC, PE, TR]</p>	Russian River ResSim/GoldSim-based Decision Support Model outputs	
Hydropower	22	Hydropower Energy Productivity	Hydropower Generation Efficiency at Coyote Valley Dam and Warm Springs Dam	<p>Monthly Power Production at Coyote Valley Dam (MWh) [PR, PE, TR]</p> <p>Monthly Power Production at Warm Springs Dam (MWh) [PR, PE, TR]</p>	Russian River ResSim/GoldSim-based DSM outputs, MATLAB Tool for Coyote Valley Dam, MATLAB Tool for Warm Springs Dam hydropower	
Equity	23	Social and Environmental Equity	Population Exposure to Risks	<p>Disproportionate exposure to vulnerable / frontline communities to risks from: [PR, PE, TR]</p> <ul style="list-style-type: none"> • Surface Water Supply Shortages • Groundwater Supply Shortages • Flood Risk • Extreme Heat • Wildfires 	<p>CalEnviroScreen, Disadvantaged Communities (DACs) Mapping Tool, Economically Distressed Areas (EDAs) Mapping Tool</p> <p>CalEnviroScreen: CalEnviroScreen - OEHHA</p>	

				<p>Vulnerable Populations experiencing water supply shortages. Vulnerable households with shortages vs. non-Vulnerable</p> <p>Vulnerable Populations experiencing flood risk: Percentage population with flood risk exposure that is vulnerable-communities vs. non-vulnerable communities</p> <p>Vulnerable Population exposure to extreme heat: Percent of population in high-exposure census tracts experiencing extreme heat days</p> <p>Vulnerable Population exposure to wildfires: Percent of population in high-exposure census tracts experiencing wildfires</p>	<p>DWR Resources: <u>Mapping Tools</u></p> <p>1) Disadvantaged Communities (DACs) Mapping Tool</p> <p>2) Economically Distressed Areas (EDAs) Mapping Tool</p> <p>Social Vulnerability Index (SVI) - https://www.atsdr.cdc.gov/place-health/php/svi/svi-interactive-map.html</p> <p>https://resilientca.org/topics/climate-equity/</p> <p>https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/saferdashboard.html</p>	
Tribal	24	Tribal Sovereignty	Tribal Beneficial Uses	Under development and discussion with the Russian River Tribes.		

Please provide general comments below: