Integration and Evaluation of Operational Machine Learning Hydrological Forecasts in Reclamation Regions

BUREAU OF RECLAMATION

HydroForecast

Plain language summary:

The U.S. Bureau of Reclamation and Upstream Tech are partnering to implement & evaluate operational machine learning inflow forecasts across key basins in all of Reclamation regions. Forecasts are all up and running and will be evaluated over the next two years.

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Upstream Tech

Reclamation's Facilitated Adoption Program

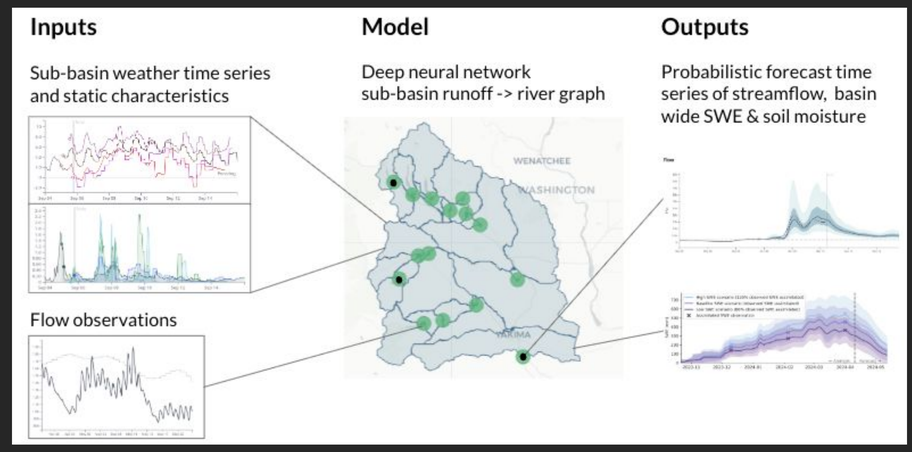
The USBR operates vital water infrastructure in the U.S. West and aims to enhance inflow forecasting for water supply, power, recreation, irrigation, and flood control.

Following a 2020-21 prize competition, Upstream Tech's HydroForecast was selected as a potential solution to improve short-term inflow forecasts.

Geographic scope - 13 basins, 20 sites

What is HydroForecast?

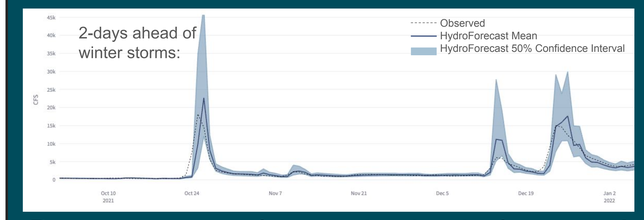
A fully operational hydrologic forecasting model that uses a machine learning core to predict hydrology, anywhere in the world.



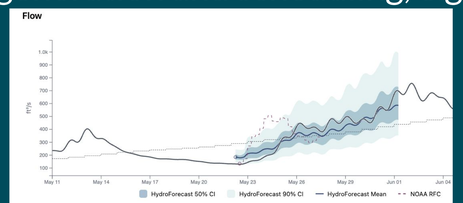
HydroForecast predicts hourly flows out to 10 days, and daily flows out a year.

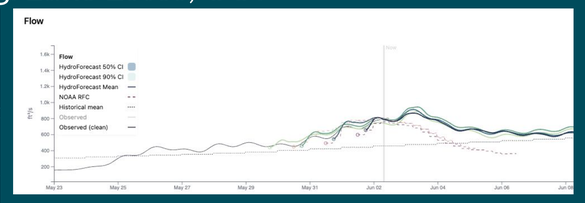
Highlights of the operational use cases included:

Flood control (aka FIRO operations)
e.g. at Folsom Lake, with upstream regulation:



Power generation and scheduling, e.g. Lake Estes, CO:



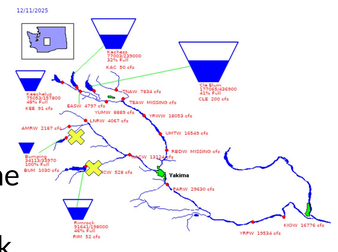


Others!
- Water Supply Deliveries
- Environmental Flow Management
- Operations staff scheduling

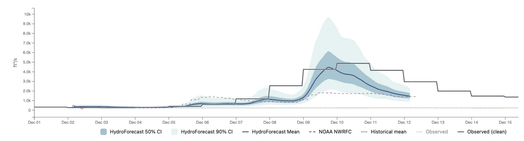
This Just In! Dec. 2025 Atmospheric River

Yakima River

Forecasts a week before the event indicated inflows exceeding reservoir storage capacity at one site and significant downstream flood risk.

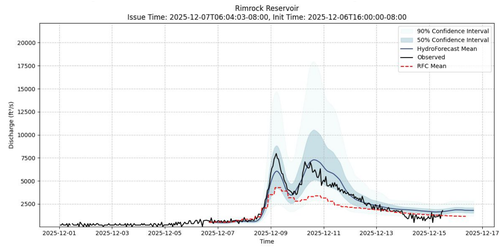


At Rimrock, forecasts issued 7 days ahead:

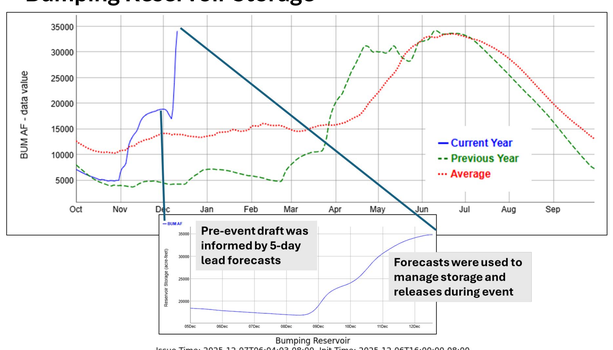


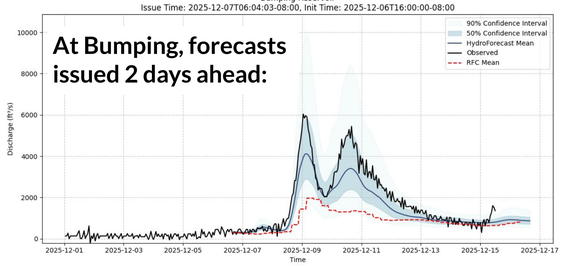
GEFS/GFS underpredicted total rain; HRRR and ECMWF were closer.

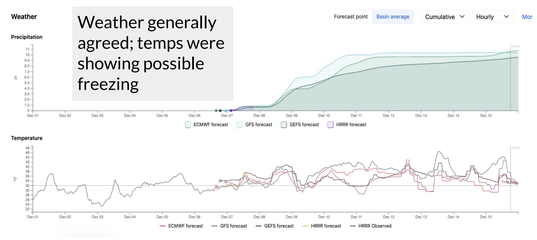
2-3 days ahead the double peak



Bumping Reservoir Storage







Weather generally agreed; temps were showing possible freezing