



Aligning Forecast-Informed Reservoir Operations and Water Control Manual Updates in the Yuba and Feather River Watersheds

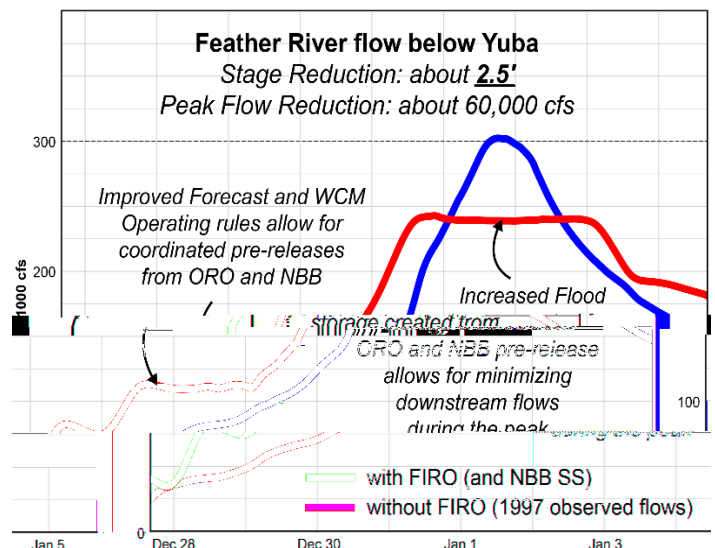
As climate change continues, the intensity of atmospheric river storms is expected to increase. To reduce flood risk from these storms without adversely impacting water availability, Yuba Water Agency (Yuba Water) and California’s Department of Water Resources (DWR) are implementing Forecast-Informed Reservoir Operations (FIRO) at Lake Oroville and New Bullards Bar Reservoirs. FIRO is a flexible water management approach that uses watershed monitoring data and improved weather forecasting to help water managers selectively retain or release water from reservoirs for increased resilience to droughts and floods. FIRO supports research, applies scientific advancements, and helps reservoir managers make more informed decisions about how much water to keep during dry periods or release before a storm.

New Bullards Bar and Lake Oroville operate according to the U.S. Army Corps of Engineers’ Water Control Manuals, in which a “guide curve” dictates a storage and release schedule based on past weather patterns. The Corps are currently in the process of updating these manuals. In the past, FIRO and Water Control Manual updates have been studied sequentially. For the first time however, FIRO is being assessed in concert with these updates.

Applying Forecast-Informed Reservoir Operations to a Flood of Record

On New Year’s Day 1997, after weeks of steady rain and snowfall, a powerful atmospheric river storm hit California and brought heavy, sustained rainfall and rapid snowmelt, causing levee breaks on the Feather River.

If FIRO had been in place at Lake Oroville and New Bullards Bar, including a planned secondary spillway at New Bullards Bar, reservoir releases could have started up to 48 hours sooner. This action may have reduced downstream water levels near the Yuba-Feather confluence by 2-3 feet on levees. This comparison shows the Feather River during the 1997 flood (blue line that peaks above 300,00 cubic feet per second) and a simulation of the potential decrease in the



peak river level with FIRO in place (red line that plateaus around 240,000 cubic feet per second).

Forecast-Informed Reservoir Operations and Water Control Manual Updates

The alignment of FIRO and the Corps' Water Control Manual updates is a groundbreaking innovation and a model for future reservoir management. Recognizing the importance of developing and documenting this process, a workgroup of water managers, researchers, engineers and policymakers held three workshops to align the implementation of FIRO with Water Control Manual updates for Lake Oroville and New Bullards Bar.

Key outcomes from the workshop included:

- Defining clear goals and objectives for each project in relation to one another
- Improving understanding of projects by participants in both processes, enabling more meaningful and effective collaboration
- Aligning schedules and common requirements to avoid duplication of efforts
- Establishing regular leadership meetings and integrating technical work groups to collaborate, share analyses, monitor progress, and adapt as needed
- Creating a model process for future FIRO-informed Water Control Manual updates
- Refining operational requirements for research

The workshop laid the groundwork for cross-fertilization between a FIRO preliminary viability assessment and the Water Control Manual update for Lake Oroville and New Bullards Bar. Next, the workgroup will conduct technical studies as part of a preliminary viability assessment for FIRO, followed by a final viability assessment. Water Control Manual updates are on-track for completion in 2024.

Model for Future Collaboration

The Yuba-Feather FIRO program and the alignment of this effort with Water Control Manual updates has been largely driven by local and state agencies. Continued state and federal investments in atmospheric river research, FIRO and Water Control Manual updates are crucial to expanding this approach to other parts of the western U.S. to address climate change and its impacts on people and the environment. For the latest status and additional information on this work, visit <https://cw3e.ucsd.edu/firo>.



Image: An aerial view of widespread flooding in Yuba and Sutter counties in 1997 after heavy rain from an atmospheric river.