Forecast Informed Reservoir Operations at **Howard A. Hanson Dam**

Howard A. Hanson Dam (HAHD), owned and operated by the U.S. Army Corps of Engineers (USACE) Seattle District, was built in 1961 on the Green River in King County, Washington. Since 1962, HAHD has prevented an estimated \$21.5 billion in flood damage. The dam also augments stream flow for fish in the summer and fall, and supports municipal water supply for about 700,000 people served by Tacoma Water and partners. Tacoma Water relies on water storage at the dam to meet peak water supply demand and minimum instream flow requirements.

The reservoir is generally filled each spring with precipitation and snowpack runoff from the Cascade Mountains. It is operated to be at roughly 50 percent of maximum authorized flood storage capacity at the start of the summer and is emptied before the winter, when its main function is flood risk management.







HAHD and Eagle Gorge Reservoir. Courtesy of USACE.

Atmospheric rivers (ARs) are the type of storm responsible for over 93 percent of all flood damage costs in Washington. Extreme ARs are projected to become more frequent, and decreased snowpack and earlier peak flows are projected to occur with changes in climate. To meet instream flow requirements and ensure the availability of the water supply in the face of these changes, a steering committee¹ was formed to explore Forecast-Informed Reservoir Operations (FIRO) at HAHD.

FIRO is a reservoir operations strategy that informs decisions to retain or release water by integrating additional flexibility into operation policies and rules with enhanced monitoring and improved weather forecasts (American Meteorological Society 2020).²

¹ Howard A. Hanson Dam FIRO Steering Committee. Co-chairs: Marty Ralph, Director, Center for Western Weather and Water Extremes, Scripps Institution of Oceanography, UC San Diego; Cary Talbot, National FIRO program lead, USACE Engineer Research and Development Center (ERDC); Jessica Knickerbocker, Deputy Superintendent, Tacoma Water. Members: Sara Marxen (USACE Seattle District), Stephen King (Northwest River Forecast Center), Lisa Abernathy (National Oceanic and Atmospheric Administration [NOAA] Fisheries), Mary Strazer (King County Flood Management), Eric Warner and Nancy Rapin (Muckleshoot Indian Tribe), and Joe Forbis (USACE, ERDC).

² American Meteorological Society, cited 2025: Forecast-informed reservoir operations. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Forecast-informed_reservoir_operations.]

FIRO successes to date in the Russian, Santa Ana, and Yuba-Feather river watersheds in California have demonstrated major benefits under FIRO operations (Water Control Manual deviations). The HAHD Steering Committee has posed the following key question to explore FIRO at HAHD:

How can improved forecasts of landfalling ARs and associated precipitation and runoff be used to improve the reliability of spring refill to support instream flows for fish and water supply storage objectives; improve summer water management in advance of the fall flood transition period; maintain or improve operations for downstream flood risk management; and ensure forecasts and operations are flexible enough to respond to a changing climate without affecting flood risk, water storage reliability, and flows for fish?

The FIRO viability assessment, described in the HAHD FIRO Work Plan (2024), will explore alternative FIRO operations and provide USACE with analyses to update the HAHD Water Control Manual using forecasts for earlier spring refill to meet instream flow requirements and water storage objectives.



Below is the timeline for completing the FIRO assessment.

To read the full Work Plan or find more information about FIRO at the Howard Hanson Dam, visit https://cw3e.ucsd.edu/firo_howard_hanson/.

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ERD



