

FORECAST INFORMED RESERVOIR OPERATIONS: PROGRESS TOWARD THE FINAL VIABILITY ASSESSMENT FOR LAKE MENDOCINO

PREPARED BY SONOMA WATER • FALL 2018

PROJECT PARTNERS



BACKGROUND

Lake Mendocino, located on the East Fork of the Russian River in California, has a total storage capacity of 122,500 acre-feet. Created by Coyote Valley Dam in 1958 for flood control, Lake Mendocino also provides water supply, recreation and environmental stream flow. The US Army Corps of Engineers (Corps) owns the project and makes flood control releases in accordance with the Water Control Manual (WCM). Sonoma Water (SW) controls releases when water levels are in the water supply pool.

The WCM, issued in 1959 and with minor revisions in 1986, was developed without the benefit of modern weather and stream flow forecasting methods.

The WCM specifies reservoir operation according to a rule curve, which dictates water storage during a flood event and water releases soon thereafter to create storage space for the next potential flood. The rule curve is predicated on historical weather patterns – wet during the winter, dry otherwise.

THE PROBLEM

This region experiences some of the most variable weather in California, with frequent droughts and floods. The rule curve does not account for increased variation in weather patterns nor a 56% reduction of diversions into Lake Mendocino from the Eel River due to changes in hydroelectric operations. As a result, the water supply reliability of Lake Mendocino is impaired with significant consequences to downstream municipal and agricultural water users as well as endangered coho salmon, threatened steelhead trout and Chinook salmon.

A VIABLE SOLUTION

Applying scientific advances in weather and stream flow prediction can mitigate the impacts of weather extremes without the need for expensive infrastructure changes. This cost-effective approach, called Forecast Informed Reservoir Operations (FIRO), can optimize water resources management and improve resilience of Lake Mendocino without increasing flood risk.

A Steering Committee is working collaboratively on this project, which has transferability potential to other reservoirs. The preliminary viability assessment (PVA), released in August 2017, indicates that FIRO is a viable approach to optimizing water supply reliability and flood risk management objectives for Lake Mendocino. Specifically, the PVA (<http://cw3e.ucsd.edu/firo-preliminary-viability-assessment-for-lake-mendocino/#TOP>) found:

- Based on data from 1985-2010, median end of year reservoir storage gain attributable to FIRO was modeled and found to range from 8,633 AF to 27,780 AF, or more than a 40% increase.
- Making decisions about reservoir releases based on forecasts of reservoir inflows and local flows does not adversely affect (and could possibly improve) flood risk management.

STEERING COMMITTEE MEMBERS

FIRO CO-CHAIRS

Jay Jasperse*

Sonoma Water

F. Martin Ralph*

Center for Western Weather and Water Extremes, Scripps Institution of Oceanography

Michael Anderson*

CA Department of Water Resources

Levi Brekke

U.S. Bureau of Reclamation

Nick Malasavage*

US Army Corps of Engineers, San Francisco District

Michael Dettinger

United States Geological Survey

Joe Forbis*

US Army Corps of Engineers, Sacramento District

Alan Haynes*

NOAA California-Nevada River Forecast Center

Natalie Manning*

NOAA National Marine Fisheries Service

Cary Talbot*

US Army Corps of Engineers Engineer Research and Development Center

Robert Webb*

NOAA's Earth System Research Laboratory

* Members of the Steering Committee who signed the Major Deviation request.

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- Atmospheric River-type storms are the key drivers of both drought and flood risk in this region, as these events produce heavy and sometimes prolonged precipitation.

PROJECT STATUS and APPLICATION TO OTHER AREAS

Based on the results of the PVA, in October 2017 members of the Steering Committee* filed a request with the Corps to allow a major deviation from its established flood control operating rules. A decision by the Corps is expected in Fall of 2018.

If approved, up to 3.8 billion gallons (11,650 acre-feet) of additional water could be stored in the reservoir between November 1 and February 28, which is enough water to supply 97,000 people for a year. The Steering Committee anticipates requesting at least one additional major deviation, applying lessons learned from the first.

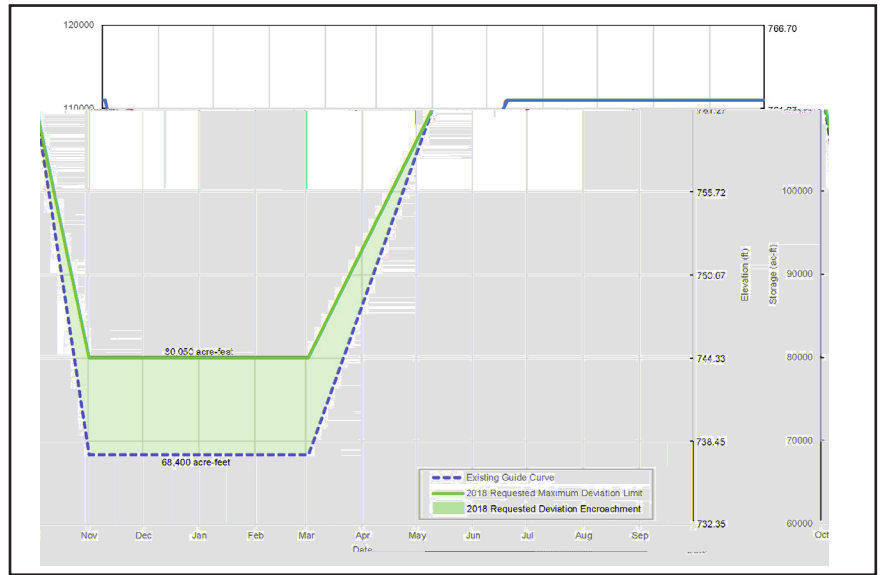
Over the next 2 years, the Steering Committee will develop a FIRO Final Viability Assessment (FVA) that will recommend FIRO strategies, science and technologies that could be implemented near-term and longer term. CA DWR, CW3E, Bureau of Reclamation, SW, the Corps and others are collaborating on additional research and technical studies including:

- Improvements in weather forecast models (WestWRF) and science to understand causes of forecast errors.
- Development of a decision support system and refinement of reservoir decision support models that leverage streamflow forecasts and associated uncertainty.
- New observations to refine atmospheric and hydrologic forecasting models (e.g., "Atmospheric River Reconnaissance").
- A study to estimate the economic benefits of FIRO at Lake Mendocino along with a transferability framework.
- A study to evaluate the potential for FIRO to improve Lake Mendocino flood management.

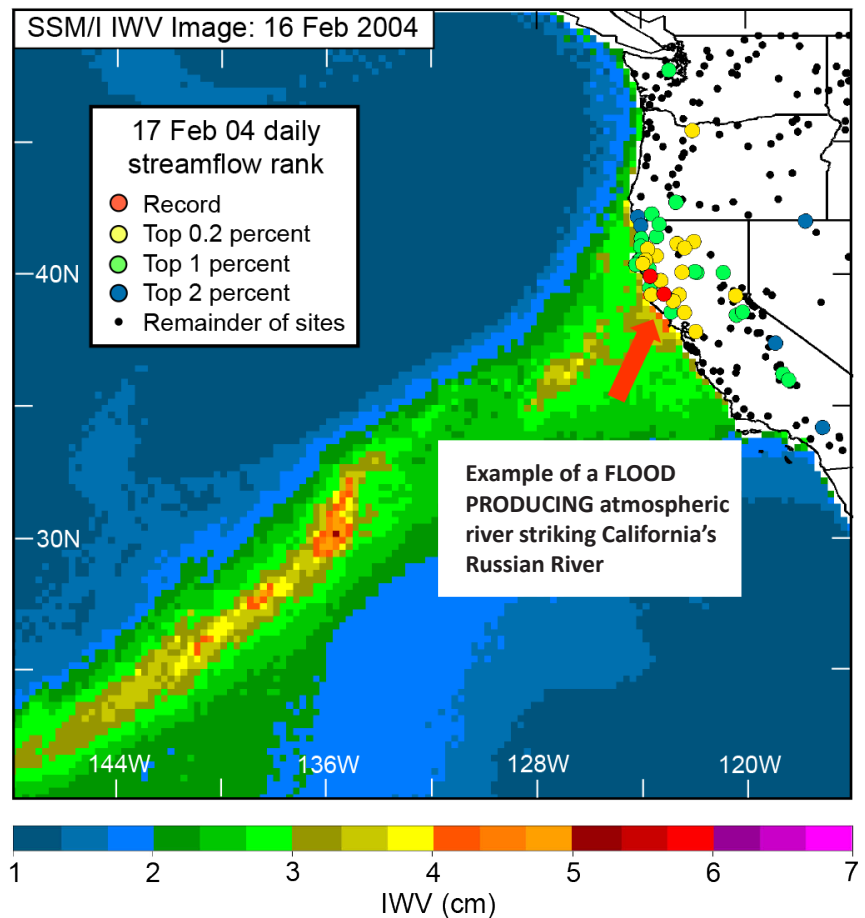
Application of FIRO is underway at Prado Dam; transferability to other reservoirs will also be assessed.

CONTACTS

Jay Jasperse • (707) 547-1959
 jay.jasperse@scwa.ca.gov
 F. Martin Ralph • (858) 822-1809
 mralph@ucsd.edu



Existing guide curve and proposed guide curve with requested major deviation changes.



Satellite image of an atmospheric river on 16 February 2004, and its impacts on the next day's streamflow.

Ralph, F. M., P. J. Neiman, G. A. Wick, S. I. Gutman, M. D. Dettinger, D. R. Cayan, and A. B. White, 2006: Flooding on California's Russian River: Role of atmospheric rivers. *Geophys. Res. Lett.*, 33, L13801, doi:10.1029/2006GL026689.

SUPPORT STAFF

Arleen O'Donnell, Eastern Research Group
 Barry Dugan, Sonoma Water
 David Ford, HDR/David Ford Consulting Engineers
 Robert Hartman, Robert K. Hartman Consulting Services