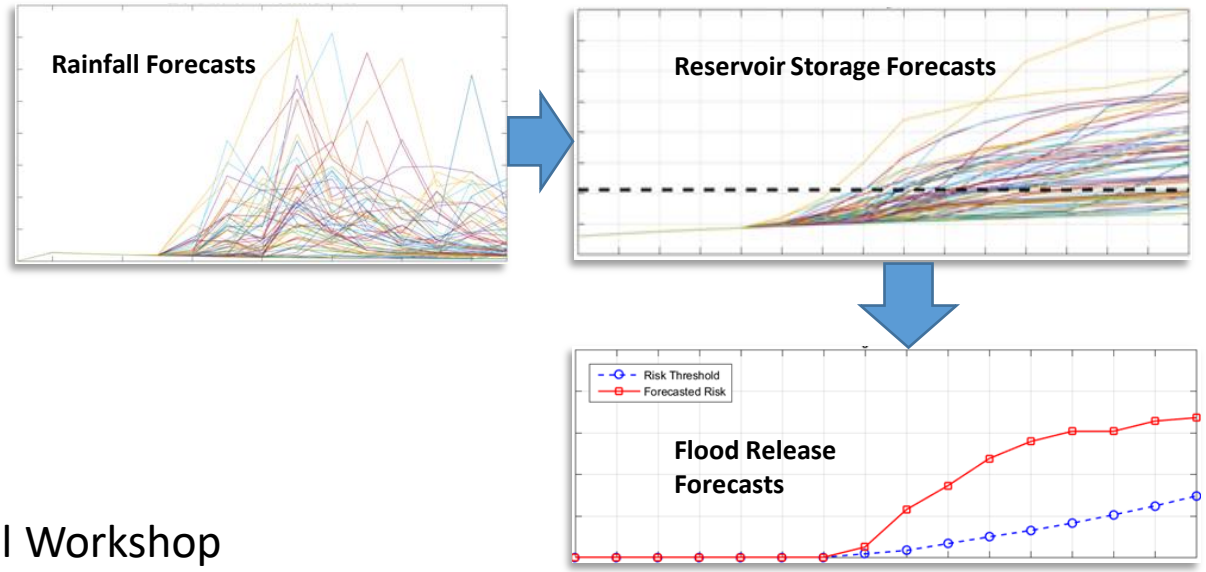
Lake Mendocino
Forecast Informed Reservoir Operations

Lake Mendocino 2014



Western States Water Council Workshop
May 19, 2022
San Diego, CA

Jay Jasperse, P.E.
Chief Engineer/Director Groundwater Management
Sonoma Water

Sonoma Water

Background - Regional Setting

Sonoma Water

- Responsible for Russian River in-stream flows and water supply releases
- Wholesale water supplier for >600,000 people in North Bay Area

Russian River Watershed

Lake Sonoma

Lake Mendocino

Russian River

Lake Mendocino

- Water Supply Pool 68,400 AF (SW)
- Flood Pool 48,100 AF (USACE)

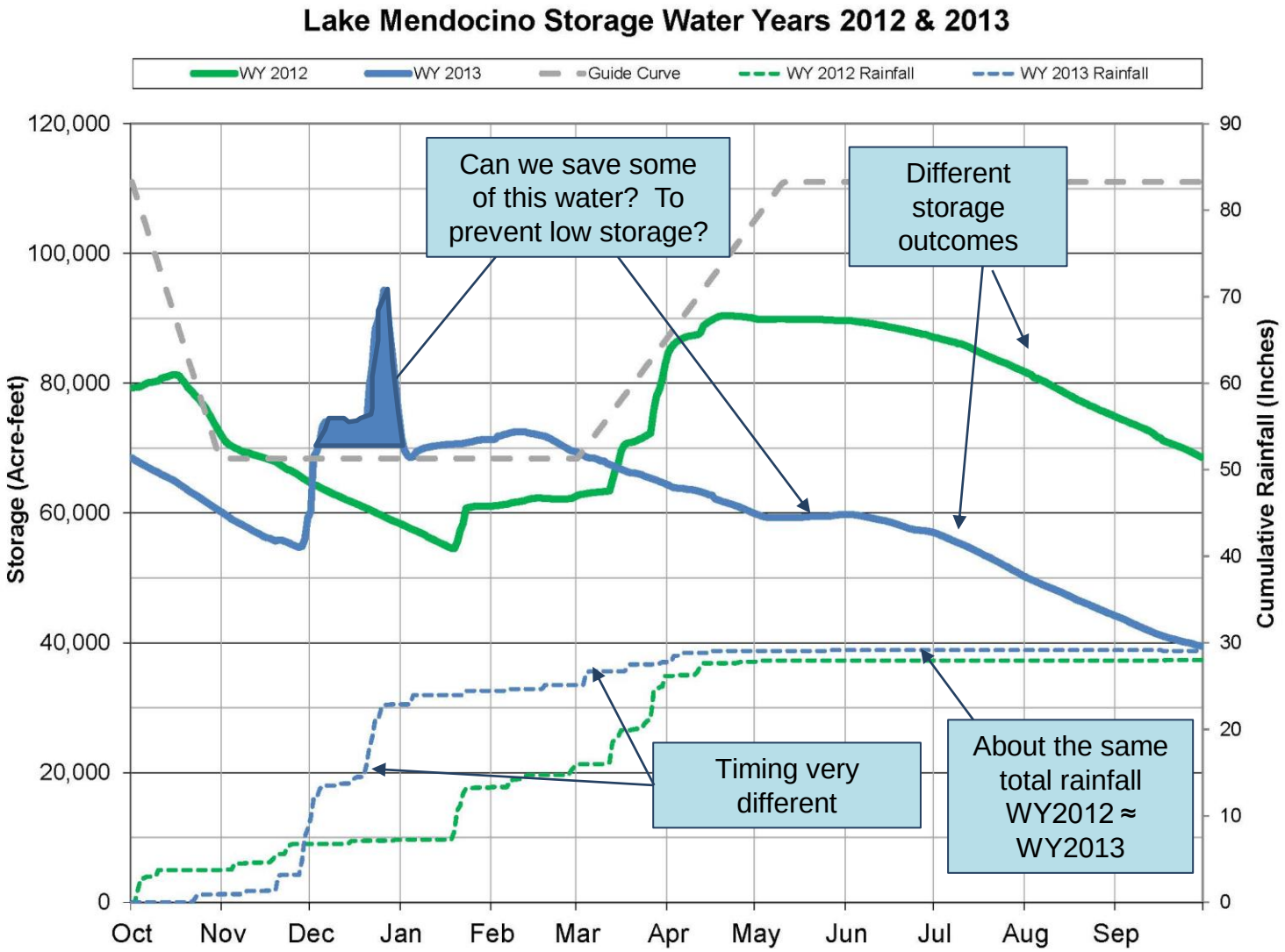
Lake Sonoma

- Water Supply Pool 245,000 AF (SW)
- Flood Pool 136,000 AF (USACE)

Regional Benefits

- Flood Risk Management
- Potable Water Supply
- Agriculture Irrigation
- Ecosystem Services
- Tourism & Recreation

Motivation for the Project:
Lk Mendocino – Water Years 2012 &2013



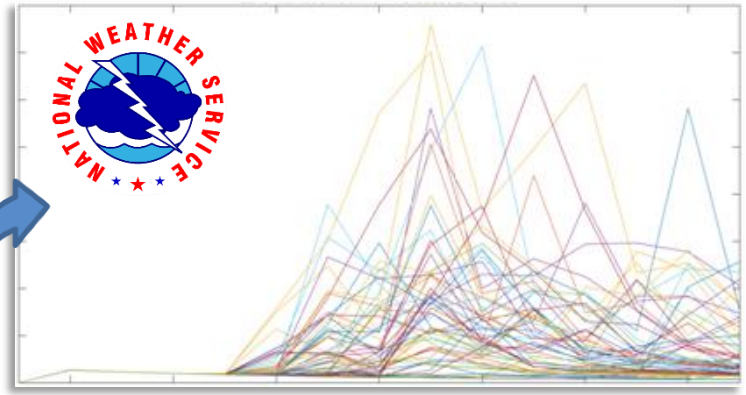
Long-Term Partnerships Have Been Key to Our Success: LK. Mendocino FIRO Steering Committee

- **Co-Chairs**
  - Jay Jasperse – Sonoma County Water Agency
  - F. Martin Ralph – UCSD / SIO / CW3E
  - Nick Malasavage – USACE/SPN
- **Members**
  - Michael Anderson – California DWR
  - Levi Brekke – USBR
  - Patrick Sing – USACE / SPN
  - Michael Dettinger – USGS
  - Joe Forbis – USACE / SPK
  - Alan Haynes – NOAA / NWS
  - Josh Fuller – NOAA / NMFS
  - Cary Talbot – USACE / ERDC
  - Robert Webb – NOAA / OAR

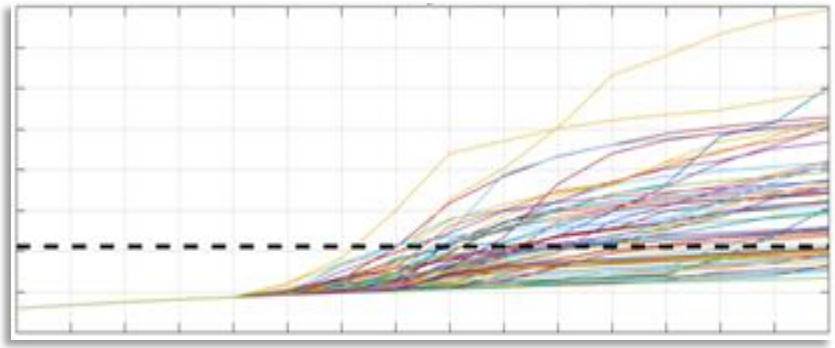
Project Partners

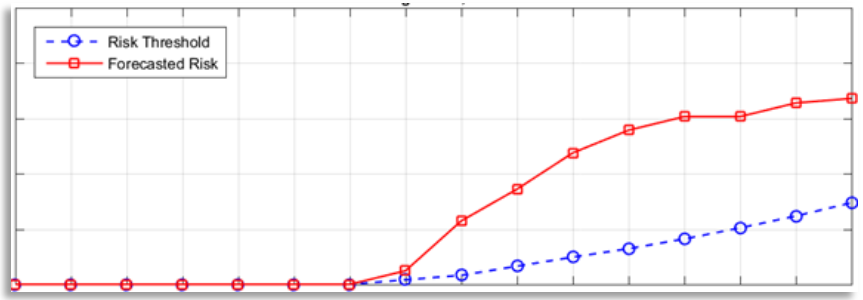
Ensemble Forecast Operations (EFO) Model

CA-NV River Forecast Center
Ensemble Flow Forecast



Storage Forecast



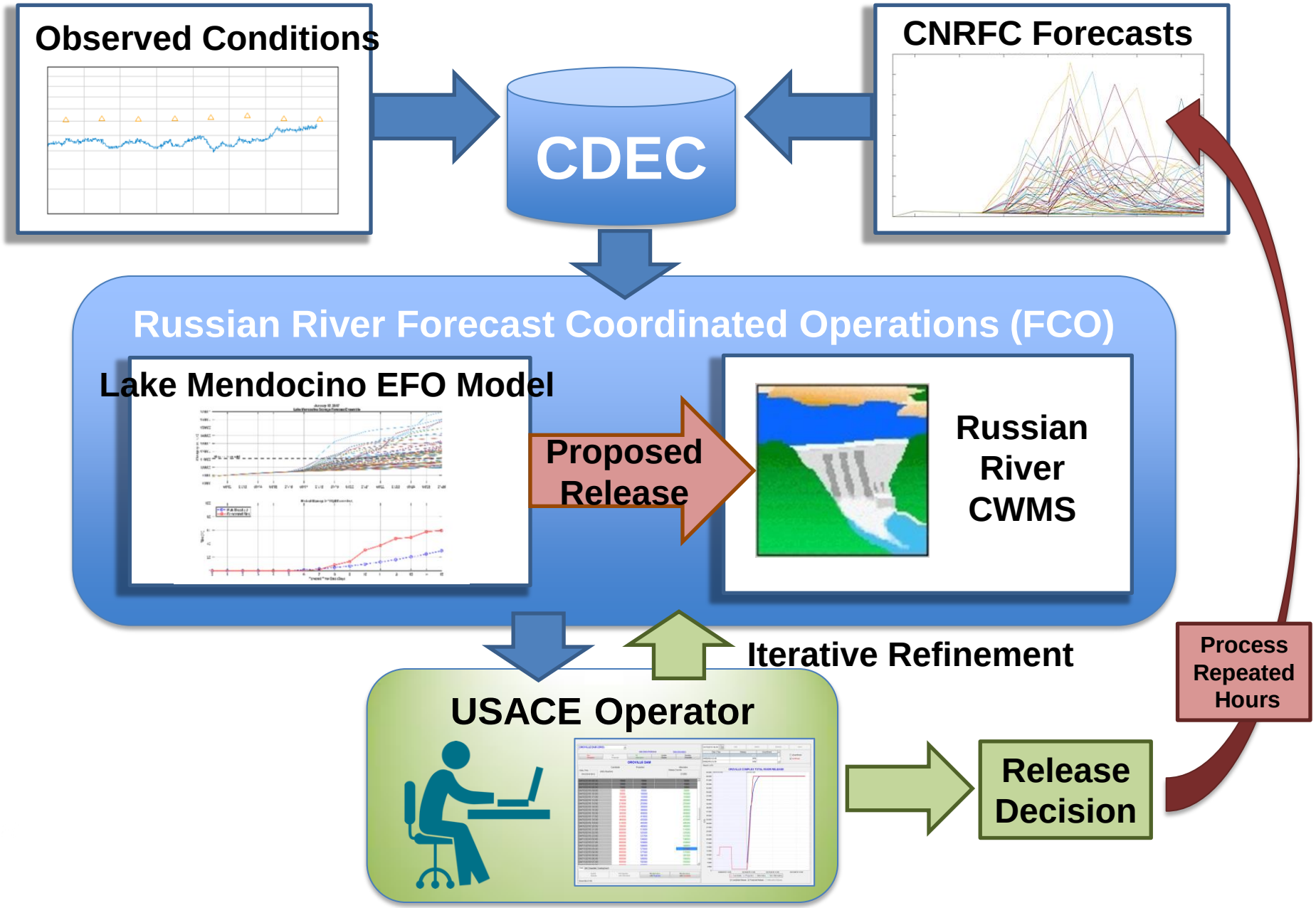


Flood Risk Analysis

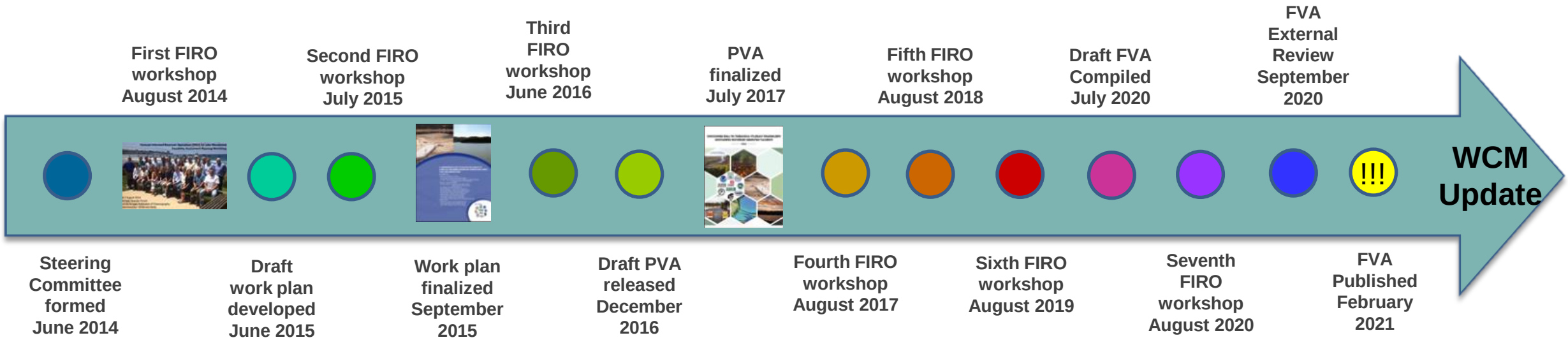
Flood Release

Process repeated each time step

Phase II: FIRO Decision Support System



A Sustained Collaborative Effort: Lake Mendocino FIRO Timeline 2014-2021



US Army Corps of Engineers ®

CW3E

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

Department of Water Resources State of California

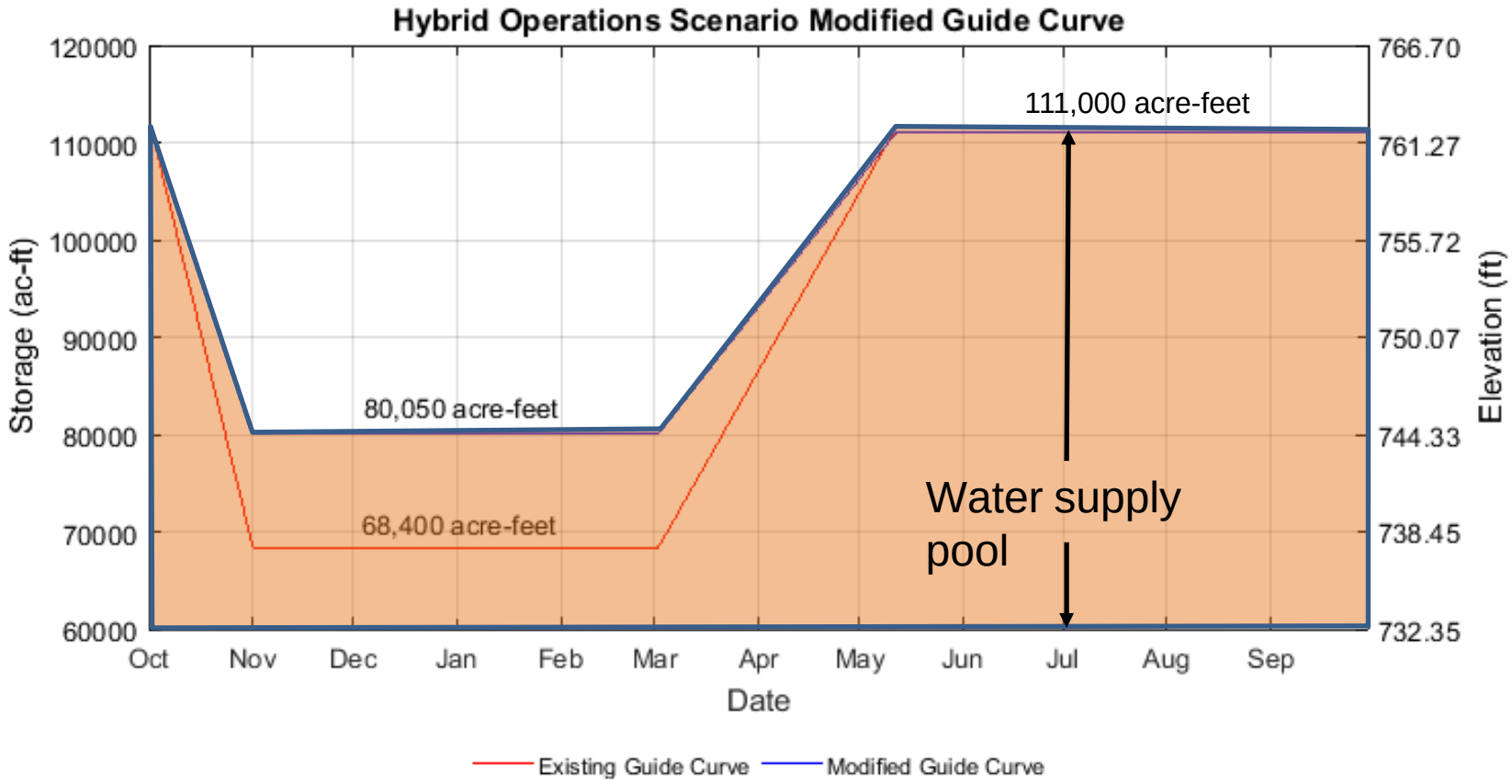
U.S. Department of the Interior Bureau of Reclamation

USGS science for a changing world

FIRO Water Control Plan (WCP) Alternatives Evaluated in FVA

ID (1)	WCP alternative (2)	Description (3)
1	Existing WCP operation (Baseline)	Includes the seasonal rule curve and release selection rules from the 1986 USACE WCM and 2003 update to the flood control diagram (FCD).
2	Ensemble Forecast Operations (EFO)	Operates without a traditional rule curve and uses the 15-day ensemble streamflow forecasts to identify required flood releases.
3	Hybrid	A combination of the Baseline WCP and the EFO. This WCP was used for Major Deviation Operations in WY19 and WY20.
4	Modified Hybrid	Identical to Hybrid but with a “corner cutting” strategy that allows for greater storage to begin February 15th to aid with spring refill.
5	5-day deterministic forecast	Defines alternative guide curves with 11,000 AF encroachment space and 10,000 draft space above and below the Baseline guide curve. Uses 5-day deterministic inflow (and Hopland) forecasts to choose the guide curve and make release decisions.

Modified Guide Curve: "Hybrid" Scenario



Evaluation Metrics

Metric (1)	Metric Description (2)
M1	Annual maximum flow frequency function at Hopland, Healdsburg, and Guerneville
M2	Annual maximum pool elevation frequency function of Lake Mendocino
M3	Annual maximum pool elevation frequency function of Lake Sonoma
M4	Annual maximum Lake Mendocino total release frequency function
M5	Annual maximum Lake Sonoma total release frequency function
M6	Annual maximum uncontrolled spill frequency function for Lake Mendocino
M7	Annual maximum uncontrolled spill frequency function for Lake Sonoma
M8	Expected annual inundation damage (EAD) at critical Russian River locations
M9	Expected annual potential (statistical) loss of life due to floodplain inundation, critical Russian River locations (assessed as “population exposed” (EAP))
M10	Reliability of water supply delivery, as measured by annual exceedance frequency of Lake Mendocino May 10 reservoir storage levels
M11	The ability to meet instream flows to support threatened and endangered fish during the summer rearing season, as measured by the annual exceedance of the number of days June through September flows exceed 125 cfs
M12	The ability to meet instream flows to support fall spawning migration, as measured by the annual exceedance of the number of days October 15 to January 1 flows exceed 105 cfs
M13	Impacts to the Bushay Campground during the rec season (Memorial Day through Labor Day), as measured by the annual exceedance of the number of days that Lake Mendocino water-surface elevation exceeds 750 ft (elevation of access road).
M14	Impacts to power production of the CVD powerhouse
M15	Lake Mendocino bank protection, as measured by annual frequency of exceeding elevation 758.8 ft. (Later refined to capture the number of days above 758.8 ft.)
M16	Impacts to hours of operation (As measured by the number of required gate changes).

Flood Risk Management

Environmental (Fisheries)

Hydropower Production

Operations Workload

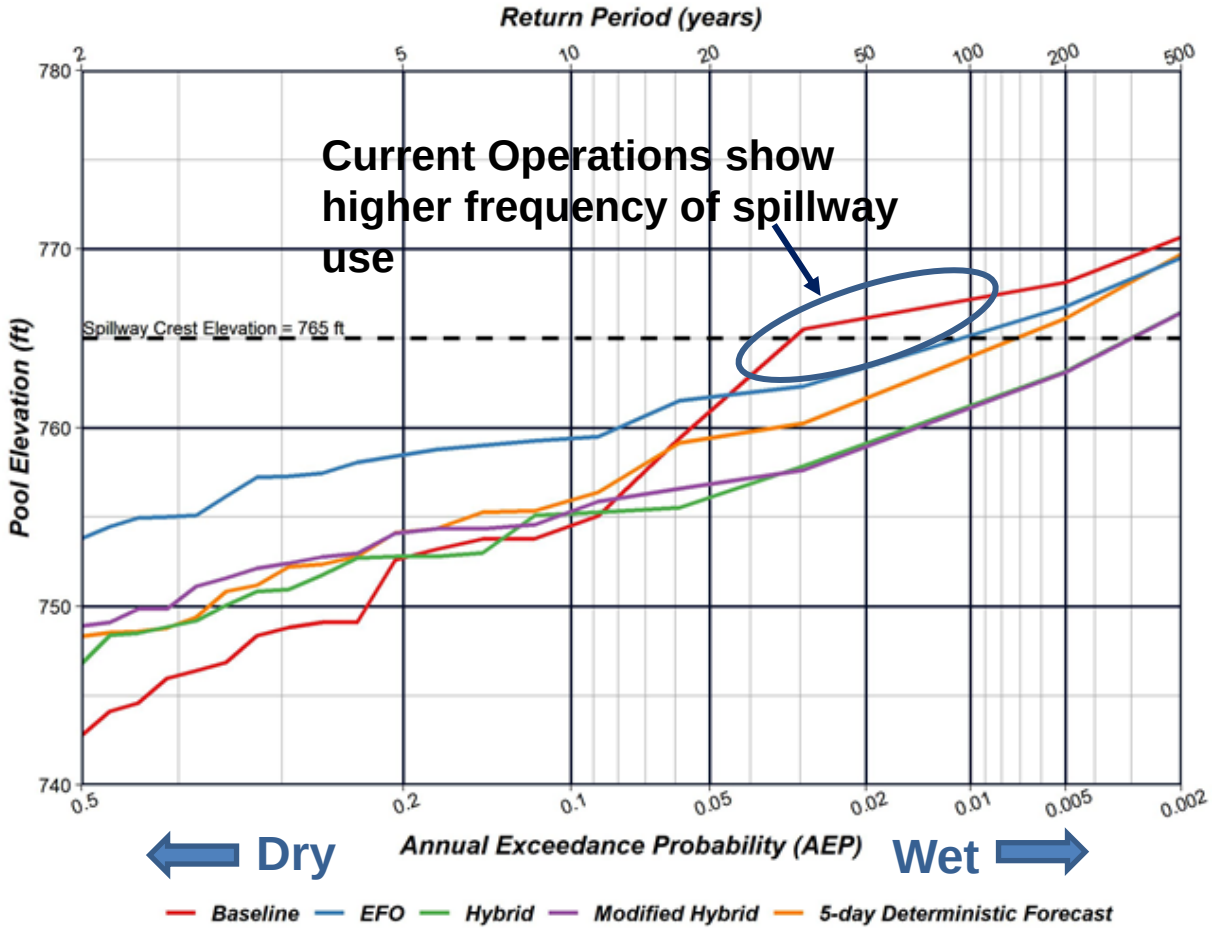
Water Supply Reliability

Recreation

Dam Safety (bank protection)

Flood Risk Management Benefits: Frequency of Maximum Annual Reservoir Elevation

FIRO alternatives have lower reservoir elevations & less activation of emergency spillway during extreme events relative to current operations

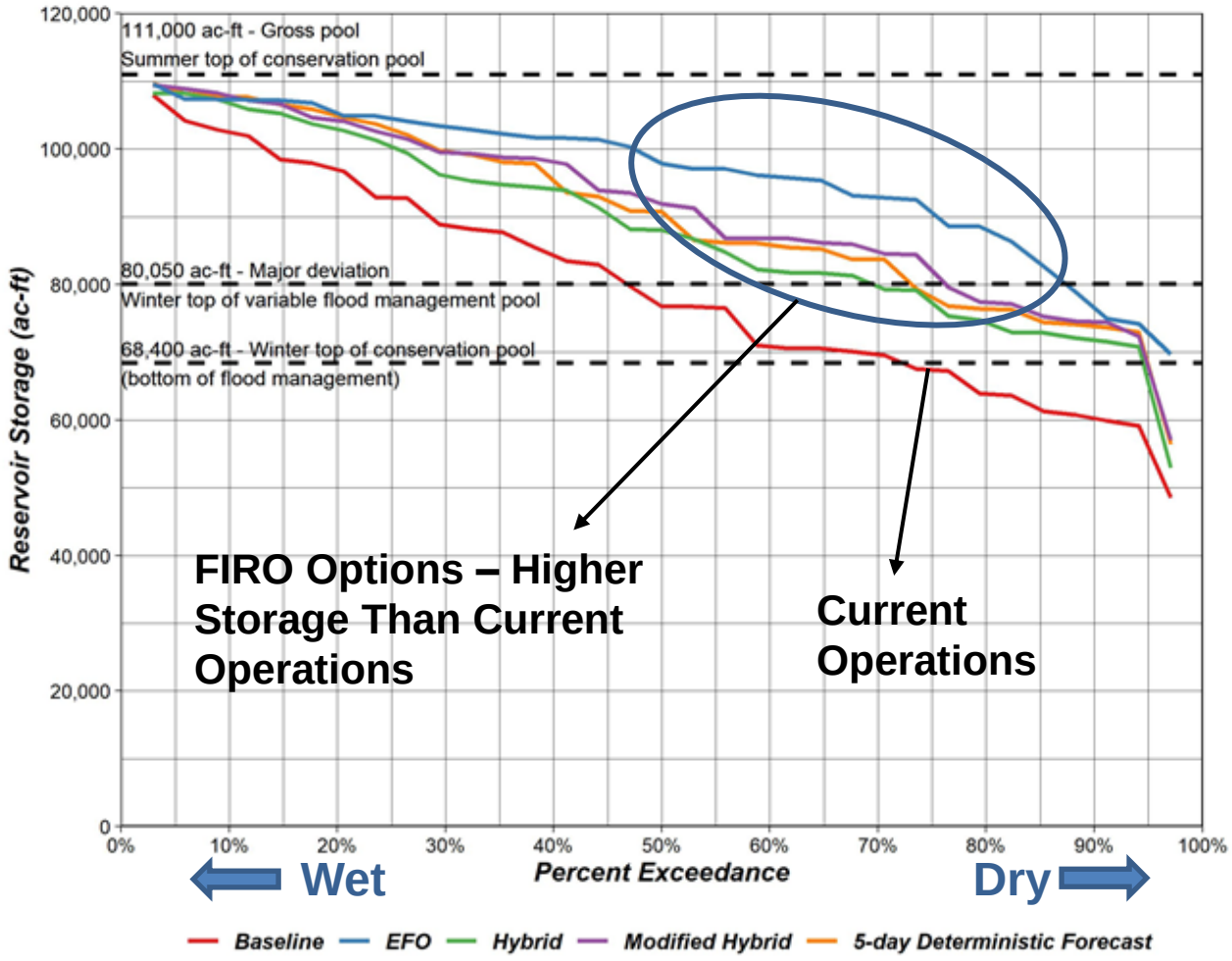


Water Supply Benefits: Frequency of May 10th Reservoir Storage

- All FIRO Strategies Show Higher Water Supply Storage Than Current Operations

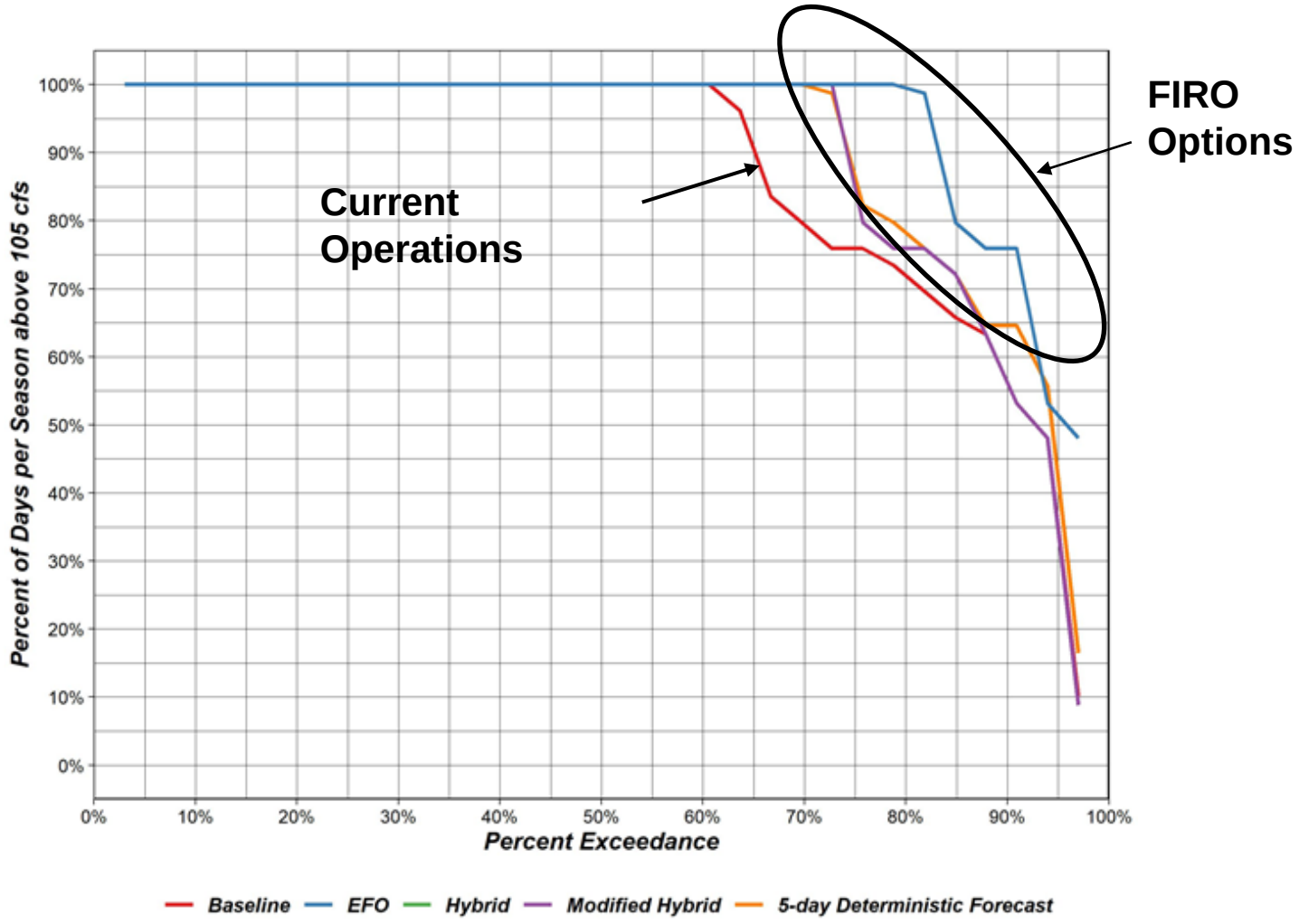
FIRO Strategies
(Storage above current operations)

- EFO 27%
- Hybrid EFO 15%
- ***Mod. Hybrid EFO 20% (Recommended)***
- 5-day Deterministic 18%



Ecosystem Benefits: Percent of Days Per Season Where Flow Satisfies Minimum for Spawning*

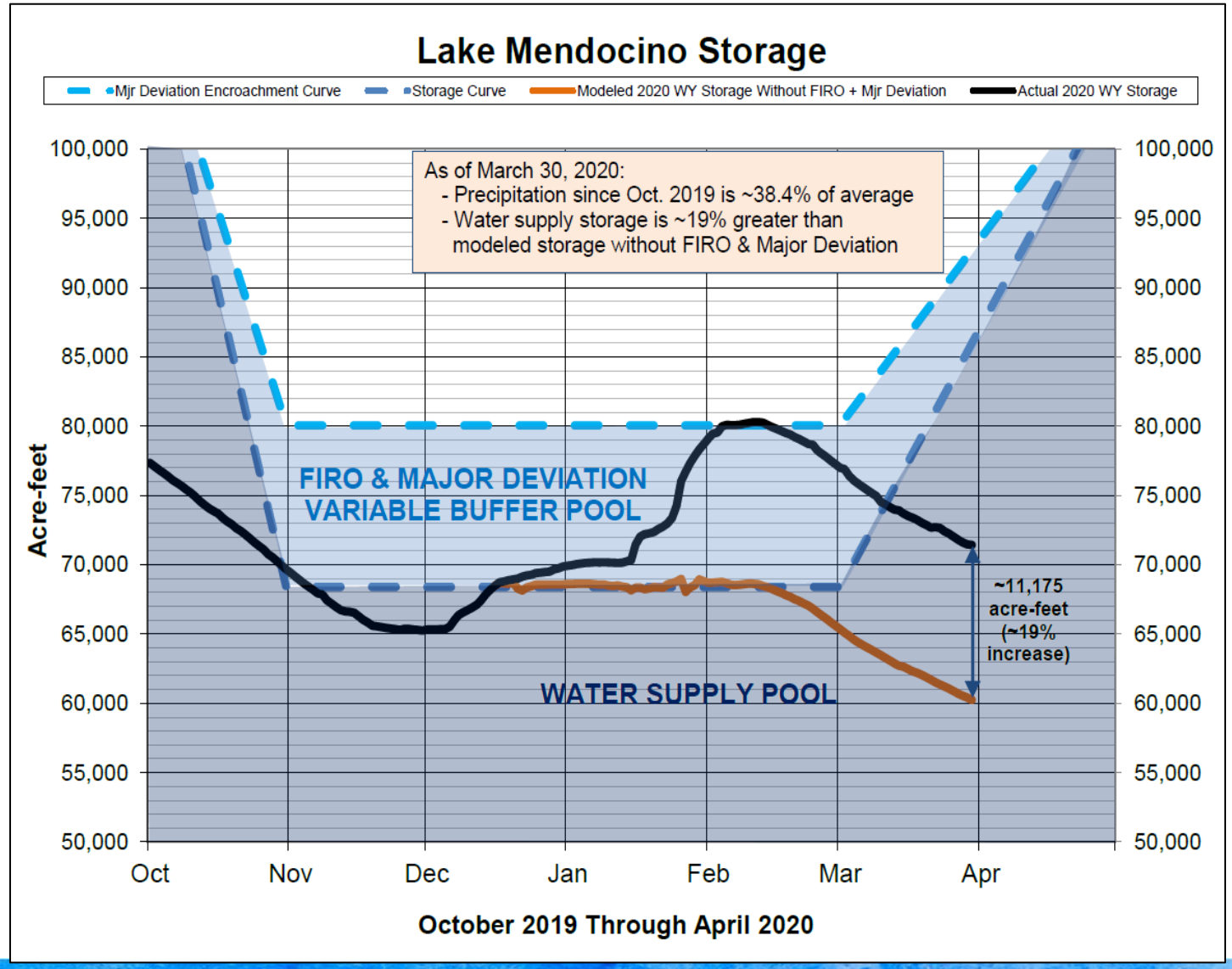
All FIRO alternatives show significant improvements in flows conditions for salmonids



* October 12 – January 1 at Healdsburg

On the Ground Experience Shows FIRO Improves Water Supply

- **Major Deviation to Water Control Manual** allowed FIRO to be implemented in WY2020
- **Precipitation** ~38.4% of average
- **Actual Water Supply Storage** using FIRO resulted in 19% increase in storage relative to standard operations



Status of Russian River FIRO Activities

Lake Mendocino:

- Final Viability Assessment published Feb. 2021
- Operating under a 5-year Major Deviation to allow for FIRO operations (WY 2021-25)
- USACE in process of updating Water Control Manual
- FIRO 2.0 pilot program

Lake Sonoma:

- Workplan to evaluate viability of FIRO completed March 2022
- Implementation of FIRO workplan beginning April 2022

Benefits of Improved S2S Forecasting

FIRO

- Improved water supply & ecosystem benefits: Improves resiliency against water supply shortages – especially early season rains followed by dry conditions
- Flood risk management benefits: Improves ability to prepare for sustained events via pre-releases

Other Drought Planning & Management Benefits

- Allocation of funding resources & staff
- Public communication
- Informed water availability assessment & water right curtailments
- Facilitate conjunctive management of surface water & groundwater