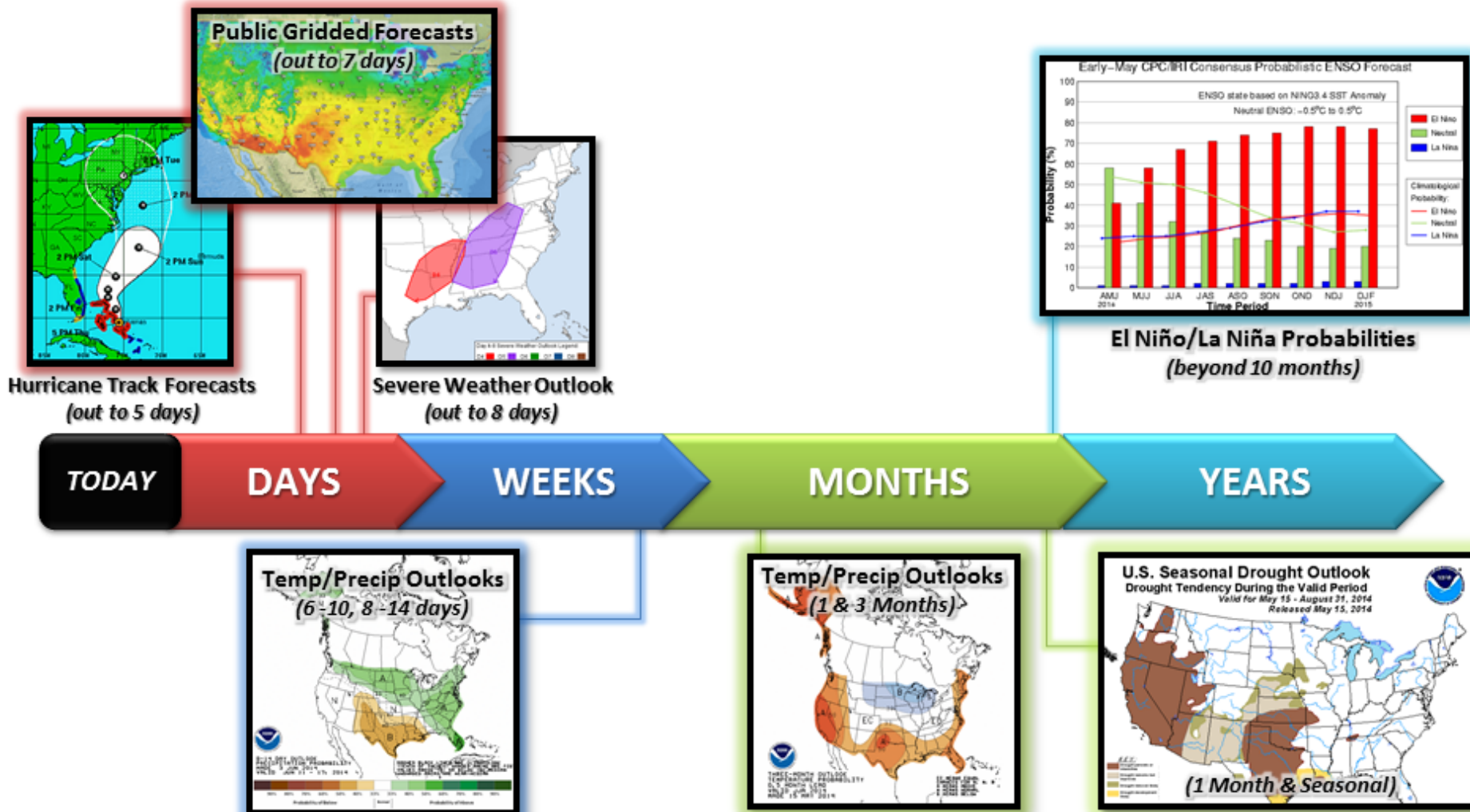




# Usable Precipitation Forecasting Skill for Water Management

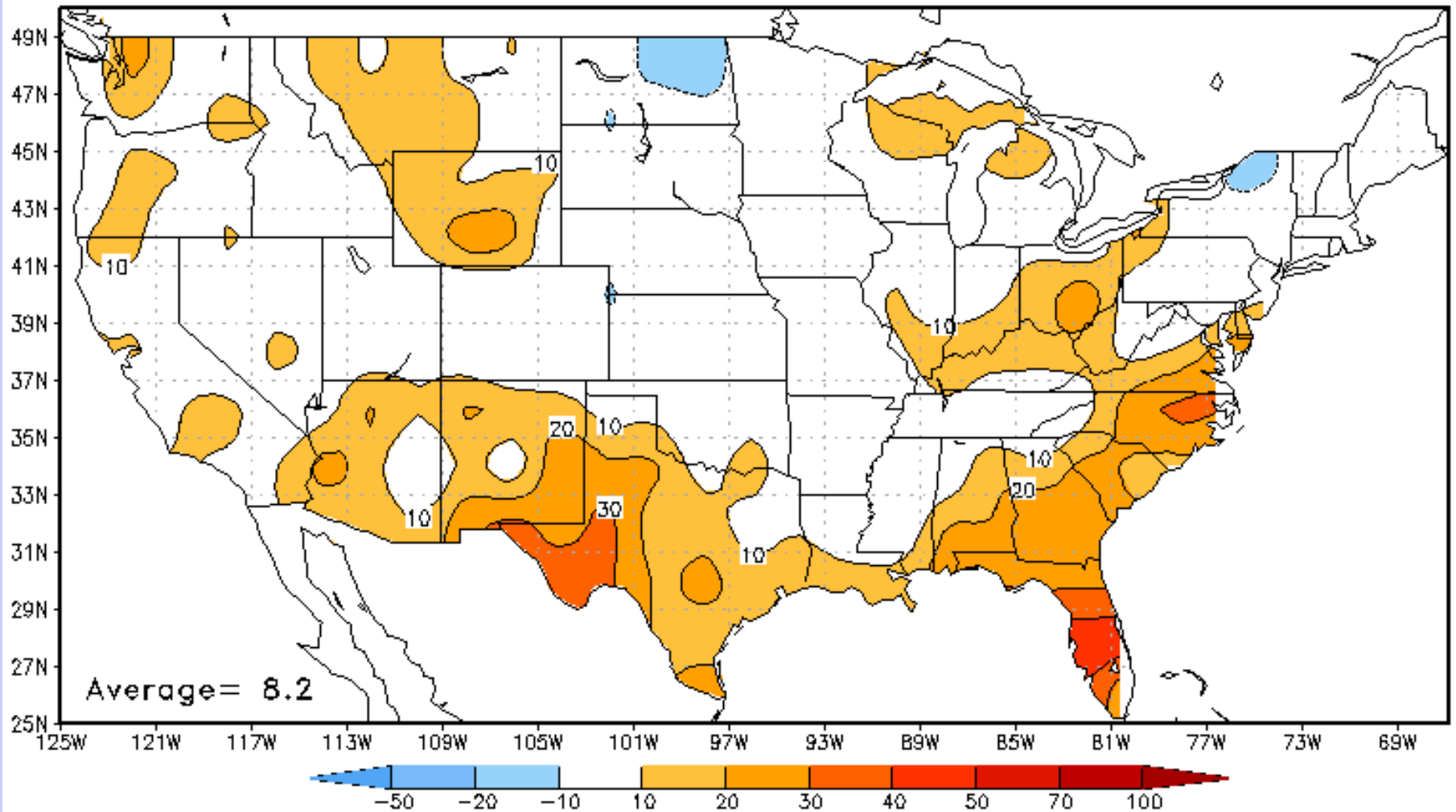
Jeanine Jones, California Department of Water Resources

# NWS Operational Products



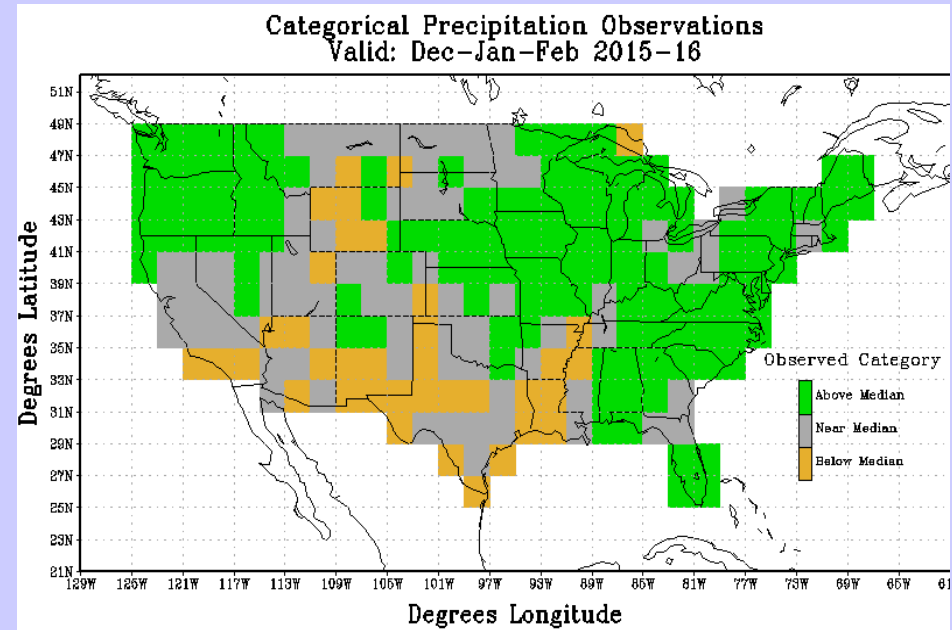
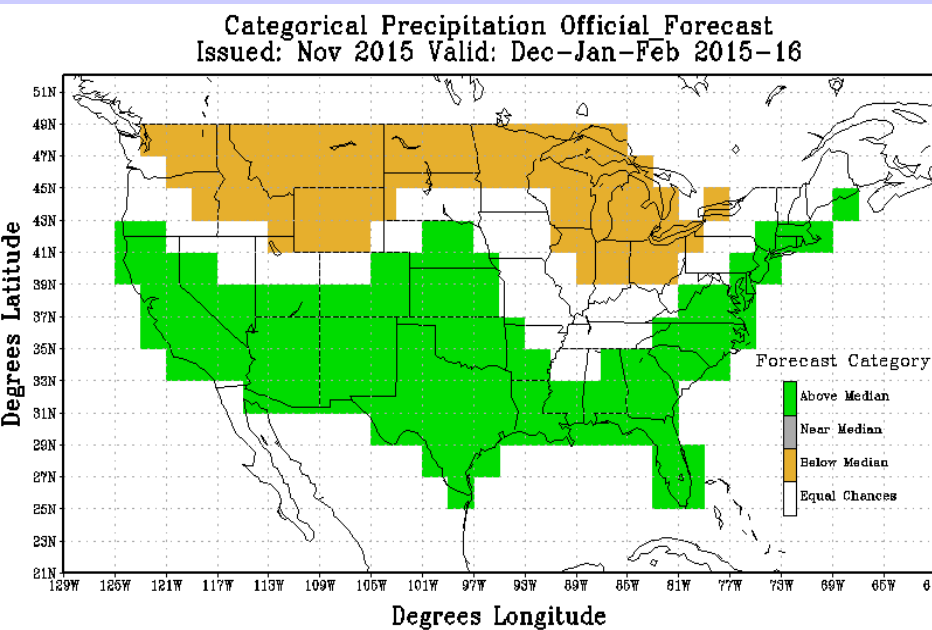
# Historical Skill of NOAA Seasonal Outlooks – Not Usable for Water Management

Seasonal (Lead 0.5 Months) Precipitation Heidke Skill Score  
DJF Manual Forecasts From 1995 to 2022



# Big Misses in Important Water Years: WY 2016

(Year 5 of a California drought, Godzilla El Niño year )



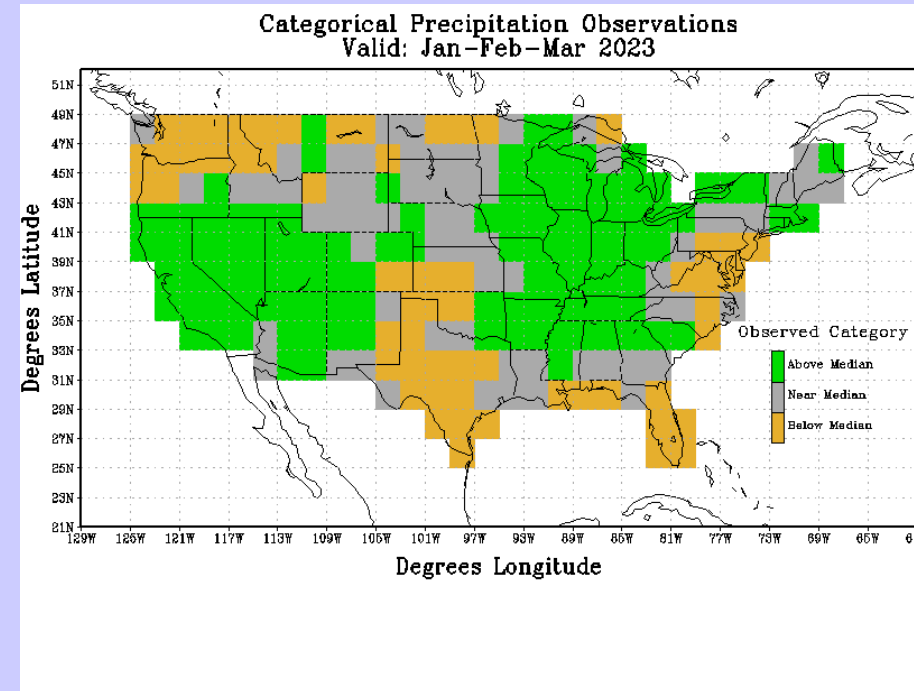
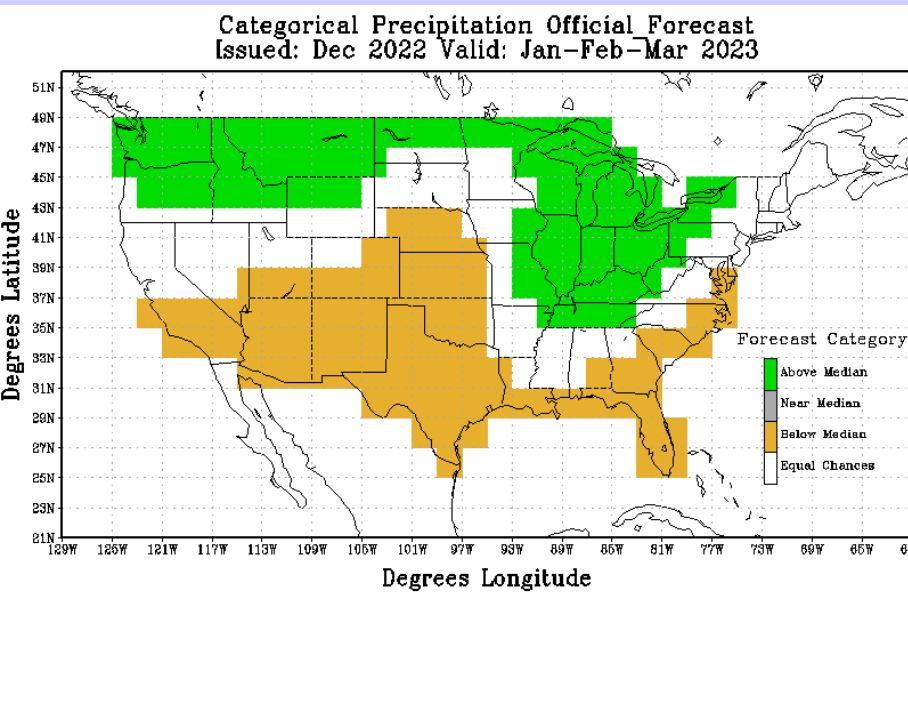
ENSO alone isn't the answer

<https://doi.org/10.1175/JCLI-D-21-0775.1>

<https://doi.org/10.1175/BAMS-D-21-0252.1>



# Big Misses in Important Water Years: WY 2023 (Weather whiplash, from extreme drought to flood)



Good forecasts are most important in extreme years

# California's Famine to Flood in WY2023



From the driest consecutive three years on record to one of the wettest

# **NOAA 2020 Report to Congress**

## **Regional Pilot Projects to Accelerate S2S Predictive Skill Improvement**

- **Winter S2S Precipitation Forecasts for Water Management in the Western U.S.**
- The dominant fraction of the annual mean precipitation along the west coast of the United States and in the mountain regions west of the Mississippi River occurs from October through April. In many regions, this precipitation falls as snow, and the mountains act as a natural reservoir. Key science challenges to improving these forecasts include: inadequate model resolution (horizontal and vertical) to resolve the mountainous terrain, which influences the intensity of precipitation and the relative fraction of precipitation that falls as rain versus snow; improved fidelity in modeling of the atmospheric boundary layer in mountainous regions; and an inability to predict periods of blocked versus unblocked flow over the eastern North Pacific Ocean and western U.S.

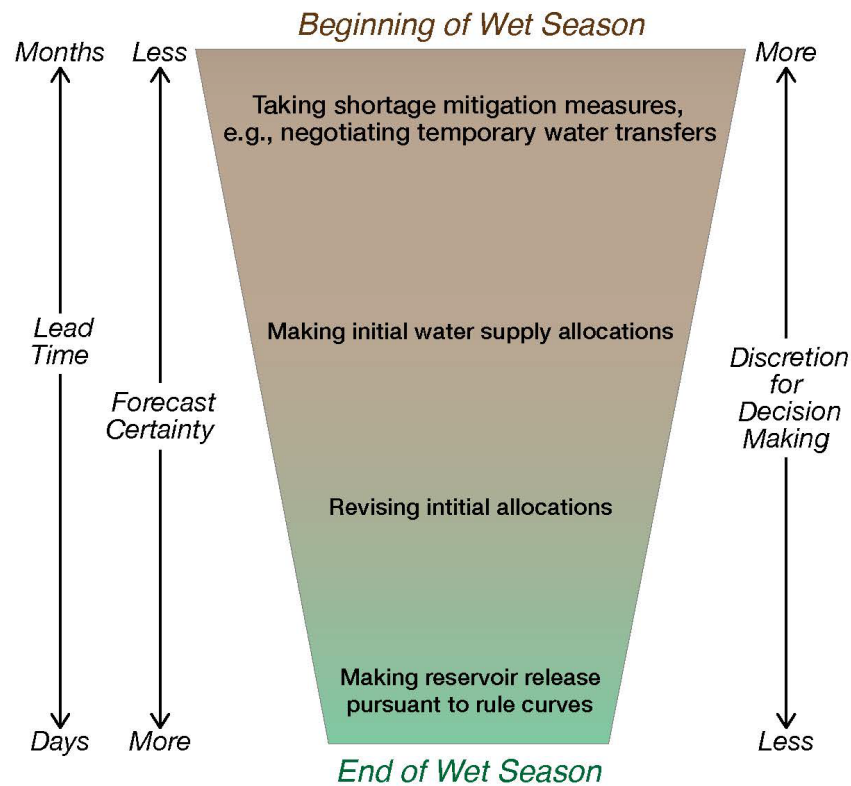
# Why S2S? Lead Times Very Important for Water Management

- Manage impact risk and financial exposure risk
- Budgeting & resource allocation (e.g. water conservation projects)
- Project financing (local water agencies)
- Contract negotiation and execution
- Environmental permitting & regulatory approvals
- Construction activities
- Supporting individual water users' decision-making (e.g. agricultural producers make planting decisions in winter to begin field preparation in spring)

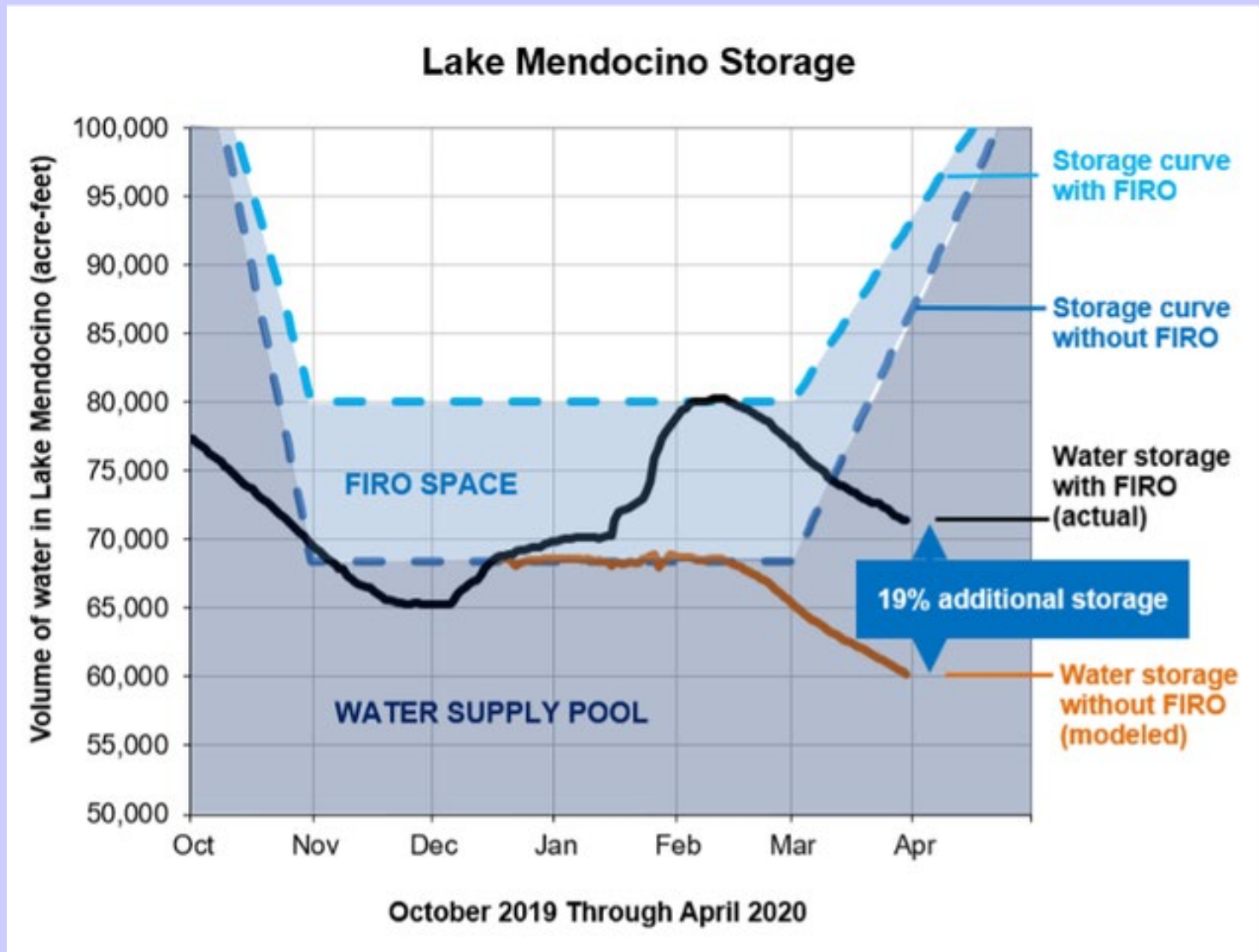


# Lead Time & Forecast Certainty

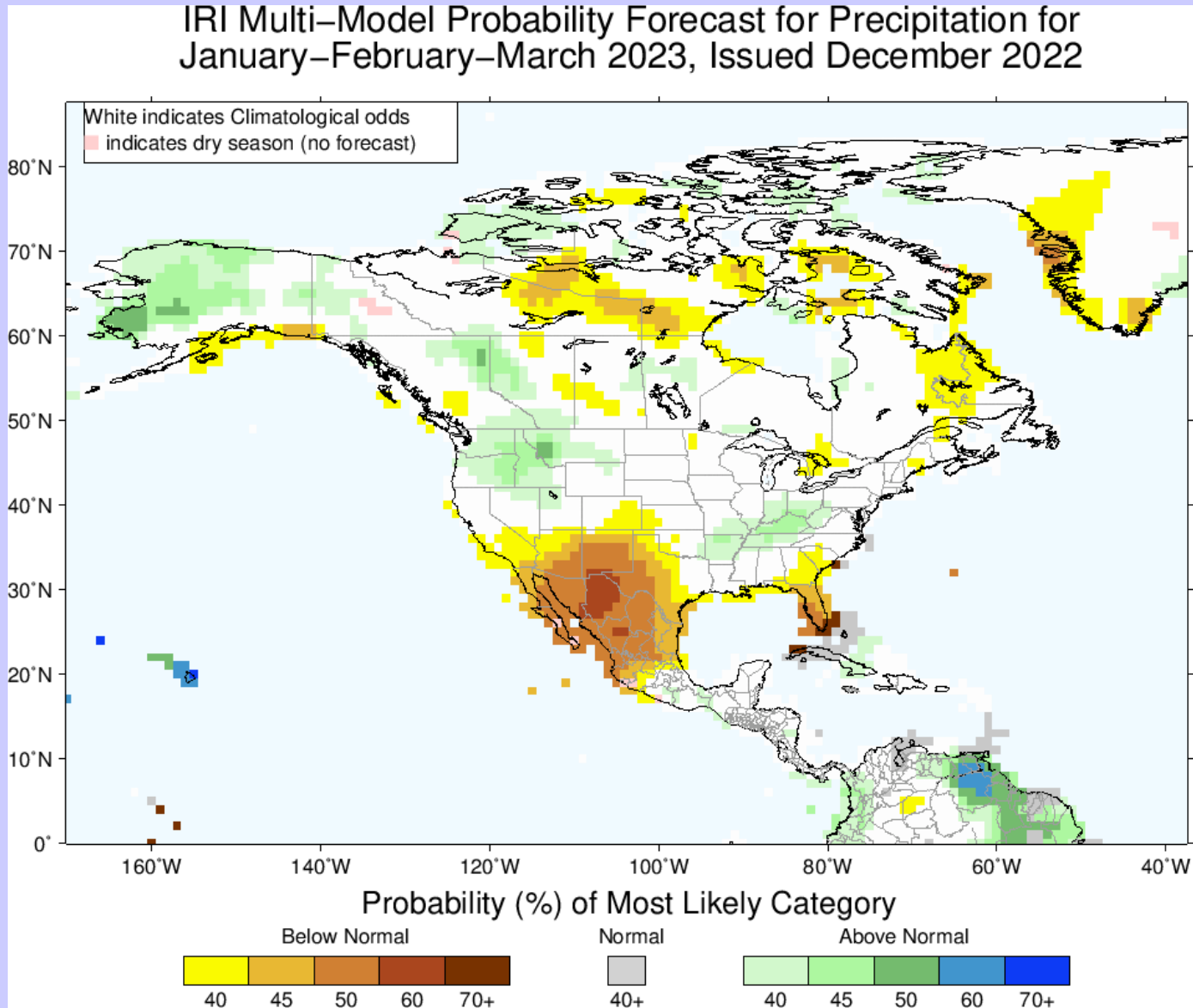
## Seasonal Water Management Funnel



# S2S Could Support More Efficient Water Management – FIRO & FloodMAR



# Potential for improving NMME's utility to a broader range of decision needs?

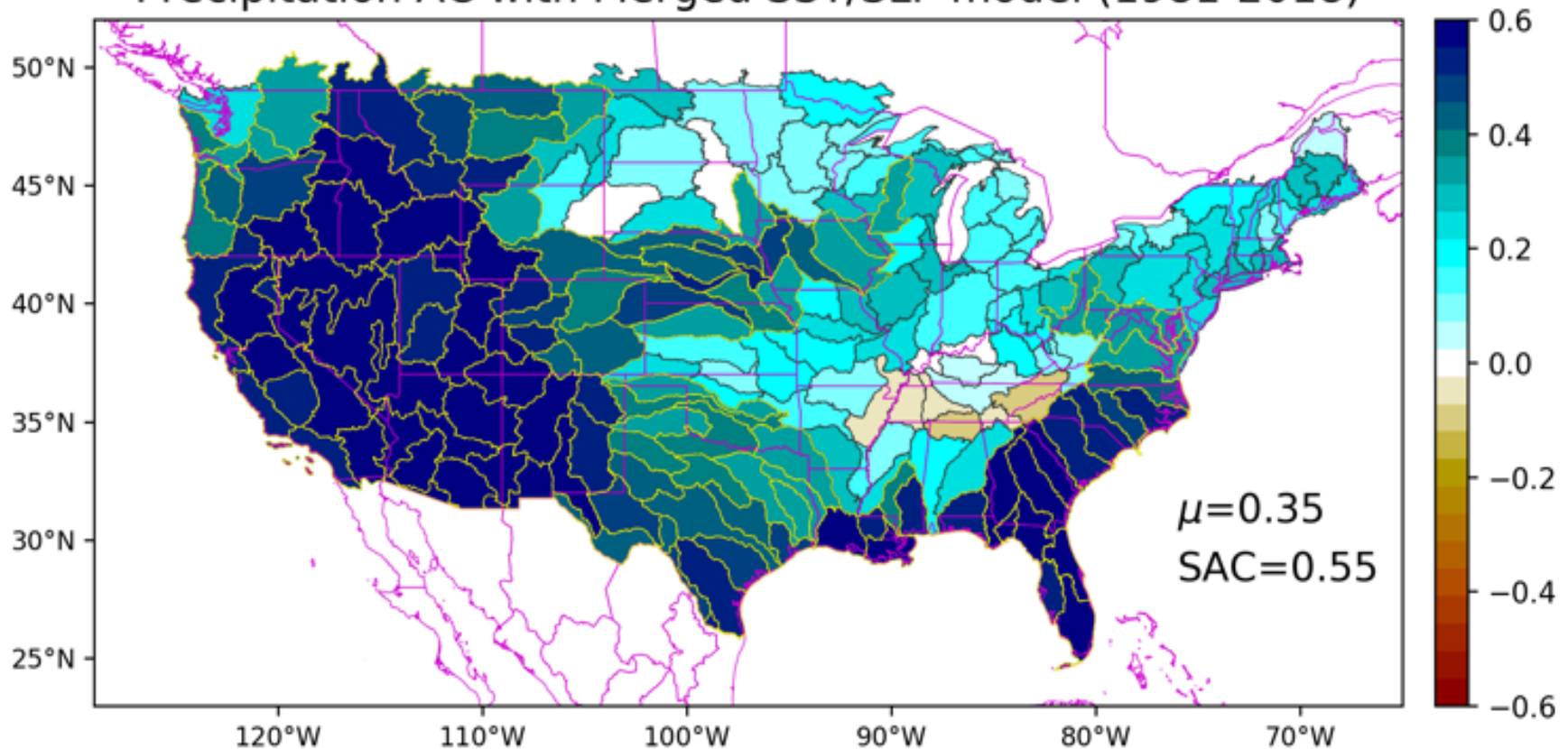


# Potential for improving NMME's utility to a broader range of decision needs?

- Presently very low
  - No usable skill for precipitation in Western watersheds
  - No identified path forward for improving skill
  - No progress since enactment of PL 115-25 in 2017

# Skill of Seasonal Experimental Precip Forecast Funded by CDWR (NOAA ESRL contract)

Precipitation AC with Merged SST/SLP model (1981-2018)

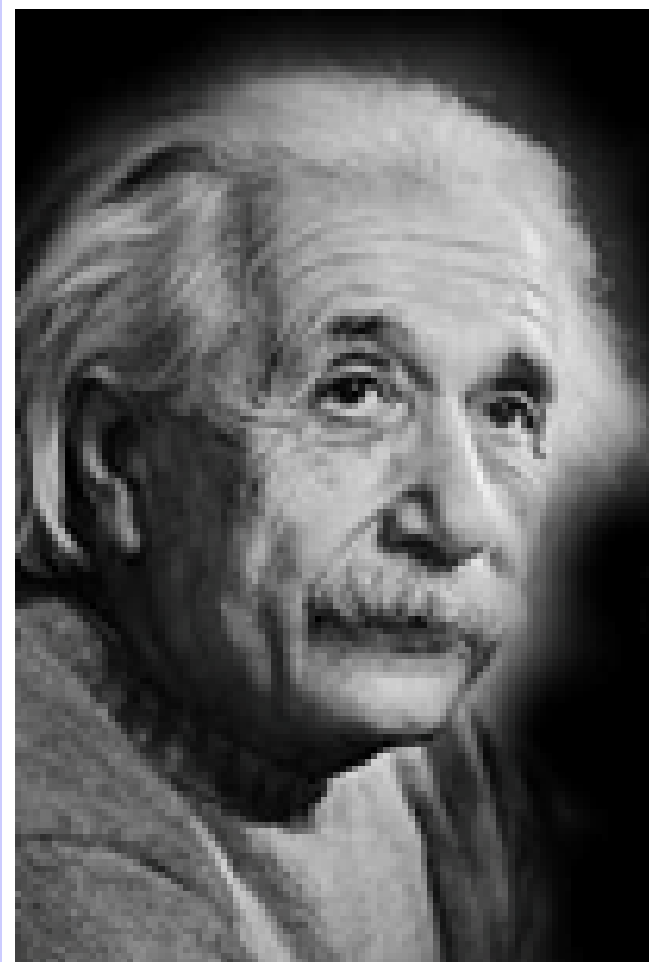


## AC Skill Scores, Switanek SCEF Model v. NMME, 1982/1983-2019/2020

HUC4 Basin Number	HUC4 Basin Name	SCEF Anomaly Corr	NMME Anomaly Corr
1401	Colorado Headwaters	0.35	0.09
1402	Gunnison	0.41	0.11
1403	Upper Colo - Dolores	0.52	0.27
1404	Great Divide - Upper Green	0.58	0.28
1405	White - Yampa	0.41	0.09
1406	Lower Green	0.53	0.19
1407	Upper Colo - Dirty Devil	0.52	0.37
1408	San Juan	0.54	0.37
1801	Klamath - N. Cal. Coastal	0.44	0.29
1802	Sacramento	0.44	0.29
1803	Tulare - Buena Vista Lakes	0.41	0.35
1804	San Joaquin	0.43	0.26
1805	San Francisco Bay	0.38	0.37
1806	Central Cal. Coast	0.41	0.45
1807	Southern Cal. Coast	0.43	0.39
1808	North Lahontan	0.51	0.19
1809	N. Mojave - Mono Lake	0.47	0.43
1810	S. Mojave - Salton Sea	0.51	0.43

# Recommendations

- Sunset review – should NMME be continued, and for what purpose?
  - NOAA has limited funding, what else could this funding be used for?
- Primary “customer” for NMME (outside of research community) should be CPC or other operational center
- NMME forecast skill needs to substantially improve to be useful. Implement workplan with performance metrics.



**"Insanity is doing the same  
thing over & over again &  
expecting different results."**

*Albert Einstein*



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Improving  
Sub-Seasonal to Seasonal  
Precipitation Forecasting for  
Water Management



WESTERN  
STATES  
WATER  
COUNCIL