Forecast-Coordinated Operations

Of Lake Oroville and New Bullards Bar Reservoir For Managing Major Flood Events

A Multi-Agency Regional Flood Management Program in Partnership with:

USACE YCWA DWR NOAA

February 2008 Update

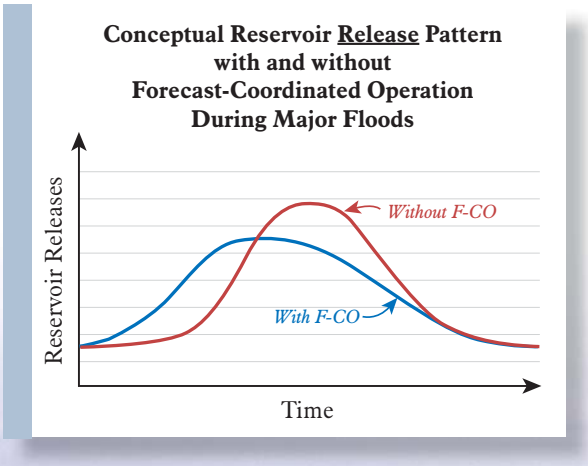
Overview

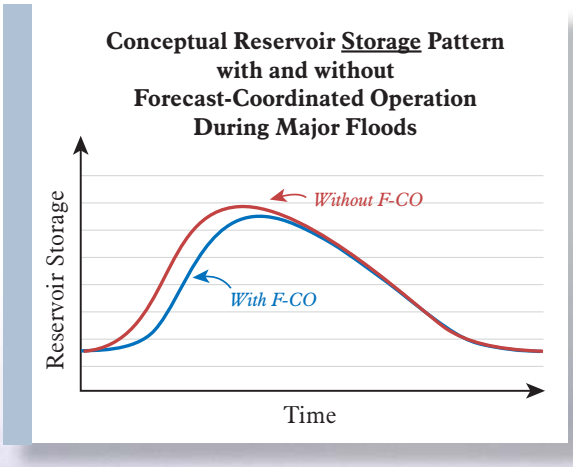
After a devastating flood in 1997, Yuba County Water Agency initiated studies directed at developing a high level of flood protection for Yuba County and the surrounding communities. The resulting *Feasibility Study for Yuba-Feather Supplemental Flood Control Project* identified six specific flood management improvement measures. It concluded that one of the most cost-effective measures would be to implement the proposed Forecast-Coordinated Operations of Lake Oroville and New Bullards Bar Reservoir (F-CO) program.

Program Goal and Objectives

The goal of the F-CO program is to improve flood protection and better protect life and property for communities along and downstream of the Yuba and Feather Rivers without impacting the water supply of Lake Oroville and New Bullards Bar Reservoir. The objective of the F-CO program is to reduce peak flood flows through better river flow forecasting and improved coordination between Lake Oroville and New Bullards Bar Reservoir flood operations.

The key to improving flood protection is the coordination of local, state and federal operations during major flood events. This coordination is further enhanced through use of a decision support system and state-of-the-art technology for flood forecasting. The F-CO program allows water managers to operate the reservoirs in advance of and during major flood events with an improved level of forecast certainty; thus, reducing peak flows of the rivers and the risk of exceeding river channel capacity. The F-CO program also improves notification processes and increases flood warning times to emergency operation managers, state and local offices of Emergency Services, levee districts and the downstream areas in danger of major flooding.





Coordinated Operations of Lake Oroville and New Bullards Bar Reservoir

Lake Oroville

New Bullards Bar Reservoir

The Feather River at Yuba City and the Yuba River at Marysville are key forecasting points downstream of the reservoirs.

The F-CO program coordinates flood operations of Lake Oroville and New Bullards Bar Reservoir, and using improved inflow forecasts, guides reservoir releases in advance of and during major flood events to reduce peak flood flows, resulting in additional levels of protection downstream.

F-CO Program Implementation

Developing and implementing the F-CO program is a multi-agency partnership effort. The participating agencies have a history of working together in preparing flood-related information, operating and maintaining the flood control structures, and serving the public during flood emergencies. The F-CO program has further enhanced working relationships as well as developing infrastructure for exchanging and sharing flood information.

Program Partners

Yuba County Water Agency (YCWA)

Department of Water Resources (DWR)
- Flood Management
- State Water Project (SWP)

National Oceanic and Atmospheric Administration, (NOAA) National Weather Service–River Forecast Center

US Army Corps of Engineers (USACE)

The F-CO program development has two phases: Phase 1–Design, and Phase 2–Implementation. Work on this multi-year program began in 2005. A Management Team was established to guide program development and review work in progress. Staff from the sponsoring agencies and consultants formed working teams to address specific tasks and work on programs. The planned major tasks for the first two years were to identify and develop tools to improve the quality of flood forecasting data, and to identify information technology needs. This included identifying additional needs for real-time hydrologic and meteorological data and installation

of remote gauging stations. During the first two years of program implementation, 19 remote gauging stations were installed with telemetry systems that transmit data to the California Data Exchange Center. The third year effort focuses primarily on developing a robust reservoir operations model and integrating the model with the National Weather Service River Forecasting Center system.

Program Status

The expertise and input of the agencies and consulting team helped the F-CO program achieve many of its objectives, and work continues to deliver the expected benefits. The F-CO program is a pilot project. The experience, information and accomplishments of the program can be used for coordinated operations of other reservoirs in the Central Valley and throughout the state.

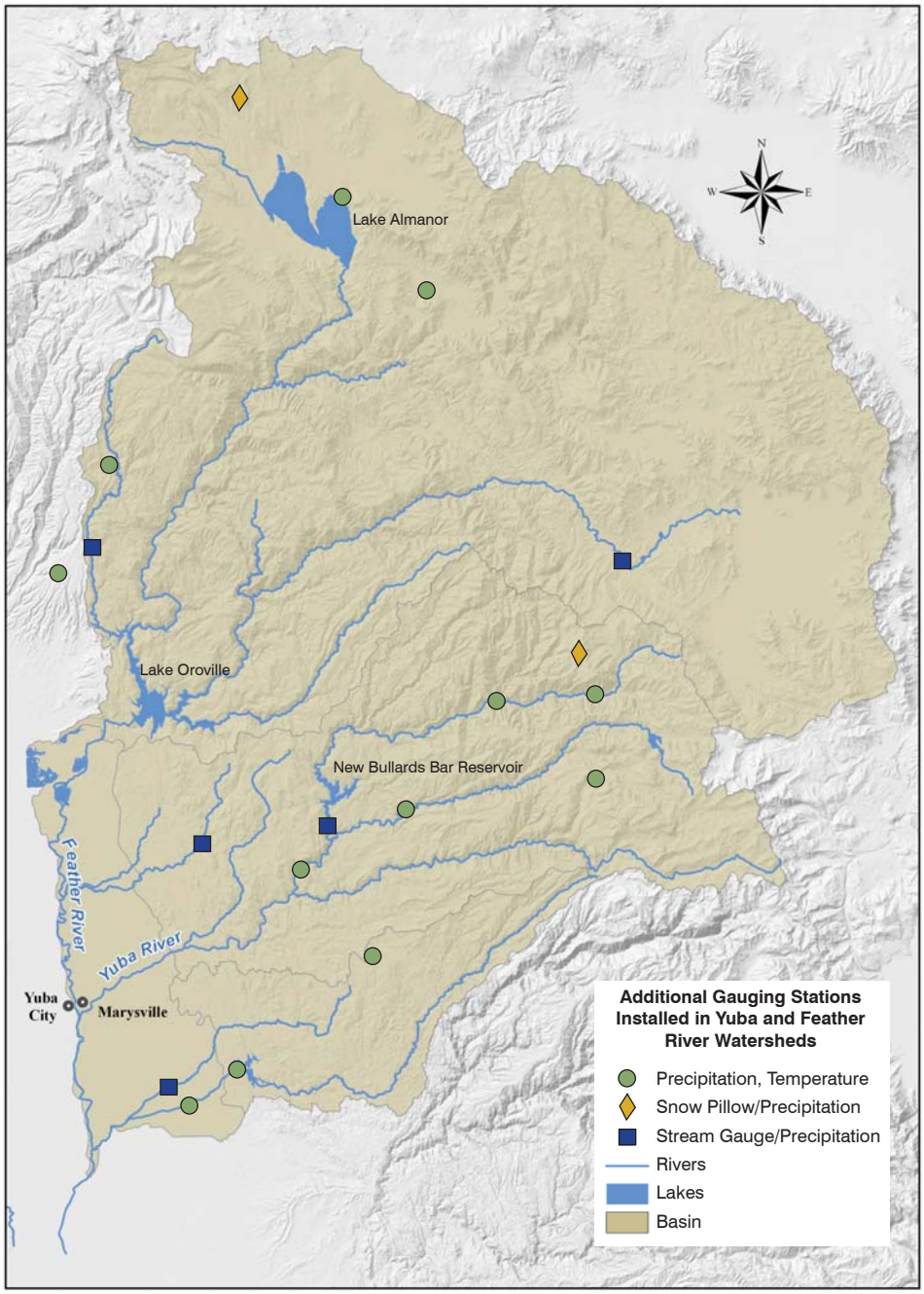
The F-CO program developed a Decision Support System (DSS) for coordinated and informed decision making of reservoir operations between all the flood management agencies. The DSS provides for storage and data sharing, and is built around the California Data Exchange Center System. It uses secure, Web-based technologies to ensure ease of use and rapid access to important flood information for the reservoir operators and public. The DSS improves data sharing and communications among participating agencies. Both forecasted and observed data are maintained in relational databases accessible through user friendly Web-based interfaces.

The program also provided new information systems technologies, an enhanced reservoir simulation model, forecasting tools, communications protocols, and operational procedures. This improves the flow of information and allows operators to make better-informed decisions, and generate forecasts that are more timely and accurate.

A major element of the F-CO program is the coordinated operation of the reservoirs on the Yuba and Feather Rivers. Considerable progress has been made to understand and formulate procedures for coordinated operation, which is being documented in the flood operation protocol manuals for Yuba and Feather Rivers.

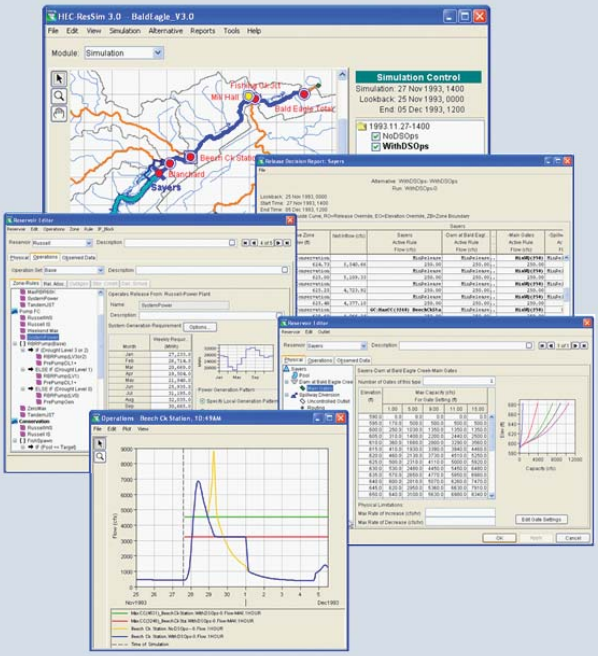
To train new staff and reservoir operators, annual flood coordination meetings were conducted in the fall of each year. In 2007, a table top flood exercise was attended by 40 staff members of the four agencies involved. A functional flood exercise is scheduled for 2008.

Nineteen additional gauges have been installed, including eight precipitation gauges, two stream gauges, and a snow pillow for the Yuba River Basin; and four precipitation gauges, three stream gauges, and one snow pillow for the Feather River Basin. These gauges compliment the existing data collection system in the watersheds. All equipment has real-time telemetry capabilities. The precipitation gauges are equipped with temperature sensors, while the stream gauges have rain sensors.



Program Accomplishments

- Identified needs and designed, installed and tested information systems platforms, including hardware, software and specific applications that improve communications among the participating agencies.
- Identified hydrologic data needs and purchased, installed, and tested state-of-the-art gauging stations that provide high quality, real-time data for multiple purposes and programs.
- Developed and tested communications protocols and software for data and information transfers between reservoir operators and the Flood Center.
- Designed the enhanced ResSim reservoir model, which can simulate a range of reservoir operating conditions and accurately simulate downstream flows at specific control point locations. The first phase of model development is complete.
- Developed a spreadsheet model for New Bullards Bar operations. This model helps field staff to operate the reservoir during a major flood event when communication systems are down.
- Designed a user-friendly interface for reservoir operators to access the enhanced ResSim, to run real-time reservoir operations scenarios and to exchange information about operation scenarios with the Flood Center. The first phase of interface development is complete.



The enhanced ResSim Model is being developed for the F-CO program by the Hydrologic Engineering Center. The model is integrated with the NWS-RFC forecasting system. The model allows for analysis of multiple forecasting scenarios, while at the same time providing a window to real-time data from the field.

- Prepared a coordinated operation procedure for New Bullards Bar Reservoir and Lake Oroville during major floods using the technical tools, data, and modeling programs.
- Conducted pre-season flood coordination meetings between SWP, YCWA, NWS-RFC, Flood Center, and USACE. Conducted a table top exercise.
- Designed tools for training and planning purposes that help operators gain experience over a wide range of potential flood operation events.

Next Steps

- Operational testing of the enhanced ResSim during flood events.
- Operational testing of the reservoir operator's interface.
- Improve watershed forecasting models.
- Prepare flood operation protocols for New Bullards Bar Reservoir.
- Prepare and conduct a comprehensive functional exercise to test F-CO program elements.
- Clarify and/or update the flood control diagrams for New Bullards Bar, and Lake Oroville, if needed.

About Yuba County Water Agency

The Yuba County Water Agency was created pursuant to an act of the California legislature in 1959. Among its powers is the "…power to control the flood and storm waters of the agency and the flood and storm waters that flow into the agency, and to conserve such waters for the beneficial and useful purposes of said agency …" (West's Water Code Appendix section 84-4.2.)

Confluence of the Feather and Bear Rivers.

a Publication of
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