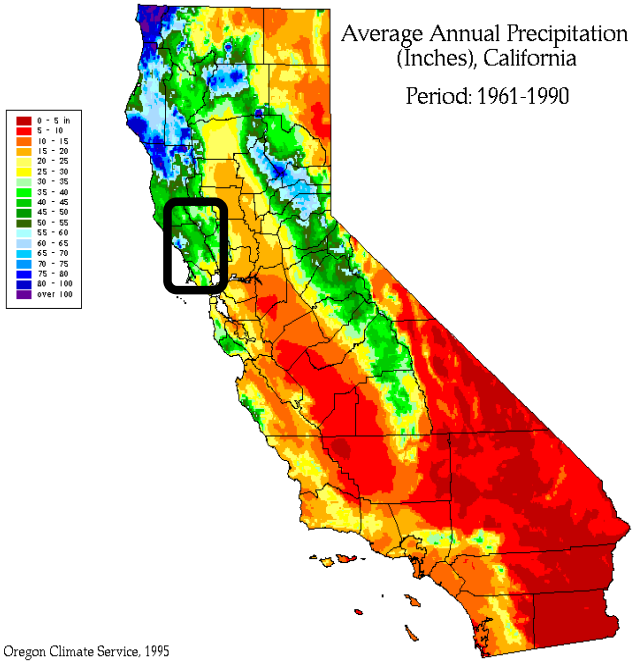
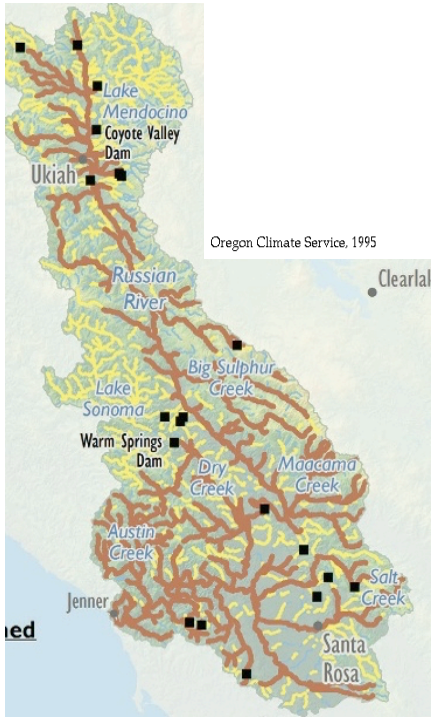
Skill and reliability of experimental GEFS ensemble forecast guidance designed to inform decision-making in reservoir management in California

+

Information Needs and Potential Entry Points



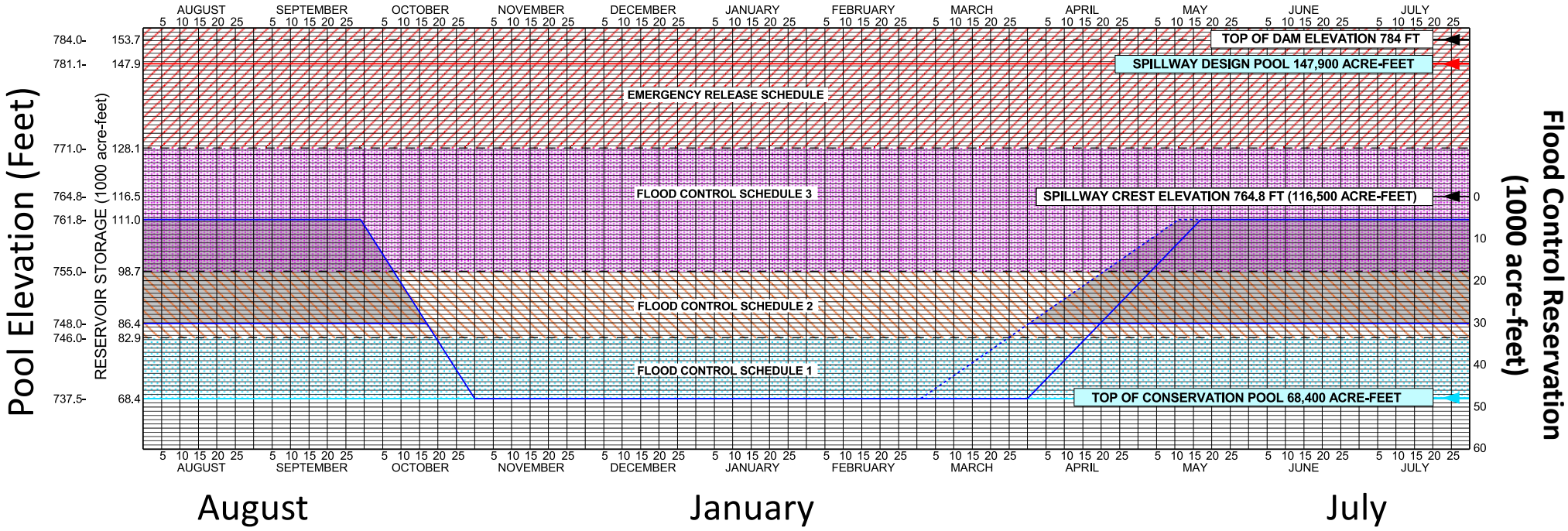


Robert S. Webb, NOAA Boulder, Boulder, CO

Michael Scheuerer, University of Colorado, CIRES, Boulder, CO

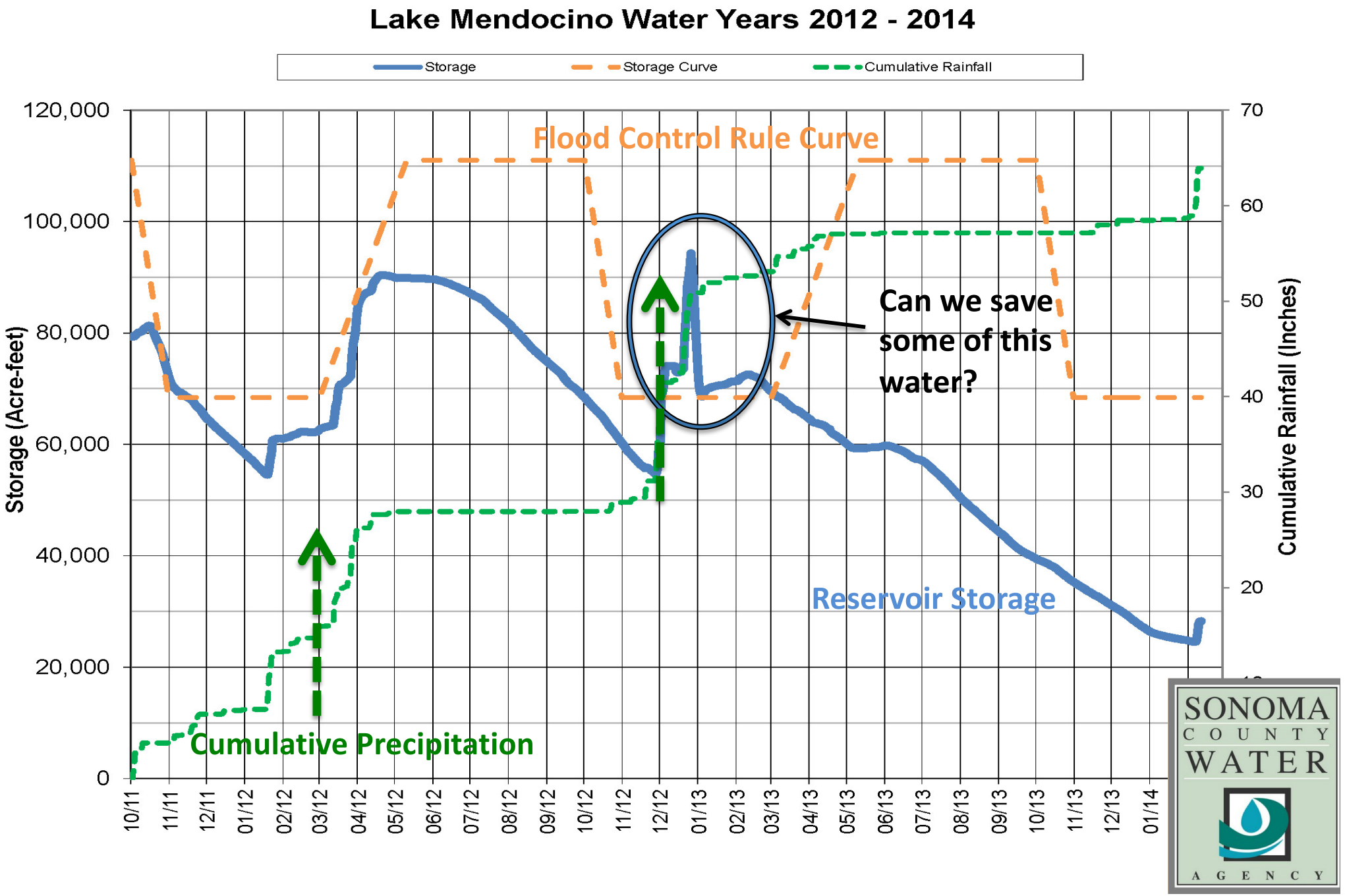
Thomas Hamill, NOAA/OAR/ESRL, Boulder, CO

Lake Mendocino Flood Pool Management

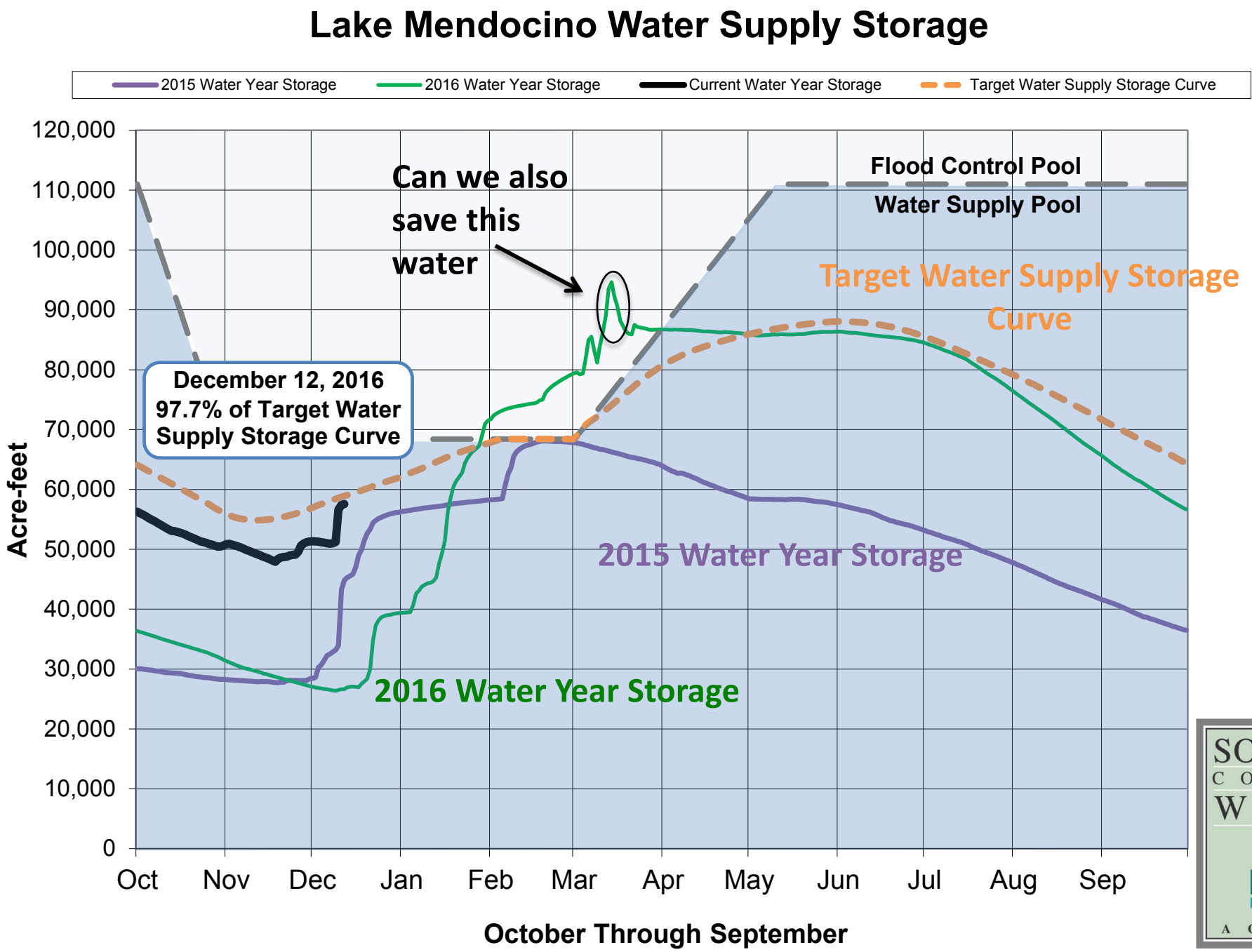


Forecast informed deviations in reservoir flood-control and water-supply operational rules to keep or release a little more water provide an opportunity to reduce both flood and water supply risk through a more efficient use of existing infrastructure.

Lake Mendocino Water Management Motivation



Lake Mendocino Water Management Opportunity



SONOMA COUNTY WATER AGENCY

Actionable Forecast Information Desired

Plan A

Reliable and skillful subseasonal to seasonal outlooks at 15 to 90 days of the risk for extreme precipitation events in the watershed before the end of the winter/spring rain season

Able to hold additional water in flood pool space until seasonal rule curve changes, adaptive actions can be taken to schedule supply deliveries and enact water conservation practices

Worthy ultimate goal but a prediction challenge at the scale of a specific watershed at these lead times

Actionable Forecast Information Desired

Plan B

Reliable and skillful outlooks at 6 to 10 days of the low risk for extreme precipitation events in the vicinity of the watershed

Able to hold additional water in flood pool for another day rather than immediately evacuate water from flood

Potentially achievable goal given the reliable predictability of synoptic scale systems/circulation at these lead times

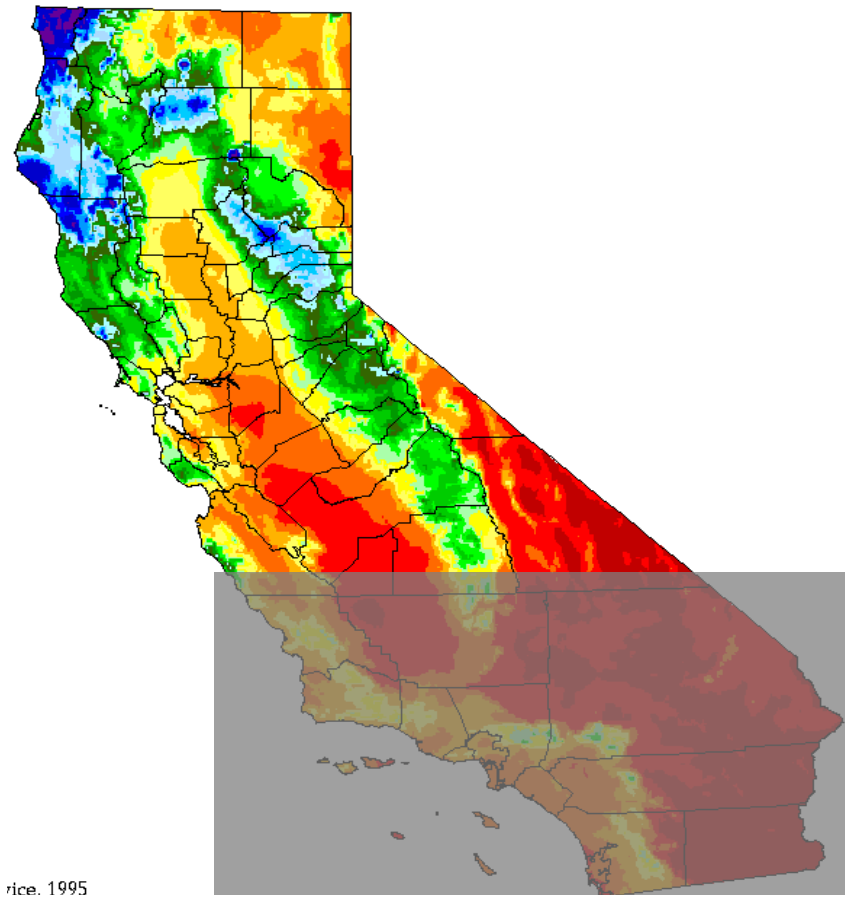
Experimental Actionable Forecast Information (Plan B)

Experimental GEFS ensemble 6 to 10 days forecast guidance for the risk of extreme precipitation events for California using the parametric approach based on censored, shifted gamma distributions (CSGDs) described by Scheuerer and Hamill (2015).

Scheuerer, M. and Hamill, T.M. (2015): Statistical post-processing of ensemble precipitation forecasts by fitting censored, shifted Gamma distributions. *Monthly Weather Review*, 143(11): 4578-4596.

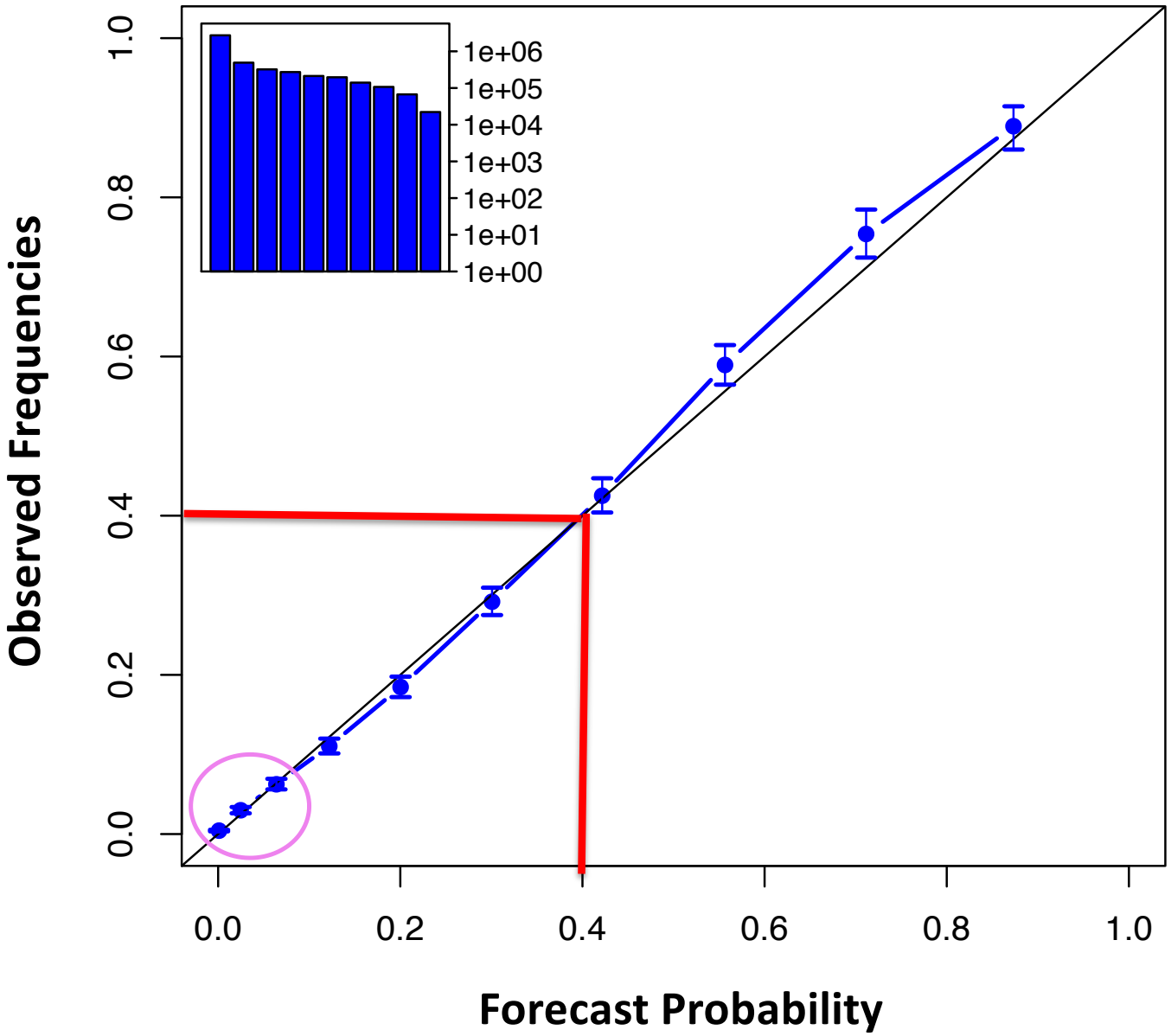
Application

Forecasts verified against the Climatology-Calibrated Precipitation Analysis (CCPA) analysis product which is at a 1/8 degree resolution (~140 km^2 per grid cell or ~12x~12 km). The reliability and discrimination plots are based on all 1663 grid points grid points within California north of 36 degree latitude.

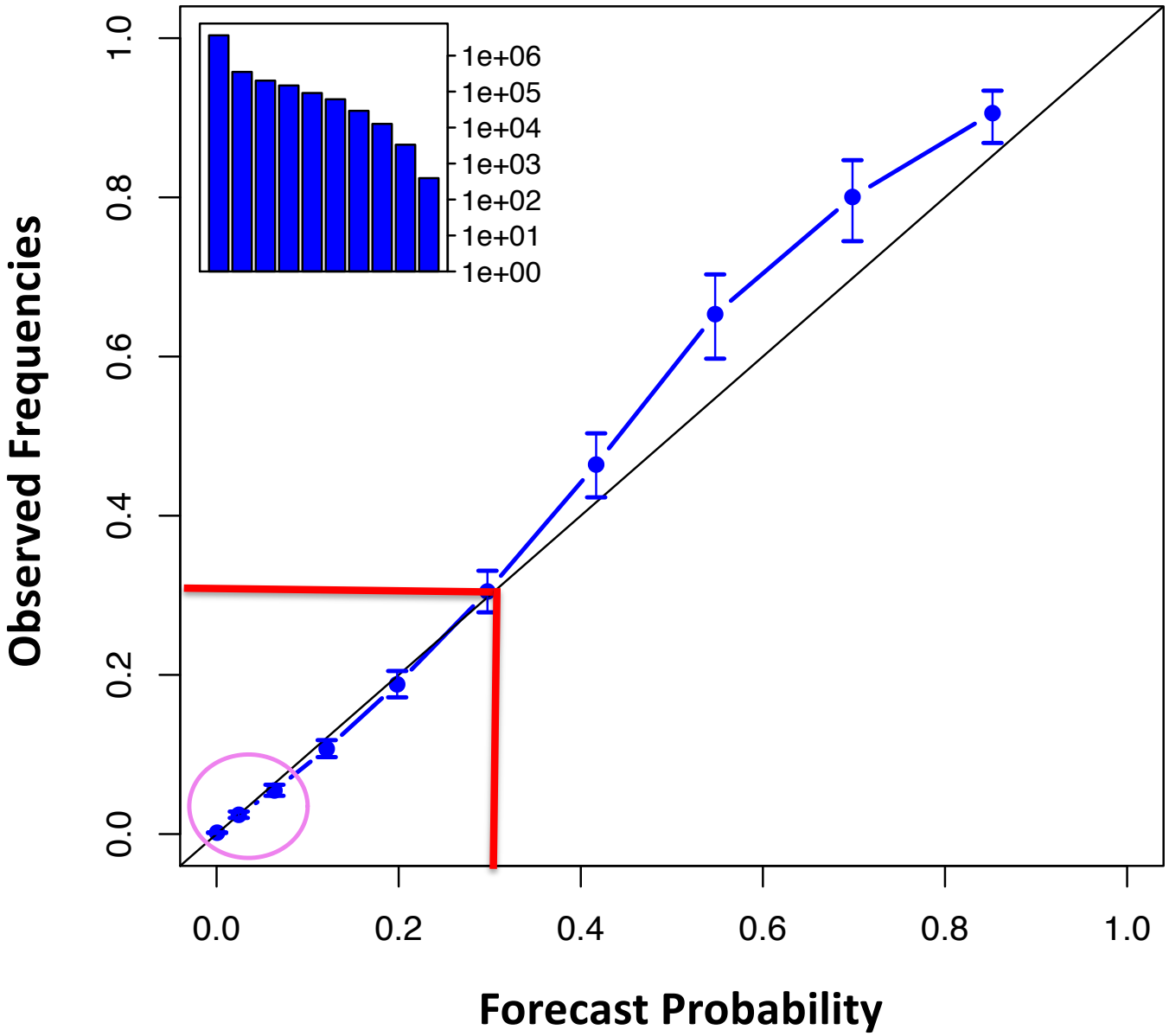


- Reliability analyses for 14 cool seasons (October - April) 6 to 10 days forecasts starting in the part way through the 2002 cool season to 2015 (2900 days)
- Experimental 6 to 10 days forecasts run for 2016 Water Year

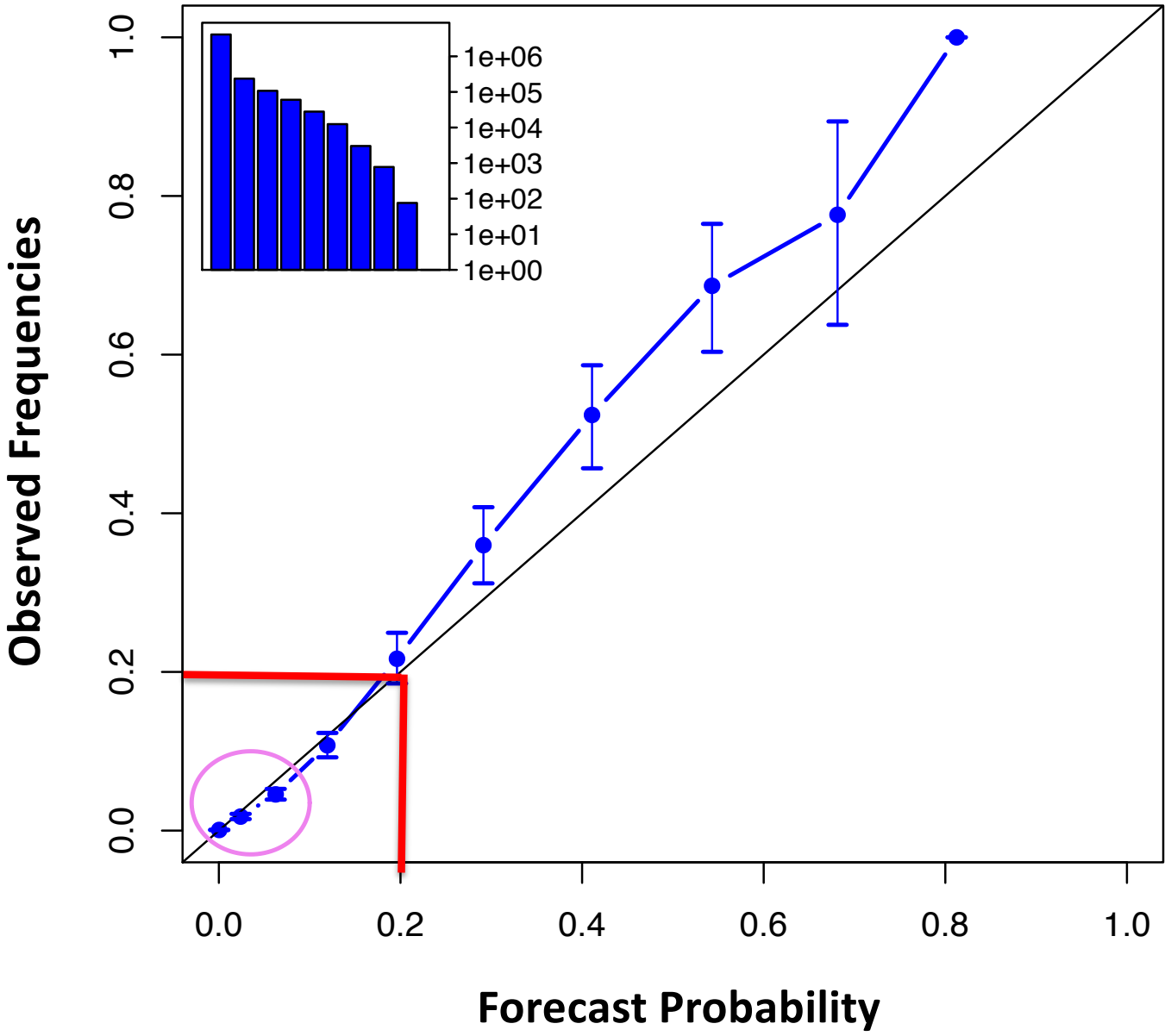
Reliability Diagram for 6 to 10 days forecasts of precipitation >50 mm



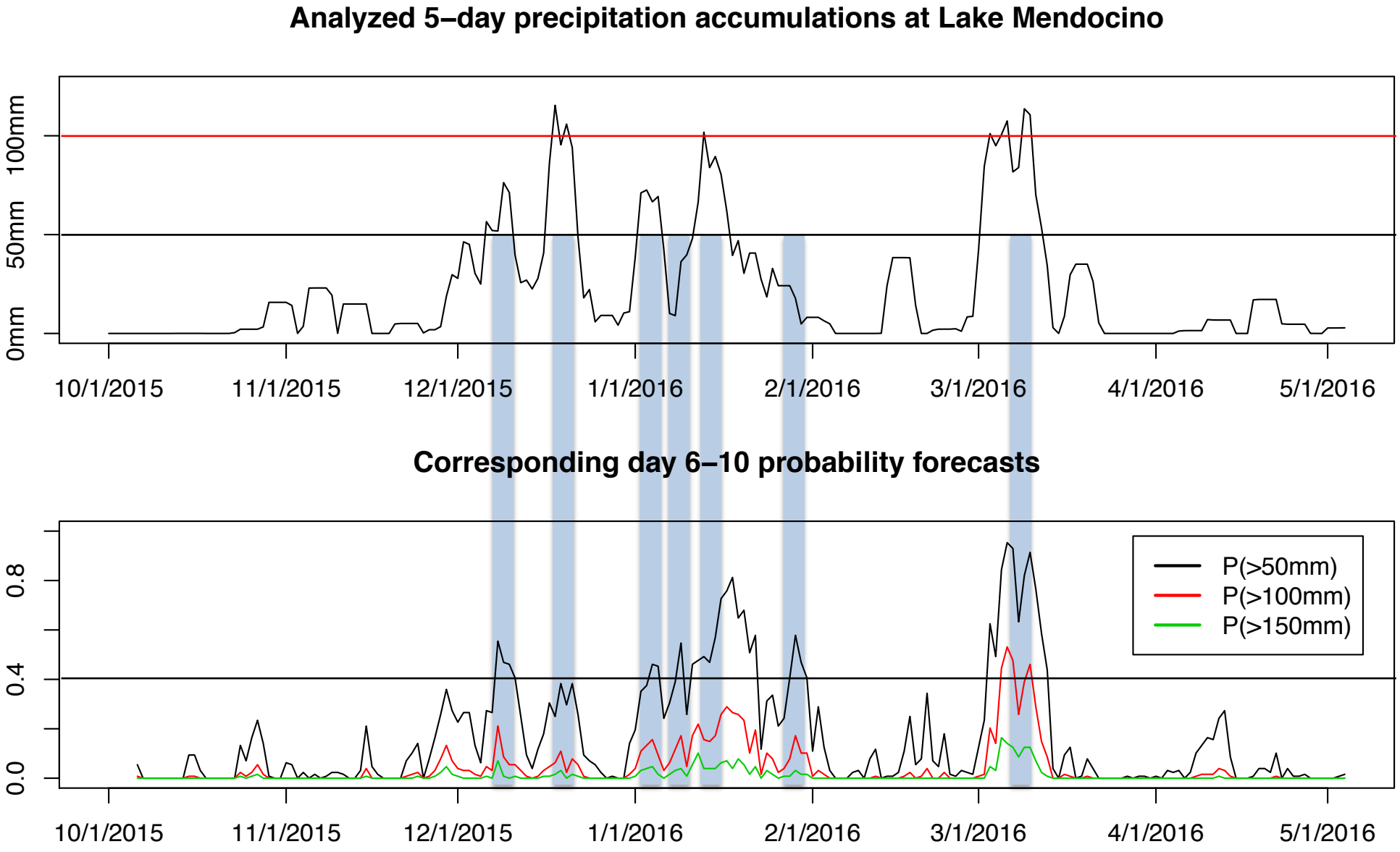
Reliability Diagram for 6 to 10 days forecasts of precipitation >100 mm



Reliability Diagram for 6 to 10 days forecasts of precipitation >150 mm

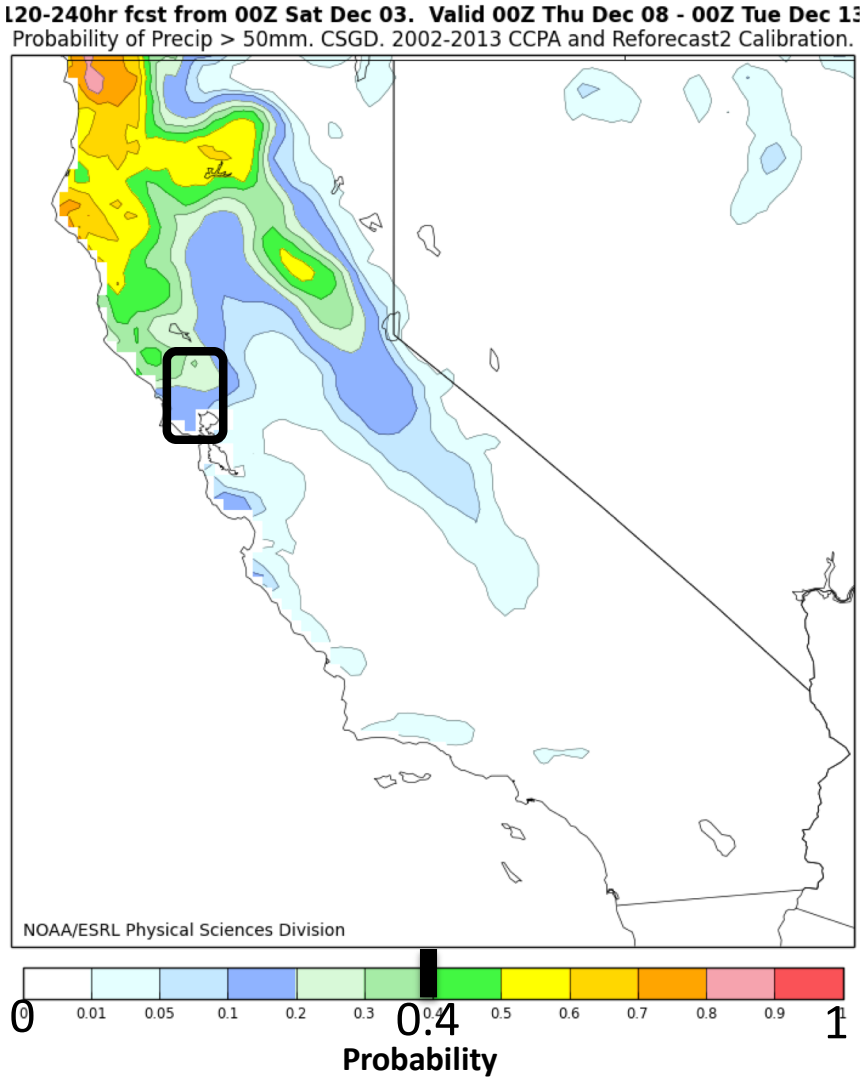


2016 Water Year Experimental 6 to 10 Day Forecasts for Lake Mendocino



Real time Experimental California Medium-Range Precipitation Forecasts, Based on NCEP GEFS Reforecasts and CCPA

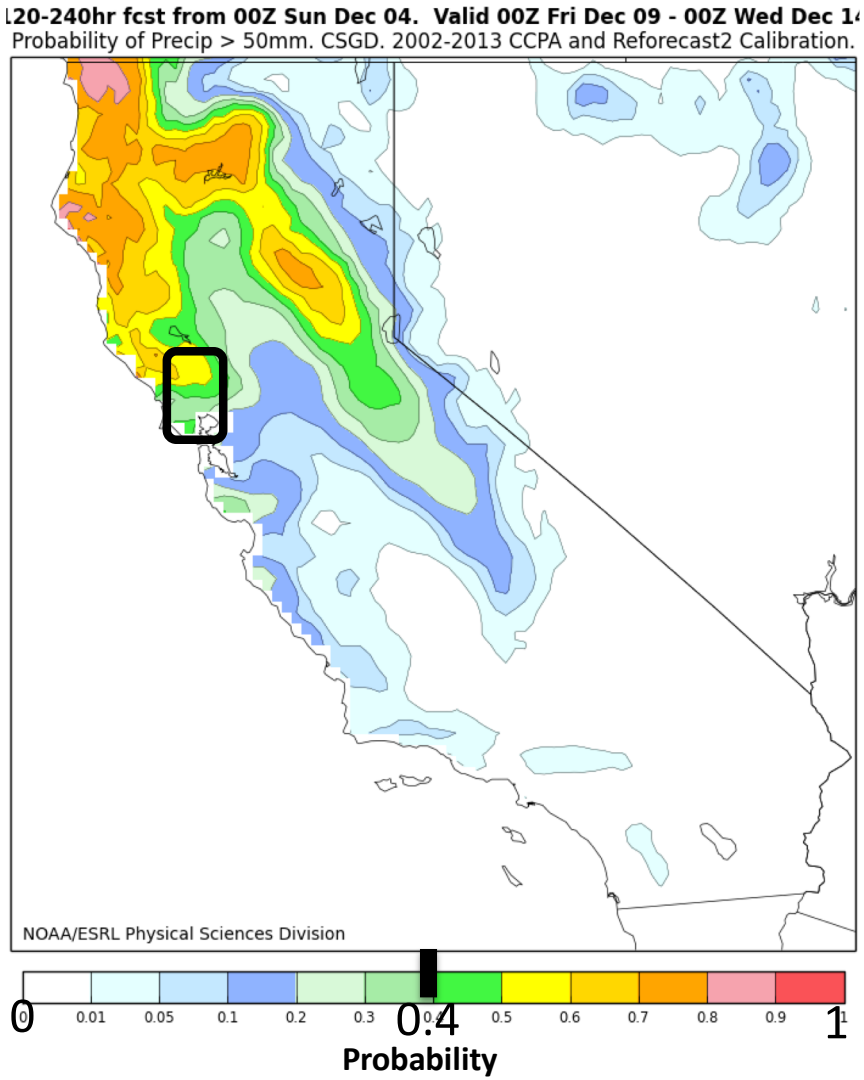
6 to 10 day forecast made December 3 for December 8 to 13



www.esrl.noaa.gov/psd/forecasts/reforecast2/calif-csgd/index.html

Real time Experimental California Medium-Range Precipitation Forecasts, Based on NCEP GEFS Reforecasts and CCPA

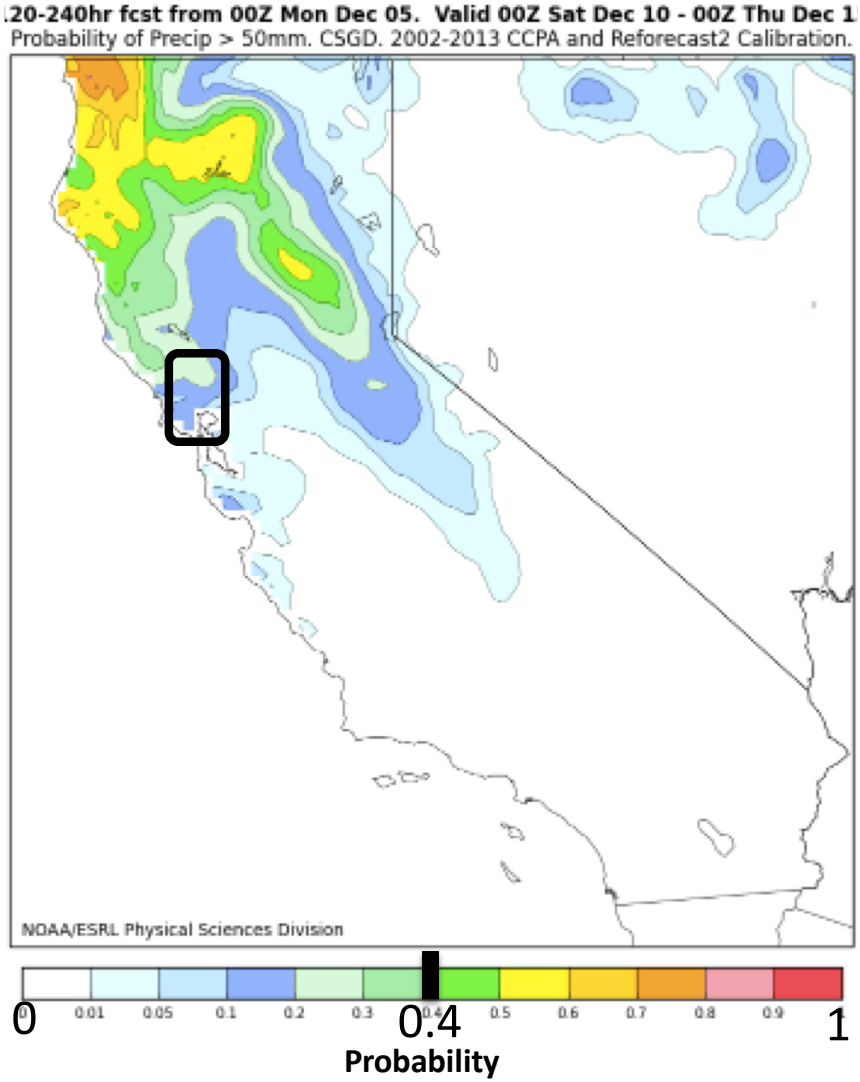
6 to 10 day forecast made December 4 for December 9 to 14



www.esrl.noaa.gov/psd/forecasts/reforecast2/calif-csgd/index.html

Real time Experimental California Medium-Range Precipitation Forecasts, Based on NCEP GEFS Reforecasts and CCPA

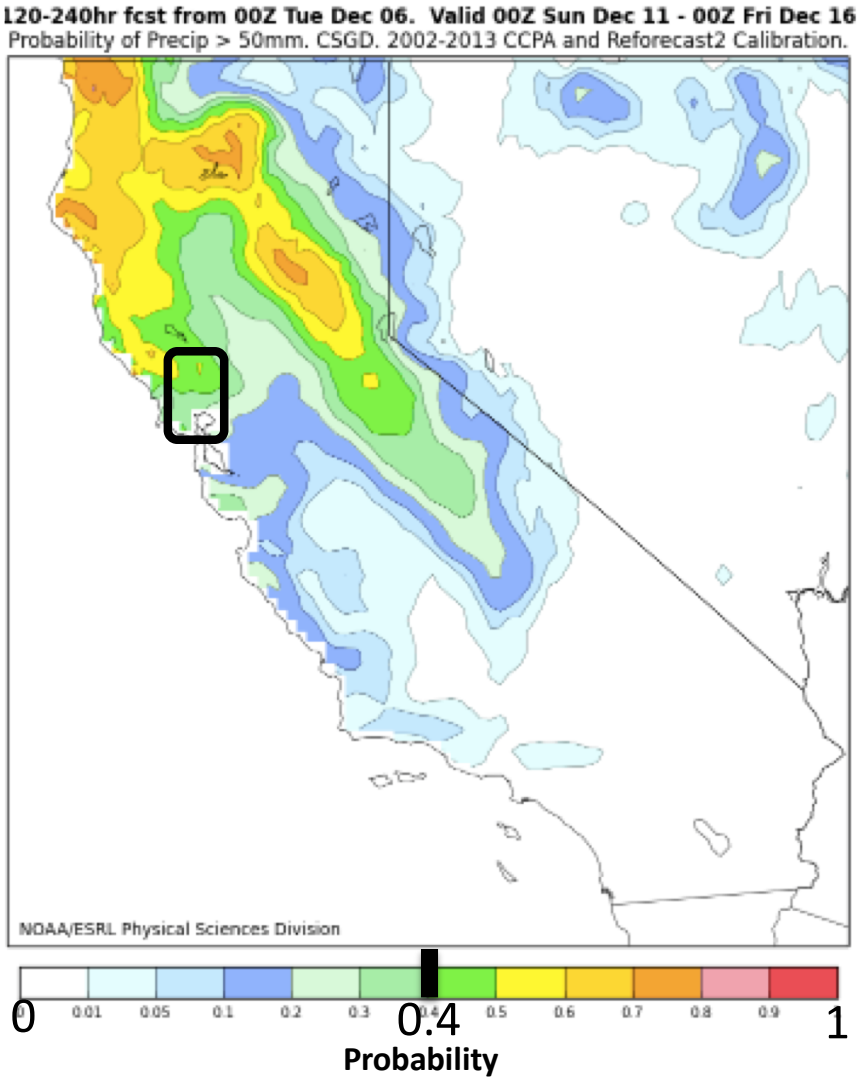
6 to 10 day forecast made December 5 for December 10 to 15



www.esrl.noaa.gov/psd/forecasts/reforecast2/calif-csgd/index.html

Real time Experimental California Medium-Range Precipitation Forecasts, Based on NCEP GEFS Reforecasts and CCPA

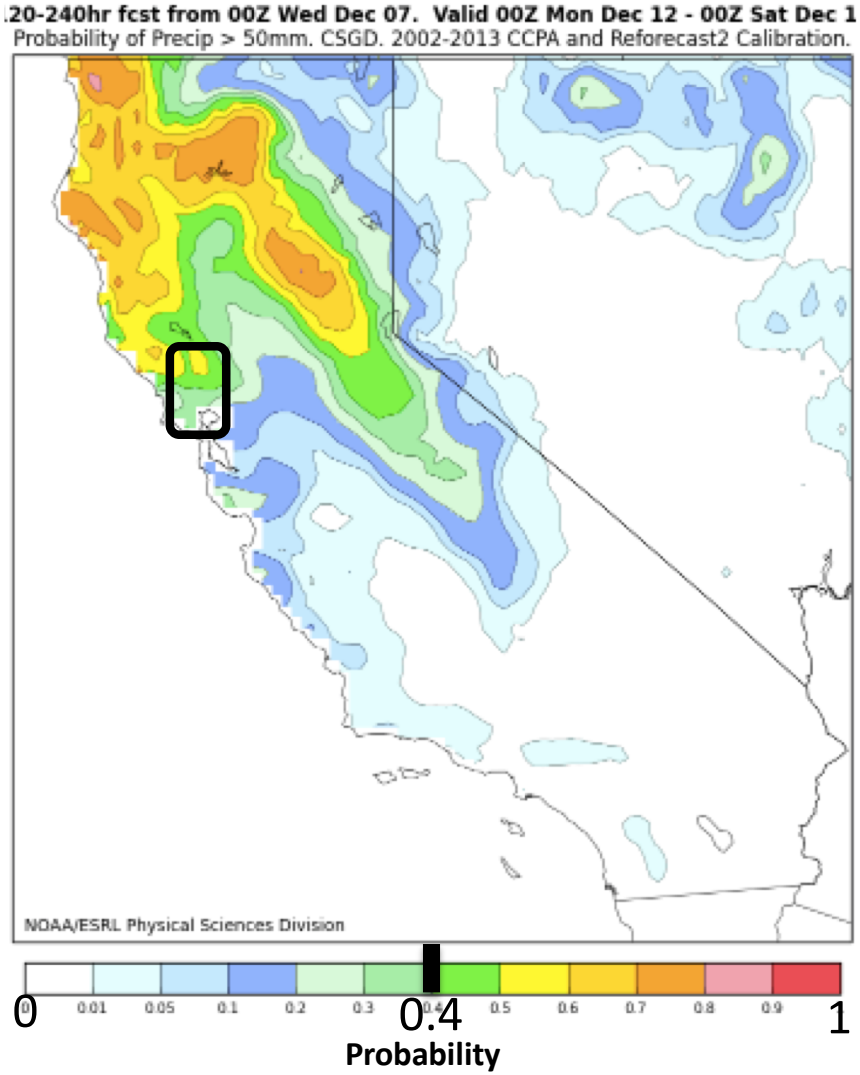
6 to 10 day forecast made December 6 for December 11 to 16



www.esrl.noaa.gov/psd/forecasts/reforecast2/calif-csgd/index.html

Real time Experimental California Medium-Range Precipitation Forecasts, Based on NCEP GEFS Reforecasts and CCPA

6 to 10 day forecast made December 7 for December 12 to 17



www.esrl.noaa.gov/psd/forecasts/reforecast2/calif-csgd/index.html

Summary

- ✓ Experimental 6 to 10 days outlooks of extreme precipitation in the proximity of river basins in northern California shows promise in providing skillful information on the risk of 50 mm events that is reliable for probabilities of 40% or less.

Ongoing Effort

- ➢ Produce experimental forecasts as guidance to inform deviations in reservoir flood-control and water-supply operational rules
- ➢ Partner with NCEP/WPC, MDL and RFCs to transform experimental forecast information into easy-to-understand and useable products for reservoir flood-control/water-supply operators (e.g., National Blend)

Decision Calendar - Information Needs and Potential Entry Points

Time Frame/Purpose	Nowcast (0 - 6 hours	Near Real Time (6 - 24 hours	Short Term (1 day - 1 Week)	Near Term (1 Week - 3 Months)	Mid Term (6 to 24 months)	Long Term (5 years and longer)
Flood Mitigation	Flood status assessment	Flood forecast Warning, deploy, System operations	Flood warning, Response, deploy, FIRO	Flood warning, Response, deploy, FIRO	Over-year storage allocation	Flood risk; Capacity development; Climate Resilience;
Water Supply	Status Assessment; intake and release operations	Forecast Informed Reservoir Operations (FIRO)	FIRO; Emergency conservation	Delivery scheduling; FIRO; Conservation	Over-year Drought Impact Mitigation; Conservation	Capacity Development Demand management; Climate Resilience;
Ecosystem Enhancement	Status Assessment	Threat assessment; FIRO and River management	Threat assessment; FIRO and River management	Threat assessment; FIRO and River management	Threat assessment; Capacity Development; Drought Impact Mitigation	Ecosystem Services and Capacity Development; Climate Resilience;
Water Quality	Status Assessment; Real-time control	Waste water capture and treatment	Threat assessment; System Optimization	Threat assessment; Capacity Development; System Optimization	Threat assessment; Capacity Development; System Optimization	Capacity Development; Climate Resilience;
Recreation	Weather status; Warning	Event Scheduling and Closures	FIRO	FIRO	Capacity Development;	Capacity Development;
Transportation	Weather status; Warning	Threat assessment; Traffic Scheduling	Threat assessment; Traffic Scheduling; Response and deployment	Threat assessment; Traffic Scheduling; Capacity Development;	Capacity Development;	Capacity Development; Climate Resilience;
Fisheries Management	Status Assessment; Real-time fish management control	Threat assessment; water quality/ temperature and flow velocities	Threat assessment; hatchery release guidance	Threat assessment; river/estuary habitat status; ocean upwelling/nutrient	Capacity Development; Habitat restoration; Co-management of native fisheries	Capacity Development; Climate Resilience; Habitat restoration; Fishery recovery
Agriculture	Status Assessment; Real-time frost control	Threat assessment; Frost Risk	Threat assessment; Frost, pests/mold, drought/flood risk	Threat assessment; Frost, pests/mold, drought/flood risk	Capacity Development; irrigation ponds; fans	Capacity Development; Climate Resilience; crop choice, irrigation ponds; fans

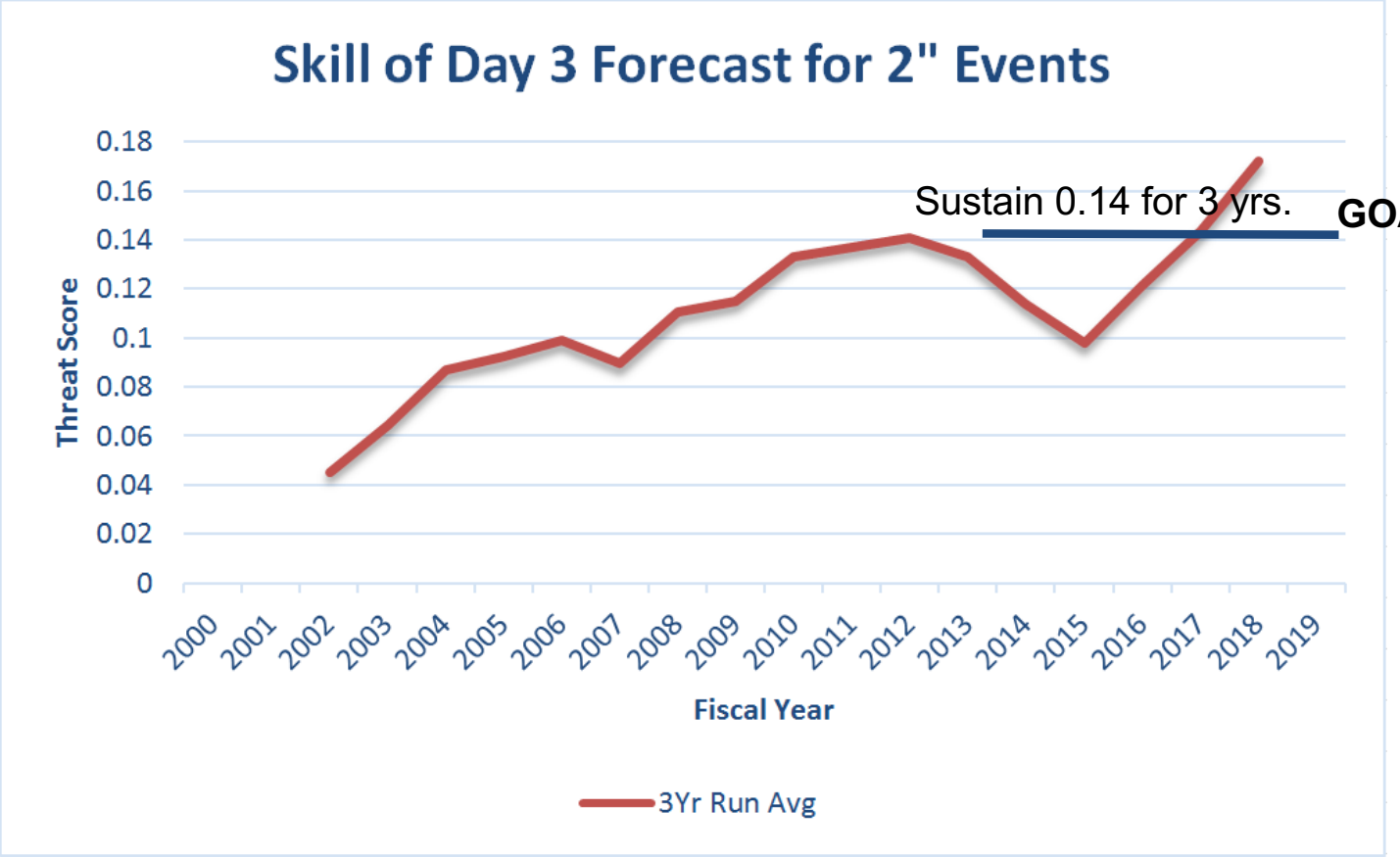
Backup Slides

NCEP WPC (Excessive Rainfall Outlook)

Threat score of two inch rainfall events forecast 3 days in advance
(3 FY running average)

3-year running average goal = 0.14

Sustaining a 0.14 Threat Score gives confidence to provide 'high risk' excessive rainfall outlook category on Day 3



FY19 performance data will be available at the end of the fiscal year. The NWS is currently on track to meet the three-year running average goal of 0.14.

What does a 0.14 Threat Score Mean?

Threat Score of 0 = NO overlap between forecast & observed location.
Threat Score of 1 = COMPLETE overlap between forecast & observed location.
Threat Score of 0.14 = Index score which represents 25% overlap between forecast and observed location

Note: Predictions with some variation are still highly useful to planning for and responding to extreme weather.