December 2024: Conditional Positional Analysis (CPA) Implementation – LOSOM Recovery Operations

Water Resources & Systems Modeling Bureau, Systems Modeling Unit

SFWMD

sfwmd.gov

CPA Overview

➢ CPA is a stochastic framework (**CPA Overview**) that transforms stages obtained from Dynamic Position Analysis (DPA) based on forecasted rainfall conditions over the next twelve months (Ali, 2016).

➢ CPA depends on DPA - DPA stage outputs are used as inputs to CPA (**DPA**).

➢ 3 rainfall outlook scenarios (climatological, CPC, and Preferred Scenario) are used to compare potential stage outlooks.

➢ December 2024 CPA was conducted for the Lake Okeechobee System Operating Manual (LOSOM) plan – Recovery Operations (RO).

➢ CPA is implemented for 200 locations in the Everglades including Lake Okeechobee. Additionally, CPA was implemented for WCA1Avg (avg of Site 7, Site 8T, and Site 9) and WCA3AAvg (avg of Site 63, Site 64, and Site 65) stages (Khare et al., 2024, **UF WI Symposium 2024 Presentation**).

Conditional Position Analysis (CPA) Gage Locations

Legend
- • BiasCorrection
- • Initial Stage Correction
- ○ CPA Locations
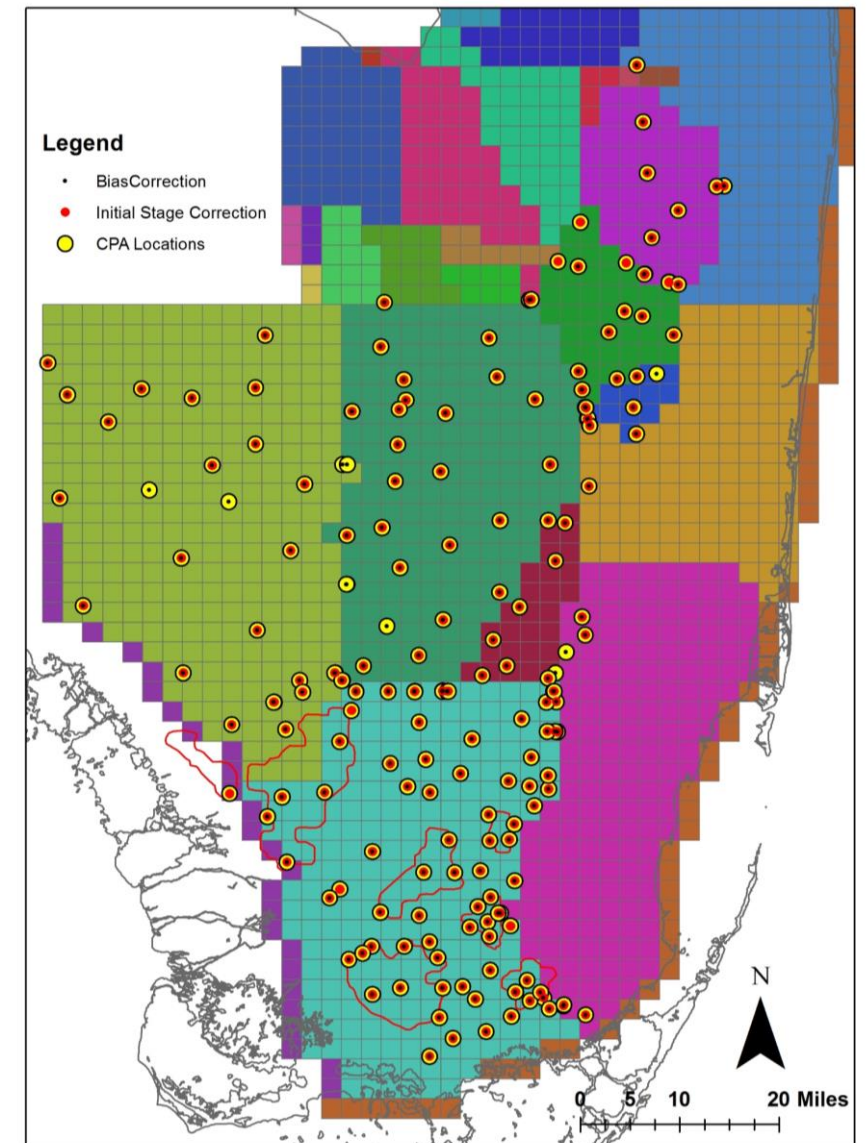
CPA Overview

➤ CPA Outputs

- CPA forecasted stage percentiles from 'Climatological' scenario are first collapsed on DPA stage percentiles. Corresponding adjustments are then applied to stage percentile lines for all other rainfall scenarios.

- Even though CPA methodology considers current operational protocols as it transforms rainfall probability outlook into stage change probability outlook via a Transition Probability Matrix, CPA generated extreme stages (i.e., extreme percentile) may not always be captured by the available model data sets.

- Currently, efforts are underway to develop mechanism to constrain CPA generated stages such that even extreme stages would conform to practically possible stages under current operational protocols.

Conditional Position Analysis (CPA) Gage Locations

Legend
- · BiasCorrection
- ● Initial Stage Correction
- ○ CPA Locations

0 5 10 20 Miles

N
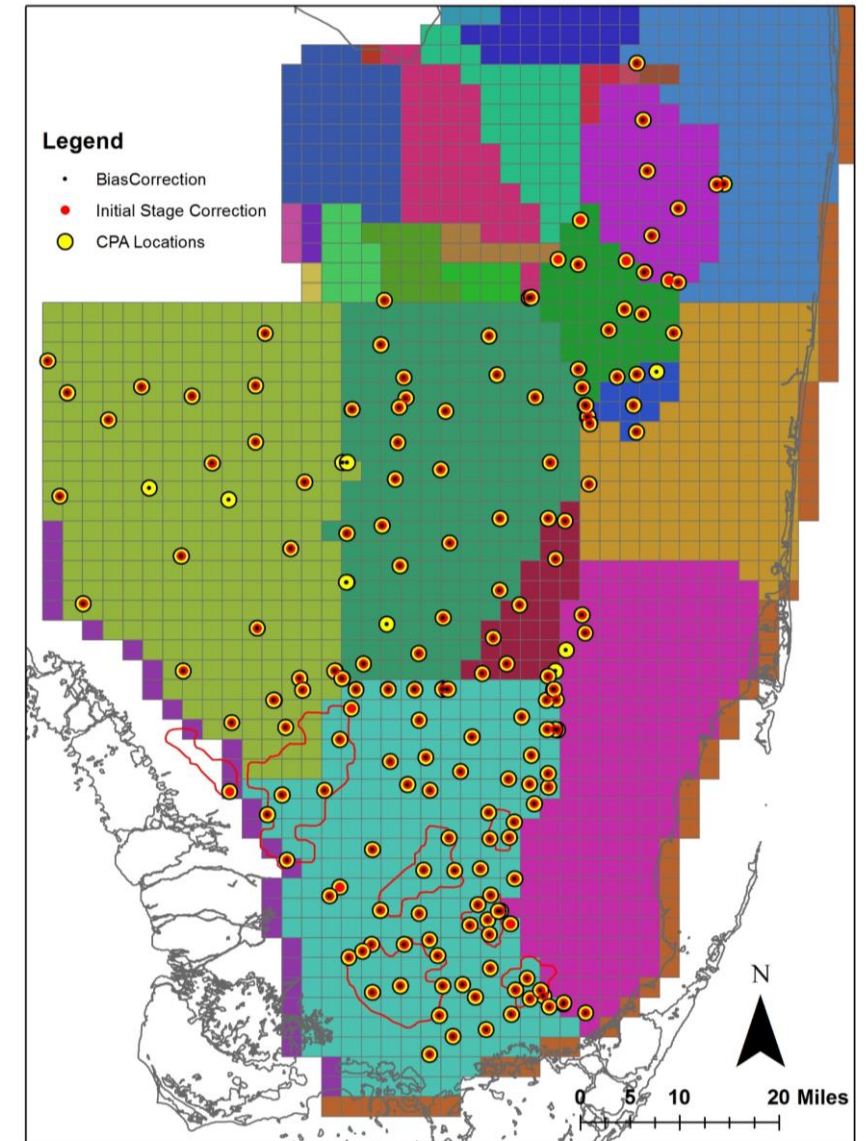
CPA: Rainfall Scenarios

➤ Climatological

- Climatological scenario assumes equal chances of below-normal/dry, normal, and above-normal/wet rainfall conditions over next twelve 3 monthly seasons (slide 5).

- This scenario is the connecting link between DPA and all other scenarios simulated under CPA.

➤ CPC

- This is based on official rainfall forecasts published by NOAA's Climate Prediction Center (CPC) every month (Climate Prediction Center - Forecasts & Outlook Maps, Graphs and tables (noaa.gov)).

- It is also used by JEM's EverForecast tool for stage prediction.

➤ Preferred Scenario (PrefSce)

- Seasonal rainfall probabilities are calculated based on historical data and projected Niño-3.4 Index (Climate Prediction Center - El Nino Southern Oscillation (noaa.gov) published by CPC.

- This scenario developed by System Modeling Unit (PrefSce Overview) represents a best professional judgement rainfall outlook and is typically more aggressive in terms of shifts from Climatological probabilities compared to CPC.

December 2024 CPA: Rainfall Scenarios
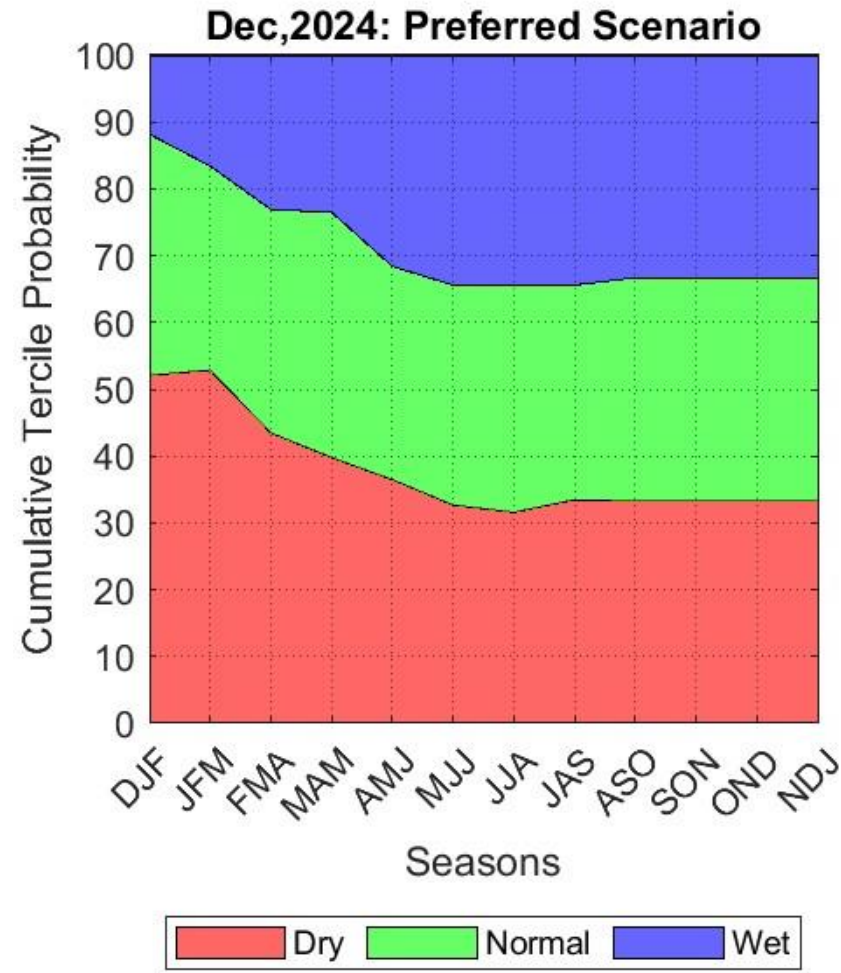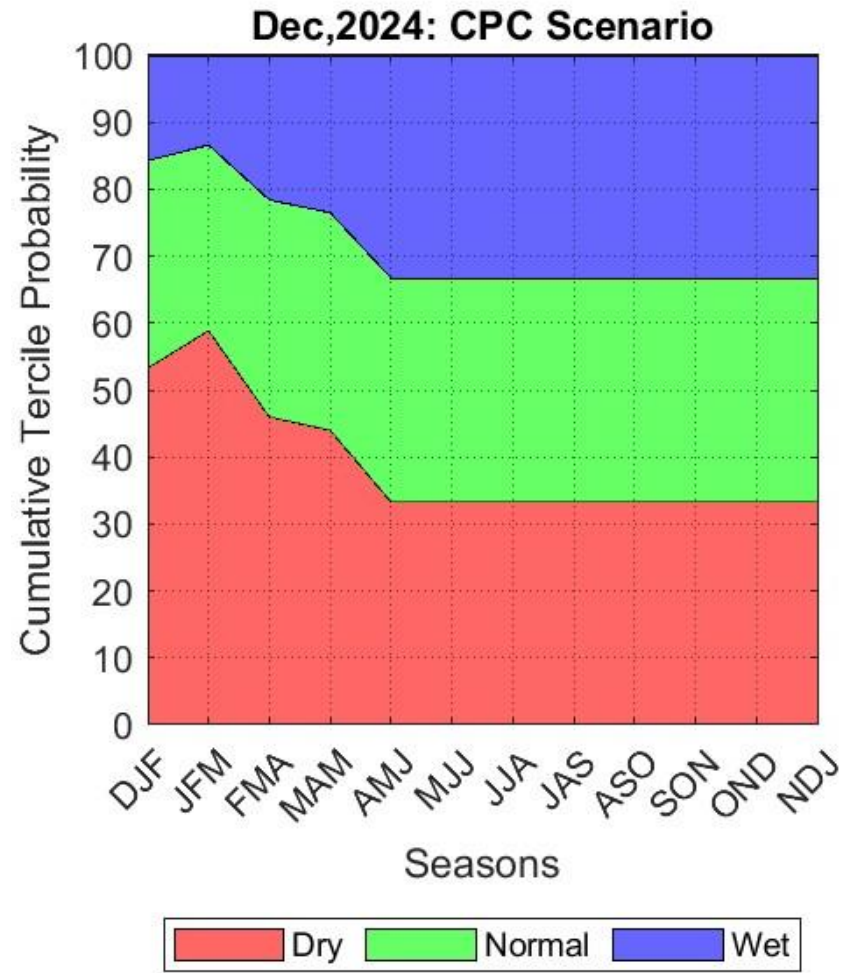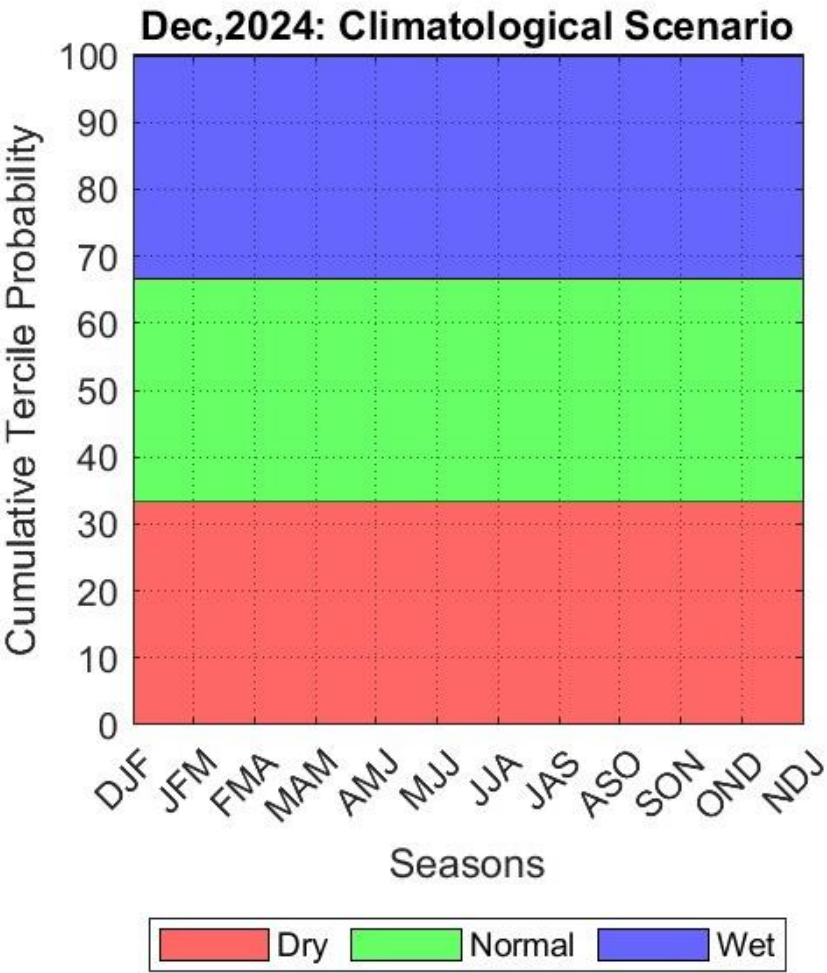
CPA: Key to Reading Results
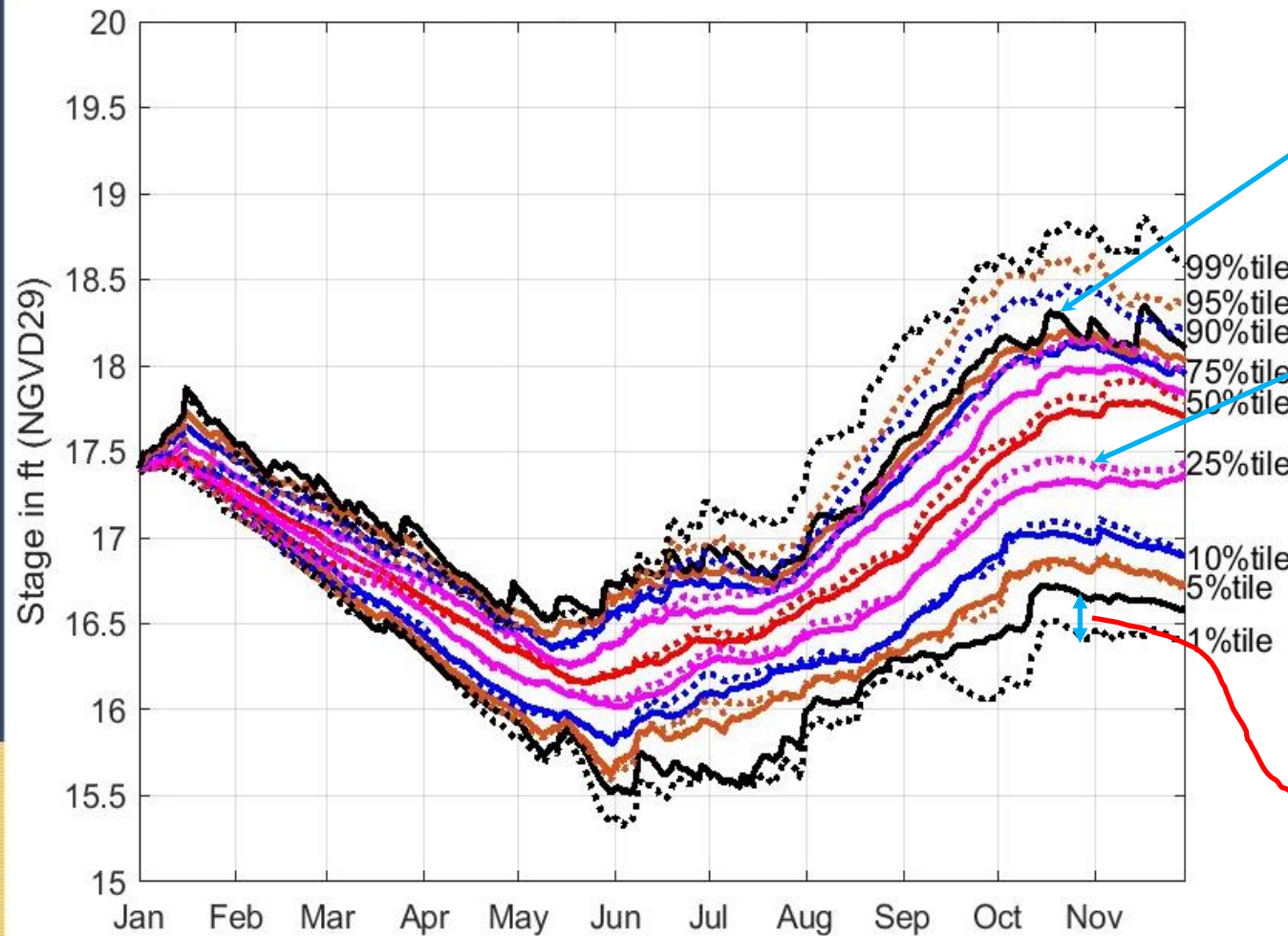
Solid lines → Climatological Scenario/DPA

Dotted lines → Alternative Rainfall Scenario

Black lines → 1% and 99%
Brown lines → 5% and 95%
Blue lines → 10% and 90%
Pink lines → 25% and 75%
Red lines → 50%

Need to focus on how DPA percentile lines shift under Alternate Rainfall Scenario

LOSOM RO

December 2024 CPA: LOSOM Recovery Operations

➢ Starting December 7 the U.S. Army Corps of Engineers (USACE) - Jacksonville District will begin releases under Lake Okeechobee Recovery Operations (RO). The goal of recovery is to lower lake levels before the onset of the wet season to allow for recovery of lake ecology.

➢ SFWMM model assumptions for the December 1, 2024 LOSOM RO DPA

➢ Lake Okeechobee releases

- 2100 cfs at S-79 to the Caloosahatchee River Estuary (CRE)

- 750 cfs at S-80 to the St. Lucie Estuary (SLW)

- Maximum practicable releases south

NOTE:
- *As per LOSOM Water Control Plan (WCP) flow target for St. Lucie Esturay is 1400 cfs. However, that includes flows from Lake Okeechobee at S-80, Gordy Road Structure, S-97, and S-49. To account for this, regulatory flow target at S-80 was set at 750 cfs.*
- *The above flow assumptions were applied to the entire simulation period and not just dry season, unlike the intention of RO. Hence, DPA-CPA results after June 1 are not applicable and masked for LO and downstream locations.*

December 2024 CPA: LOK

CPC

LOK
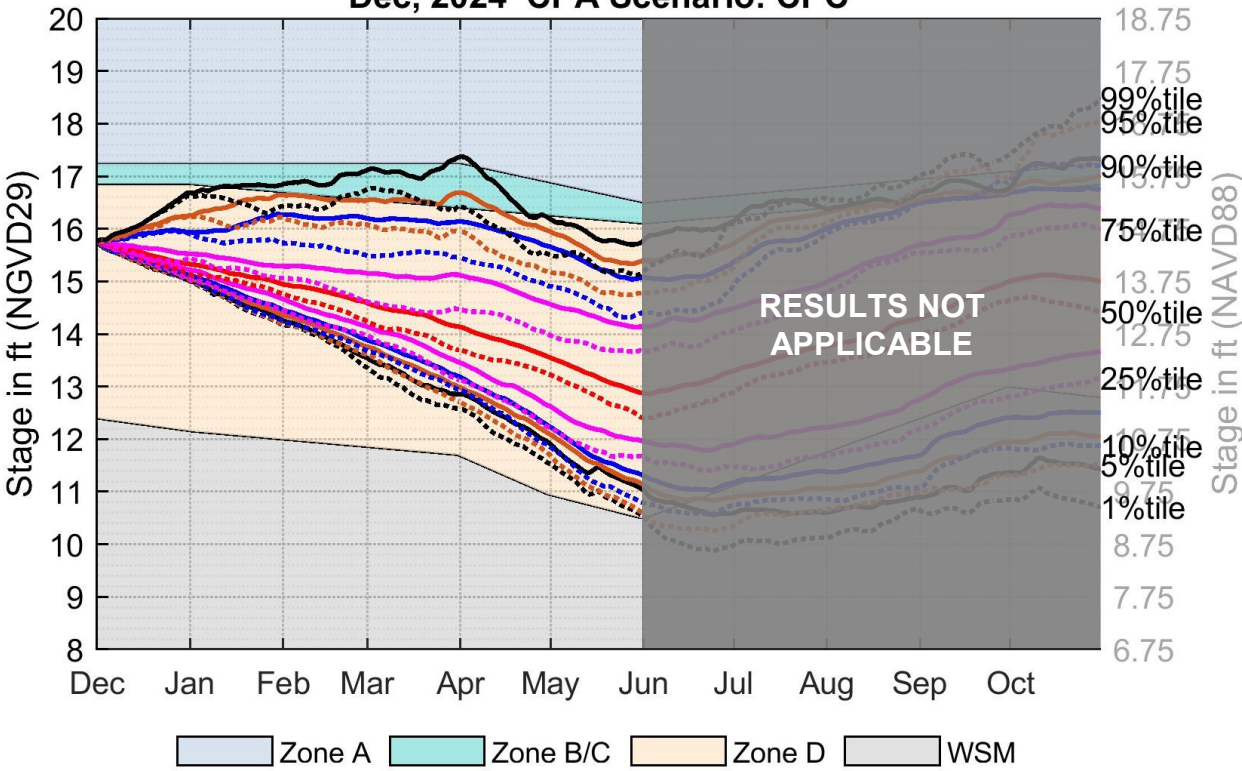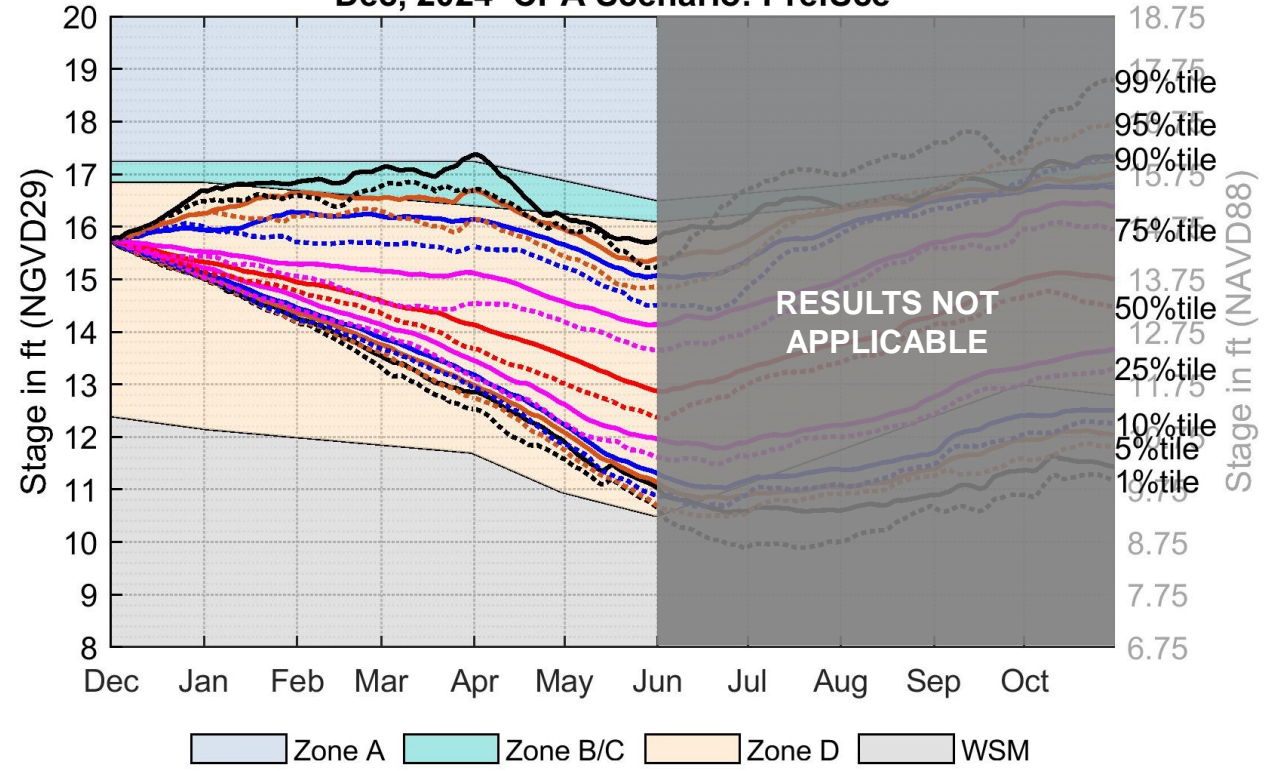
PrefSce

LOK

Secondary vertical axis shows stages in NAVD88. These stages are based on Agreed Upon Regulation Schedule Conversion Offsets between NGVD29 and NAVD88 (1.25 ft for Lake Okeechobee).
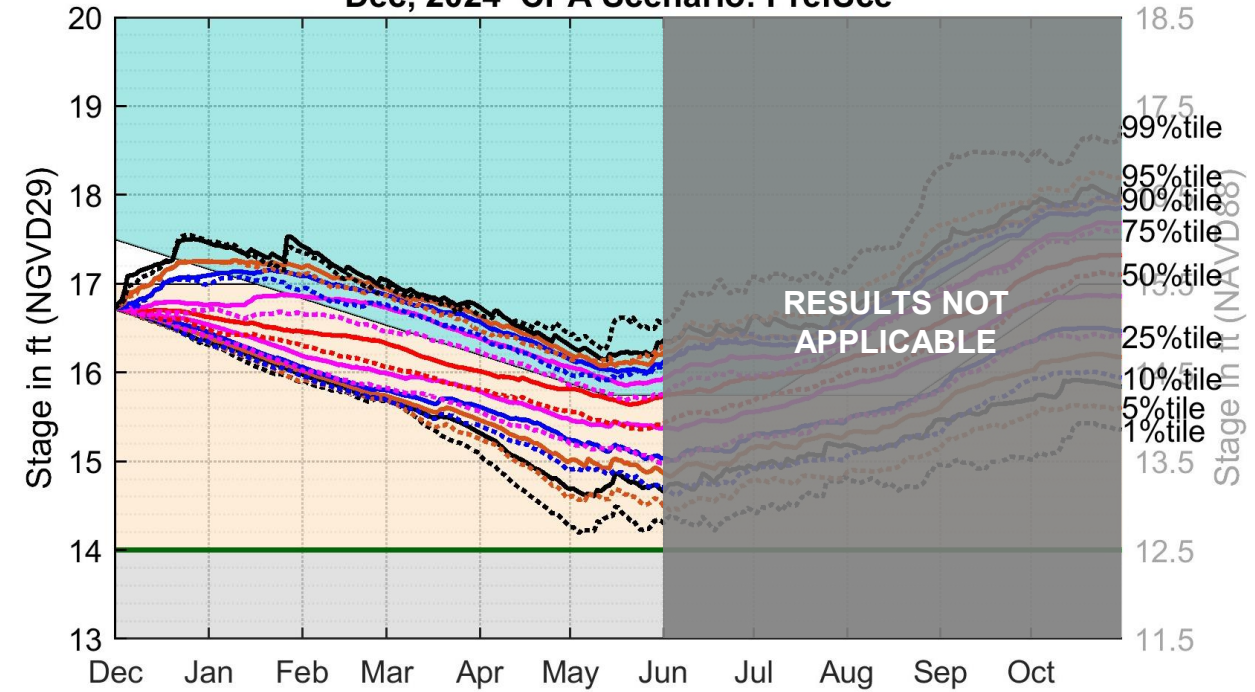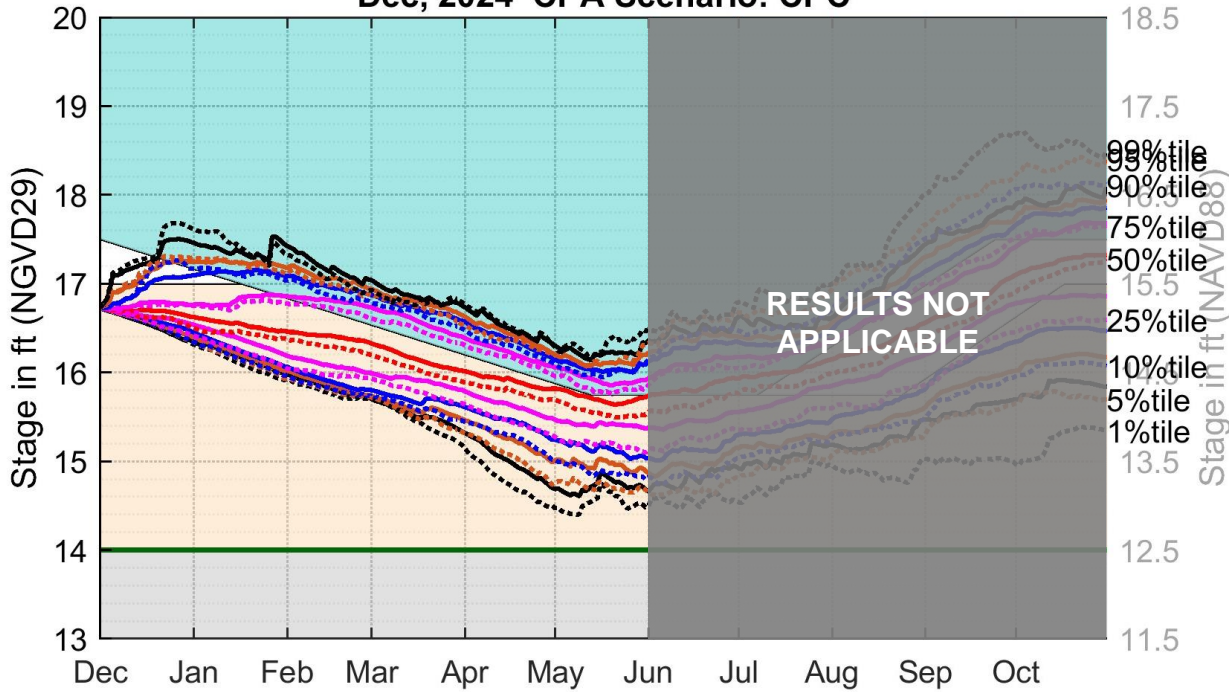
CPC

PrefSce

Secondary vertical axis shows stages in NAVD88. These stages are based on Agreed Upon Regulation Schedule Conversion Offsets between NGVD29 and NAVD88 (1.5 ft for WCA1).
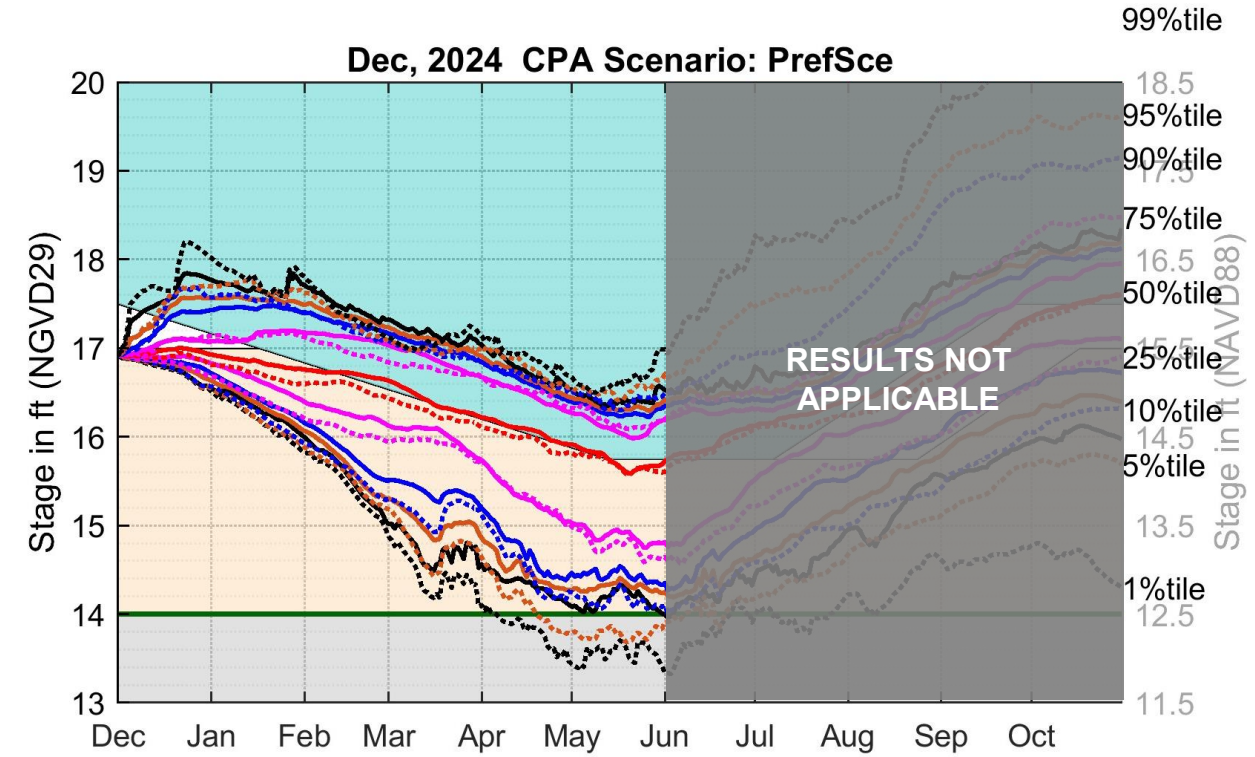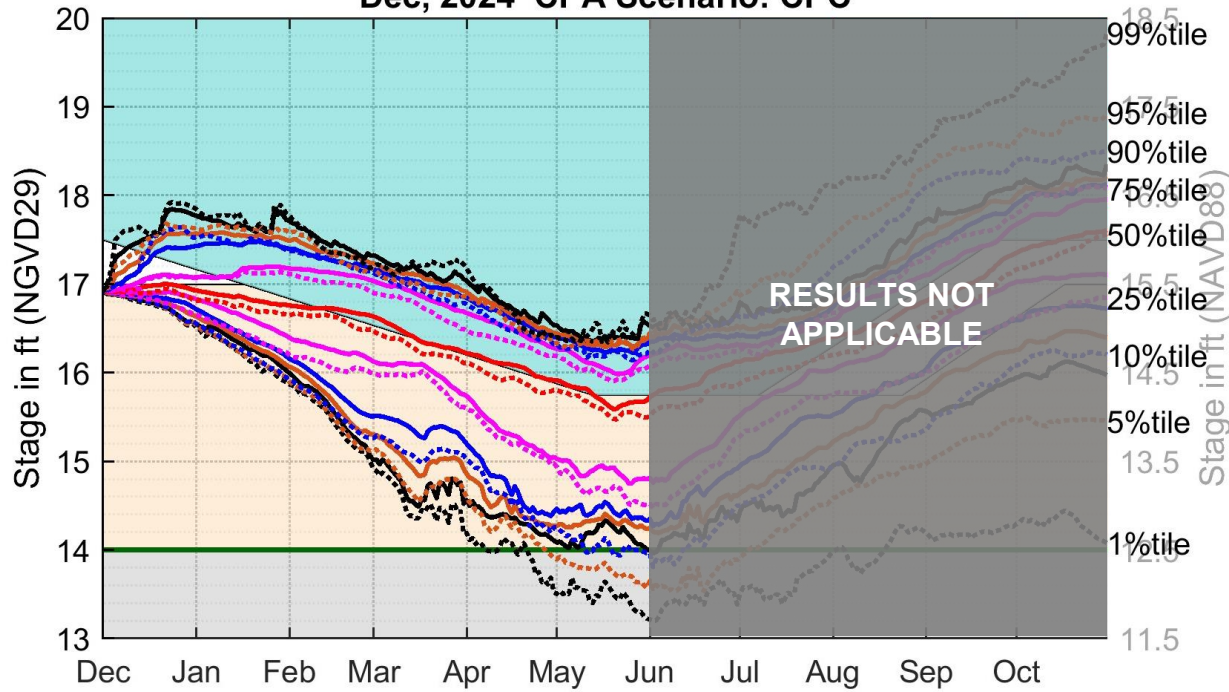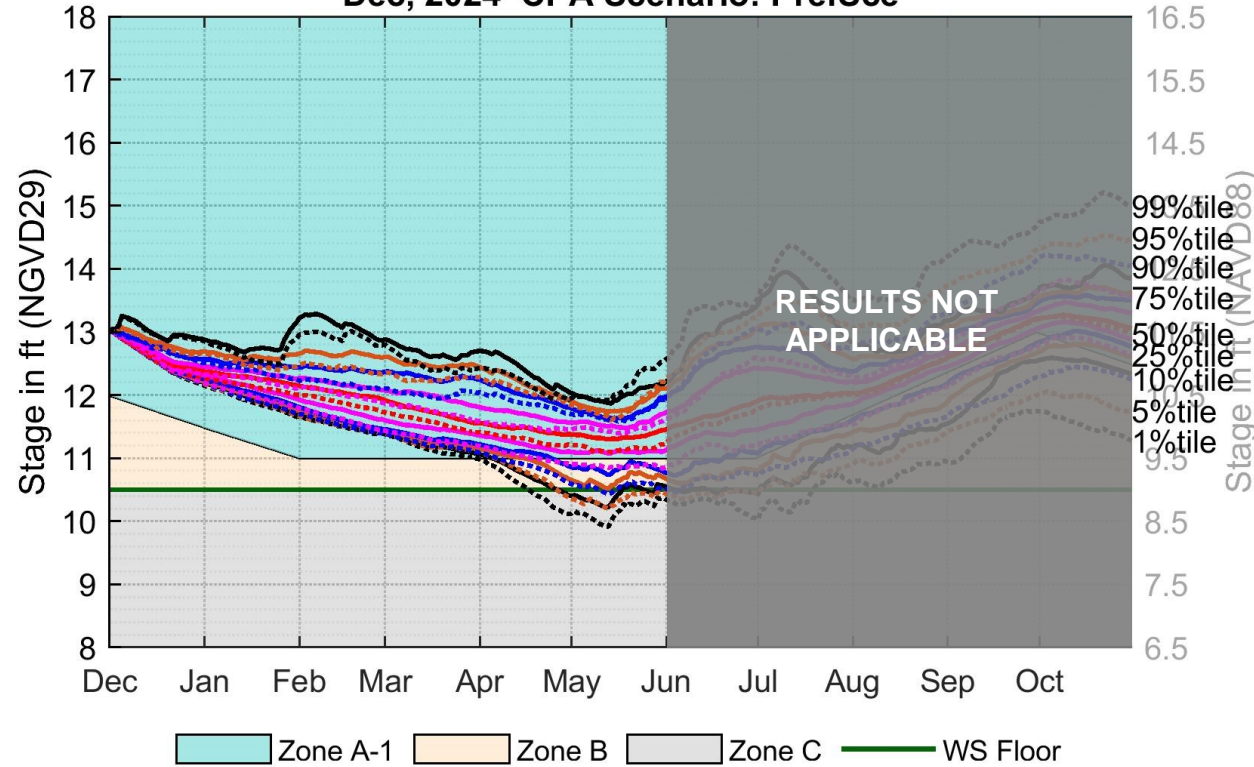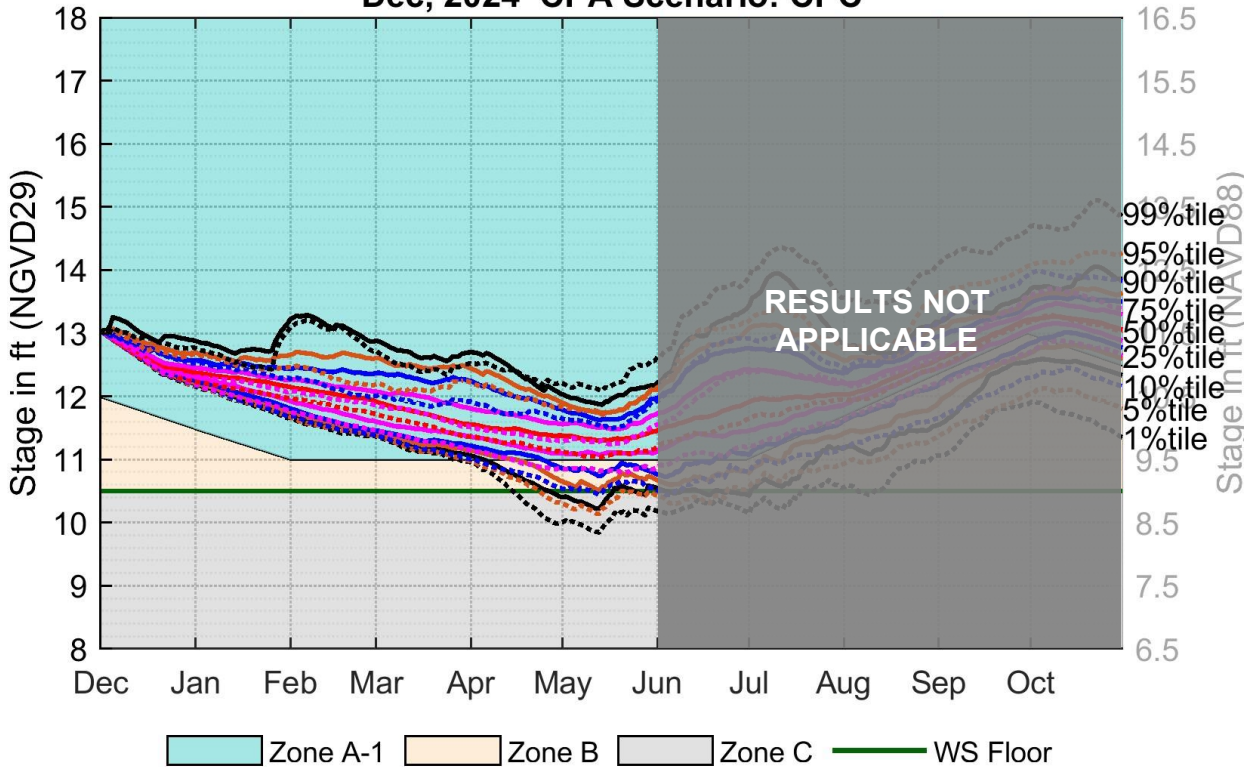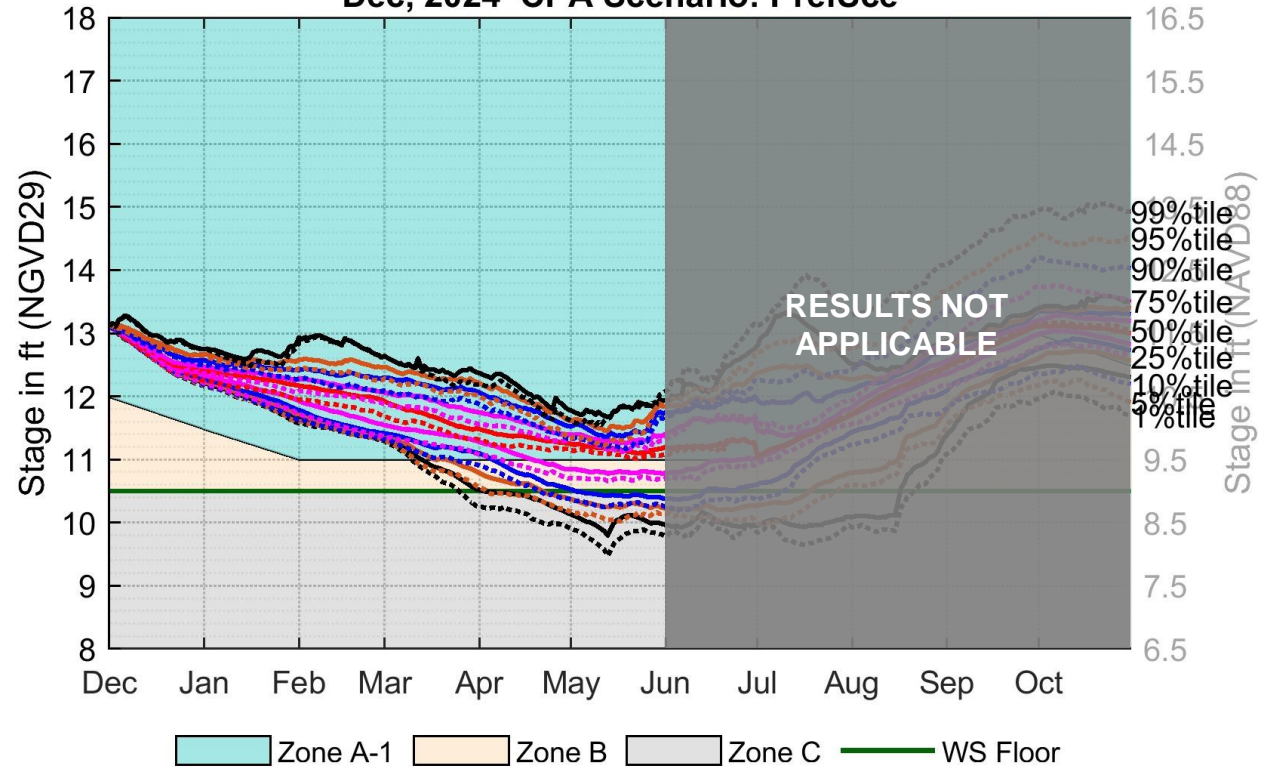
December 2024 CPA: WCA1 Site 8-C

Secondary vertical axis shows stages in NAVD88. These stages are based on Agreed Upon Regulation Schedule Conversion Offsets between NGVD29 and NAVD88 (1.5 ft for WCA1).

11

December 2024 CPA: WCA2A Site 17

CPC

PrefSce

Secondary vertical axis shows stages in NAVD88. These stages are based on Agreed Upon Regulation Schedule Conversion Offsets between NGVD29 and NAVD88 (1.5 ft for WCA2A).
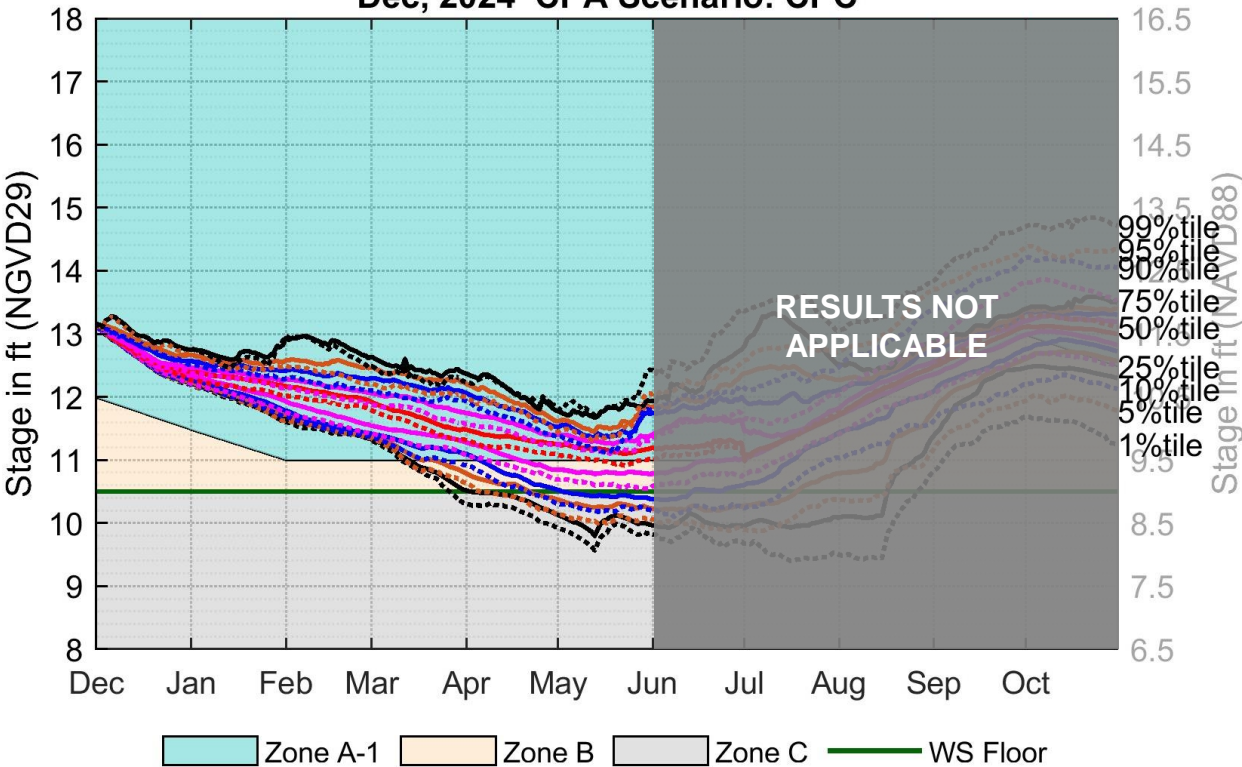
December 2024 CPA: WCA2A S11B_H

Secondary vertical axis shows stages in NAVD88. These stages are based on Agreed Upon Regulation Schedule Conversion Offsets between NGVD29 and NAVD88 (1.5 ft for WCA2A).
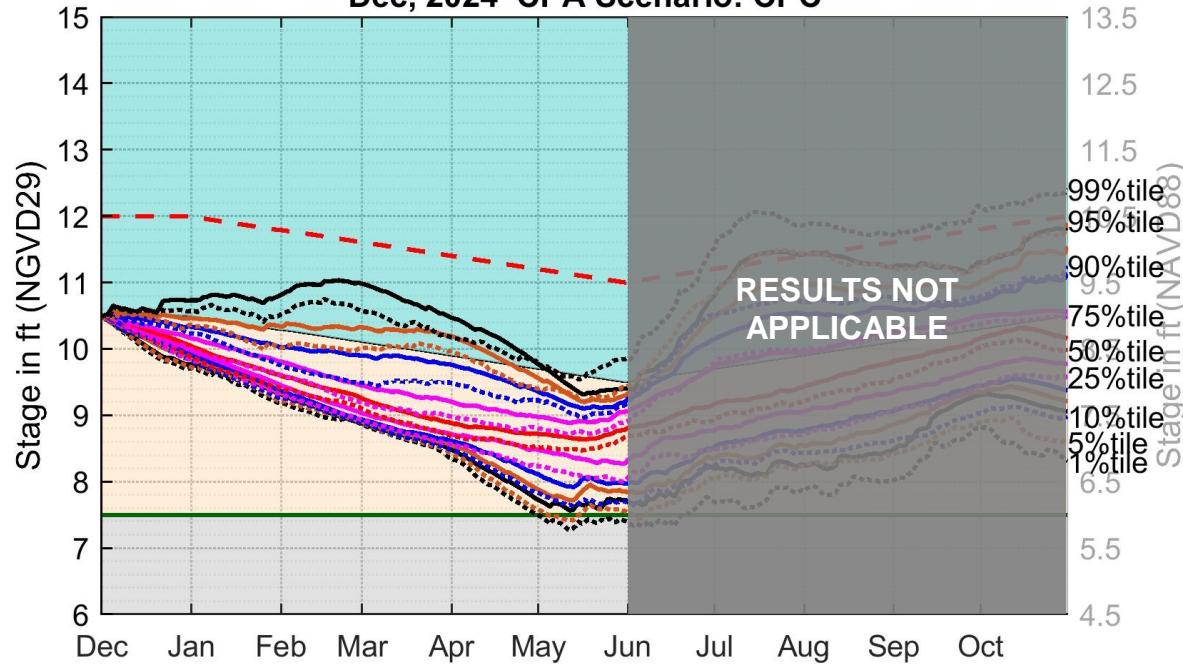
December 2024 CPA: WCA3A 3 Gage Avg.

Secondary vertical axis shows stages in NAVD88. These stages are based on Agreed Upon Regulation Schedule Conversion Offsets between NGVD29 and NAVD88 (1.5 ft for WCA3A).