

SacWAM-SJWAM Forecasting

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Acknowledgements

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Motivation and Goals

- Motivations
 - 2021 forecasts of seasonal runoff were overly optimistic
 - Water Board staff need time to prepare for dry water years
- Goals
 - Starting in October, every month, provide an automated forecast for the current water year, including:
 - Estimated Land Use
 - Delta watershed runoff - Sacramento, San Joaquin, Eastside Streams
 - Water Year Types for Sacramento and San Joaquin
 - Central Valley Operations

Forecast System

NMME and gridMET

- North-American Multi-Model Ensemble
 - Developed to address need for seasonal forecast periods of weeks to months
 - Utilizes data on longer-term drivers such as sea-surface temps, snow cover, sea ice extent, soil moisture
 - Produces 7-month, 1-degree forecasts of “anomalies” in temperature and precipitation
- gridMET*
 - Provides gridded (4km) meteorological variables for North America
 - Historical (daily, up until yesterday)
 - Forecasts – based on coarse grid anomalies from NMME
 - Daily data are provided based on historical analogs

* Abatzoglou, J. T. (2013), Development of gridded surface meteorological data for ecological applications and modelling. Int. J. Climatol., 33: 121–131.

Forecast System Schematic

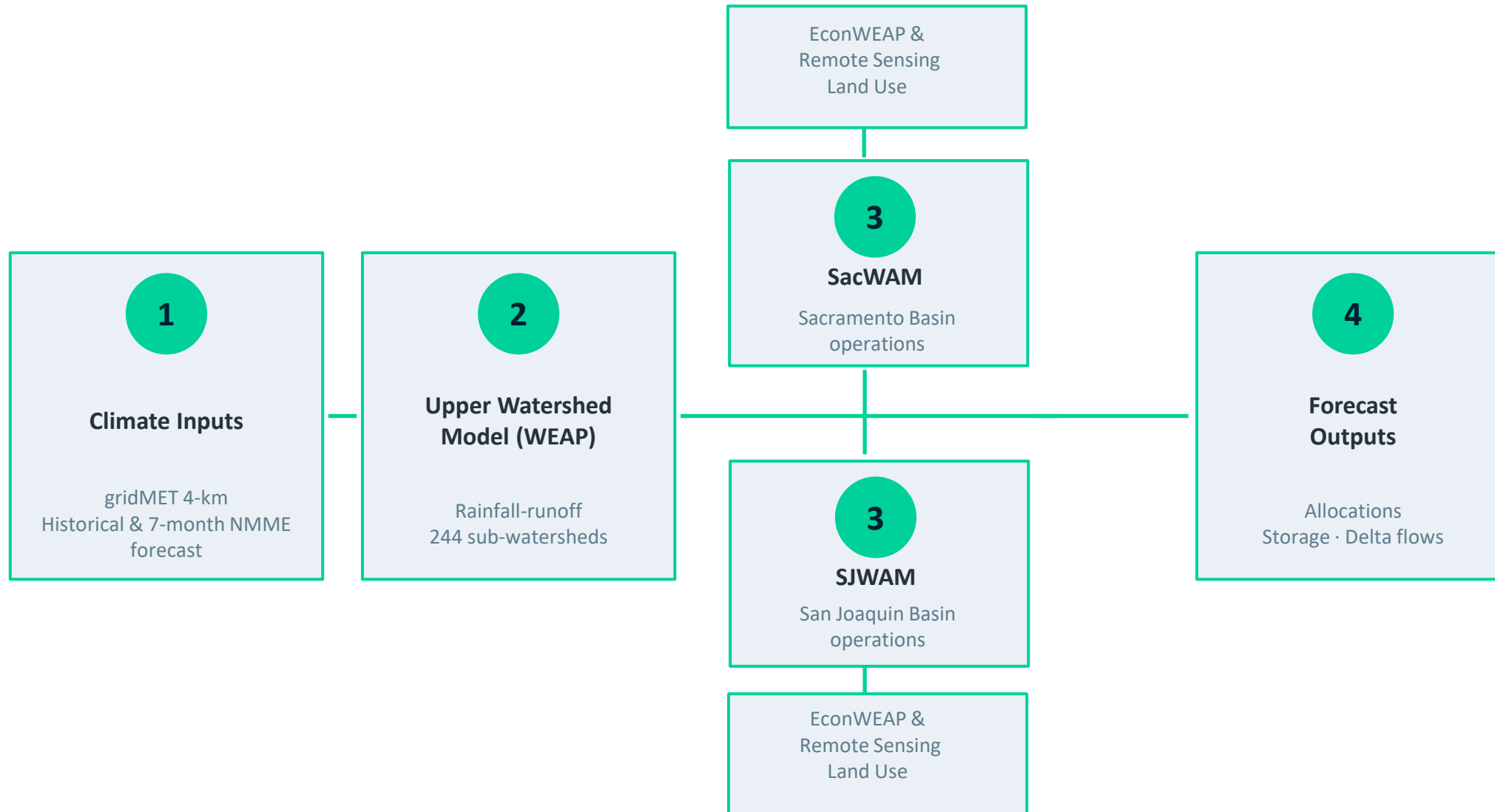


Upper Watershed Model Domain

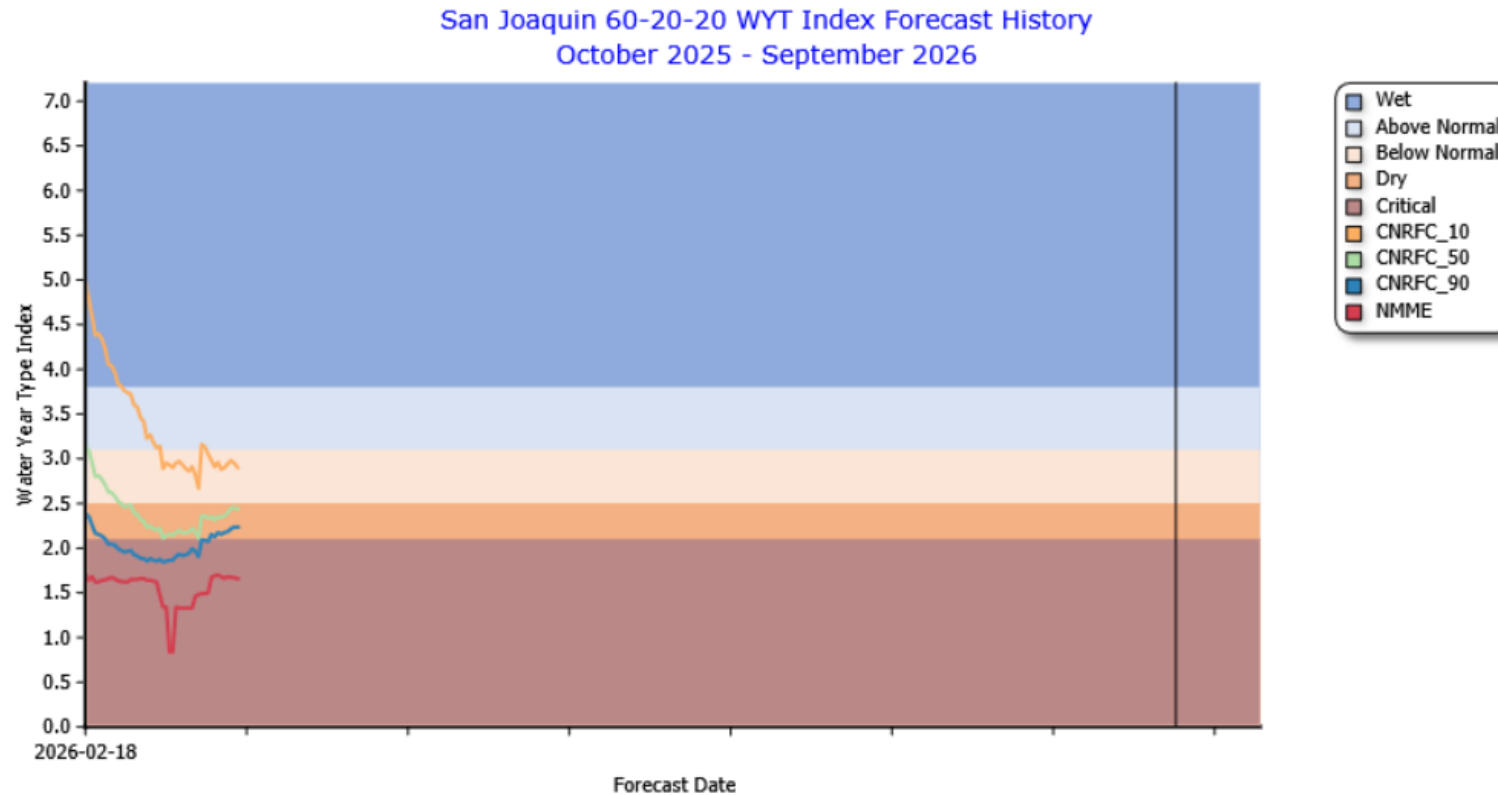


SacWAM-SJWAM Stream Network

Integrated Forecasting System

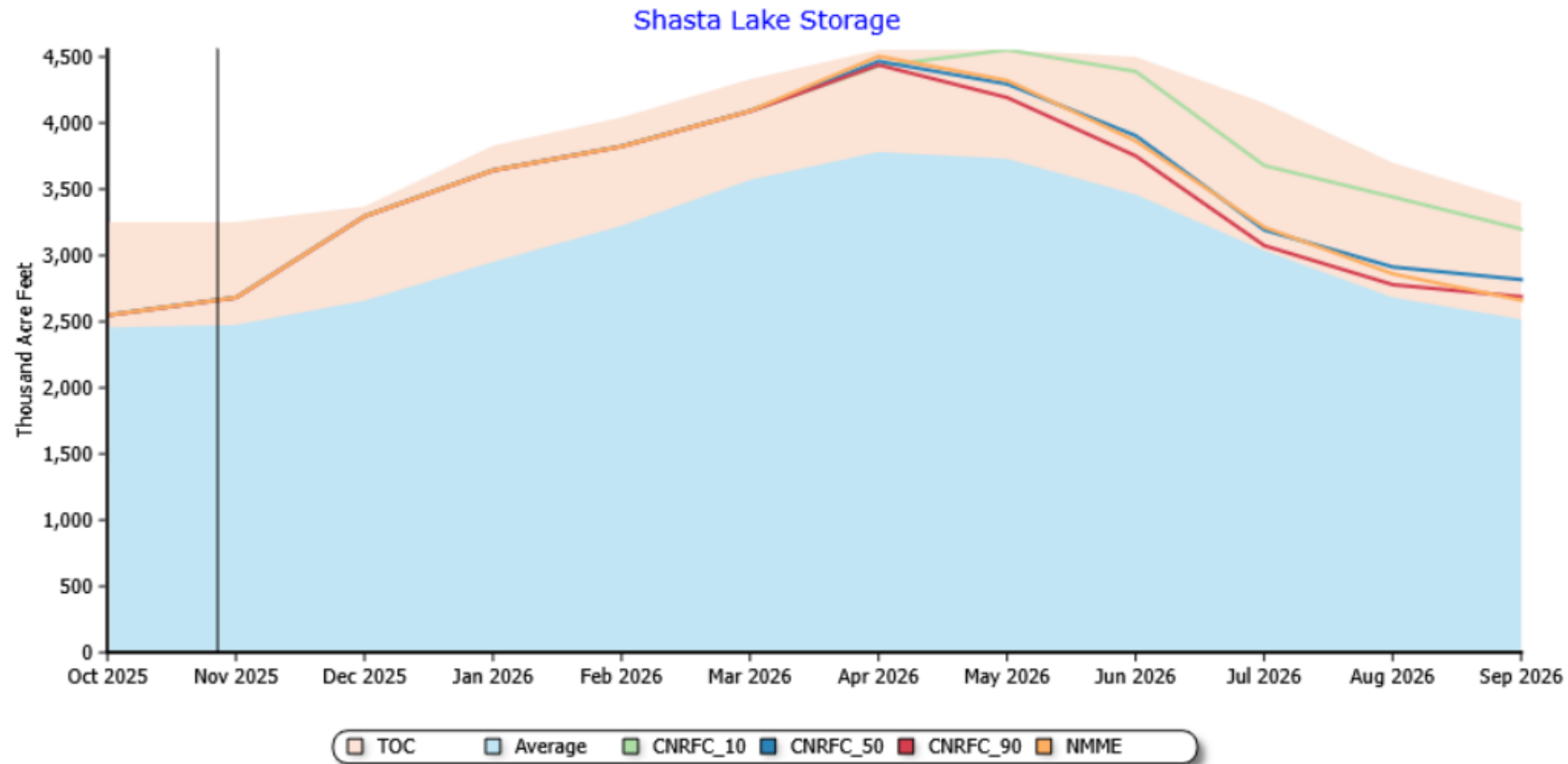


Forecast System Outputs



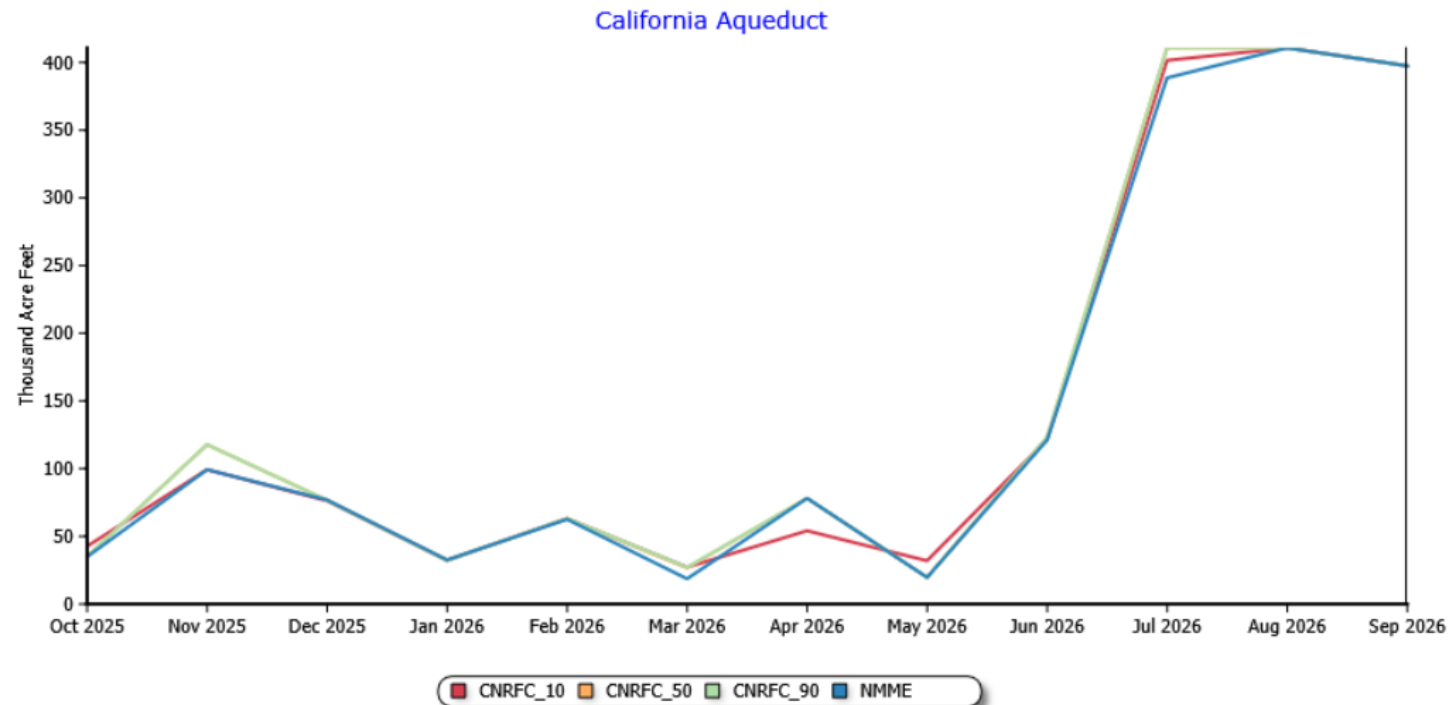
Water Year Type

Forecast System Outputs



Reservoir Storage

Forecast System Outputs

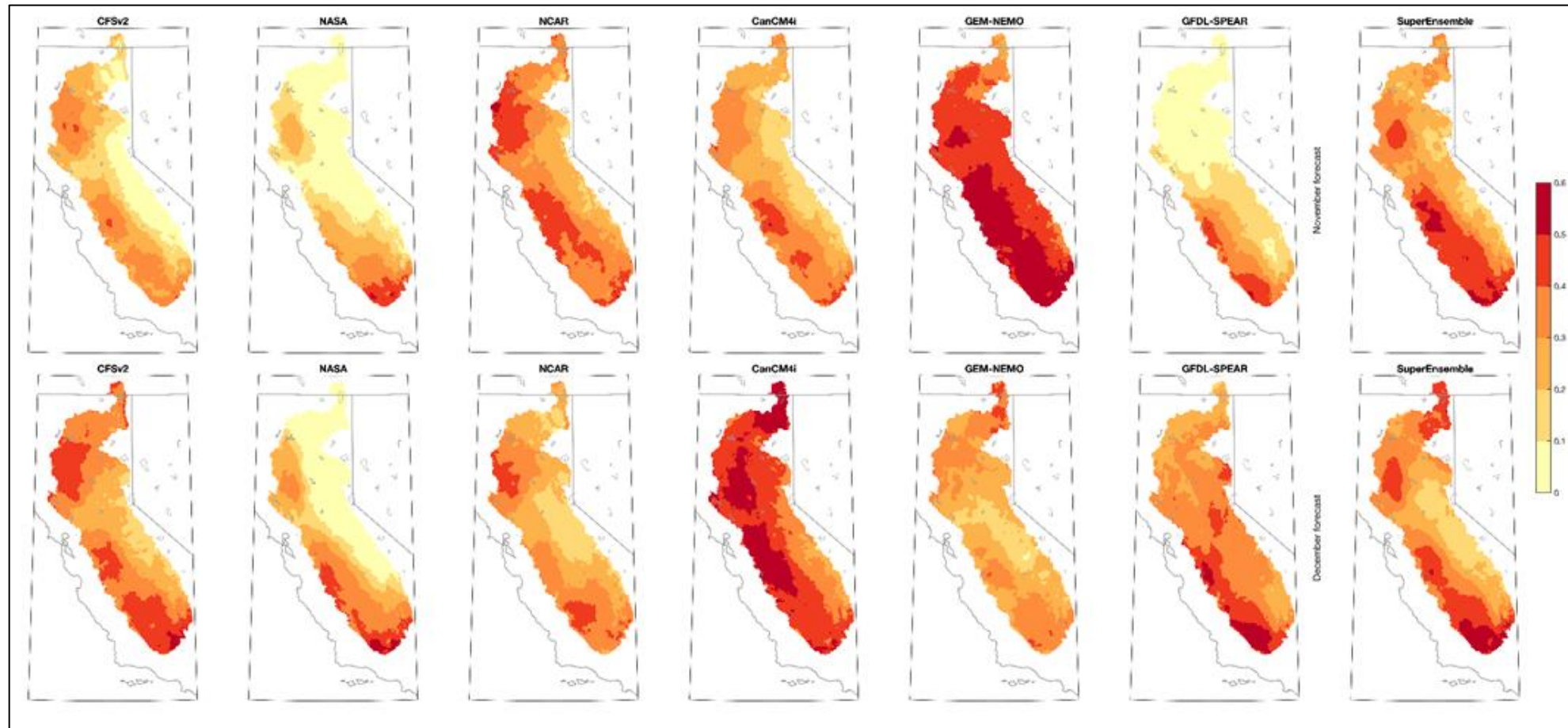


California
Aqueduct



Meteorological Forecast Performance

Meteorological Forecast Skill

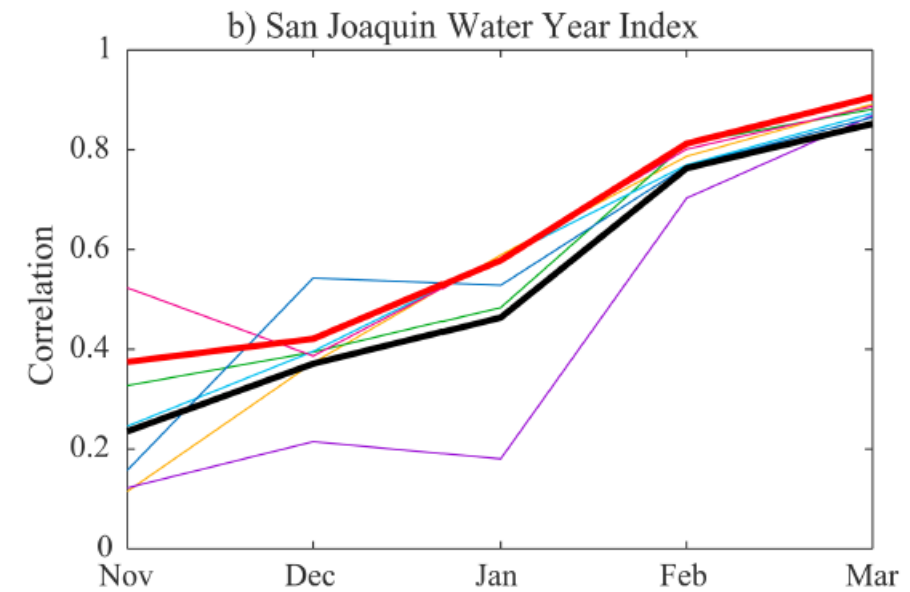
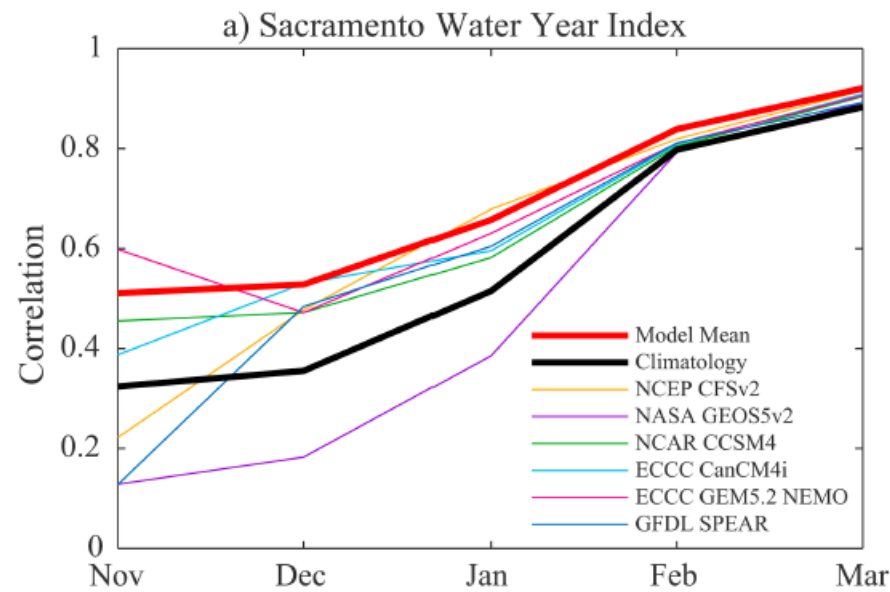


Nov

Dec

Dec – Mar Precipitation (1991-2022)

Meteorological Forecast Skill



Water Year Index Forecast (1991-2022)

* Abatzoglou, J. T., Young, C. A., Mehta, V. K., Viers, J. H., Hegeswich, K. C. (2025). Predicting California water year types using seasonal climate forecasts. *Journal of Applied Meteorology and Climatology*, 64(8), 987-999. <https://doi.org/10.1175/JAMC-D-24-0244.1>.

Runoff Forecast Performance

Hindcast Forecast Skill: Correlation Coefficients

Correlation between forecasted and observed total Oct–Jul unimpaired flow by forecast initialization month (WY 1983–2021)

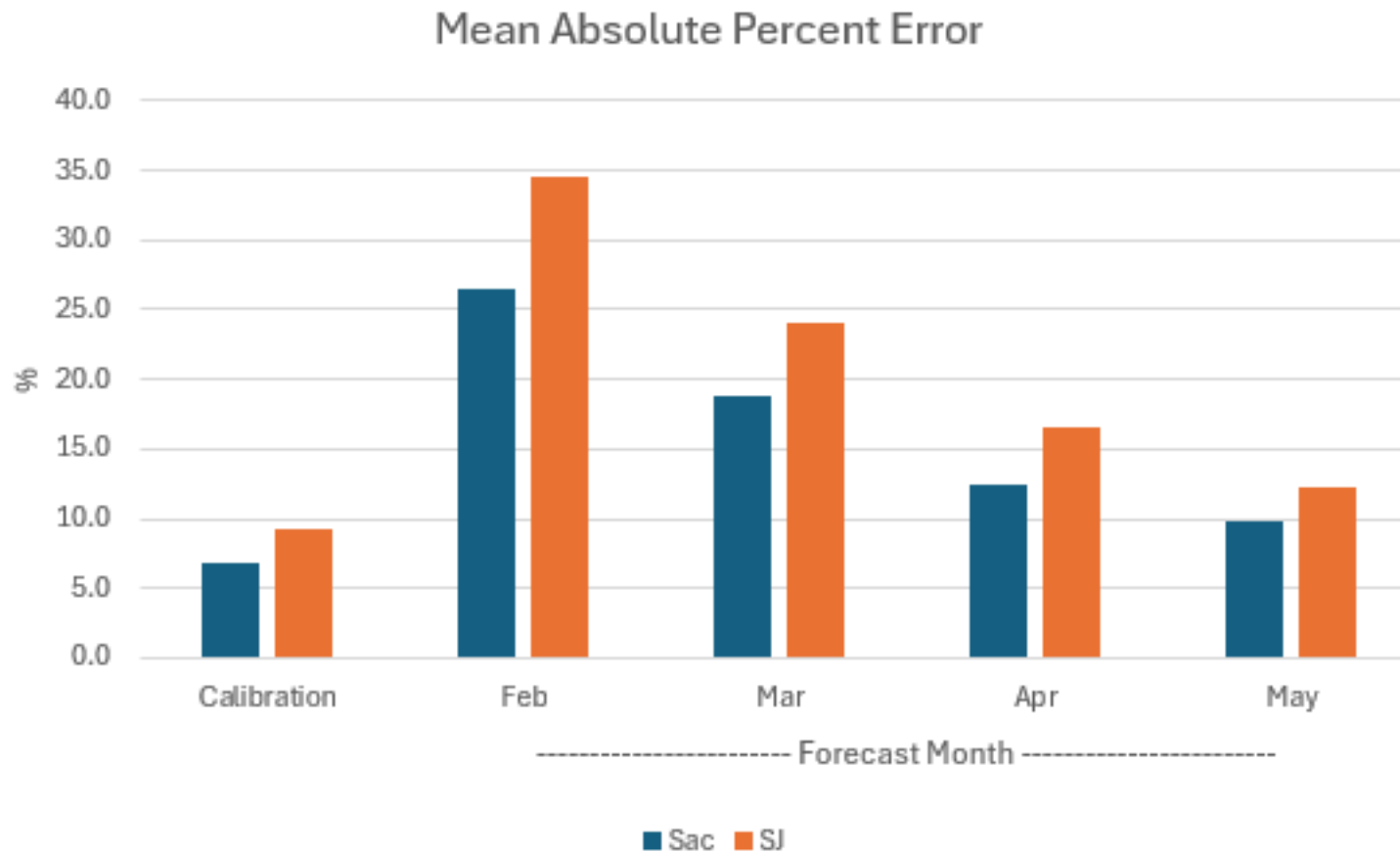
	Feb	Mar	Apr	May
Sacramento	0.83	0.94	0.94	0.99
Feather	0.80	0.94	0.94	0.99
Yuba	0.79	0.93	0.94	0.98
Bear	0.80	0.94	0.96	0.99
American	0.78	0.93	0.95	0.98
Cosumnes	0.81	0.94	0.97	0.99
Mokelumne	0.77	0.91	0.93	0.97
Stanislaus	0.78	0.91	0.94	0.98
Tuolumne	0.78	0.91	0.94	0.97
Merced	0.83	0.93	0.95	0.97
San Joaquin	0.77	0.91	0.95	0.97
Trinity	0.81	0.91	0.92	0.96

Key Findings

- February correlations: 0.53–0.90 (volume-weighted avg 0.77)
- Skill improves each month as observed data is incorporated
- By May, most basins reach $r \geq 0.97$

Mean Absolute Percent Error in Oct-Jul Runoff Forecast

Volume-weighted avg MAPE for Oct–Jul season total (WY 1983–2021)

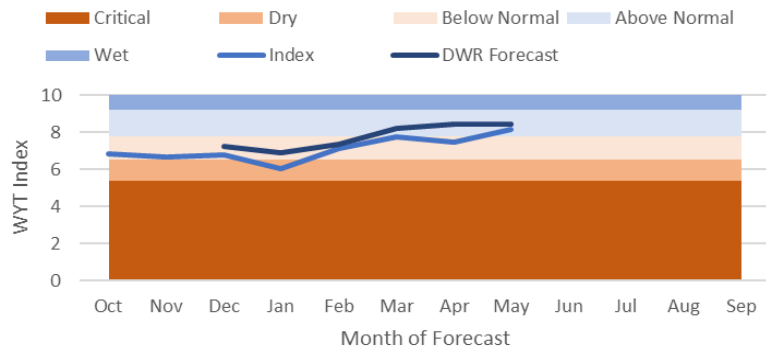


WYT Forecast Progression

WYT Forecast Progression 2024, 2025, 2026

Sacramento Forecasted 2024 "40 30 30" WYT

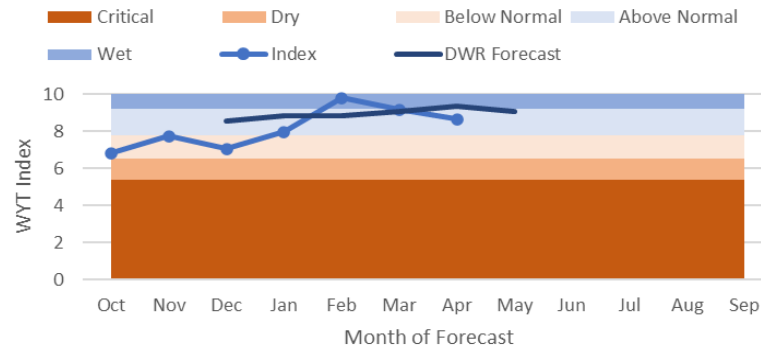
Based on NMME Ensemble



5/14/2024

Sacramento Forecasted 2025 "40 30 30" WYT

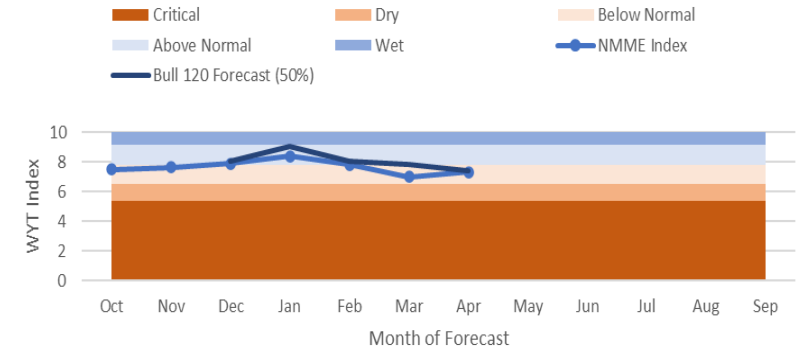
Based on NMME Ensemble



4/8/2025

Sacramento Forecasted 2026 "40 30 30" WYT

Based on NMME Ensemble



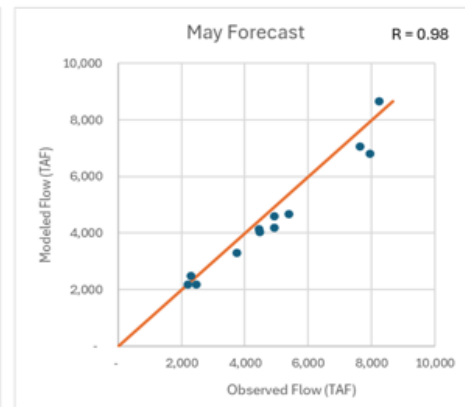
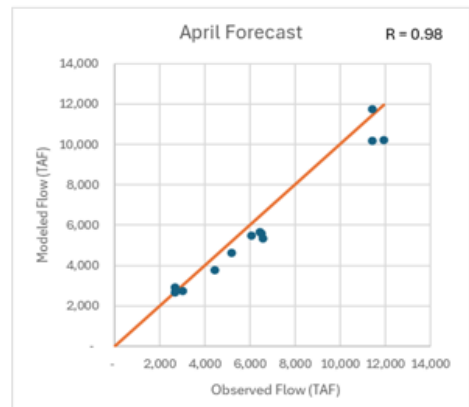
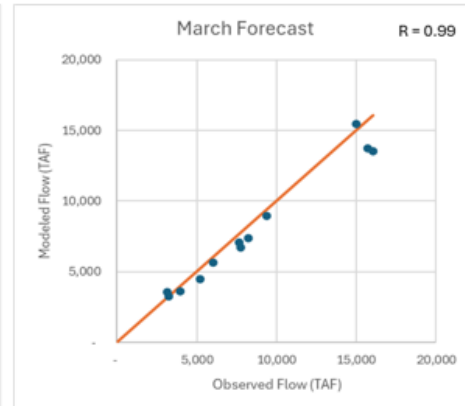
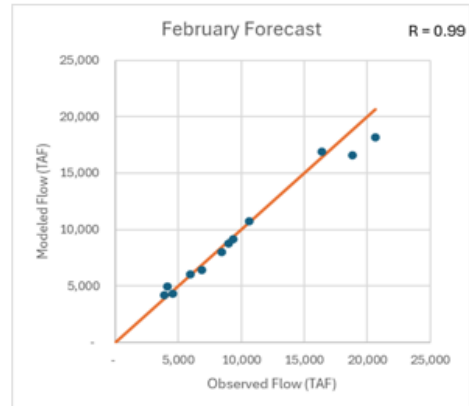
4/8/2026

SacWAM & SJWAM

Operations Forecast Performance

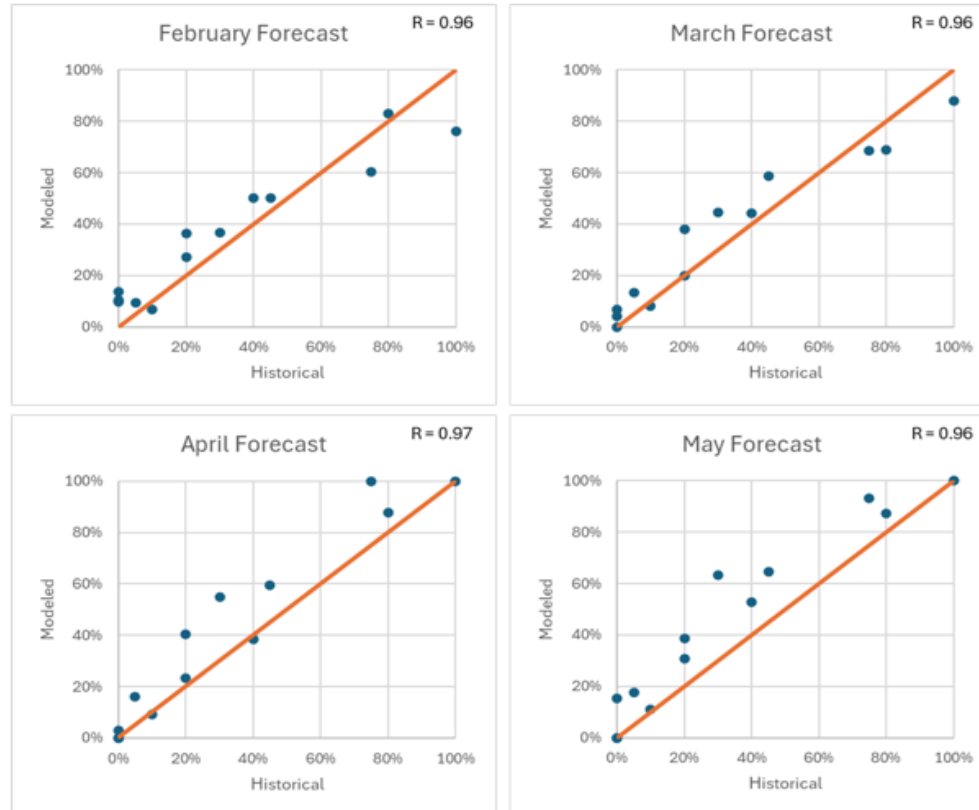
Sacramento River Flow into Delta

Sacramento River flows into Delta (2010-2021)



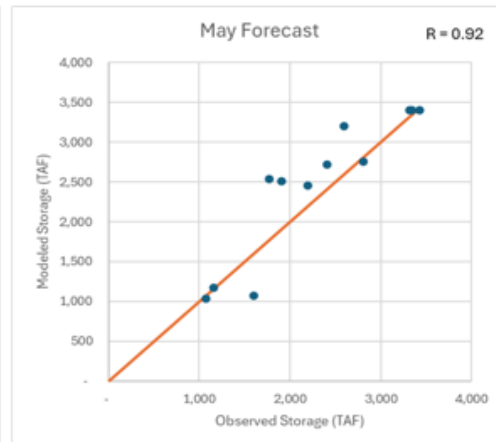
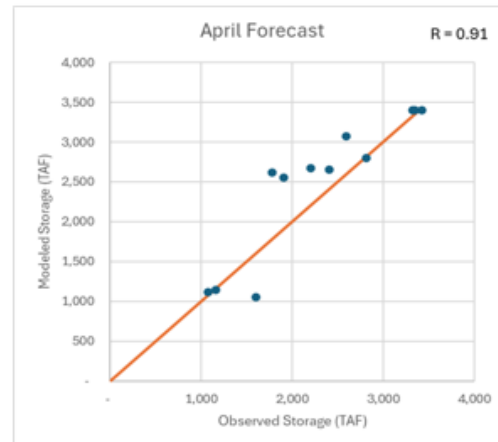
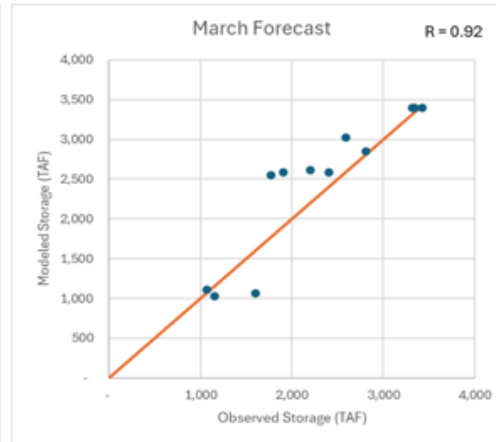
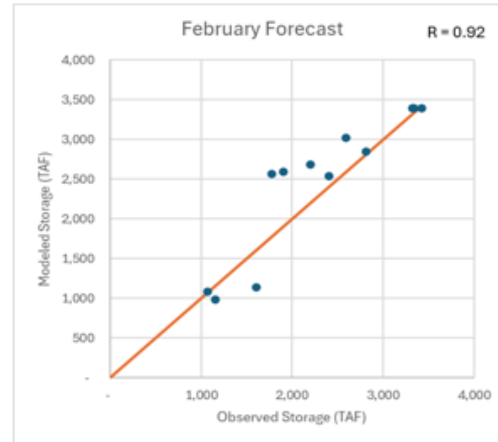
CVP South-of-Delta Ag Allocations

CVP SOD Ag Allocations (2010-2021)



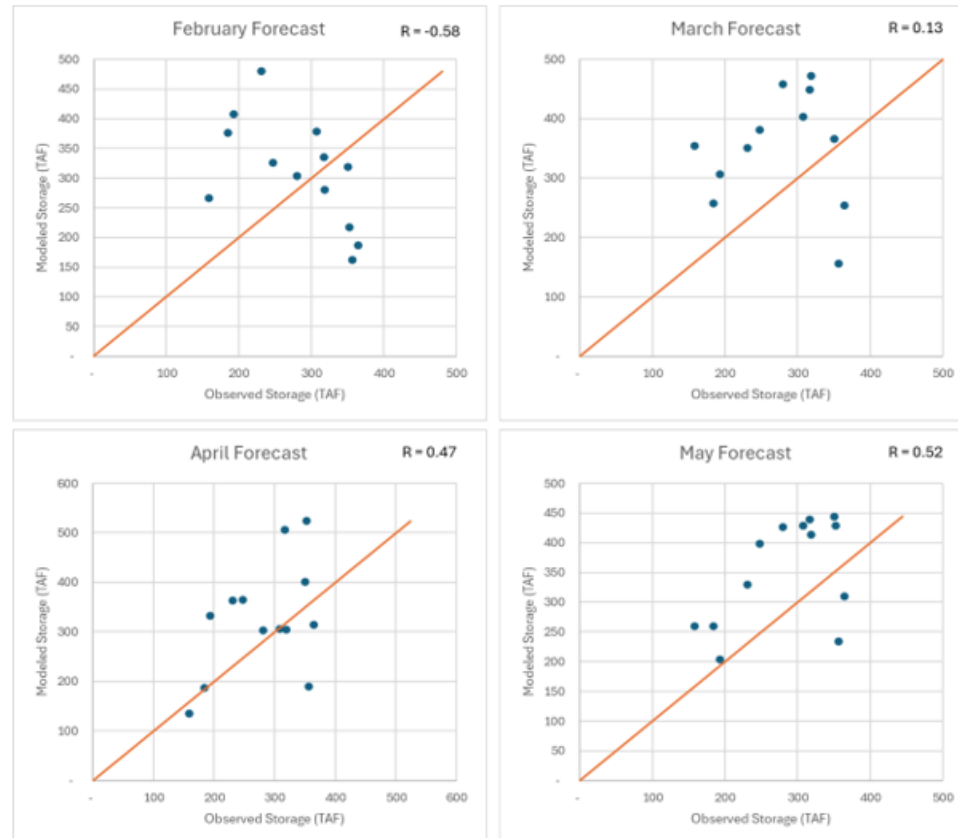
Shasta Carryover Storage

Shasta Carryover Storage (2010-2021)



Millerton Carryover Storage

Millerton Carryover Storage (2010-2021)



Summary & Conclusions

- Achieved original goals of developing a forecasting and land use monitoring system
- Seasonal forecasts provide some skill, however California is a challenging environment for forecasting
- The developed forecasting system can provide useful information that improves as the season progresses

Thank you!
