2. Russian River Watershed and Study Area

2.1 Watershed Overview

The Russian River watershed is a crucial resource for Northern California, supplying drinking water to more than 700,000 residents across Sonoma, Mendocino, and Marin counties, including numerous Native American Tribes. The health and resilience of the Russian River watershed are central to sustaining the environment, local economies, and quality of life for the many communities that depend on it.

Stretching approximately 110 miles from its headwaters in the Redwood and Potter Valleys to its mouth at the Pacific Ocean in Jenner, the Russian River and its watershed encompass almost 1,500 square miles. This region features a rich mosaic of forests, agricultural lands (most notably vineyards), wetlands, and urban communities.

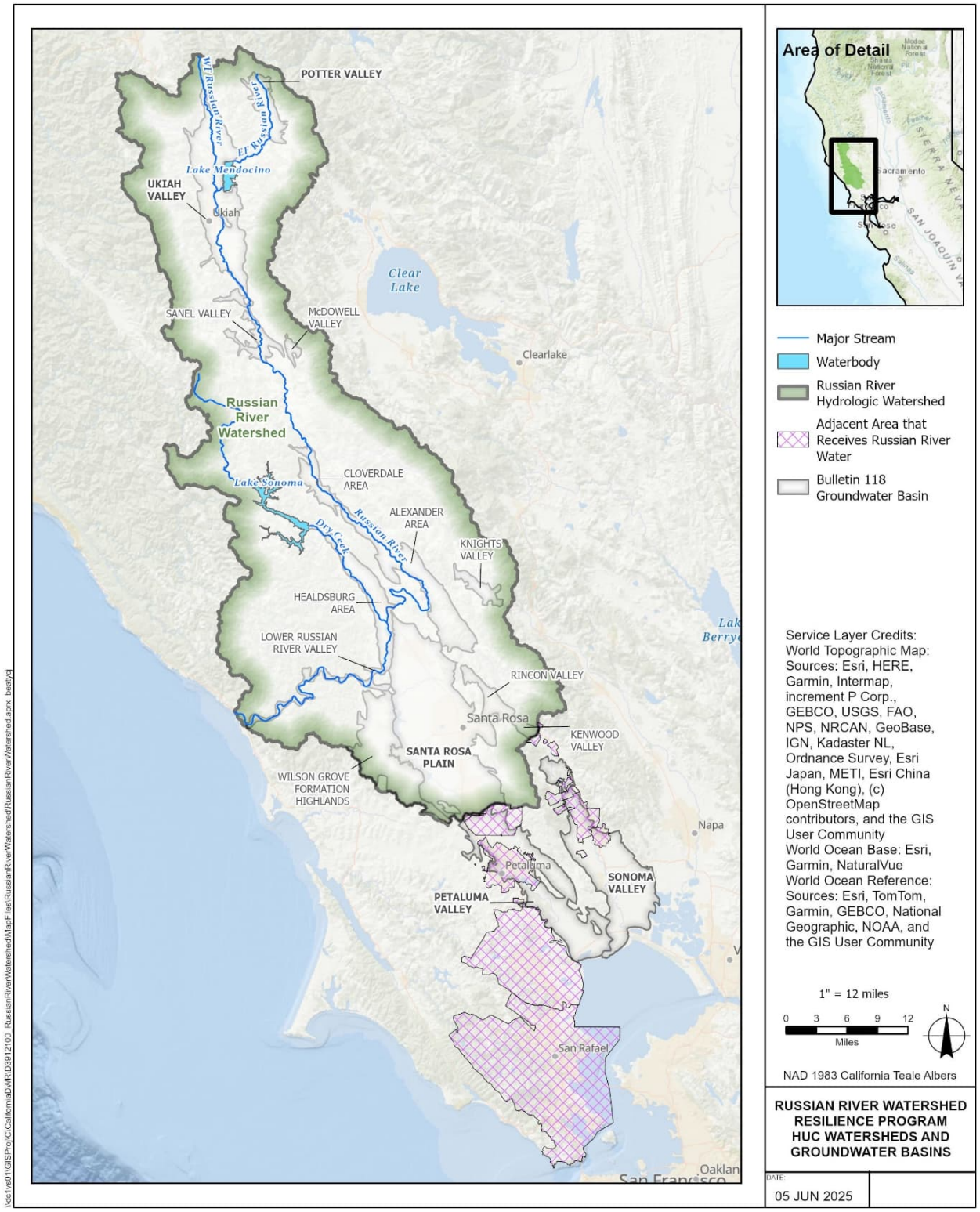
The Russian River's hydrology is defined by a complex network of tributaries, reservoirs, and managed flow regimes that support water supply, flood control, ecosystem functions, and recreation across Sonoma and Mendocino counties. Five principal tributaries—the East and West Forks of the Russian River, Big Sulphur Creek, Mark West Creek, Maacama Creek, and Dry Creek—contribute to the river's approximately 1,500-square-mile drainage area. The East Fork flows through Potter Valley into Lake Mendocino, while the West Fork begins at the tip of the Ukiah Valley and joins the East Fork southwest of the reservoir. From there, the river flows south through agricultural valleys and the communities of Ukiah, Hopland, Cloverdale, and Healdsburg before being joined by Dry Creek. Downstream of Healdsburg, the river meanders west through the lower Russian River Valley—passing Rio Nido, Guerneville, Monte Rio, Sheridan, and Duncan Mills—before reaching its outlet at Jenner on the Pacific coast.

Lake Mendocino and Lake Sonoma provide the watershed's primary managed water storage and flood protection. Lake Mendocino, created by the Coyote Valley Dam on the East Fork in 1958, and Lake Sonoma, formed by Warm Springs Dam on Dry Creek in 1982, are dual-purpose systems that provide both flood control and water supply storage. Flood operations at both reservoirs are managed by the U.S. Army Corps of Engineers, while Sonoma Water, as the local sponsor, operates water supply releases in accordance with its water right permits and the State Water Resources Control Board's Decision 1610. This decision establishes minimum instream flow requirements in the Russian River and Dry Creek to support municipal, agricultural, and industrial water uses, as well as critical beneficial uses including fisheries, recreation, and aquatic habitat. Through this coordinated management framework, the hydrologic system balances human water needs with ecological protections across a highly variable watershed influenced by seasonal precipitation, climate variability, and interannual hydrologic extremes.

2.2 Study Area

For the Russian River Pilot, the study area boundary adopts the HUC-8 Russian River watershed delineation from the *California Watershed Resilience Assessment* (DWR 2024) and adds adjacent areas that receive Russian River water supply. Figure 2-1 shows the watershed study area. The study area includes all or the portions of the following HUC-8s: Russian River (18010110), portions of San Pablo Bay (18050002) overlapping with Sonoma Water service areas, and portions of Tomales-Drake Bays (18050005) overlapping with Sonoma Water service areas. Figure 2-1 shows the Russian River hydrological watershed with an outline in green and the adjacent areas to the south of the watershed that receive Russian River water as hatched areas.

Figure 2-1. Russian River Watershed Resilience Pilot Study Area



The study area includes the entire Russian River watershed, including important hydrological features such as Lake Mendocino and Lake Sonoma; Potter Valley, Ukiah Valley, Santa Rosa Plain, and Alexander Valley groundwater basins; and the Laguna de Santa Rosa and Russian River Estuary. The study area also includes adjacent areas that receive Russian River water, also termed "plus" areas. These areas encompass portions of the North Bay watershed (i.e., Sonoma Water service areas) including the portions of the Sonoma Valley and Petaluma Valley groundwater basins that underlie the Sonoma Water service area, and Sonoma Water service areas in the City of Petaluma, Valley of the Moon Water District, City of Sonoma, North Marin Water District (Novato), and Marin Municipal Water District's (Marin Water) service area. This "plus" area expansion ensures that the hydrologic and hydrogeologic conditions of the Russian River watershed that affect water supply to all relevant communities, infrastructure, and populations are being considered for this effort.

The study area encompasses the upland headwaters and tributaries of the Russian River in addition to the significant resources along the mainstem Russian River. The boundary includes two federally owned reservoirs that affect flows in the Russian River watershed, Lake Mendocino and Lake Sonoma. The U.S. Army Corps of Engineers (USACE) owns these facilities and manages releases from the respective flood pools while Sonoma Water, as the local sponsor, controls and manages releases from the water conservation pools to meet consumptive demands by authorized users and minimum instream flow requirements pursuant to State Water Resources Control Board Decision 1610. Releases from Lake Mendocino, located in the upper Russian River watershed near Ukiah, into the Russian River meet minimum instream flow requirements and downstream water demands for the Upper Russian River, a 63-mile stretch of the Russian River from Coyote Valley Dam to the confluence of Dry Creek near Healdsburg. Sonoma Water also manages water supply releases from Lake Sonoma, located in the lower watershed, into Dry Creek to meet minimum instream flow requirements and downstream demands for a 14-mile stretch of Dry Creek to the confluence of the Russian River, as well for the 31-mile stretch of the Russian River from the confluence of Dry Creek to the Pacific Ocean near Jenner. Sonoma Water diverts water from the Russian River at its Wohler and Mirabel diversion facilities located near the town of Forestville and delivers potable water via its regional transmission system to its water contractors and customers in Sonoma and Marin counties. The Russian River also receives trans-basin imports from the Eel River through the Potter Valley Project (PVP), a hydroelectric facility owned and operated by PG&E. Imports from the PVP are released into the upper reach of the East Fork Russian River approximately 12 miles upstream of Lake Mendocino. In addition, the study area includes reservoirs managed by Marin Water and North Marin Water District. North Marin Water District and Marin Water supplement their local water supply with Russian River water that is delivered through Sonoma Water's transmission system.

The comprehensive climate vulnerability assessment for the Russian River Pilot was conducted for the Russian River hydrologic watershed. A limited evaluation of water supply, both surface water and groundwater, was conducted in the "plus" areas outside the Russian River watershed that are included in the study area boundary.

2.2.1 History of the Study Area

The Russian River watershed has a long and dynamic history shaped by Indigenous stewardship, European settlement, and modern development. In the early 19th century, Russian fur traders established settlements along the coast, giving the river its current name, followed by American settlers whose logging, agriculture, and urbanization transformed the landscape. Over time, the watershed became an important resource for farming, particularly vineyards, and for the expanding communities of Sonoma and Mendocino counties. Today, the Russian River watershed serves as a critical environmental and economic foundation that supplies drinking water to more than 700,000 people, Tribes, supports agriculture, and attracts millions of recreational visitors each year. The region now faces growing pressures from climate change, including drought, flooding, and threats to water quality and endangered species.

Indigenous Peoples of the Watershed

The Indigenous peoples of the Russian River watershed are the original stewards of the area. Indigenous land management practices, including controlled burning, selective harvesting, and traditional resource stewardship, shaped the watershed's ecology and continues to influence hydrology in the present. These practices created resilient landscapes that supported diverse ecosystems and sustained communities through careful observation and adaptive management. Their ongoing relationship with the watershed represents the deepest form of ecological resilience and their collective stewardship created the resilient landscapes that European settlers encountered upon their arrival in the 1800s.

European colonization beginning in the 1800s resulted in forced displacement of Indigenous populations, introduction of new land and water management systems, and restricted access to traditional territories. The construction of dams altered river flows and blocked historic salmon migration routes. Water management policies developed during this period generally did not incorporate Traditional Ecological Knowledge or include Indigenous governance structures.

Tribal governments and communities continue to engage in watershed planning and management activities. Their participation brings multi-generational knowledge of local ecosystems, historical ecological conditions, and traditional management practices to contemporary water resource decisions. Since time immemorial, Indigenous and Tribal people have observed, adapted to, and influenced hydrological patterns through sophisticated practices that maintained watershed health across generations. This knowledge encompasses deep understanding of seasonal water cycles, species interrelationships, land-water connections, and the long-term impacts of a co-managed approach to watershed resiliency. Traditional practices complement and often exceed the temporal and spatial scales of conventional water management. Meaningful collaboration with Tribal governments and knowledge holders requires respect and reciprocity recognizing Tribal sovereignty over their knowledge systems and ensuring that Indigenous voices have decision-making authority in watershed planning and management.

Multiple Tribes maintain connections to the watershed, including: Bear River Band of Rohnerville Rancheria, Big Valley Band of Pomo Indians of the Big Valley Rancheria, Cahto Tribe, Cloverdale Rancheria of Pomo Indians, Coyote Valley Band of Pomo Indians, Dry Creek Rancheria of Pomo Indians, Elem Indian Colony Pomo Tribe, Estom Yumeka Maidu Tribe of the Enterprise Rancheria, Federated Indians of Graton Rancheria, Grindstone Rancheria of Wintun-Wailaki, Guidiville Rancheria of California, Habematolel Pomo of Upper Lake, Hopland Band of Pomo Indians, Kashia Band of Pomo Indians of the Stewarts Point Rancheria, Lytton Rancheria, Manchester Band of Pomo Indians of the Manchester Rancheria, Middletown Rancheria of Pomo Indians of California, Mishewal-Wappo Tribe of Alexander Valley, Muwekma Ohlone Tribe of the San Francisco Bay Area, Noyo River Indian Community, Pinoleville Pomo Nation, Potter Valley Tribe, Redwood Valley or Little River Band of Pomo Indians, Robinson Rancheria of Pomo Indians,

Round Valley Reservation/Covelo Indian Community, Scotts Valley Band of Pomo, Sherwood Valley Rancheria of Pomo, and the Yokayo Tribe.

2.3 Water Resource Sectors

Guidance from DWR for the WRP and each of the Pilots included addressing each of the following seven water resource sectors. These are sectors that are dependent on, or impacted by, variation in the hydrologic cycle as driven by climate change.

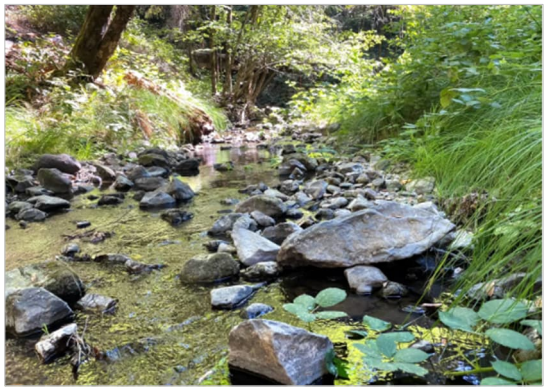
- Surface Water Supply
- Groundwater Supply
- Flood Management
- Ecosystems
- Water Quality
- Recreation
- Hydropower

2.3.1 Surface Water Supply

The Russian River watershed is a vital water source for Northern California, encompassing about 1,500 square miles across Mendocino and Sonoma counties. The surface water resources of the Russian River watershed serve as the region's primary water source, supplying over 700,000 residents in Sonoma, Mendocino, and Marin counties. Water from the Russian River supports a wide range of uses, including residential, commercial, agricultural, and environmental needs. Russian River water is stored in major reservoirs like Lake Mendocino and Lake Sonoma within the watershed, and in Lake Stafford and Marin Reservoirs, which are critical for maintaining water supply and minimum stream flows, especially during dry periods.

2.3.2 Groundwater Supply

Groundwater is a critical part of the Russian River watershed's water supply, supporting homes, farms, and businesses across Sonoma and Mendocino counties. Many residents, especially those in rural areas—depend on groundwater wells for their drinking and irrigation water, while agriculture and municipal systems also rely on groundwater to meet demand when surface water supply is limited. Climate change is expected to reduce natural recharge rates due to less frequent and more intense precipitation events, increased evaporation, and shorter, warmer winters.



2.3.3 Flood Management

Atmospheric rivers are responsible for over 99% of flood damages in Sonoma County, with all major Russian River floods since 1997 linked to these events (Corringham et al 2019). The lower Russian River's narrow floodplain and steep terrain accelerate and deepen floodwaters, increasing risk to communities like Guerneville and Monte Rio. Flooding is compounded by sedimentation from upland erosion and post-fire runoff, which reduces channel capacity and increases the likelihood of levee overtopping and infrastructure damage. Flood management is further complicated by aging infrastructure and high-risk development in flood-prone areas

2.3.4 Ecosystems

Ecosystems in the Russian River watershed are fundamental to the region's health and resilience, providing a wide array of benefits that support both people and nature. In the upper reaches, ancient redwood forests and oak woodlands provide habitat for a variety of plants and animals, while lush riparian corridors along the riverbanks help filter water, stabilize soils, and offer critical refuge for endangered coho salmon and threatened steelhead trout (California Department of Fish and Wildlife, 2023; Sonoma County Water Agency, 2024). Wetlands and floodplains, including those restored in the lower watershed, enhance biodiversity, reduce flood risks, and serve as important stopovers for migratory birds (NOAA Fisheries, 2024). These interconnected habitats also sustain unique species such as Pacific lamprey and California roach, and iconic redwoods protected in parks like Armstrong Redwoods State Natural Reserve (California State Parks, 2024). Ongoing conservation efforts by local agencies, conservation groups, and federal partners aim to balance ecological health with community needs, striving to ensure that the Russian River's ecosystems continue to provide clean water, recreation, and resilience against climate change (Sonoma County Water Agency, 2024; NOAA Fisheries, 2024). Ecosystem health in the Russian River watershed is directly threatened by climate-driven changes such as warmer stream temperatures, reduced flows, and increased sedimentation—especially after wildfires and during drought. These conditions have led to documented strandings and mortality of endangered salmon and steelhead in tributaries like Mill Creek, Green Valley Creek, and Dutch Bill Creek during dry years, while post-fire sediment runoff, such as after the Walbridge Fire, has degraded critical habitats and increased risks to aquatic life.

2.3.5 Water Quality

Many waterbodies in the Russian River watershed are listed under Clean Water Act Section 303(d) due to water quality impairments caused by several different pollutants. The Russian River watershed is impaired for sediment and temperature as well as pathogen, mercury, phosphorus, and dissolved oxygen impairments identified in waterbodies throughout the watershed. Water quality is at risk from a combination of drought, wildfire, and agricultural runoff. Drought concentrates pollutants and nutrients, increasing the likelihood of harmful algal blooms and degraded drinking water. Post-fire runoff increases sediment and ash in waterways, threatening both water supply (notably Lake Sonoma's drinking water) and aquatic species.

2.3.6 Recreation

The Russian River is a major recreational asset for the region. Visitors and locals enjoy canoeing, kayaking, tubing, and even some whitewater rafting along the river's scenic stretches, while over 100 miles of trails invite hikers, runners, mountain bikers, and horseback riders to explore the region's redwoods and rolling hills. Fishing is a popular activity, and several beaches—including Johnson's Beach and Memorial Beach—provide great spots for swimming, picnicking, and relaxing by the water. Recreation is closely tied to watershed health. The Lake Mendocino and Lake Sonoma Recreation Areas offer a variety of recreational activities, including boating, water skiing, swimming, camping, fishing, hunting, picnicking, mountain biking, horseback riding, and sightseeing. Floods, droughts, and wildfires can restrict access, degrade water quality, and reduce opportunities for boating, fishing, and other activities.

2.3.7 Hydropower

Within the Russian River watershed, hydropower is generated from water released from Lake Mendocino at Coyote Valley Dam and from Lake Sonoma at Warm Springs Dam. The hydropower generation at each of these dams is primarily opportunistic, subject to releases for water supply, flood management, and instream flow purposes. For over a century, the Potter Valley Project (PVP), owned and operated by Pacific Gas & Electric (PG&E), has imported water from the Eel River to generate hydropower. However, PG&E stopped generating power at the facility in 2021 due to failure of a transformer bank at the powerhouse. The FERC license for PVP expired in April 2022 and the PVP is currently operated under annual license issued by FERC. In July 2025 PG&E filed a license surrender application with FERC that proposes to decommission the project and remove the two dams.