

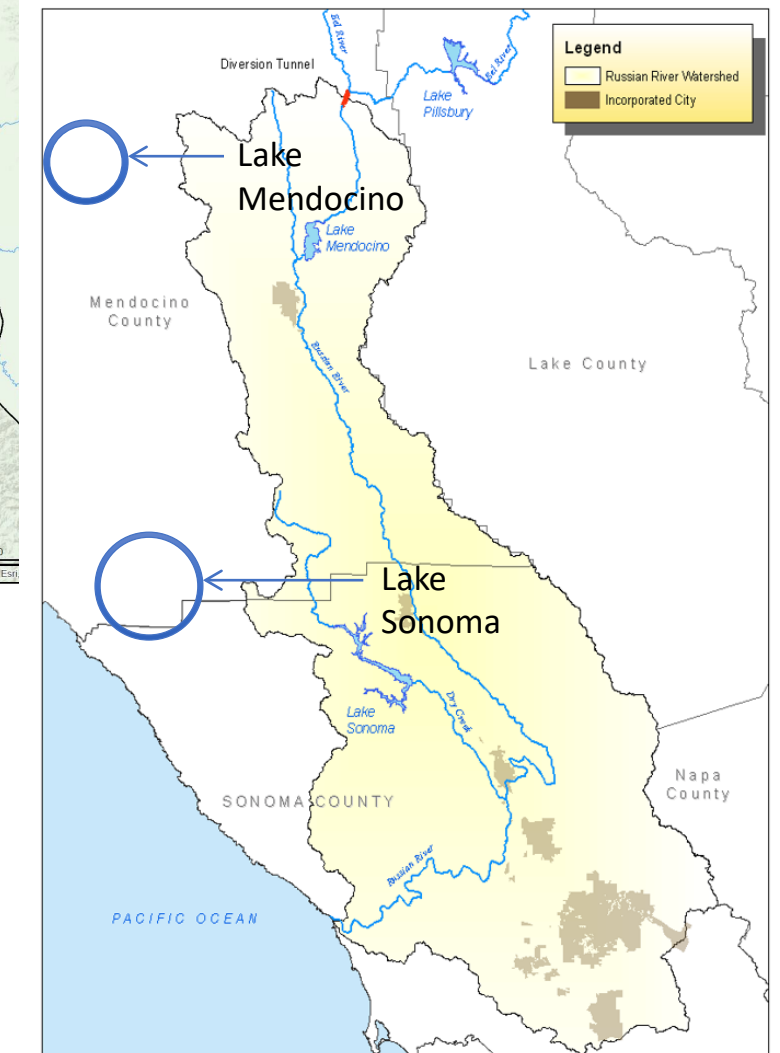
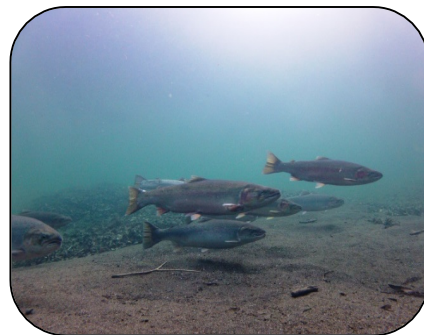
Landscape-Scale Approach to Restoring Balance in the Russian River Watershed

...without pouring one bucket of cement

- **Water supply**
- **Flood Control**
- Hydropower
- Recreation
- Agriculture (wine)
- **Endangered salmonids:**



Coho salmon
Chinook salmon
Steelhead trout



PRESENTATION OUTLINE

- ISSUES IN THE WATERSHED
- COLLABORATIVE DECISION MAKING PROCESS
- EARLY RESULTS



Landscape-Scale Problems Require Landscape-Scale Solutions

Drought of 2013-2015



Landscape-Scale Problems Require Landscape-Scale Solutions

Spring Flooding, 2017



Landscape-Scale Problems Require Landscape-Scale Solutions

Tubbs Fire, October 2017 and Kincaid Fire, 2019



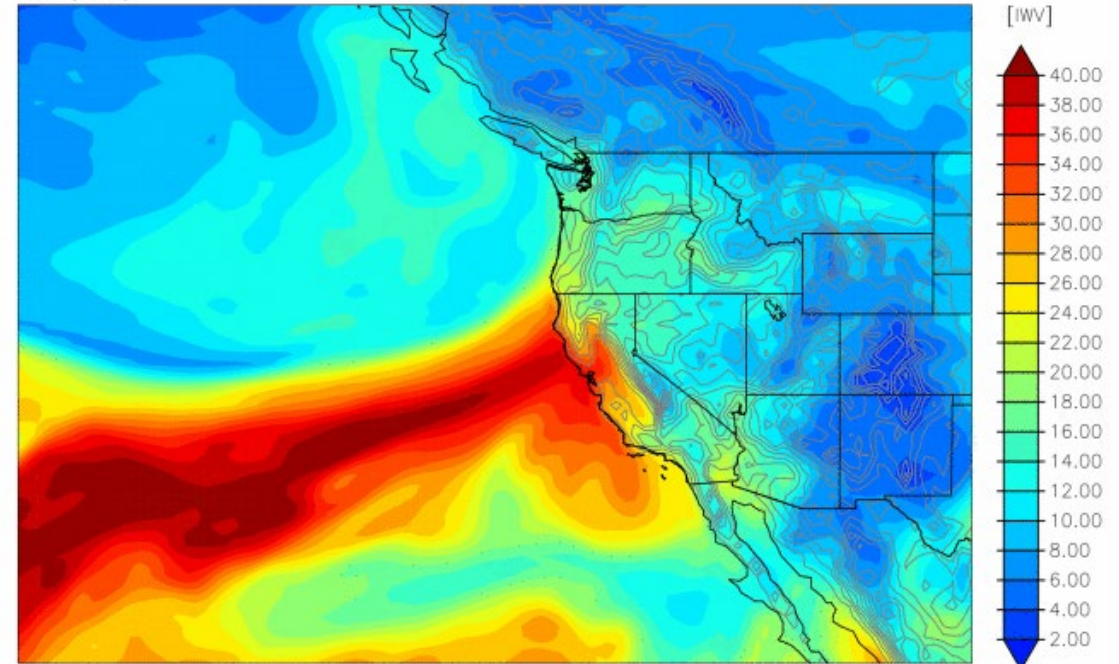
The Problem: Water Management Doesn't Reflect Changing Climate

- Increased frequency and variability of droughts, floods, and wildfires
- 50% rainfall & 90% flooding from atmospheric rivers (poor step cousin of hurricanes)
- Dams operated under rules from 1950s



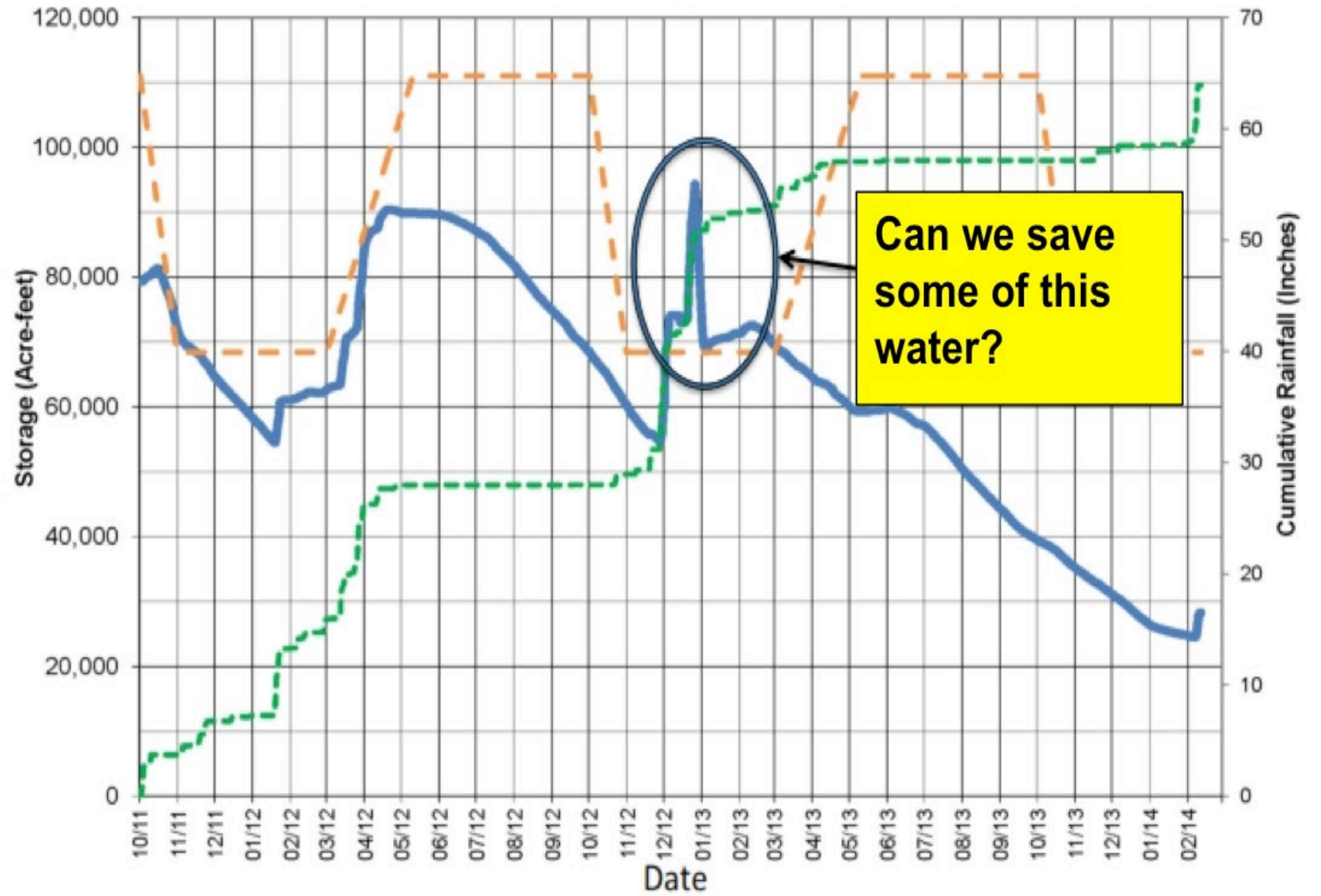
12z Nov 30, 2012 GFS F45 valid 09z Dec 02, 2012

IWV (mm)



LAKE MENDOCINO
Oct 2011-Feb 2014

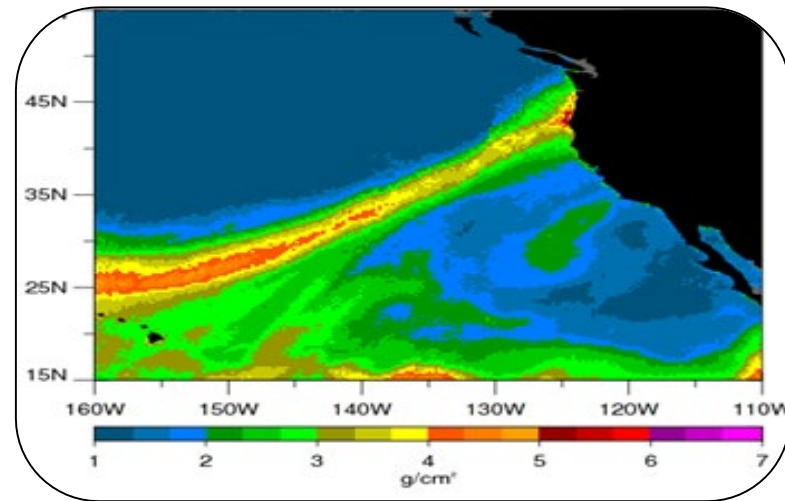
RESERVOIR LEVEL --
RULE CURVE --
CUMULATIVE RAINFALL --



Army Corps needs reliable weather predictions before they will deviate from the rule curve.

A Solution: Forecast Informed Reservoir Operations

Forecasting atmospheric rivers to predict when to hold water and when to let it go for drought resiliency, better flood control and stream flow for salmonid populations.



...without pouring one bucket of cement



RUSSIAN RIVER WATERSHED HABITAT RESTORATION SUMMIT TO SEA PARTNERS

Initiatives

- Habitat Blueprint for Salmon Restoration
- Resilient Lands and Waters Initiative
- Frost Protection for Vineyards
- Water quality modeling requirements for salmon
- Coastal monitoring and modeling – sea level rise
- **Forecast Informed Reservoir Operations**

Partners

- Bureau of Reclamation
- NOAA NMFS, OAR, NWS
- US Army Corps of Engineers
- CEQ, CA DWR and CA Div. F&W
- USGS
- Sonoma Water Agency
- Scripps Institution of Oceanography
- Sea Grant
- CA Farm Bureau



Lake Mendocino FIRO Steering Committee (2014-Present)

Federal

NOAA (OAR, NWS, NMFS)

USGS

Army Corps of Engineers

U.S. Bureau of Reclamation

State

California Dept. of Water Resources

Academic

Scripps Institution of Oceanography

Regional:

Sonoma Water Agency

Russian River Flood Control District



How Did This Happen?

Right Place, Right Time:
Leadership with Benefits:
Don't Ask Permission:
A Potent Mix:
Ownership:

Workshop During Drought Peak
Scripps Hosts "Demo" Project
Self-Appointed Committee
Fisheries, Meteorologists, Water Suppliers, Dam Operators
Group effort

REVOLUTIONARY  EVERYONE SEES A BENEFIT  SOCIAL

Scientific Ingredients



(1) Meteorological research – Improving forecast skill

(2) Hydrologic Modeling:

What does it look like to operate the reservoir differently?

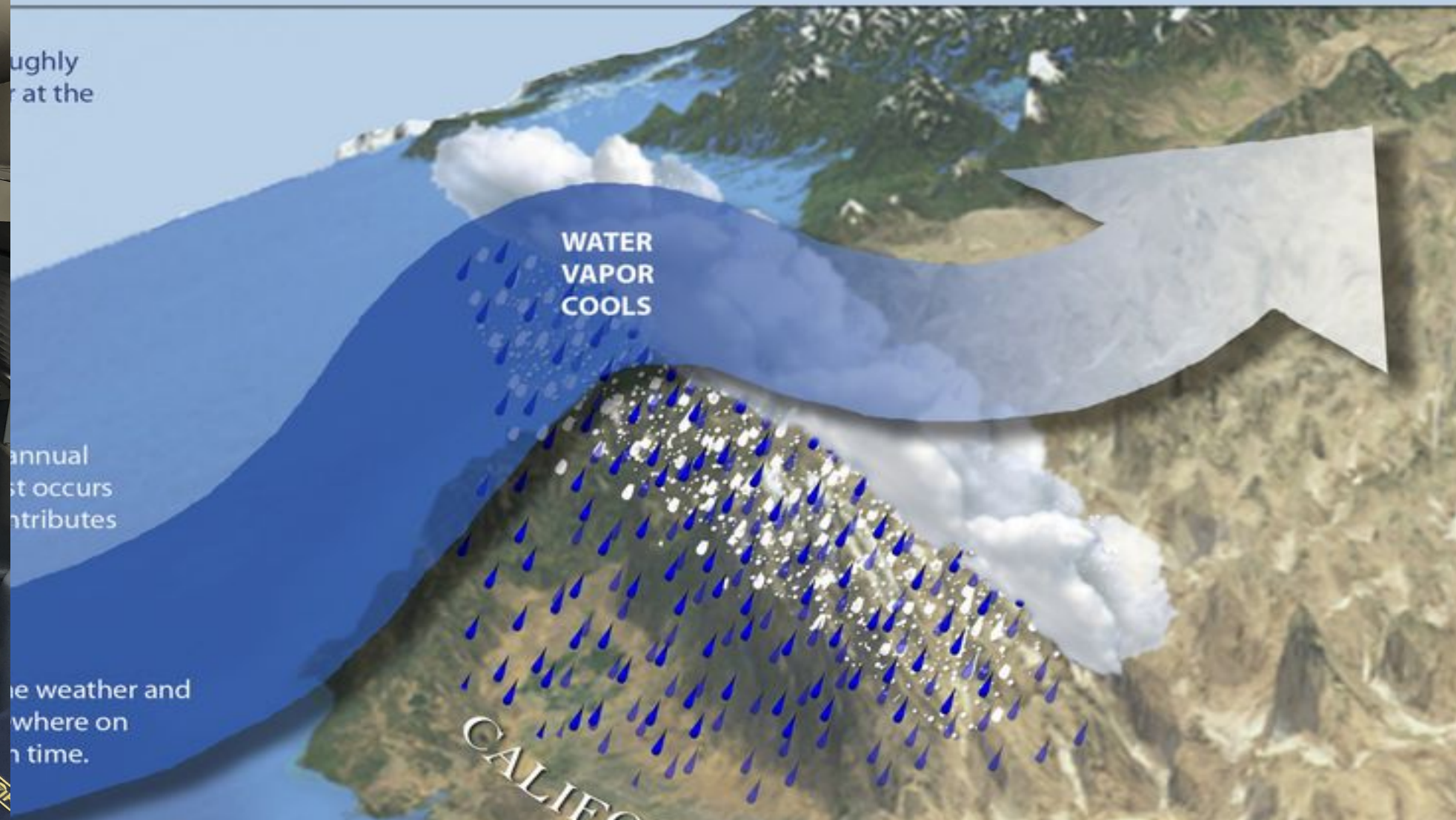
What is the potential for increasing downstream water availability?

Will it cause more flooding?

Will it help or hurt fisheries?

science behind atmospheric river

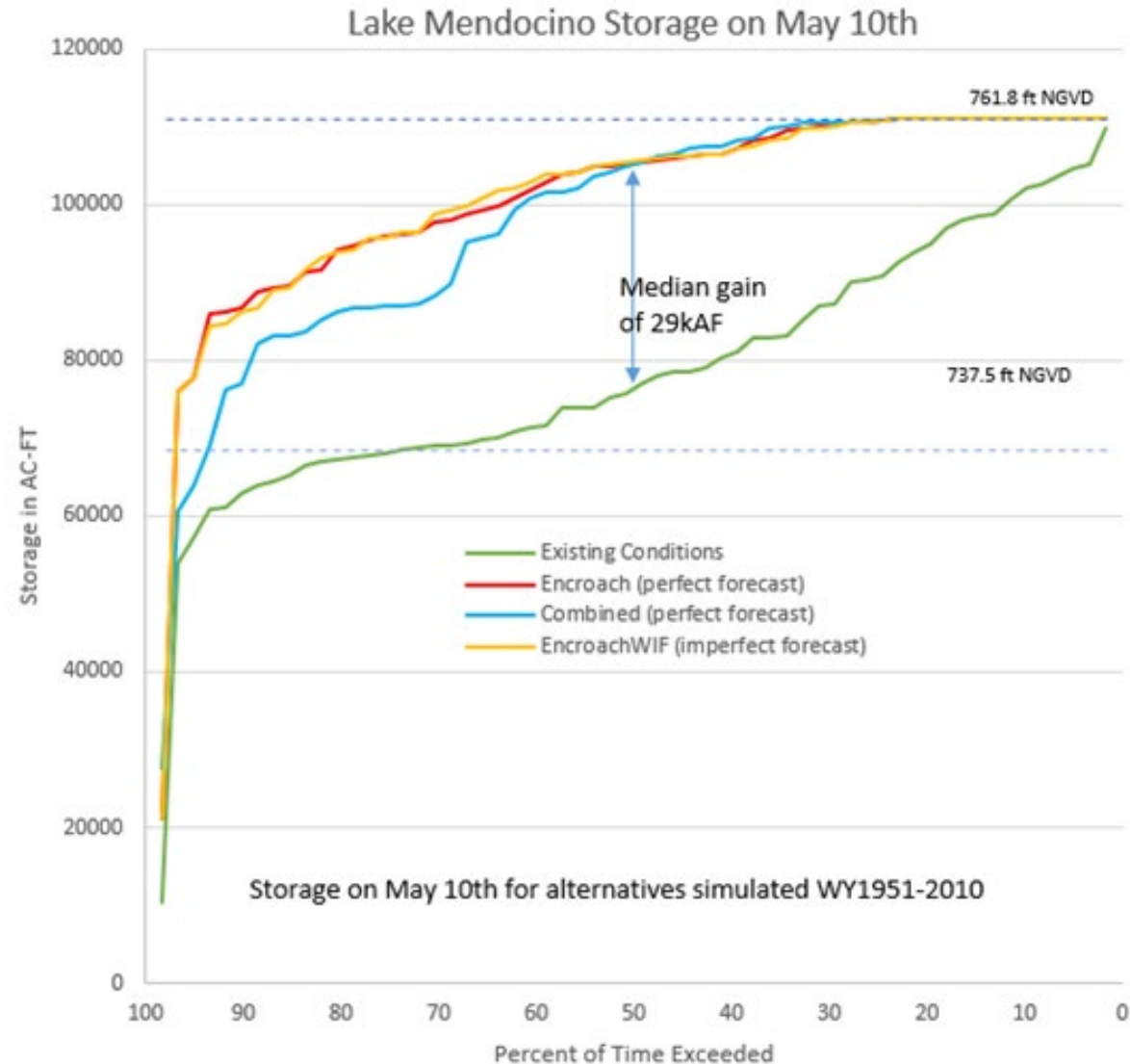
of condensed water vapor in the atmosphere responsible for producing significant levels of rain and snow. As ARs move inland and sweep over the mountains, the water vapor rises and cools to create heavy precipitation. While they typically provide beneficial rain or snow, some of the larger, more powerful ARs can create extreme rainfall and flooding, leading to catastrophic damage to life and property. Visit www.research.noaa.gov to learn more.



Water Storage Outcome with FIRO- Water Supplier Happy

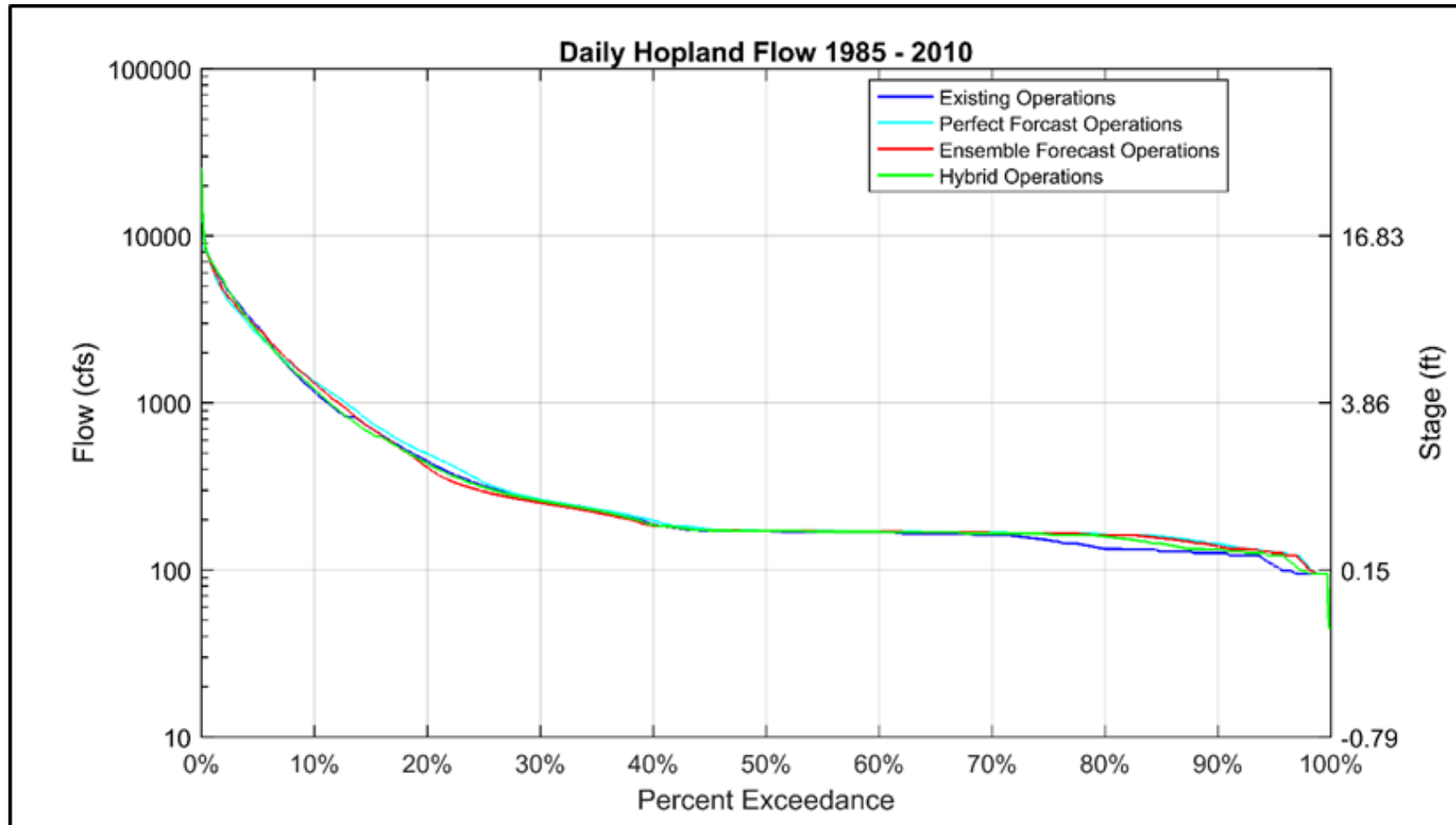
Median end of water year (May 10) reservoir storage attributable to FIRO ranged from 8,633 AF to 27,780 AF, or **up to a 49% increase**

At least 2 billion gallons of water.



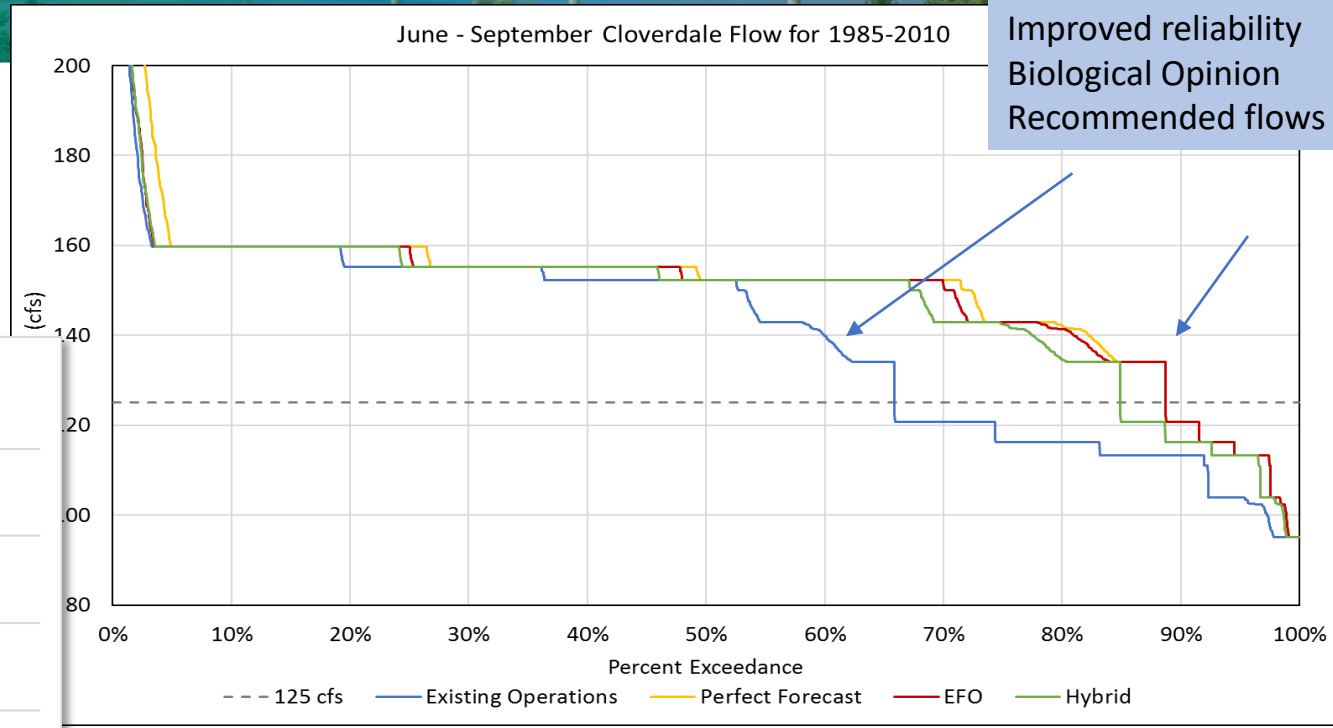
Flood Outcome with FIRO – Dam Operators Happy

**ZERO
INCREASE
IN FLOOD
RISK**

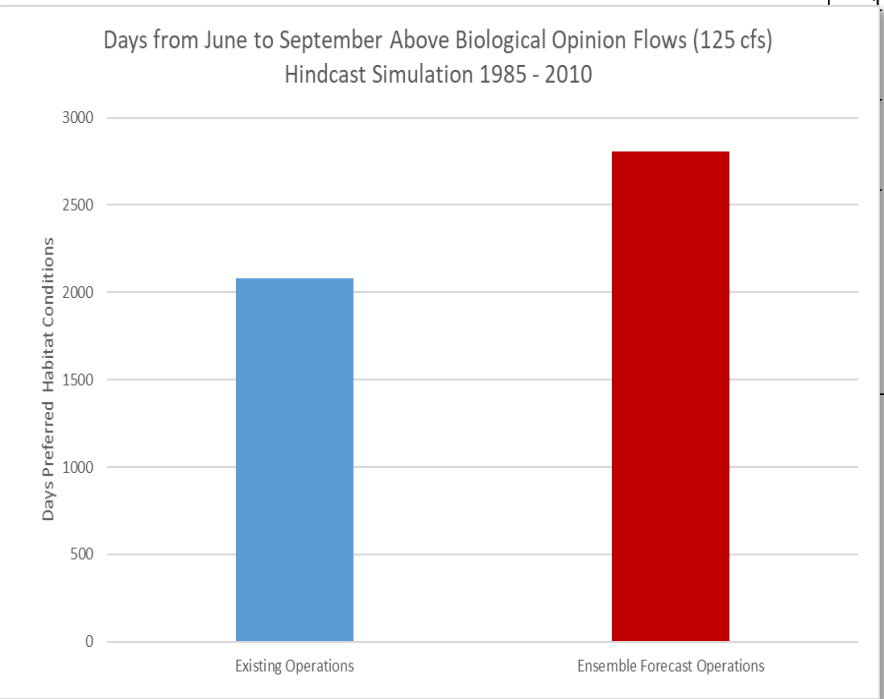


Can FIRO Improve Fish Happiness?

Improved reliability
Biological Opinion
Recommended flows



Days from June to September Above Biological Opinion Flows (125 cfs)
Hindcast Simulation 1985 - 2010

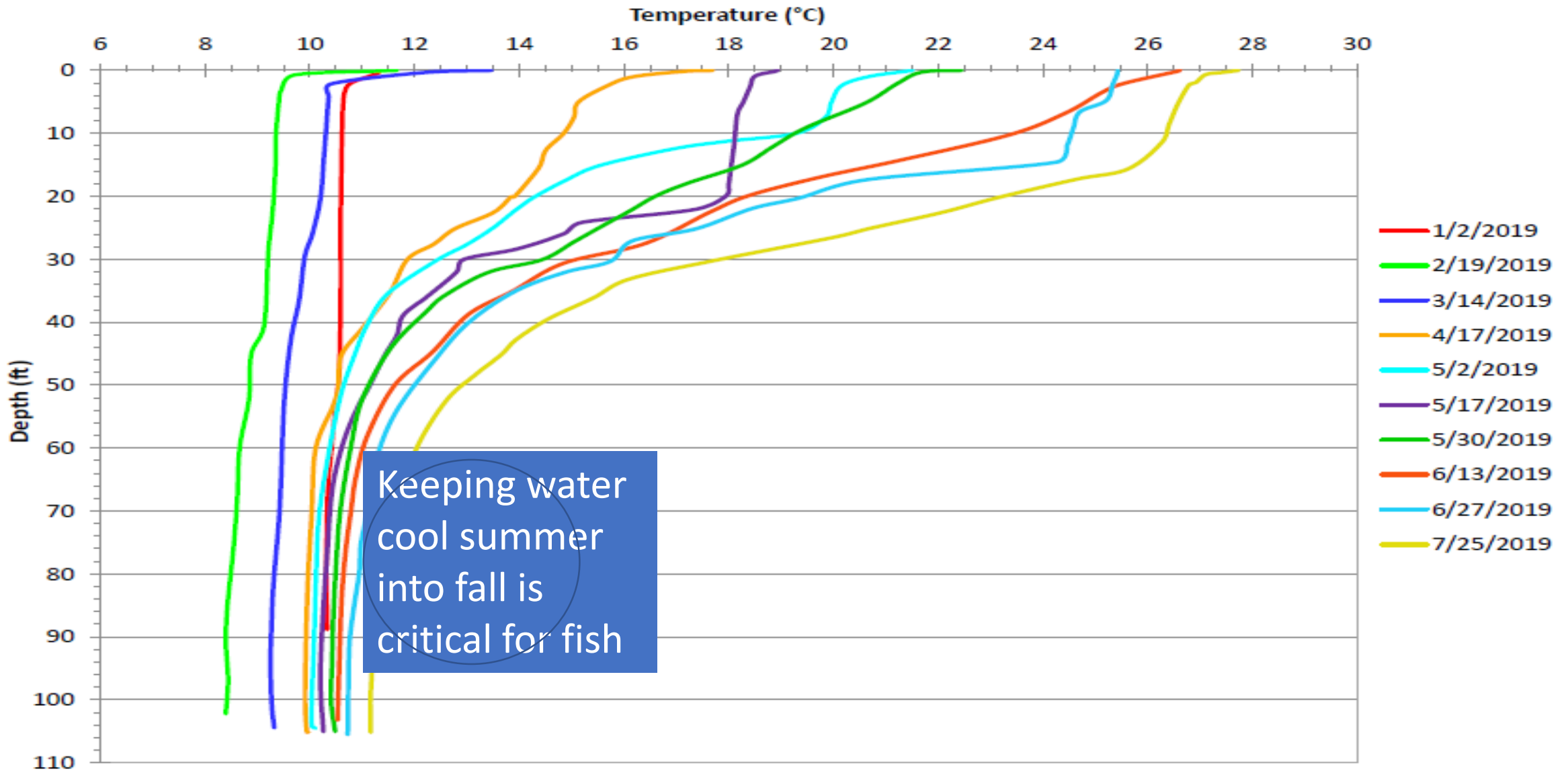


Blue

Red

Number Days Ecologically Beneficial
Summer River Flows

LM Dam - Vertical Temperature Profile 2019



Results and Next Steps



Results:

- Major Deviations to the Rule Curve – Approved!
- Storage level increased by 15%
- New national policy allows forecast operations
- Increased Russian River tours

Next:

- Change to Rule Curve and Adaptive Management Approach (2020-2021)
- Sociologist doing study on collaboration process

In the End

