

Lake Sonoma FORECAST INFORMED RESERVOIR OPERATIONS

Viability Assessment

The Russian River watershed has two major reservoirs, Lake Mendocino (built in 1959), and Lake Sonoma (built in 1983) (Figure 1), both of which are used for flood risk management and water supply. The U.S. Army Corps of Engineers (USACE) manages releases from the flood control pool for each, and Sonoma Water manages releases from the water supply pool for each.

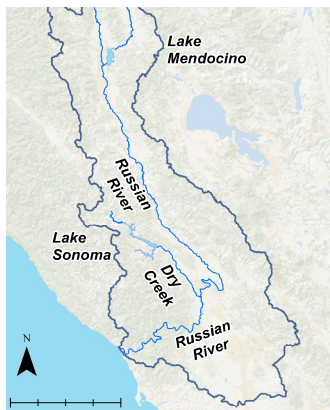


Figure 1. Russian River Watershed with Lake Sonoma at center and Lake Mendocino in the upper watershed.

The reservoirs are governed by USACE water control manuals (WCMs), which were originally developed without the benefit of modern precipitation and

streamflow forecasts. Each WCM specifies reservoir operation according to a guide curve, which dictates water levels during a flood event and water releases soon thereafter to create storage space for the next storm event. Lake Mendocino has a variable guide curve, while the guide curve for Lake Sonoma is a constant value that does not reflect seasonality (Figure 3).

FIRO Success at Lake Mendocino

The Lake Mendocino FIRO Steering Committee completed a FIRO viability assessment for Lake Mendocino in 2021. FIRO operations have resulted in higher end-of-water year storage, with nearly 20 percent increased storage in 2020, a dry year, as well as a net water increase in 2023, a wet year. In addition to increased storage, FIRO resulted in a deeper, cooler pool that benefits threatened and endangered salmonids.



Forecast Informed Reservoir Operations (FIRO)

FIRO is a management strategy that uses data from watershed monitoring and modern weather and water forecasting to help water managers selectively retain or release water from reservoirs.

The ability to mitigate potential impacts of drought and flooding through FIRO hinges on accurate forecasts of atmospheric river storms (Figure 2) because they provide roughly half the water supply, and yet cause more than 90 percent of all flood damages. Forecast skill for atmospheric river storms must be sufficient to ensure adequate lead time to inform dam operators' decisions whether to release or store water in anticipation of incoming precipitation (or lack thereof). Improving forecast skill can result in greater flexibility over time.

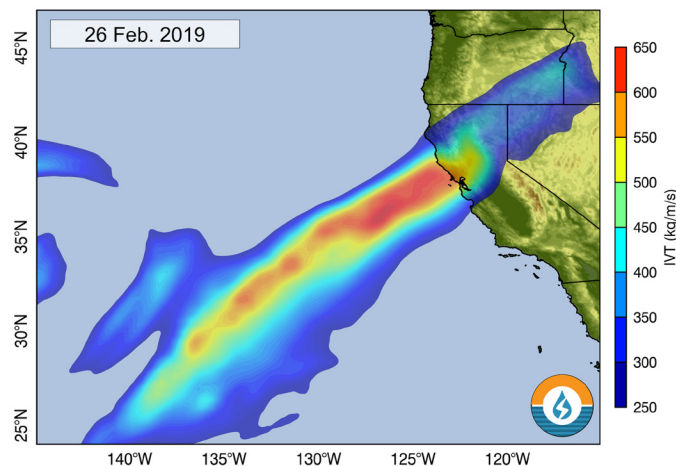


Figure 2. An atmospheric river making landfall in the Russian River area. Shading represents integrated water vapor transport, which indicates the strength of the atmospheric river.

Applying FIRO to Lake Sonoma

Based on the positive outcomes from Lake Mendocino, the Steering Committee was reconstituted to form the Russian River FIRO Steering Committee, focused on expanding FIRO to Lake Sonoma on Dry Creek. In December 2022, Lake Sonoma declined to its lowest level (40 percent of the total water supply pool) ever recorded, underscoring the need to improve resilience. FIRO operations under a minor deviation to the WCM during that same water year demonstrated significant water supply benefits, as shown in Figure 3.

Lake Sonoma FIRO goals are to:

- Maintain and possibly enhance flood risk management.
- Protect fisheries habitat on Dry Creek.
- Improve Lake Sonoma cold water pool reliability for the Don Clausen Fish Hatchery.
- Improve drought resiliency for water supply, environmental, and recreational benefits.
- Evaluate conceptual secondary outlet configurations from Lake Sonoma to enhance flood risk management and regional water supply resilience by helping to offset reduced Eel River diversion to the Russian River.

The Russian River Steering Committee (see text box at right) is working on the FIRO viability assessment, which is anticipated to be completed in March 2026 (Figure 4). Upon completion, the Steering Committee will support USACE in updating the WCM to incorporate FIRO operations. To streamline the process, USACE's Water Manager for the San Francisco District is leading the water resources engineering portion of the viability assessment, so that the work done by the Steering Committee can be used directly in the WCM update rather than conducting a separate analysis, saving time and money.

Lake Sonoma FIRO Timeline



Figure 4. A timeline for FIRO development at Lake Sonoma.

To read the full Work Plan or find more information about FIRO at Lake Sonoma, visit https://cw3e.ucsd.edu/firo_russian_river.

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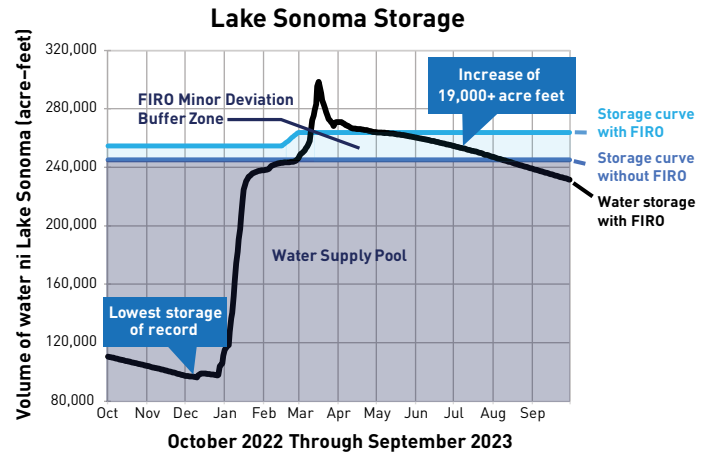


Figure 3. Lake Sonoma guide curve, showing more than 19,000 acre-feet of increased water storage in WY 2023 with FIRO operations under a minor deviation approved and implemented by USACE.

Russian River Steering Committee

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| ■ Nick Malasavage, USACE (Co-chair) | ■ Joe Forbis (USACE) |
| ■ Marty Ralph, CW3E (Co-chair) | ■ Joshua Fuller (NOAA Fisheries) |
| ■ Don Seymour, Sonoma Water (Co-chair) | ■ Alan Haynes (NOAA NWS, CNRFC) |
| ■ Michael Anderson (California DWR) | ■ Cary Talbot (USACE) |
| ■ Chris Frans (U.S. Bureau of Reclamation) | ■ Robin Webb (NOAA OAR) |

