

Climate Change Resilience: Research Helps Modernize Reservoir Operations in the Yuba-Feather Watersheds

Yuba Water Agency (Yuba Water); the California Department of Water Resources (DWR); U.C. San Diego, Scripps Institution of Oceanography, Center for Western Weather and Water Extremes (CW3E); the U.S. Army Corps of Engineers (USACE); and others are working together on a critical public safety initiative to reduce flood risk and improve climate change resilience for Yuba and Sutter counties.

Atmospheric rivers (ARs) have a profound impact on water management in California. Applying modern forecasting research will improve the ability to better predict the duration, intensity, and location of these storms and by providing critical data for water managers to determine how much water to release and when.

Implementing Forecast-Informed Reservoir Operations (FIRO) at New Bullards Bar and Oroville reservoirs will allow for coordinated, early releases of water in advance of epic storms, creating additional reservoir capacity to manage incoming inflows. Additionally, there is potential to improve water supply storage and increase hydropower generation, both valuable assets in light of climate change impacts.

Research Methods – Data Collection

To improve the ability to predict ARs, the CW3E researchers are installing new meteorological monitoring equipment in the Yuba-Feather watersheds. In December 2019, CW3E launched the first trial radiosonde from Marysville. The radiosonde is lifted into the atmosphere up to 80,000 feet by a weather balloon,



where it measures air temperature, pressure, moisture, and wind direction and speed. During major ARs, radiosondes will be launched as often as every few hours from Marysville and Bodega Bay.

These data will be coupled with data from dropsondes, which transmit similar information after they are released during storms over the Pacific Ocean via aircraft. Analysis of these data will advance understanding and improve prediction of the impacts of ARs in the Yuba-Feather watersheds.

Carly Ellis of CW3E and John James of Yuba Water launching a trial radiosonde

Researchers are also installing additional gaging stations to monitor precipitation, humidity, pressure, temperature, solar radiation, wind speed, and wind direction to enhance existing real-time monitoring in



Carly Ellis from CW3E installing a gaging station

the Yuba-Feather watersheds.

These sites will be equipped with soil moisture sensors, taking measurements down to one meter below the surface, to improve the understanding of the relationship between ground saturation and runoff during storms. Three monitoring stations will be installed in the Yuba River watershed and three in the Feather River watershed.

In addition, vertically pointing micro rain radar sites will be installed to observe the freezing level dynamics during AR events. This is important for determining the area of the watershed subject to runoff during storm events.

Research Impact

From this research, Yuba Water and DWR plan to work with the USACE to develop new adaptive operational procedures for managing flood flows.

Meteorological and hydrological data from these sites will improve the understanding and forecasting of ARs and their impacts on the watersheds. The results will improve runoff predictions, which will help water managers fine-tune reservoir operations, significantly reducing flood risk and potentially improving water supply and renewable hydropower generation as well.

Collaboration

The Yuba Feather FIRO project is a collaborative effort led by a Steering Committee* representing local, state, and federal agencies and researchers at CW3E. Yuba Water and DWR are working closely with the USACE and other members of the Committee to use research results to inform new operational procedures for better managing flood flows.

In addition to financial contributions by Yuba Water Agency, the California Legislature and U.S. Congress have provided significant AR research support, which is being funded through DWR and the USACE. This leadership has been crucial for the success of this effort.

***Yuba-Feather FIRO Steering Committee:** Co-chairs Marty Ralph (CW3E), Curt Aikens (Yuba Water), and John Leahigh (DWR); Molly White (DWR), John James (Yuba Water), Cary Talbot (USACE), Joseph Forbis (USACE), Alan Haynes (National Weather Service), Jay Jasperse (Sonoma Water), Mike Anderson (DWR), and Steven Lindley (NOAA Fisheries)