

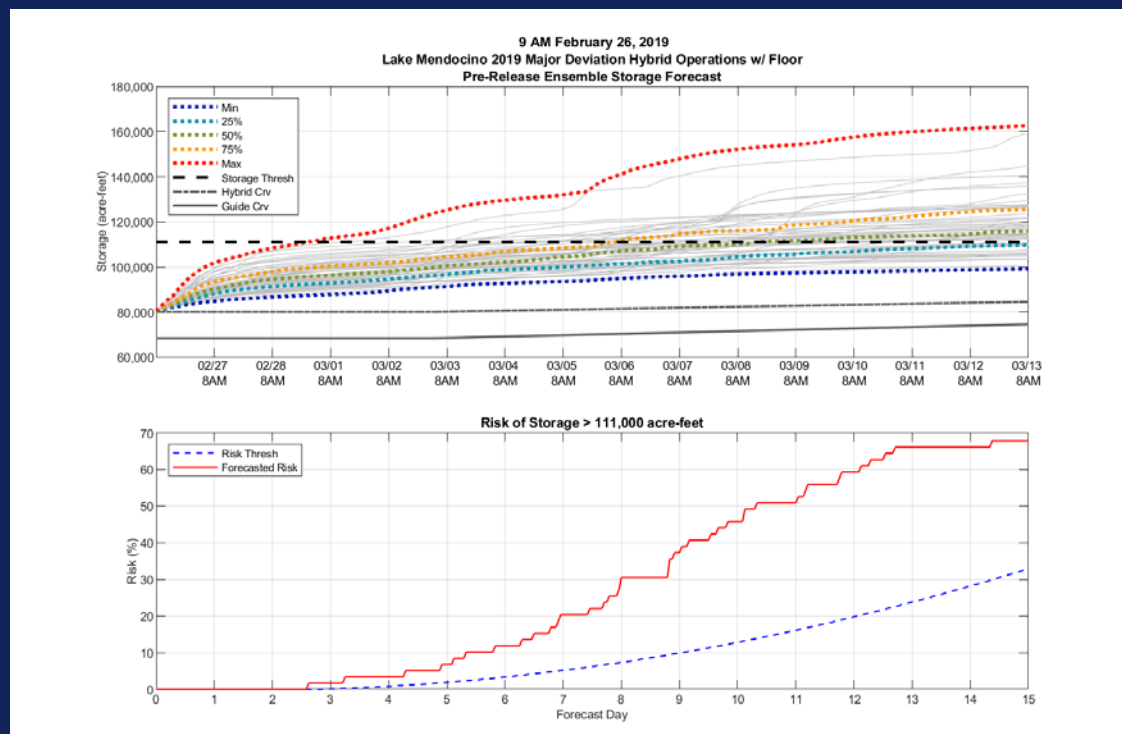


Sonoma  
Water

# Ensemble Streamflow Predictions for Risk Based Reservoir Operations of Lake Mendocino in Mendocino County, California

Chris Delaney  
John Mendoza  
Rob Hartman  
Jay Jasperse  
Marty Ralph  
Cary Talbot

August 29, 2019



# Forecast Informed Reservoir Operations

## Lake Mendocino FIRO Demonstration Project

### ❖ Objective

- Improve water supply reliability, yet
- Not increase flood risk to downstream communities.



### ❖ Steering Committee

- County, State and Federal Agencies
- Co-Chairs:
  - Jay Jasperse, Sonoma Water
  - Marty Ralph, Center for Western Weather & Water Extremes (CW3E)

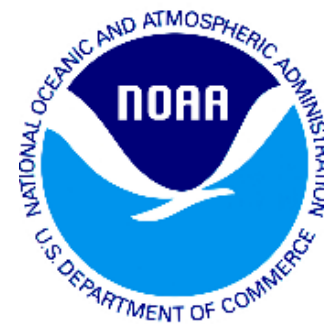


### ❖ Preliminary Viability Assessment – Summer 2017

Sonoma Water



US Army Corps  
of Engineers ®



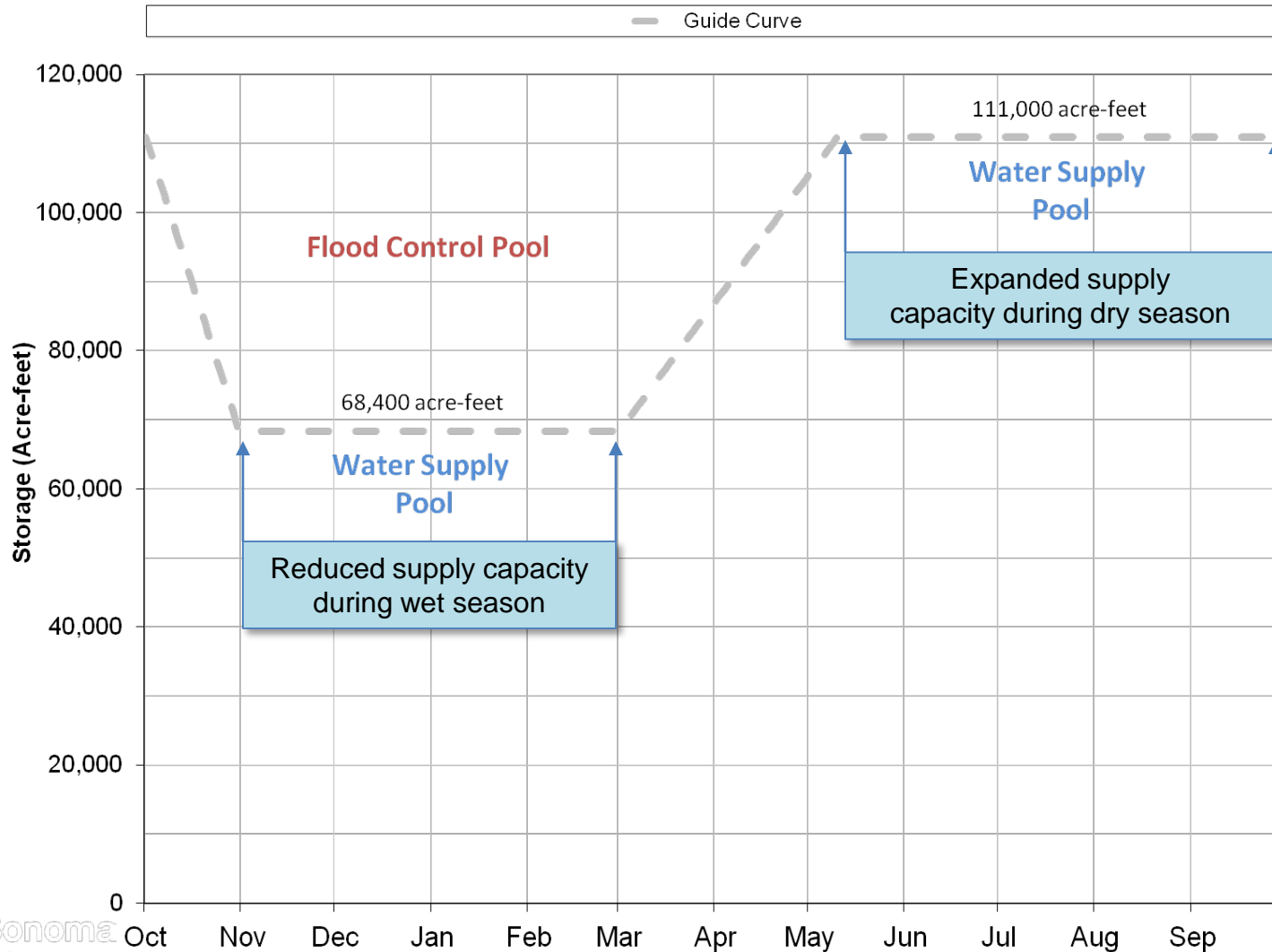
# Lake Mendocino

- ❖ Upper Russian River Watershed
- ❖ Coyote Valley Dam
  - Constructed by the Army Corps of Engineers in 1959
  - USACE: Flood Control
  - Sonoma Water: Water Supply
- ❖ Watershed Area: 105 mi<sup>2</sup>
- ❖ Max Water Supply: 111,000 acre-feet



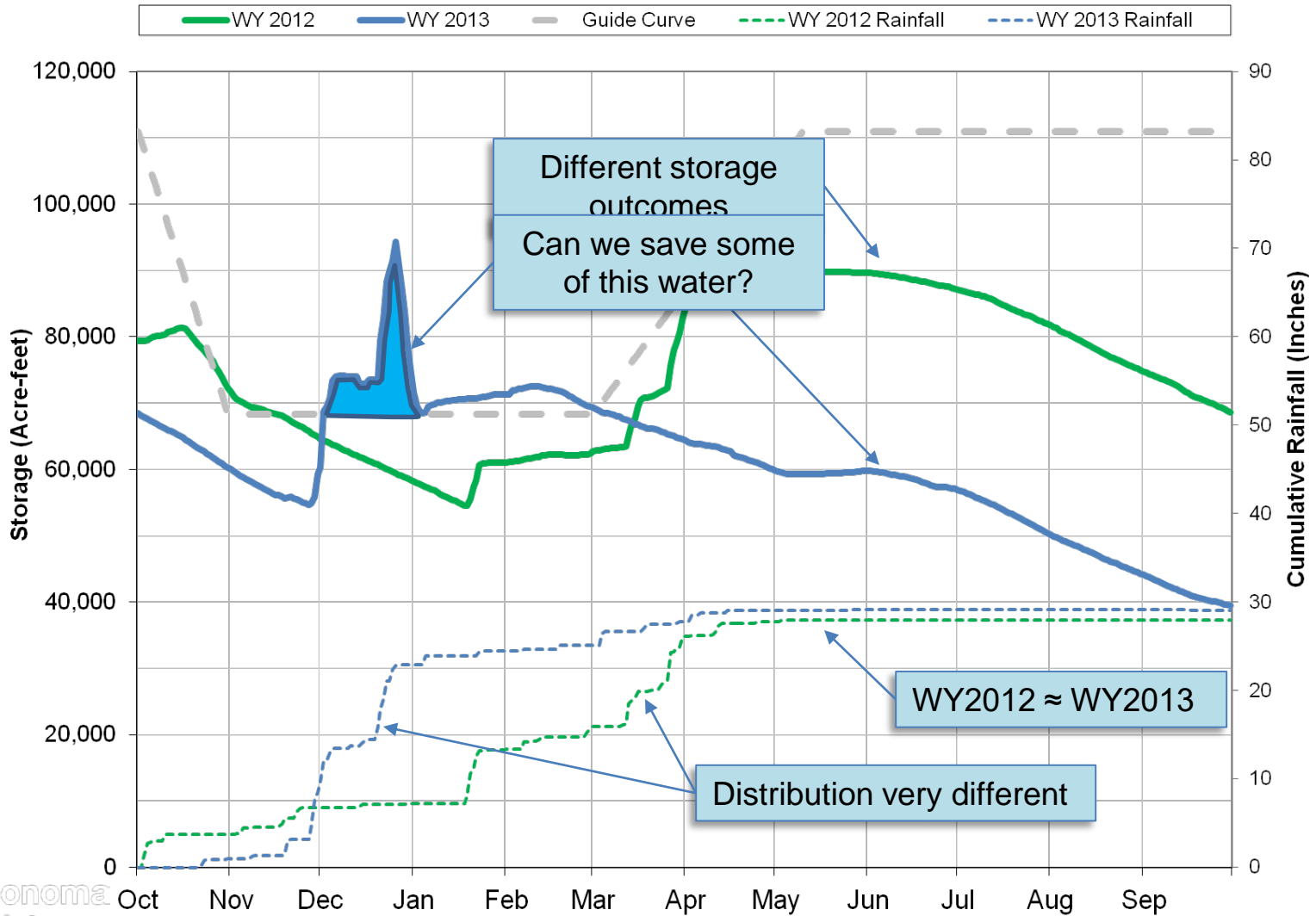
# Lake Mendocino Guide Curve

## Lake Mendocino Storage Water Years 2012 & 2013



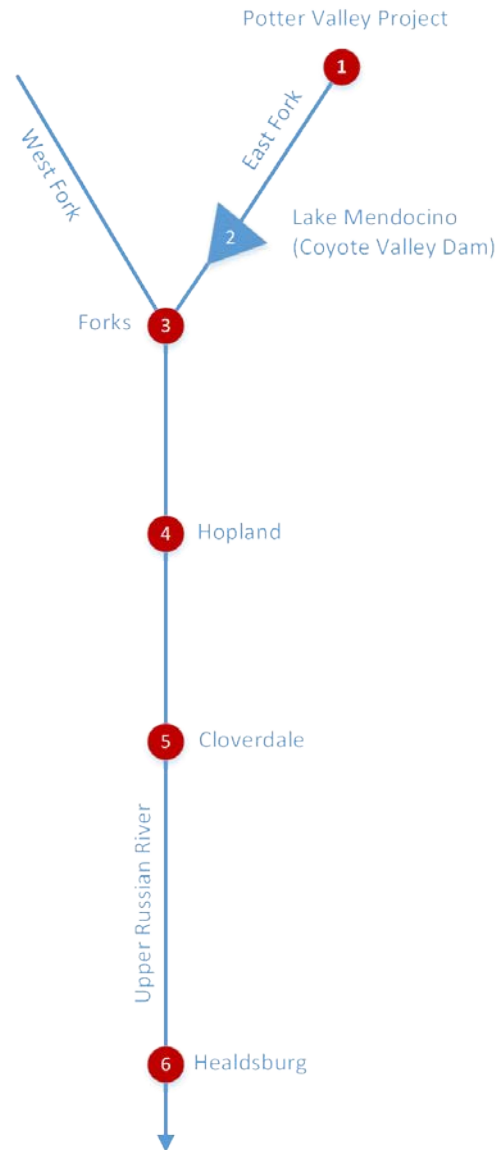
# Lake Mendocino Guide Curve

## Lake Mendocino Storage Water Years 2012 & 2013



# Lake Mendocino

## Ensemble Forecast Operations Model



### ❖ Reservoir Management Model

- Developed in MatLab
- Hourly and Daily Time Step

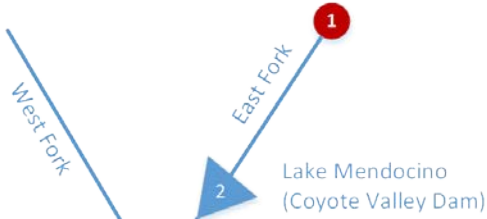
### ❖ Upper Russian River

- Headwaters to the City of Healdsburg
- 70 mile reach
- 6 Model Junctions
  - USGS Discharge Gages
  - NOAA Flow Forecast Points

# Lake Mendocino Ensemble Forecast Operations Model CNRFC

California Nevada River Forecast Center

Potter Valley Project



Forks

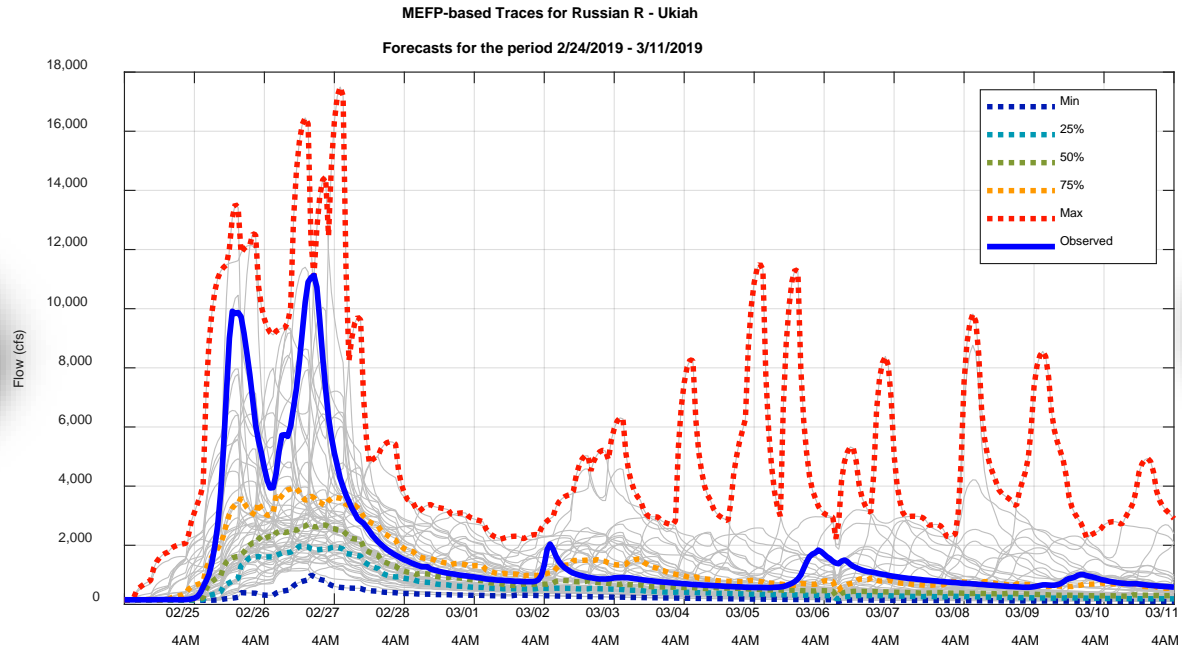


4 Hopland

5 Cloverdale

Upper Russian River

6 Healdsburg  
Sonoma  
Water



## HEFS

Hydrologic Ensemble Forecast System

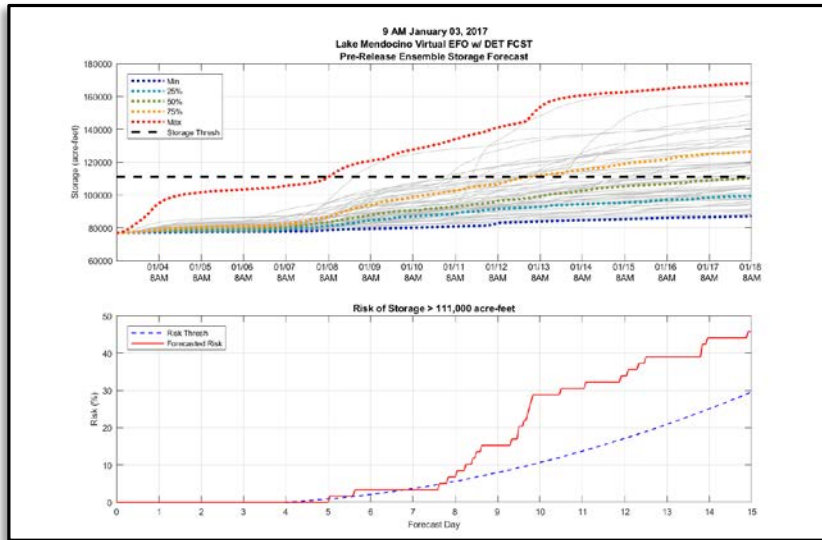
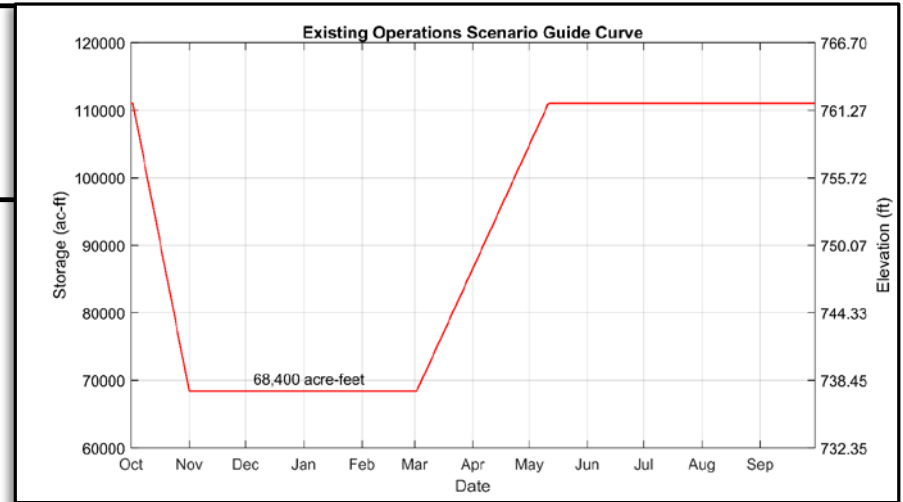
### ❖ HEFS Reforecast

- **Historical Conditions: 1985-2010**
  - 61 member, 15-day

# 3 Model Scenarios

## 1. Existing Operations

- Current Storage Guide Curve



## 2. Ensemble Forecast Operations (EFO)

- Risk based approach

## 3. Perfect Forecast Operations

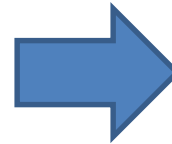
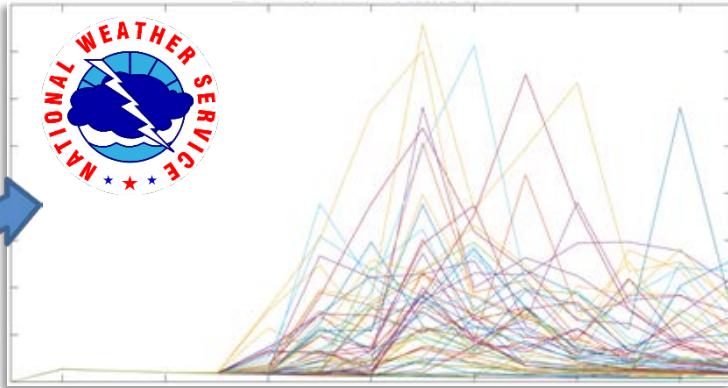
- Observed flows in place of hindcasted flows



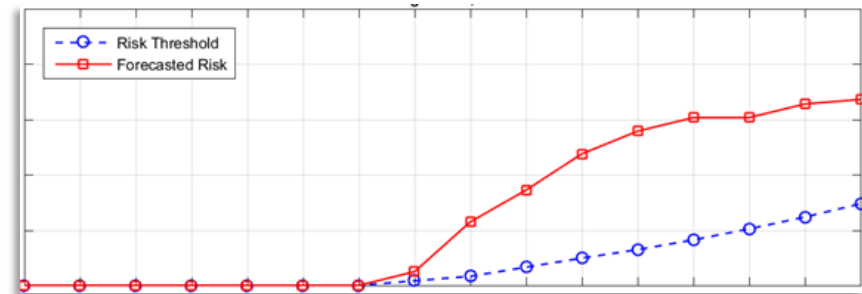
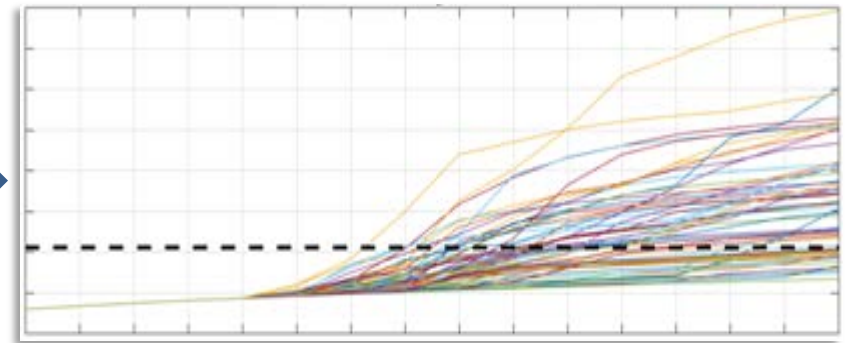


# Ensemble Forecast Operations (EFO)

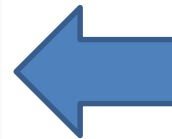
CA-NV River Forecast Center  
Ensemble Flow Forecast



Storage Forecast



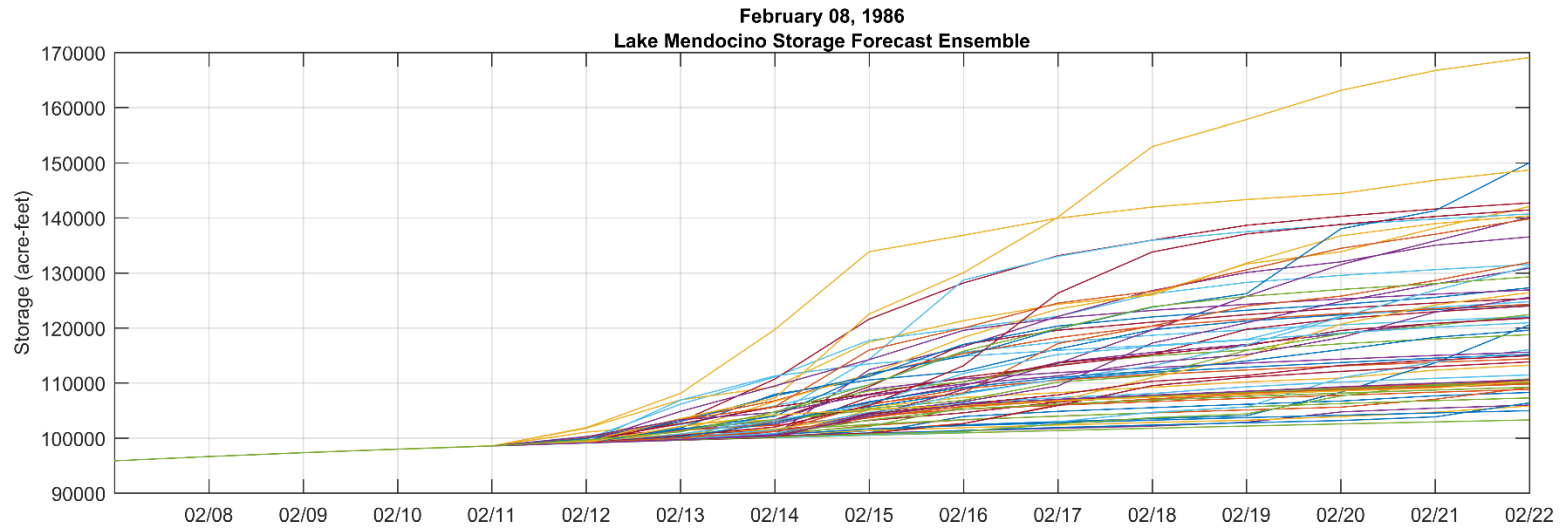
Flood Risk Analysis



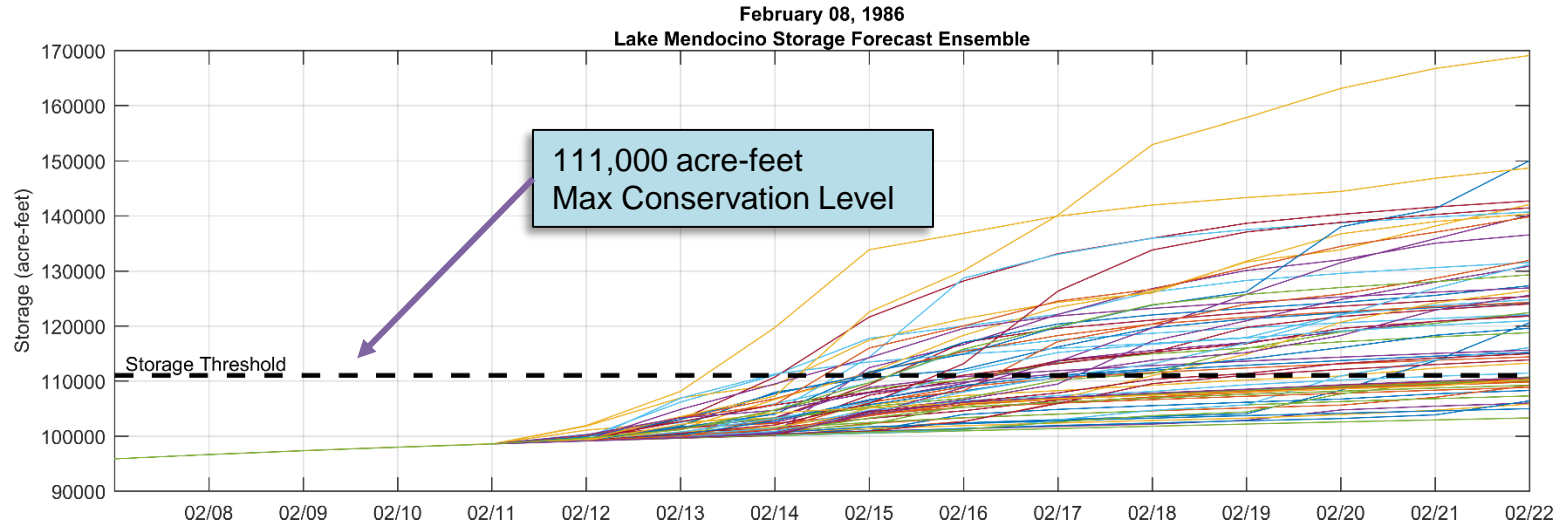
Flood Release

Process repeated each time step

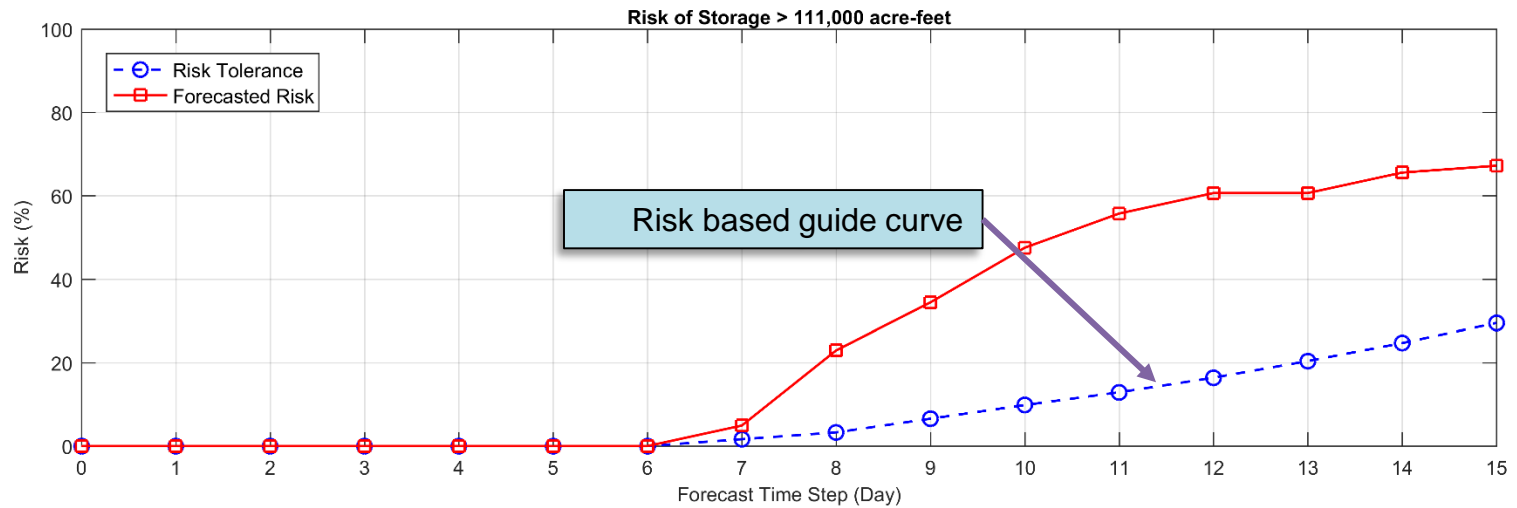
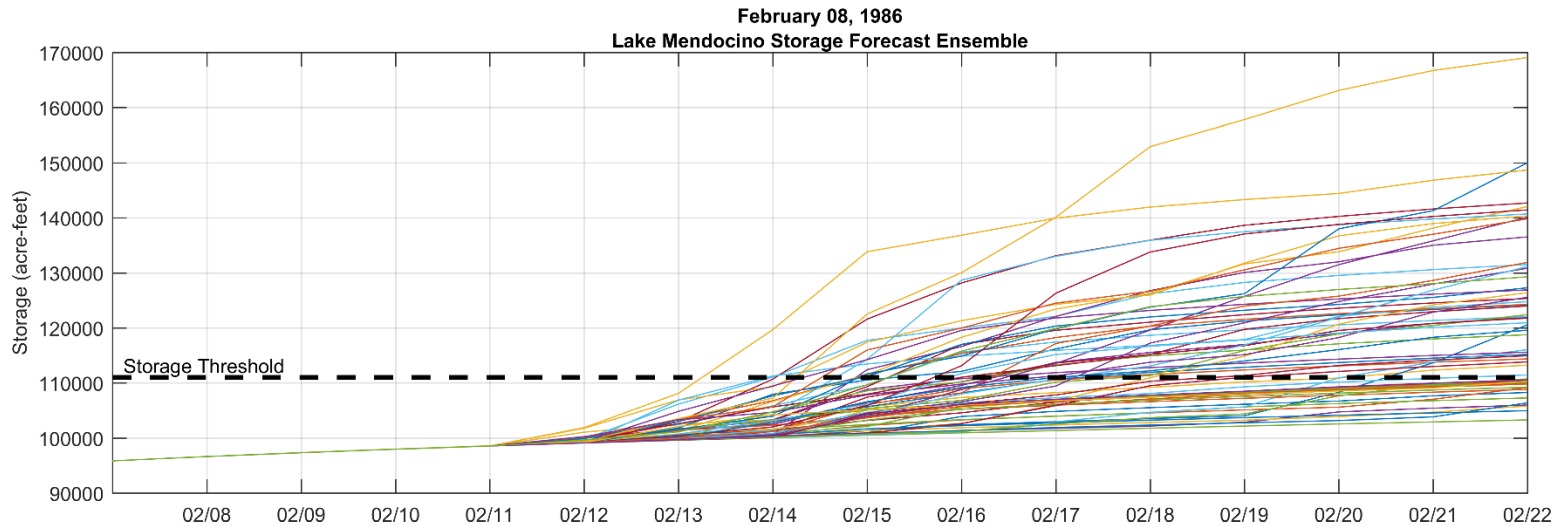
# February 8, 1986 Example



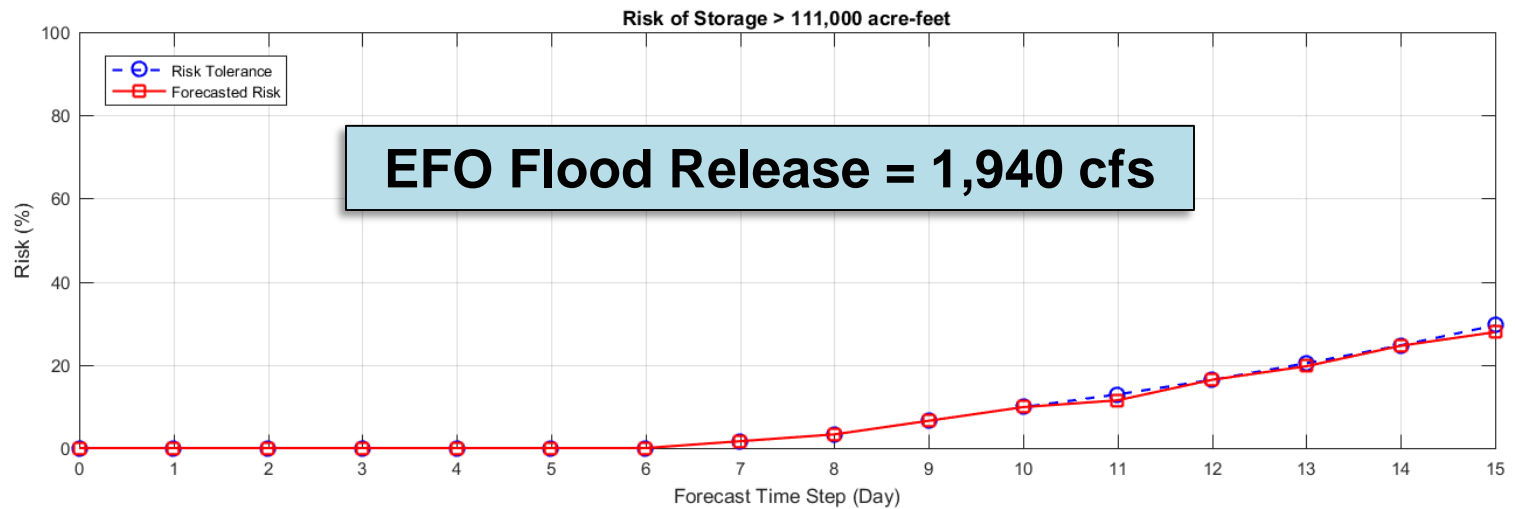
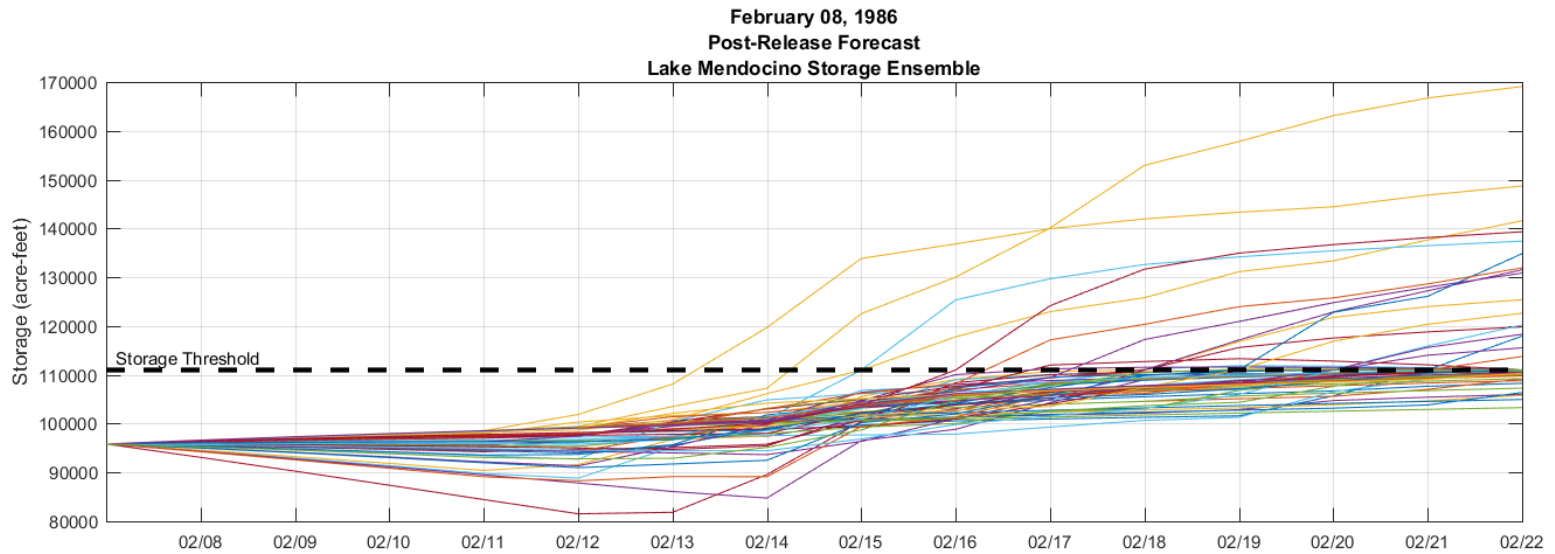
# February 8, 1986 Example



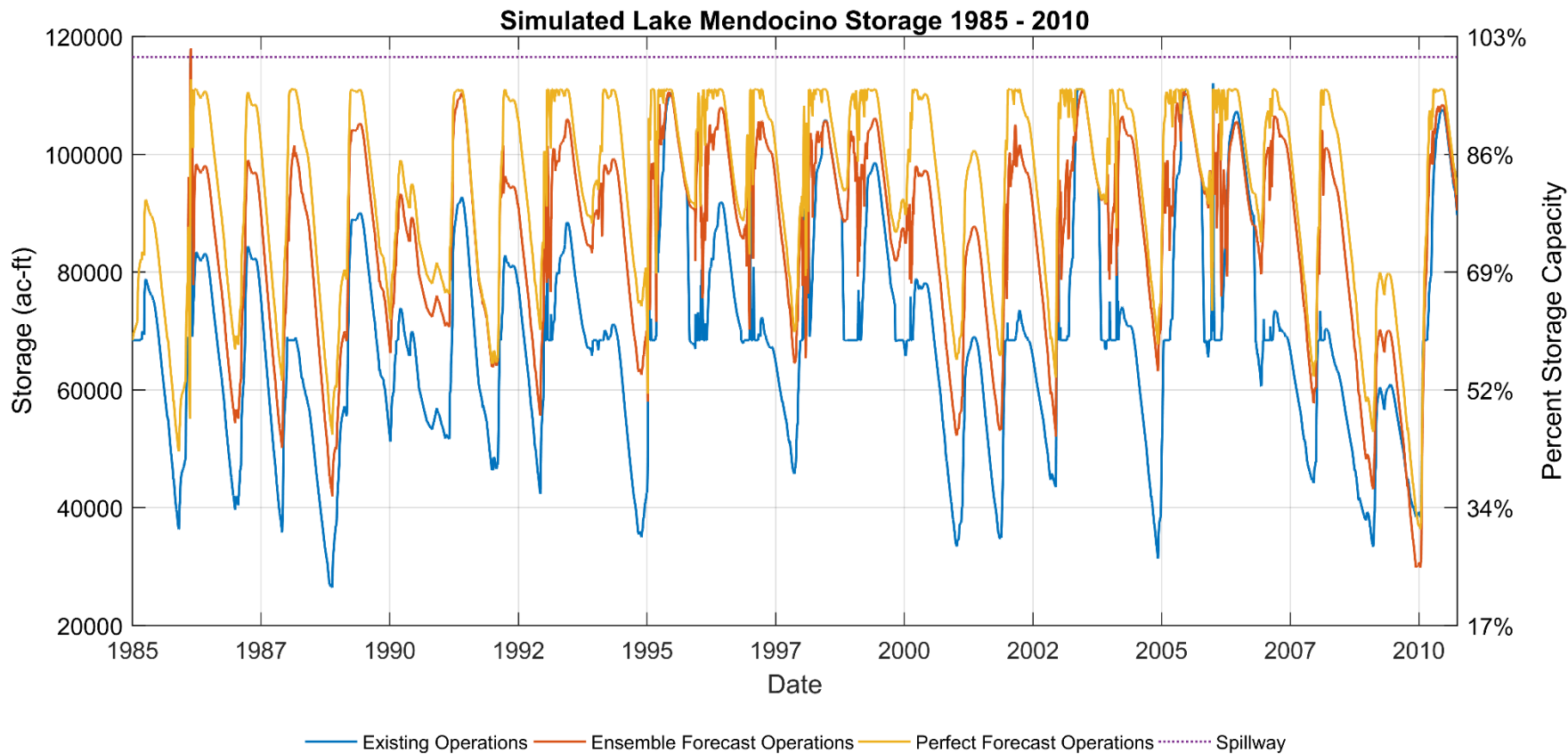
# February 8, 1986 Example



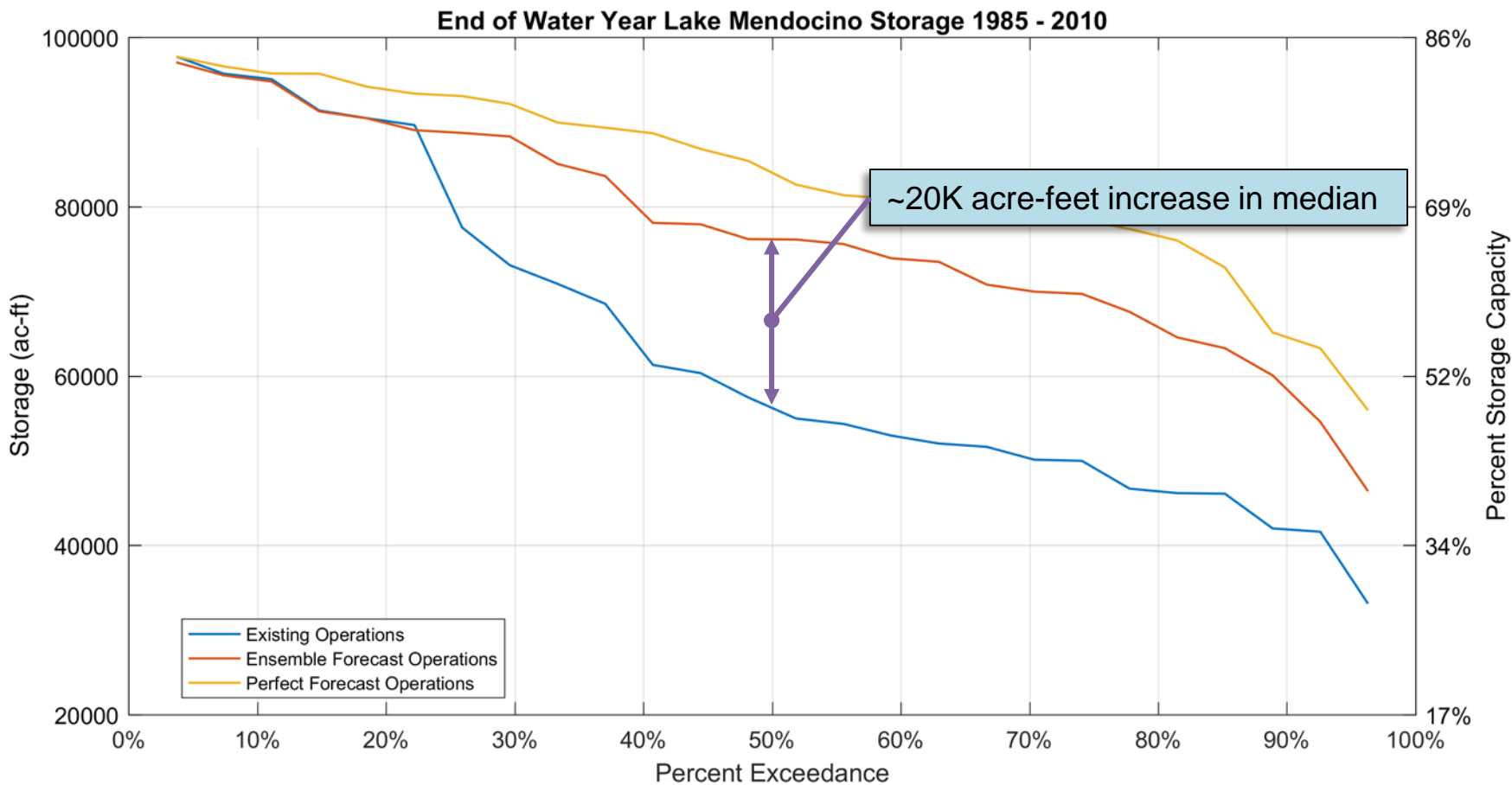
# February 8, 1986 Example



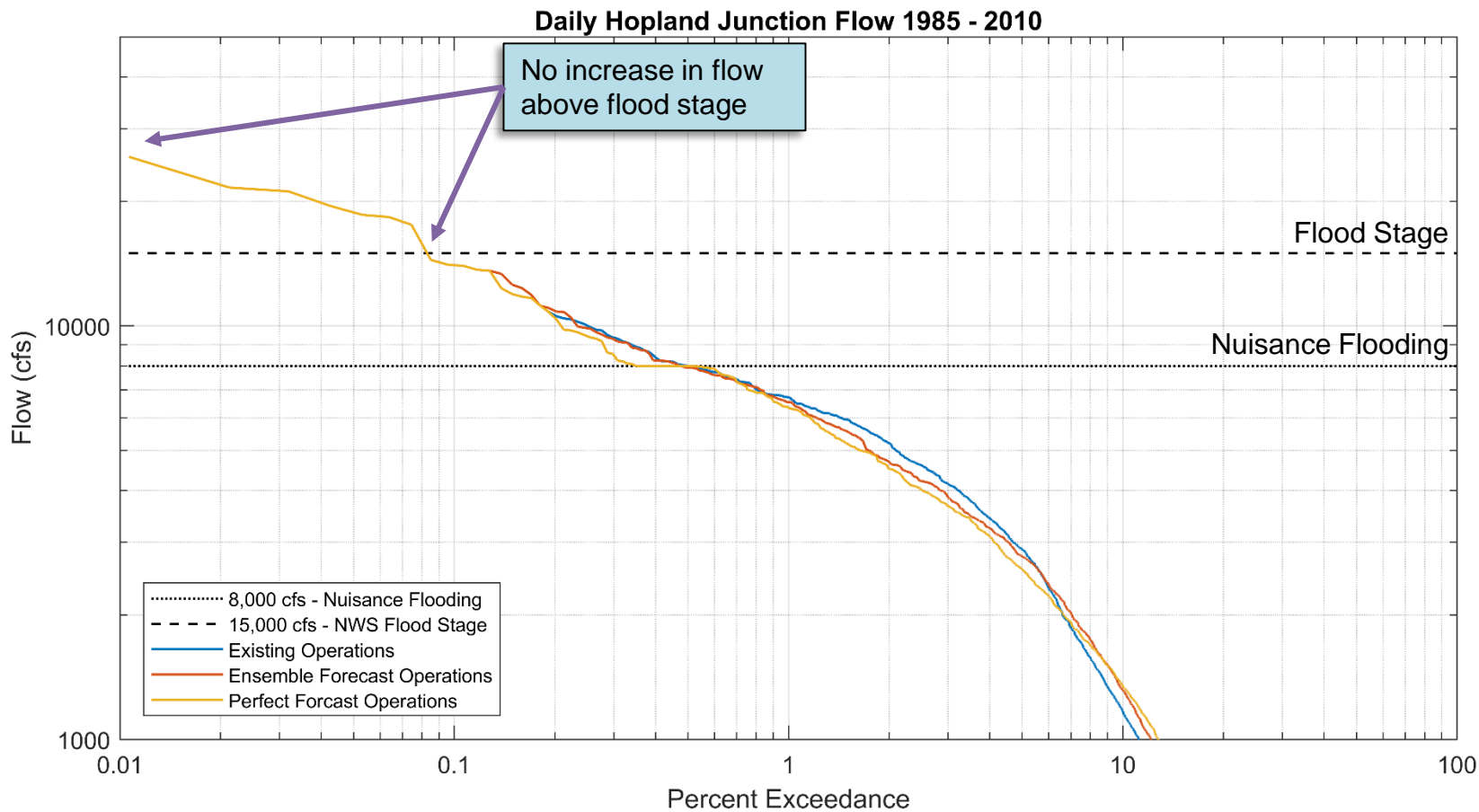
# 1985-2010 Historical Simulation Lake Mendocino Storage



# 1985-2010 Historical Simulation End of Water Year Storage



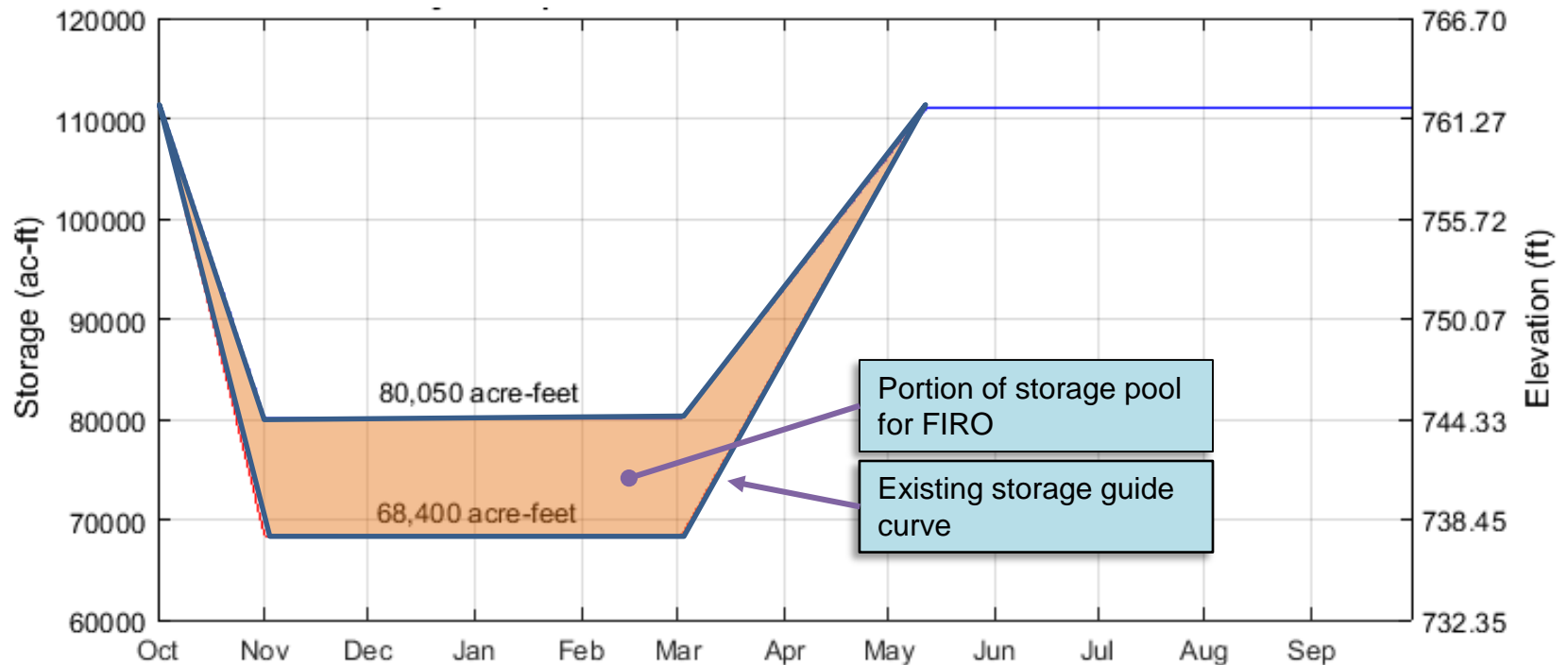
# 1985-2010 Historical Simulation Hopland Flows



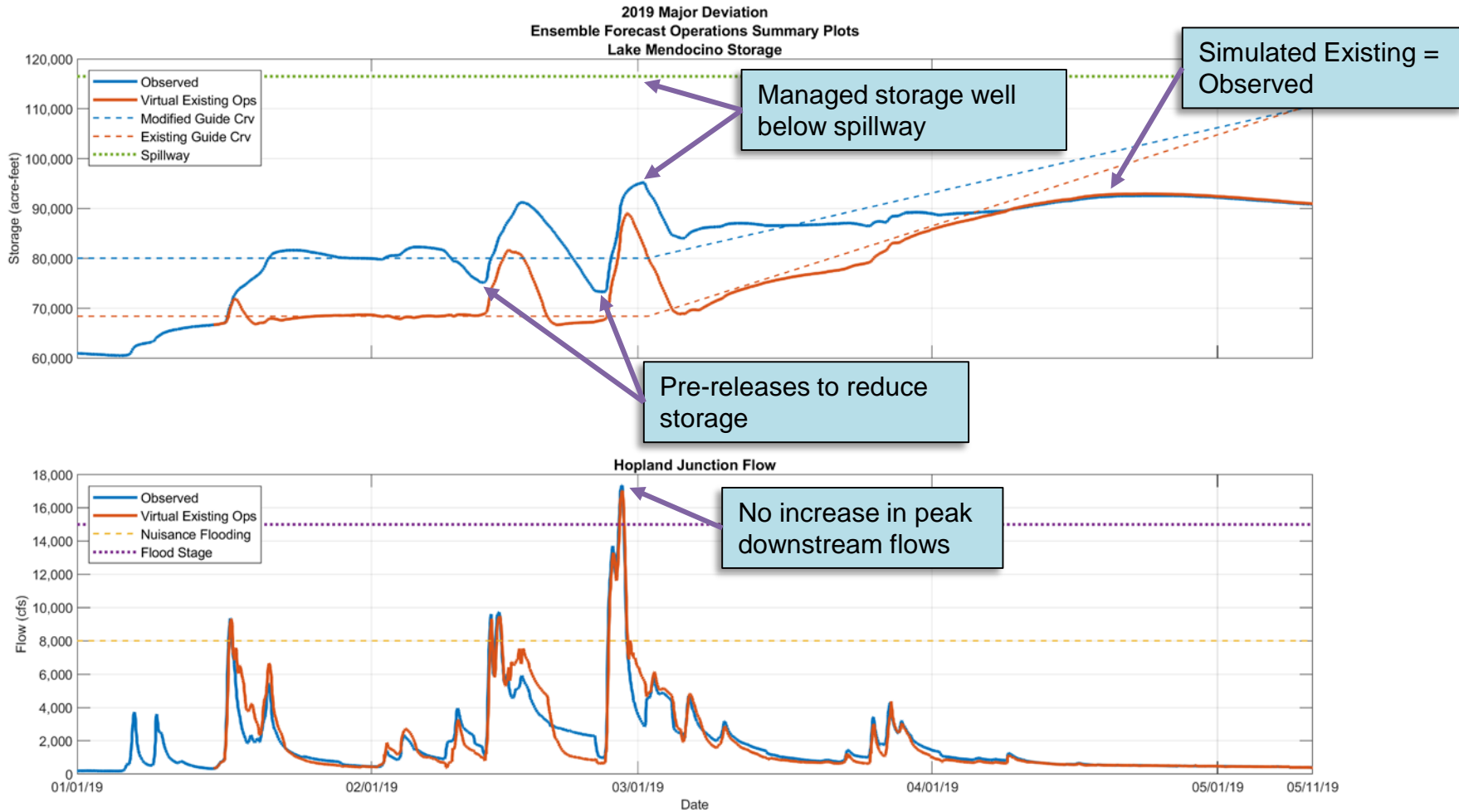


# 2019 Major Deviation

- Major Deviation to Water Control Manual
  - Approved by USACE in November 2018 for 2018/2019 winter and spring season



# 2019 Major Deviation



# Thank You



**Sonoma  
Water**

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Engineer  
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[sonomawater.ca.gov](http://sonomawater.ca.gov)