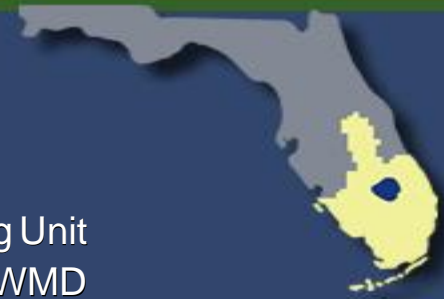


# July 2024: Conditional Positional Analysis (CPA) Implementation

Water Resources & Systems Modeling Bureau, Systems Modeling Unit  
SFWMD

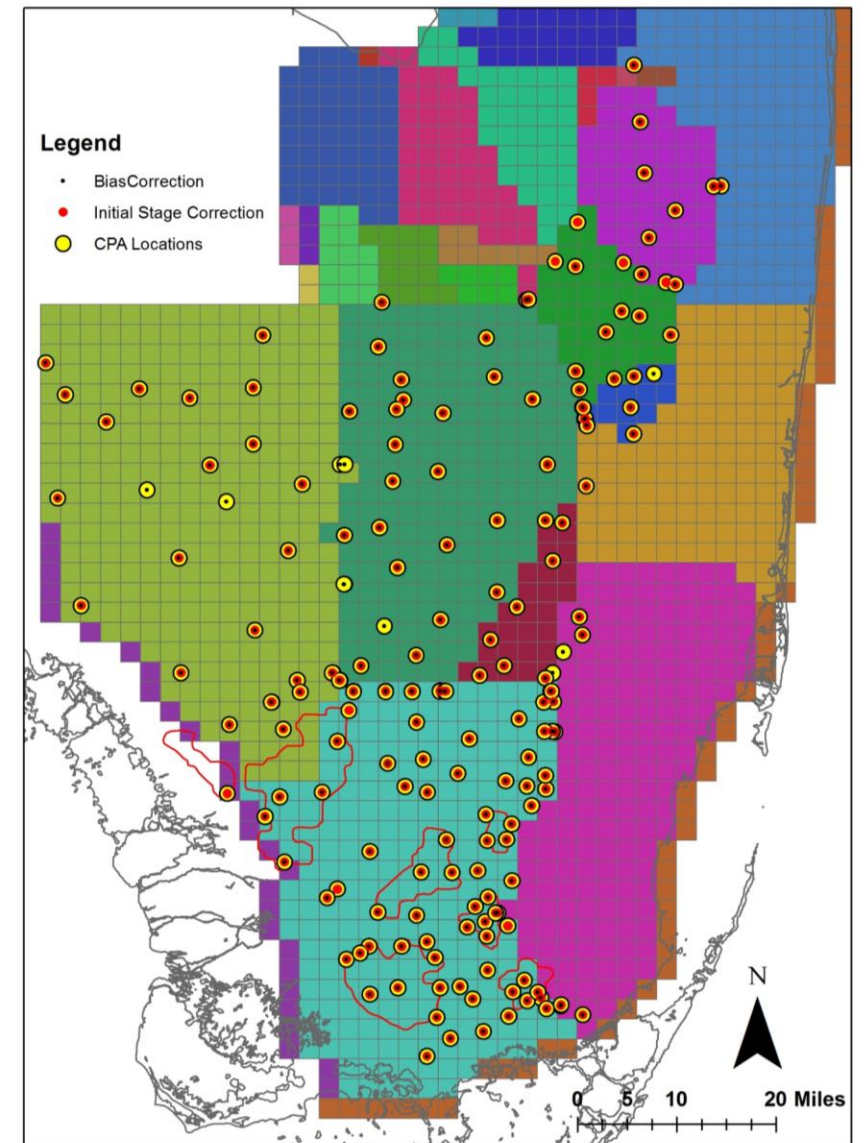


## CPA Overview



- 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 compare potential stage outlooks.
- July 2024 CPA was conducted for two Lake Okeechobee regulation plans - LORS2008 and LOSOM.
- 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



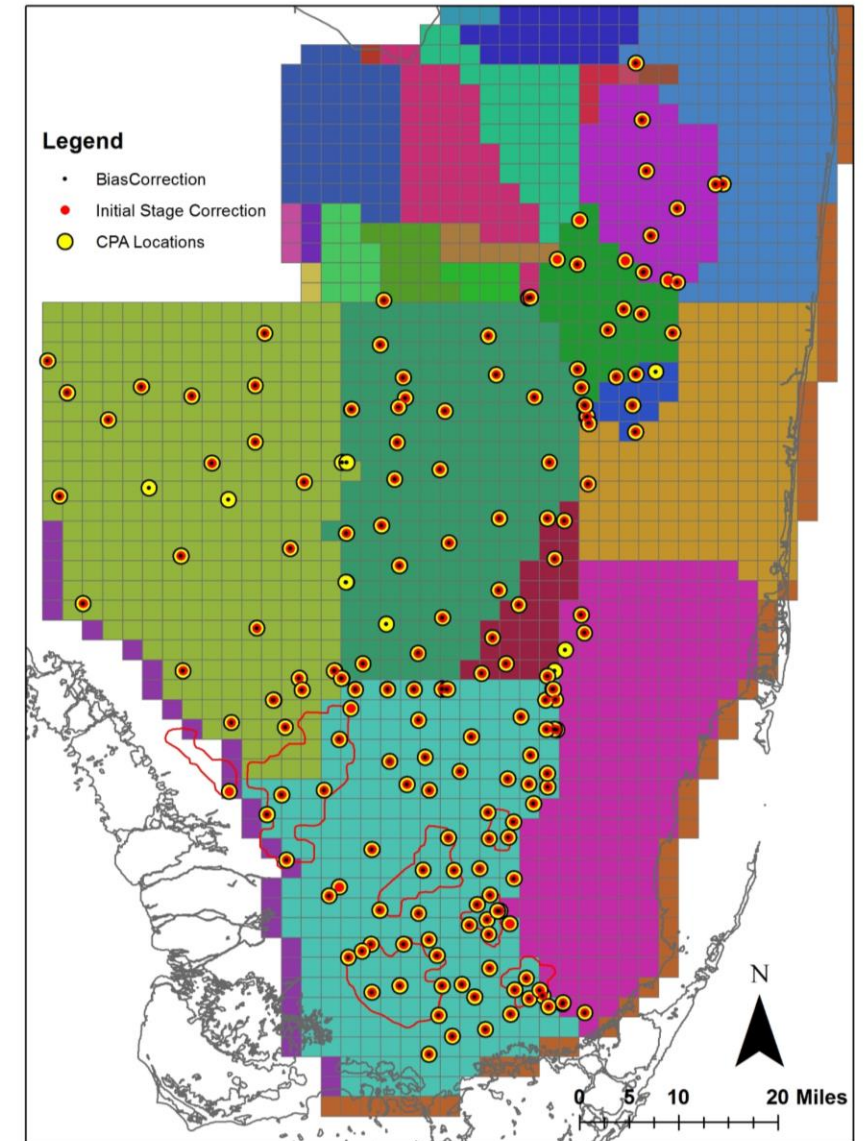
## CPA Overview



### ➤ 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



## 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 \(noaa.gov\)](https://www.noaa.gov/climate-prediction-center-forecasts-outlook)).
- It is also used by JEM's EverForecast tool for stage prediction.

### ➤ Preferred Scenario (PrefSce)

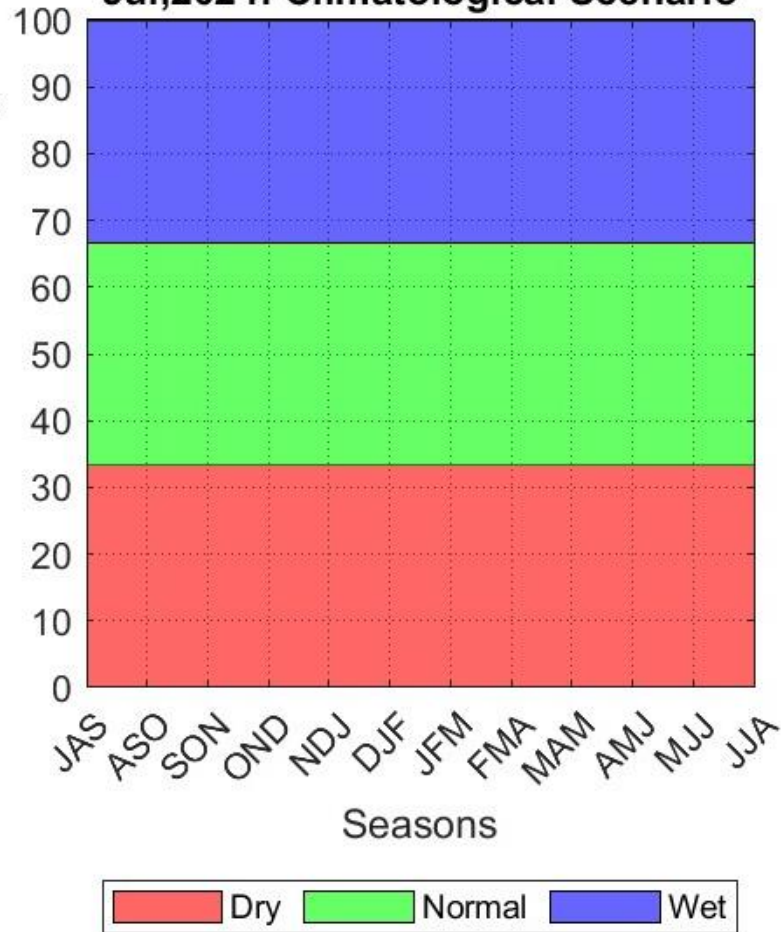
- Seasonal rainfall probabilities are calculated based on historical data and projected Niño-3.4 Index ([Climate Prediction Center - El Nino Southern Oscillation \(noaa.gov\)](https://www.noaa.gov/el-nino-southern-oscillation)) published by CPC.
- This scenario developed by System Modeling Unit ([PrefSce Overview](#)) represents a best professional judgement rainfall outlook and is typically more aggressive in terms of shifts from Climatological probabilities compared to CPC.



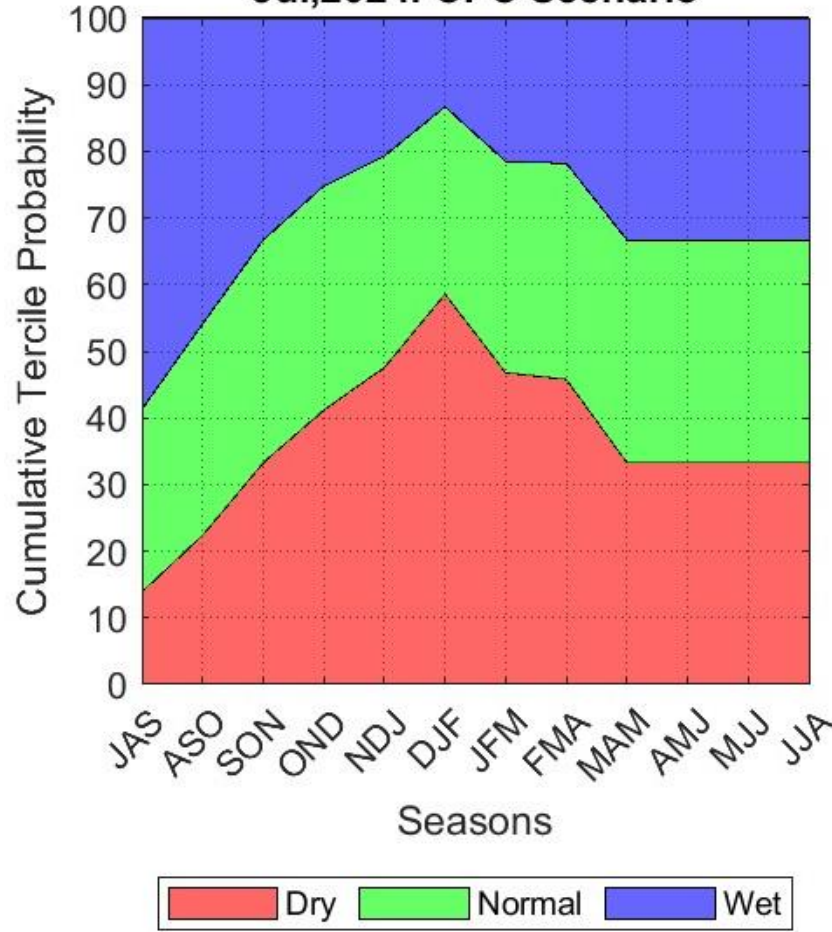
# July 2024 CPA: Rainfall Scenarios



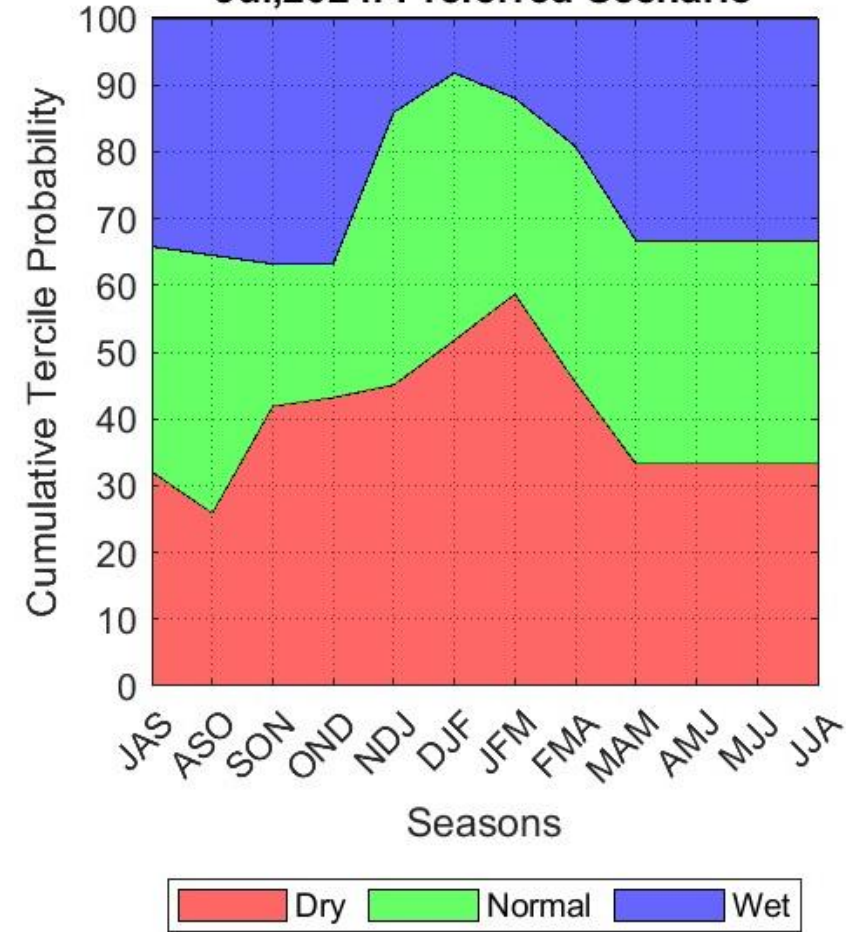
Jul,2024: Climatological Scenario



Jul,2024: CPC Scenario

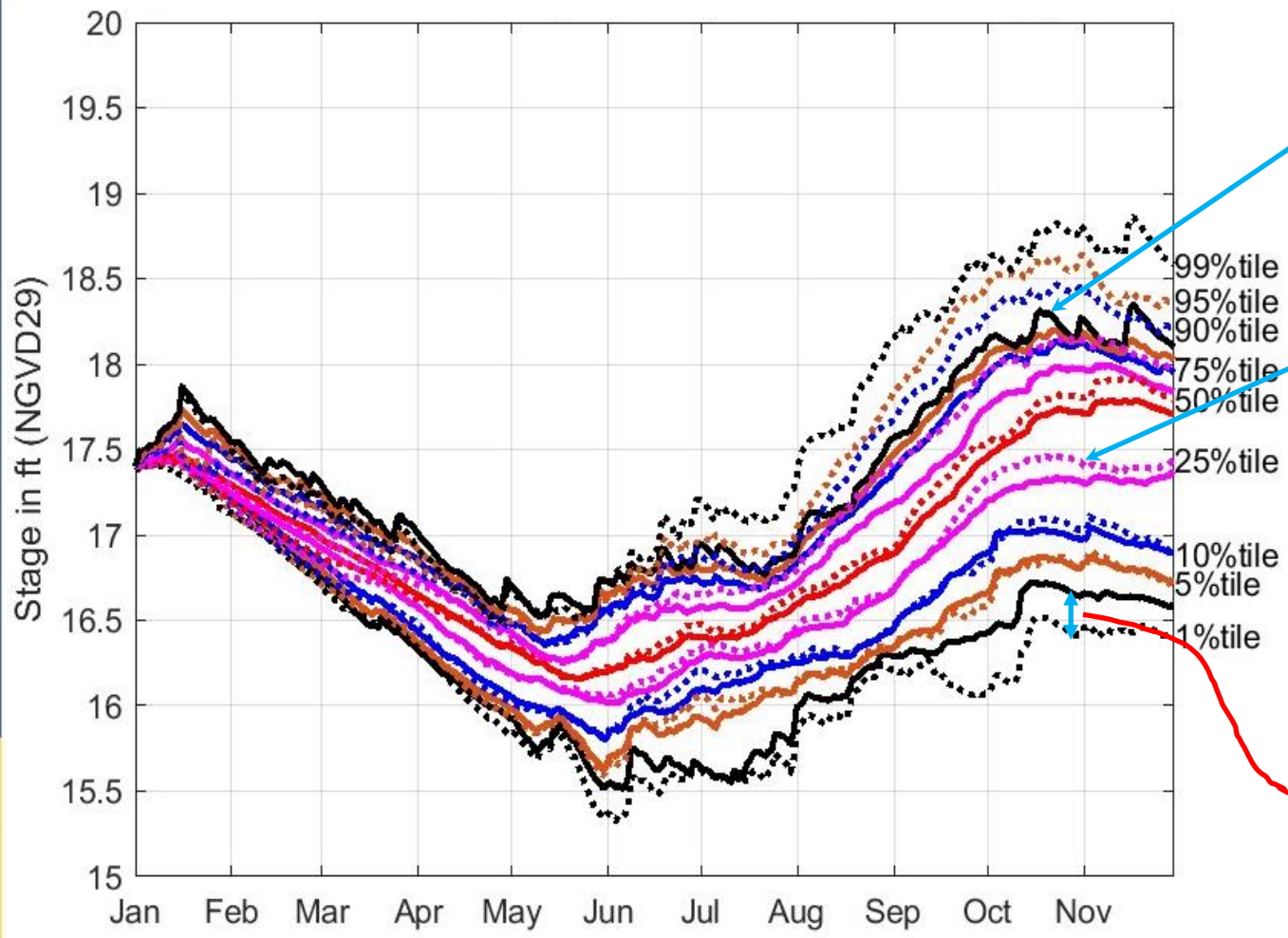


Jul,2024: Preferred Scenario





# 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**



# LORS2008

# July 2024 CPA: LOK under LORS2008



CPC

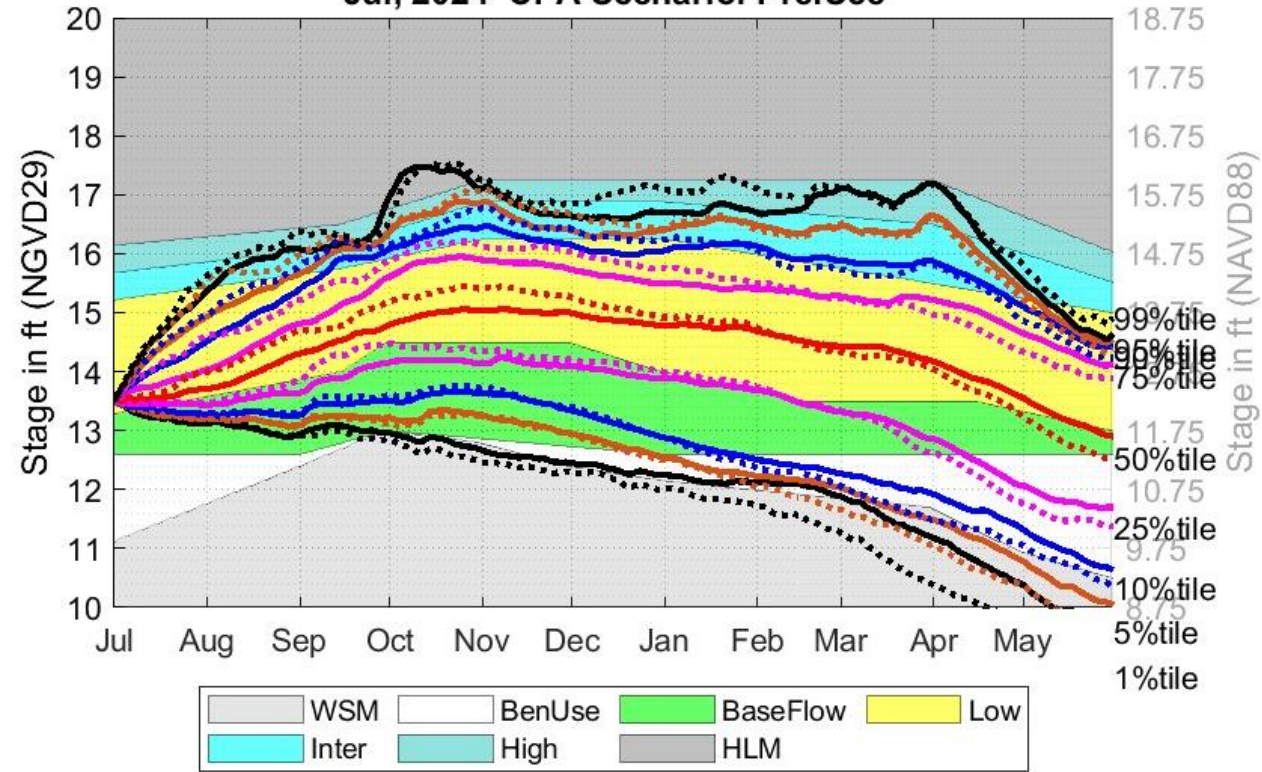
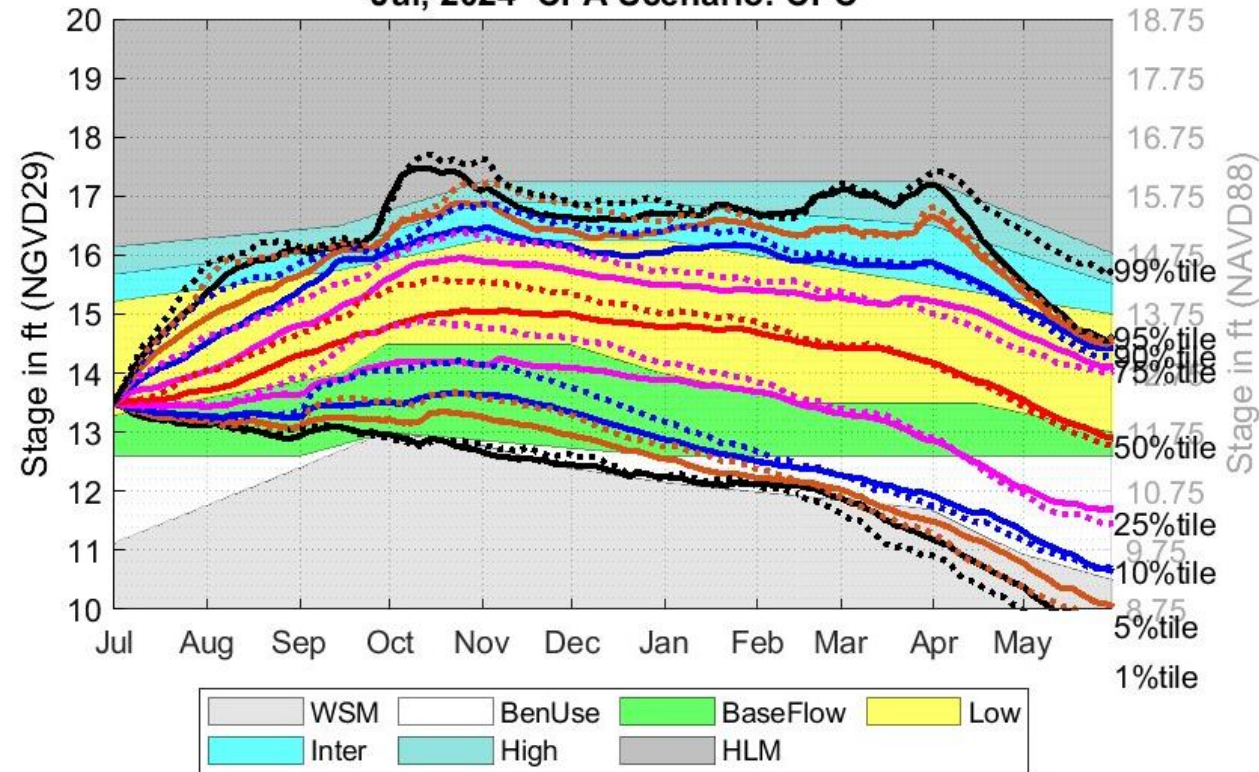
LOK

PrefSce

LOK

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: PrefSce



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).



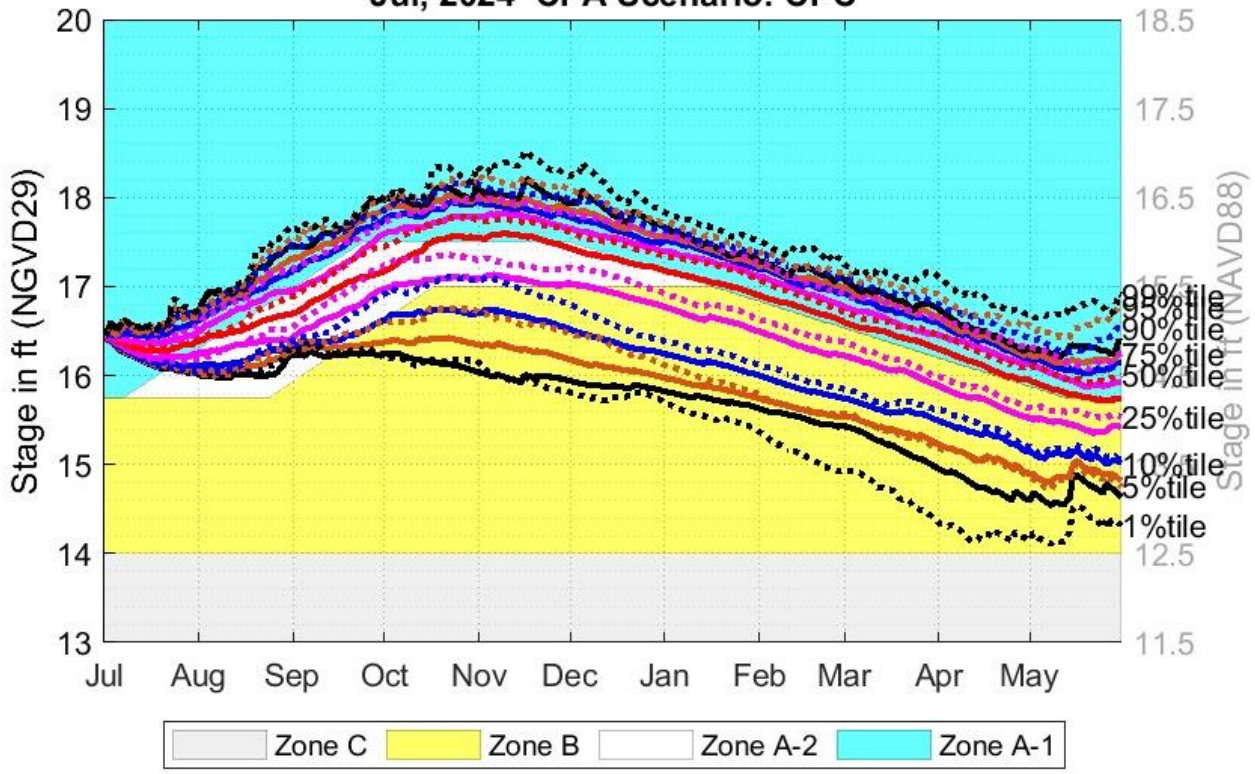
# July 2024 CPA: WCA1 under LORS2008



## CPC

### WCA1 3 Gage Avg

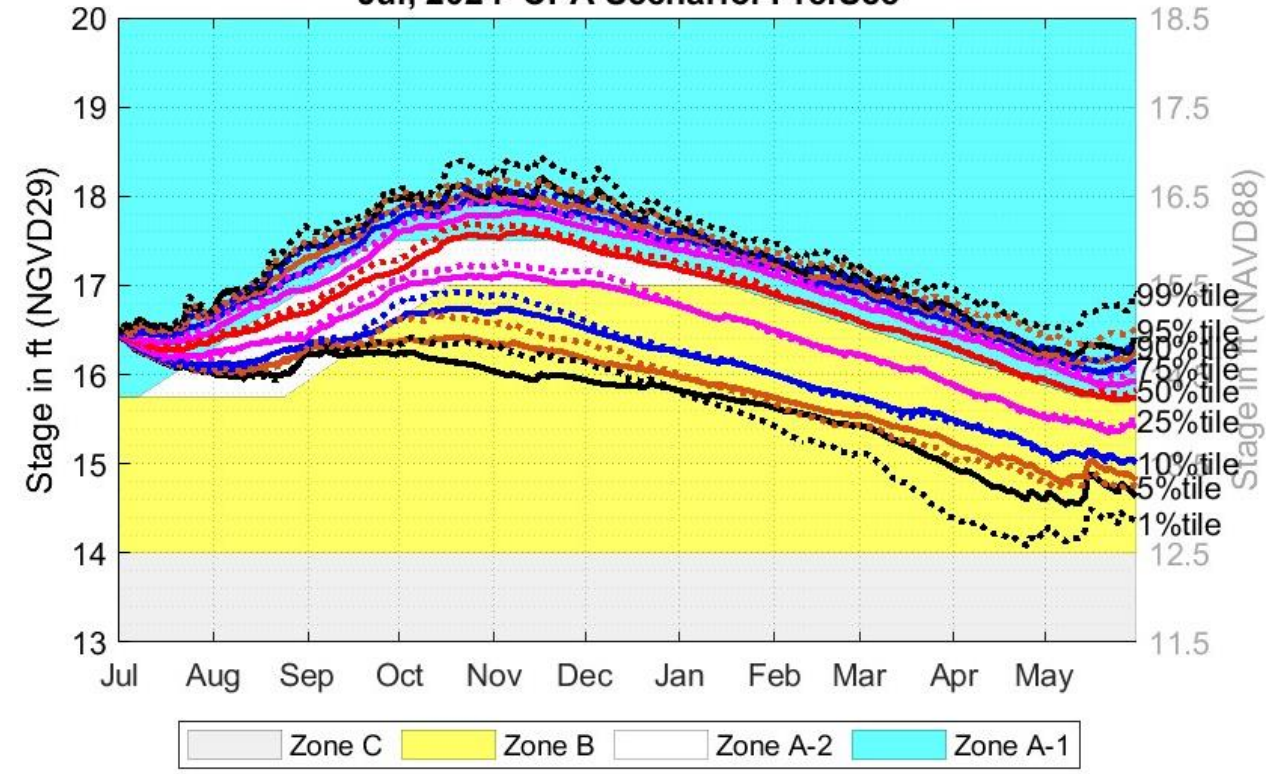
Jul, 2024 CPA Scenario: CPC



## PrefSce

### WCA1 3 Gage Avg

Jul, 2024 CPA Scenario: 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).

# July 2024 CPA: WCA1 under LORS2008



CPC

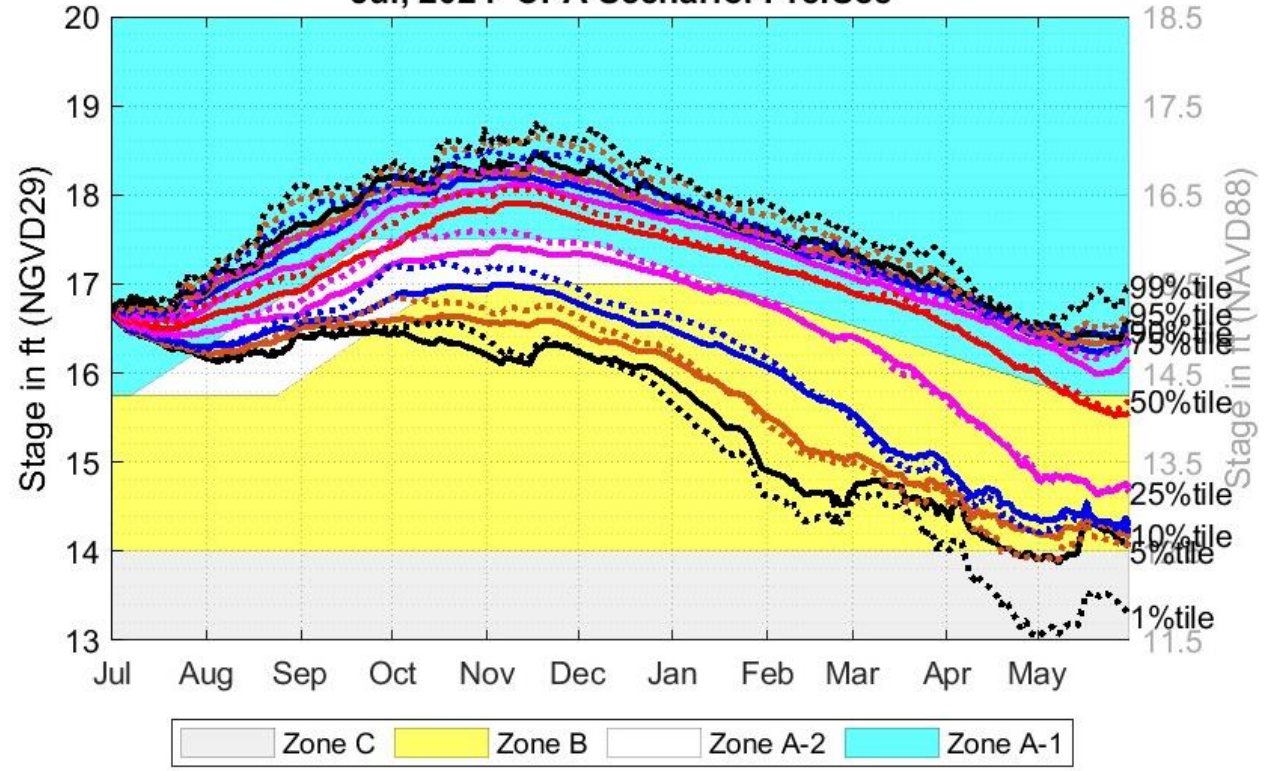
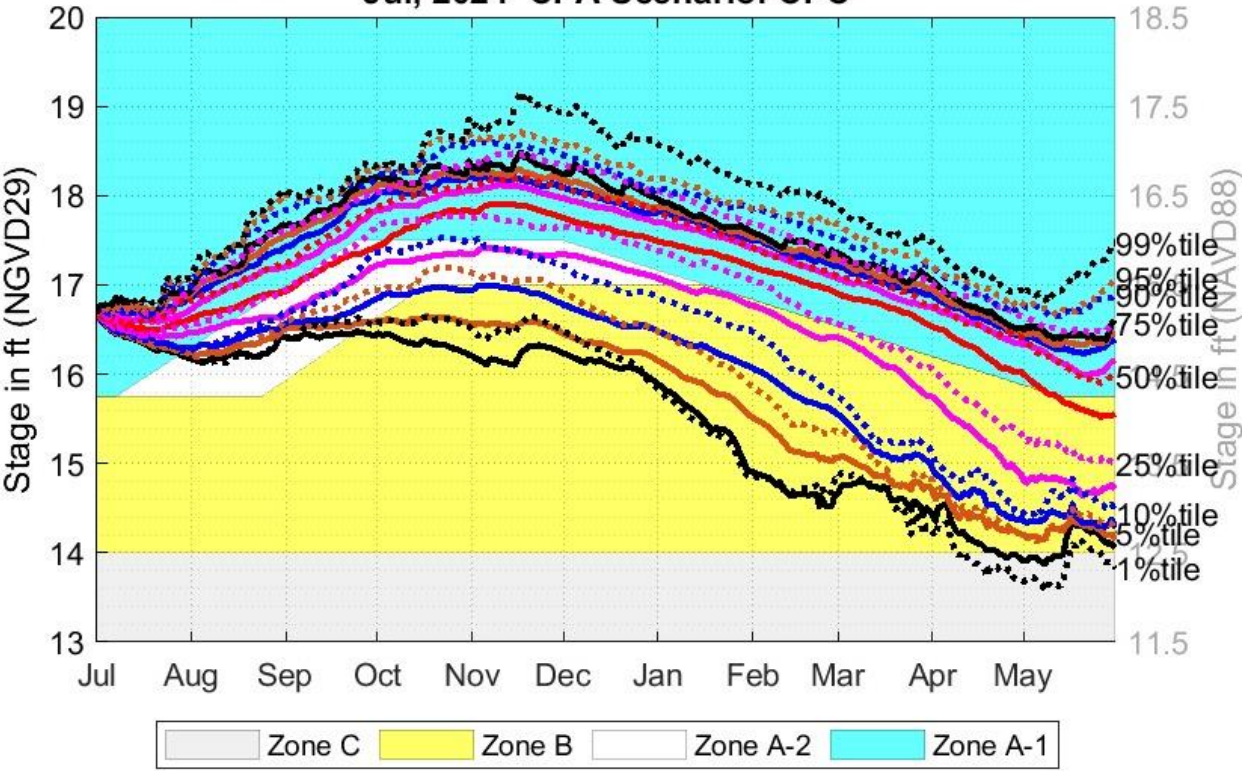
WCA1 1-8C

Jul, 2024 CPA Scenario: CPC

PrefSce

WCA1 1-8C

Jul, 2024 CPA Scenario: 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).

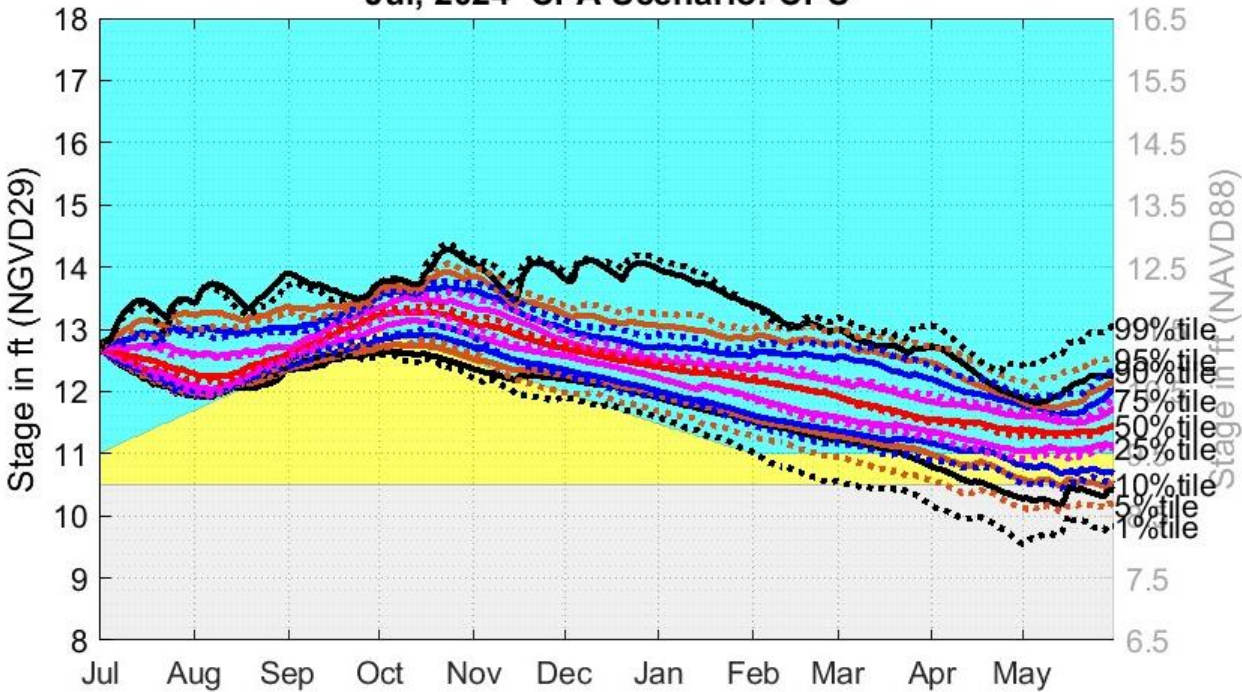
# July 2024 CPA: WCA2A under LORS2008



CPC

WCA2A Site 2-17

Jul, 2024 CPA Scenario: CPC

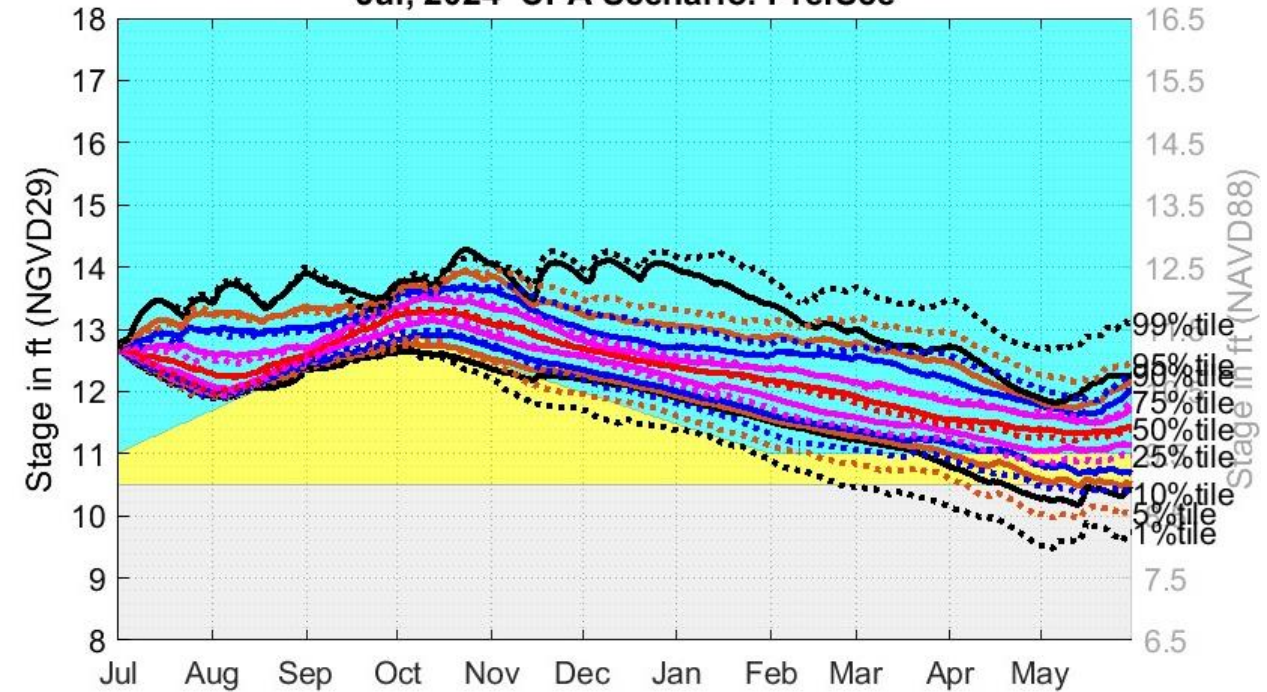


Zone C    Zone B    Zone A-1

PrefSc

WCA2A Site 2-17

Jul, 2024 CPA Scenario: PrefSc



Zone C    Zone B    Zone A-1

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).

# July 2024 CPA: WCA2A under LORS2008



CPC

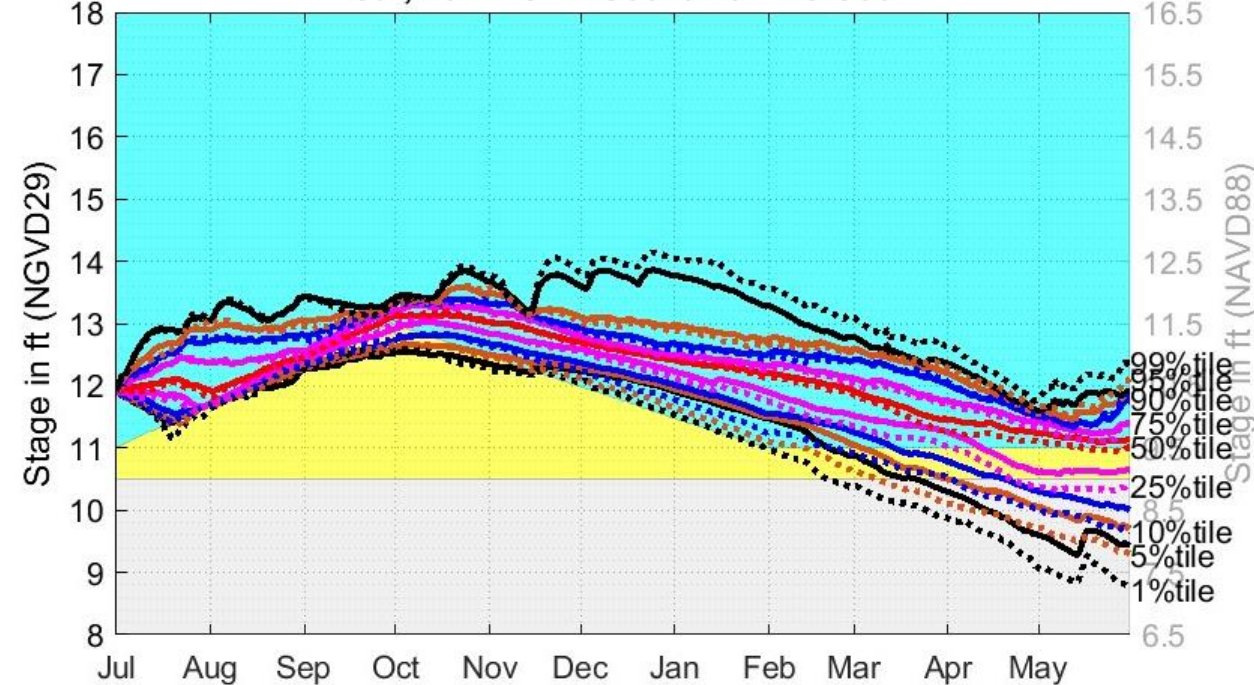
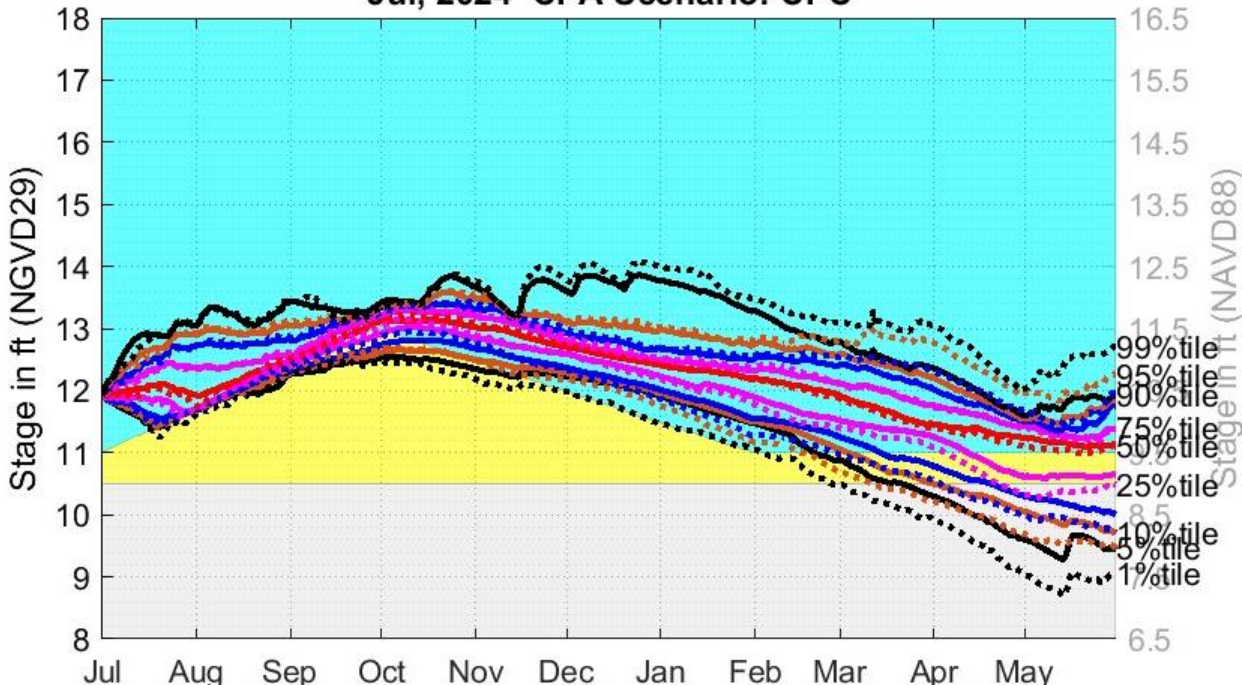
PrefScce

WCA2AS11B\_H

WCA2AS11B\_H

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: PrefScce



Zone C Zone B Zone A-1

Zone C Zone B Zone A-1

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).

# July 2024 CPA: WCA3A under LORS2008



CPC

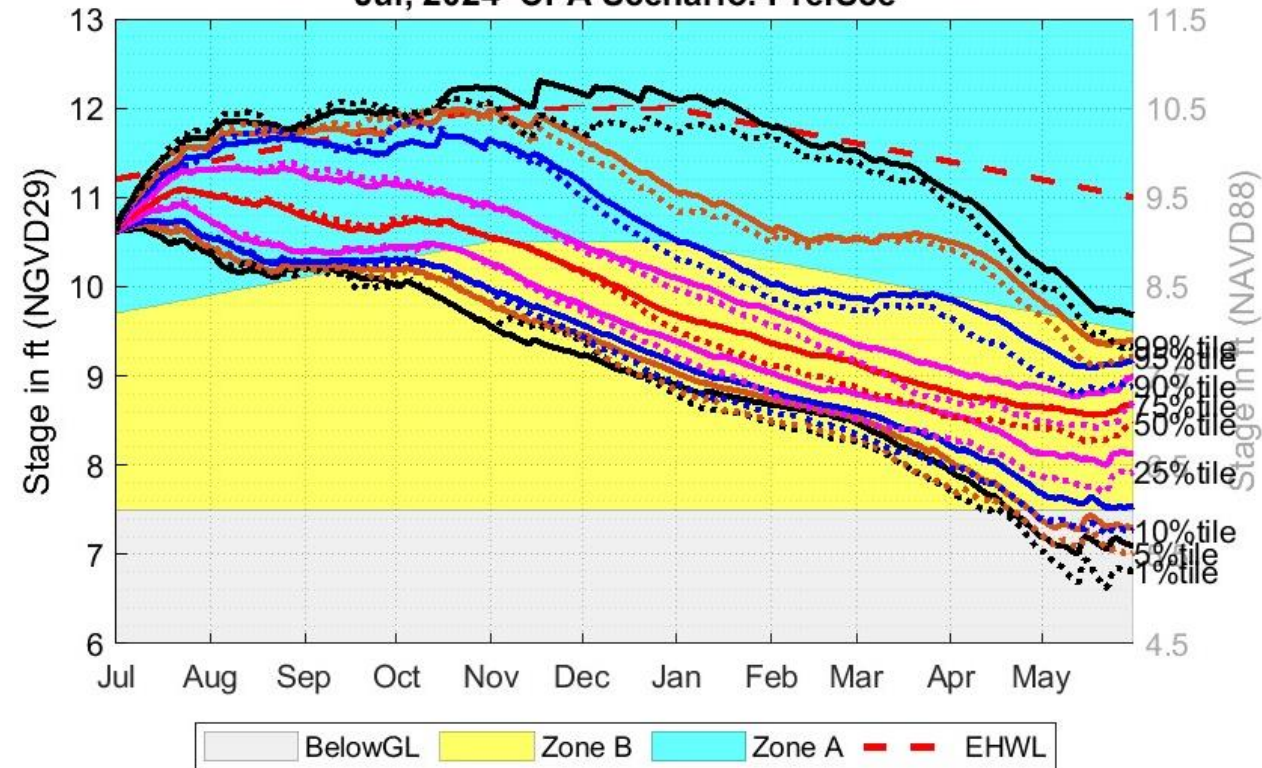
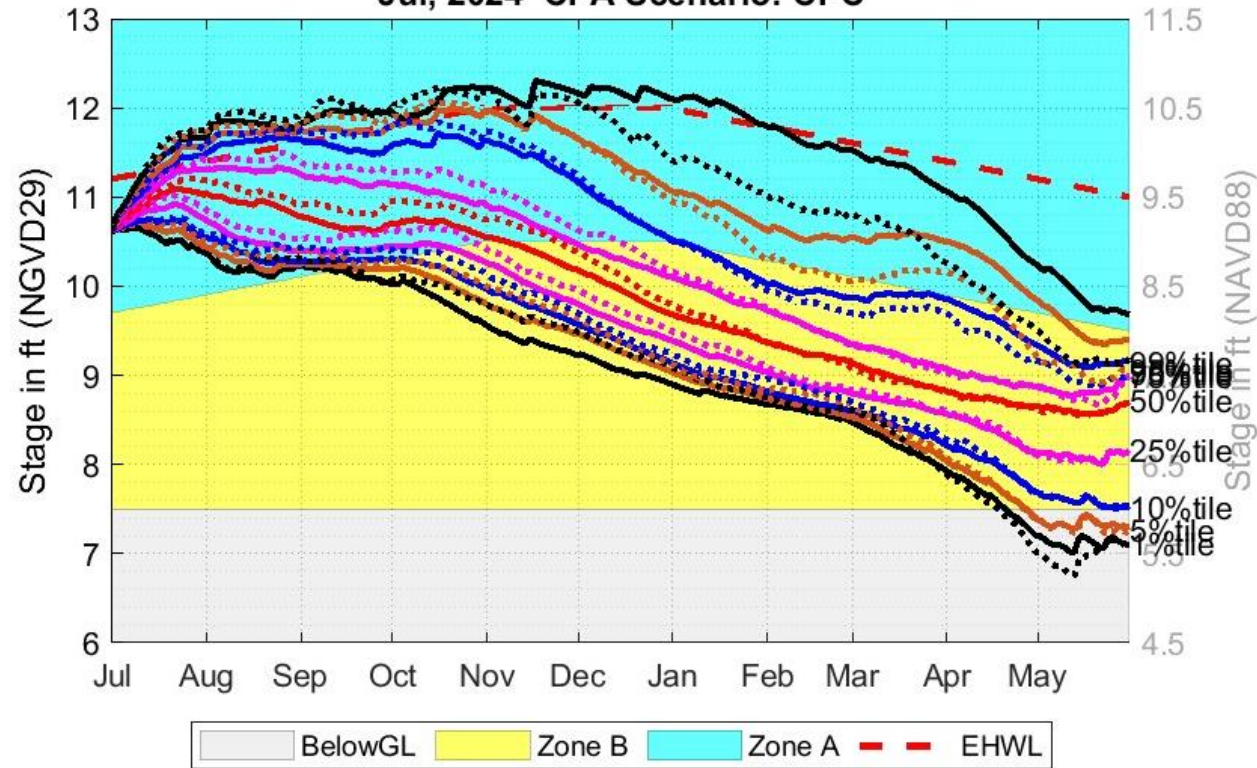
PrefSce

WCA3AAvg

WCA3AAvg

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: 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 WCA3A).



# LOSOM

# July 2024 CPA: LOK under LOSOM



CPC

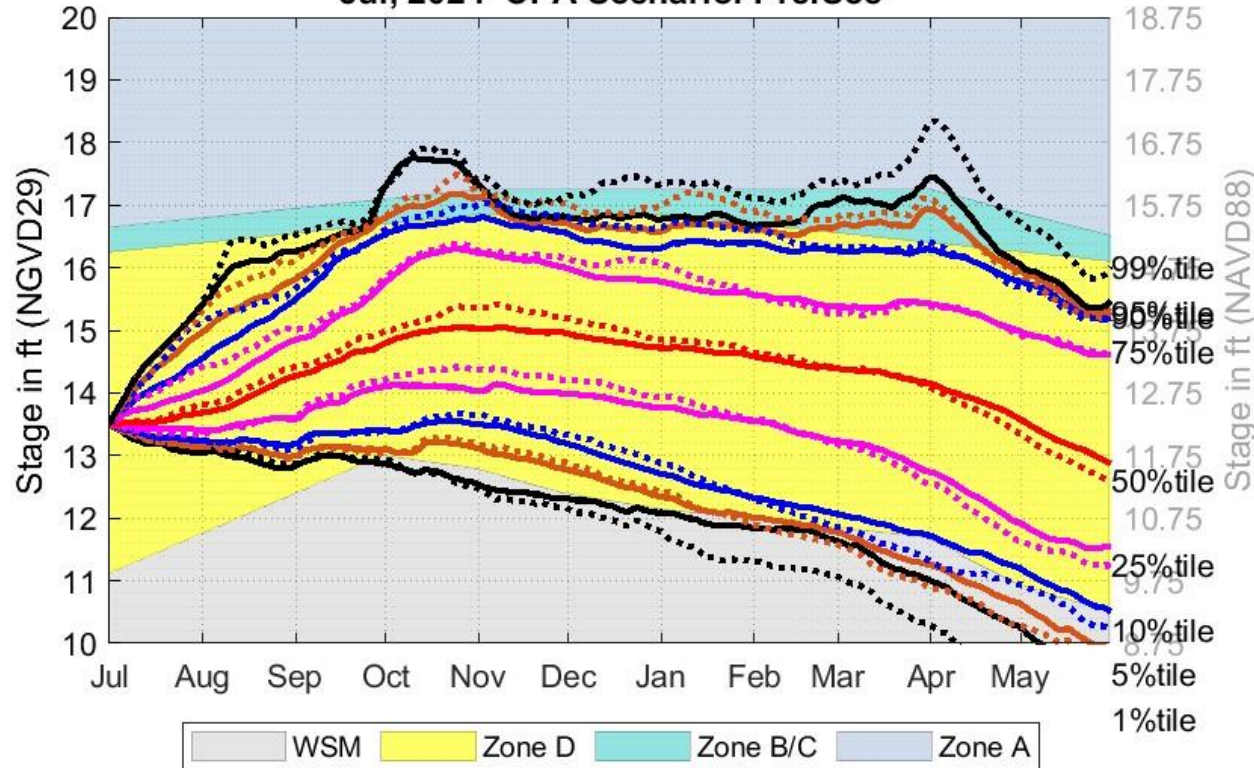
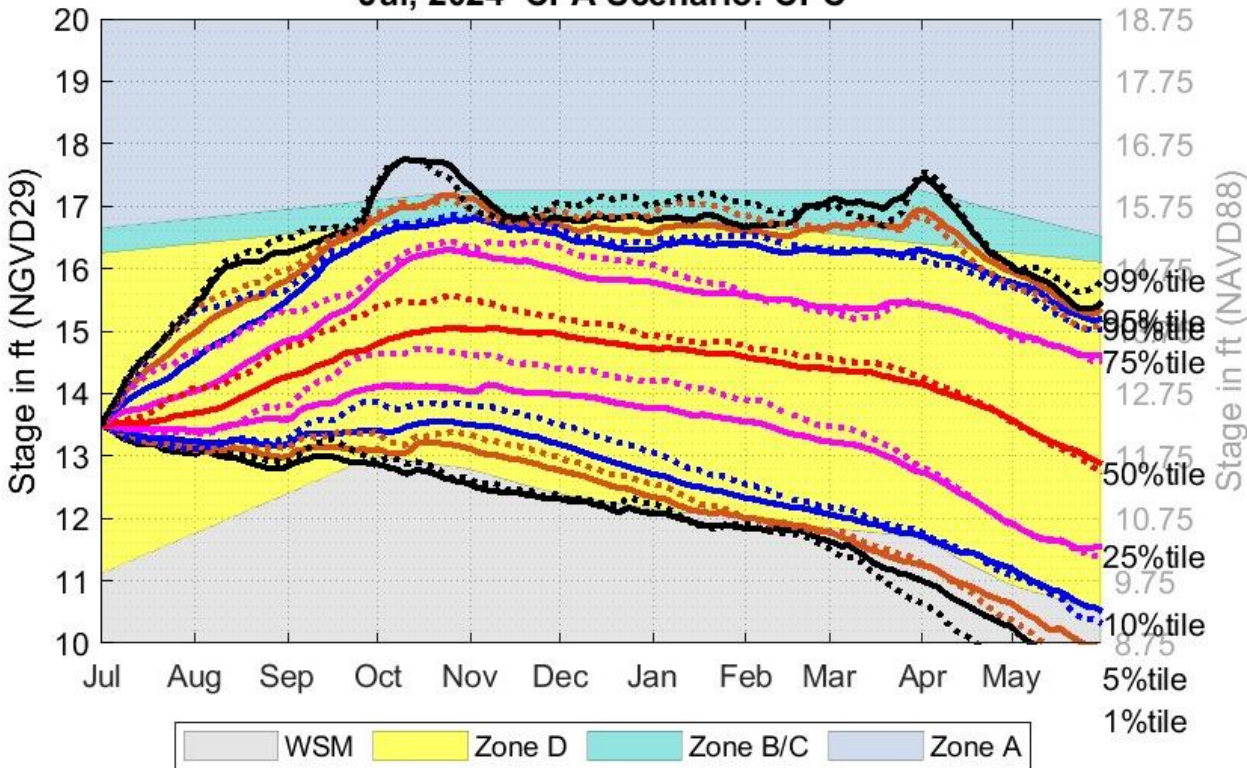
LOK

PrefSce

LOK

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: PrefSce



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).

# July 2024 CPA: WCA1 under LOSOM



CPC

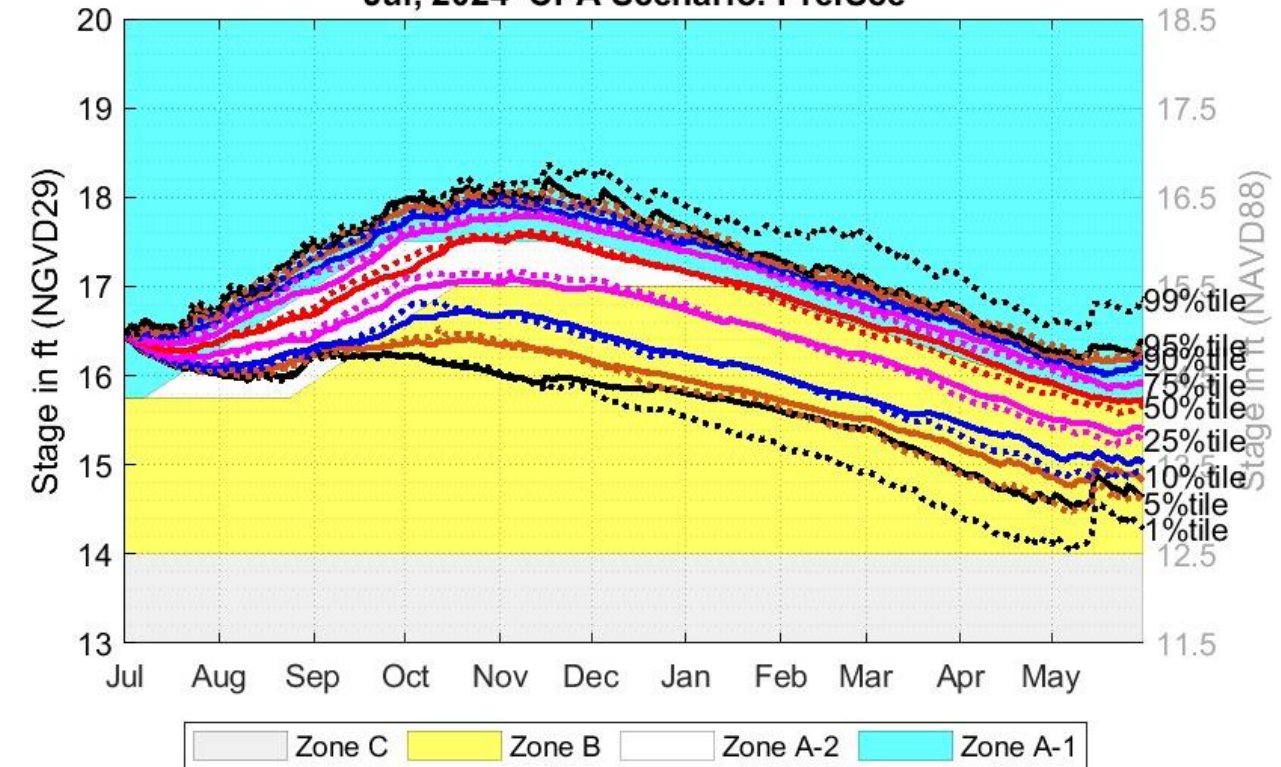
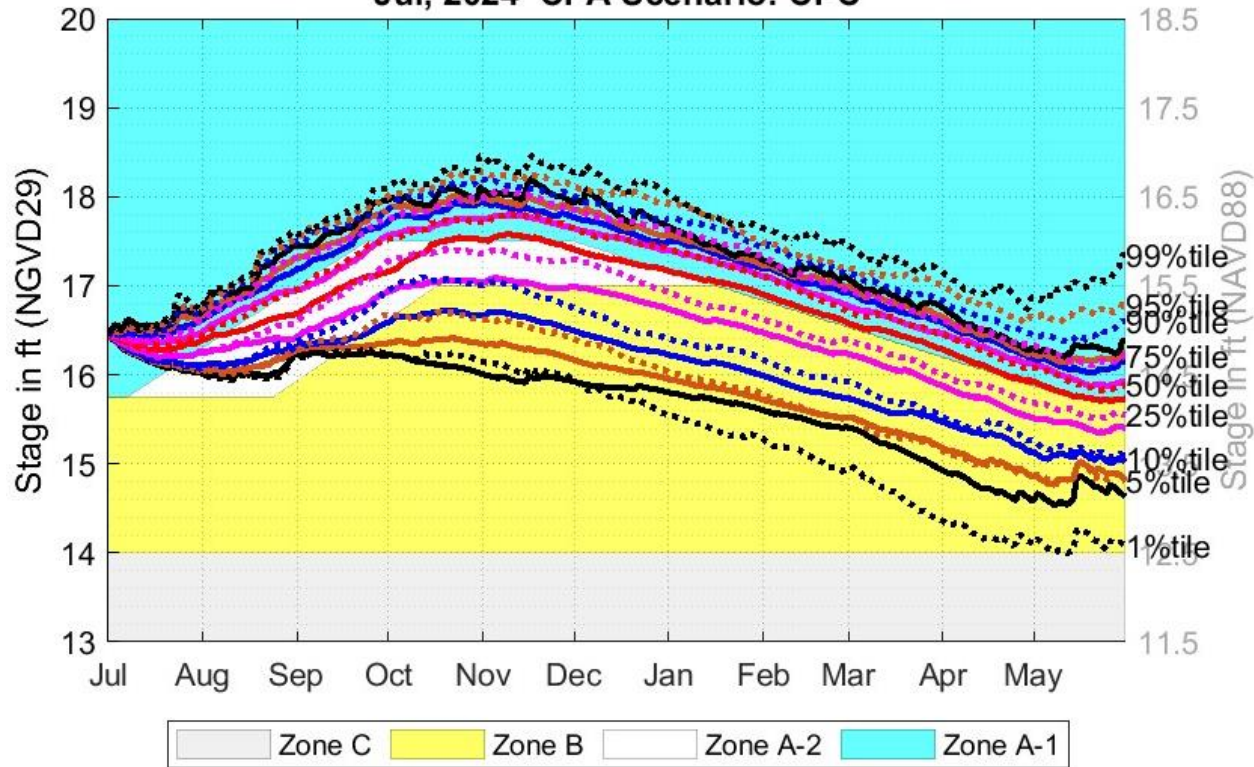
PrefSce

WCA1 3 Gage Avg

WCA1 3 Gage Avg

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: 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).



# July 2024 CPA: WCA1 under LOSOM



CPC

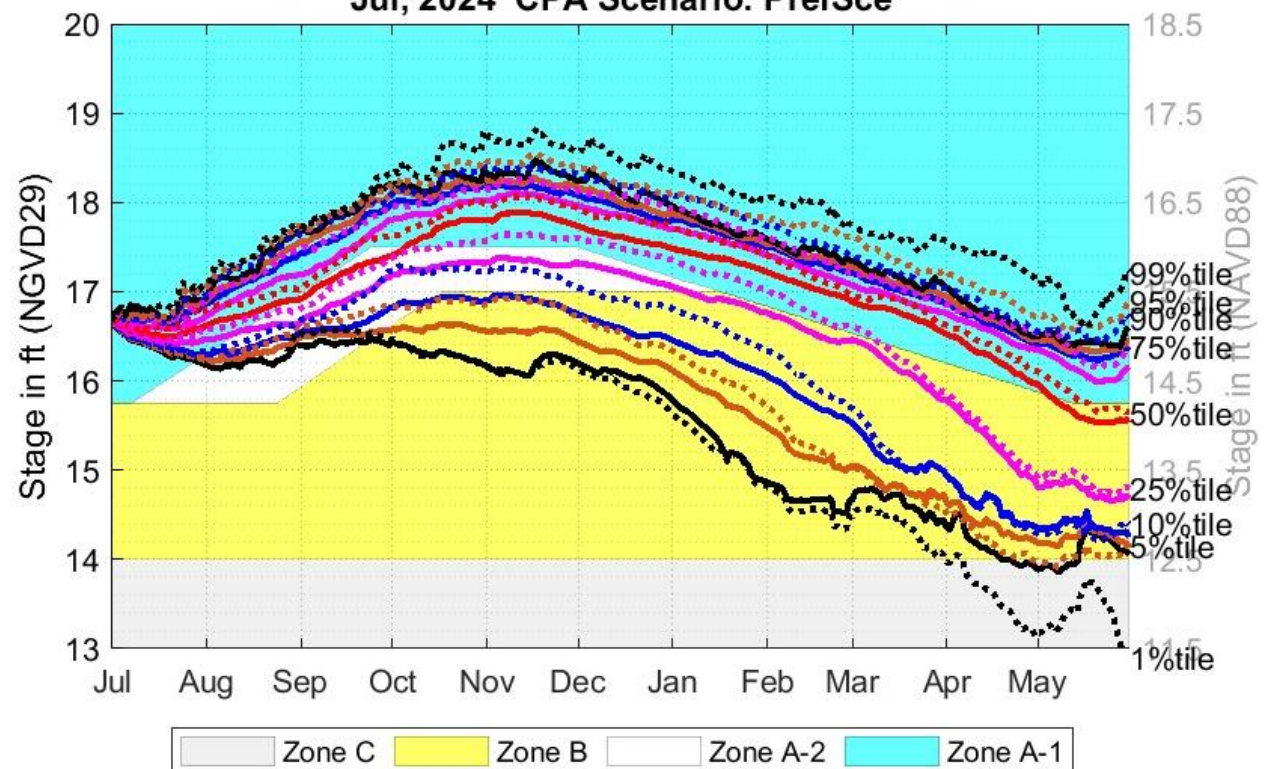
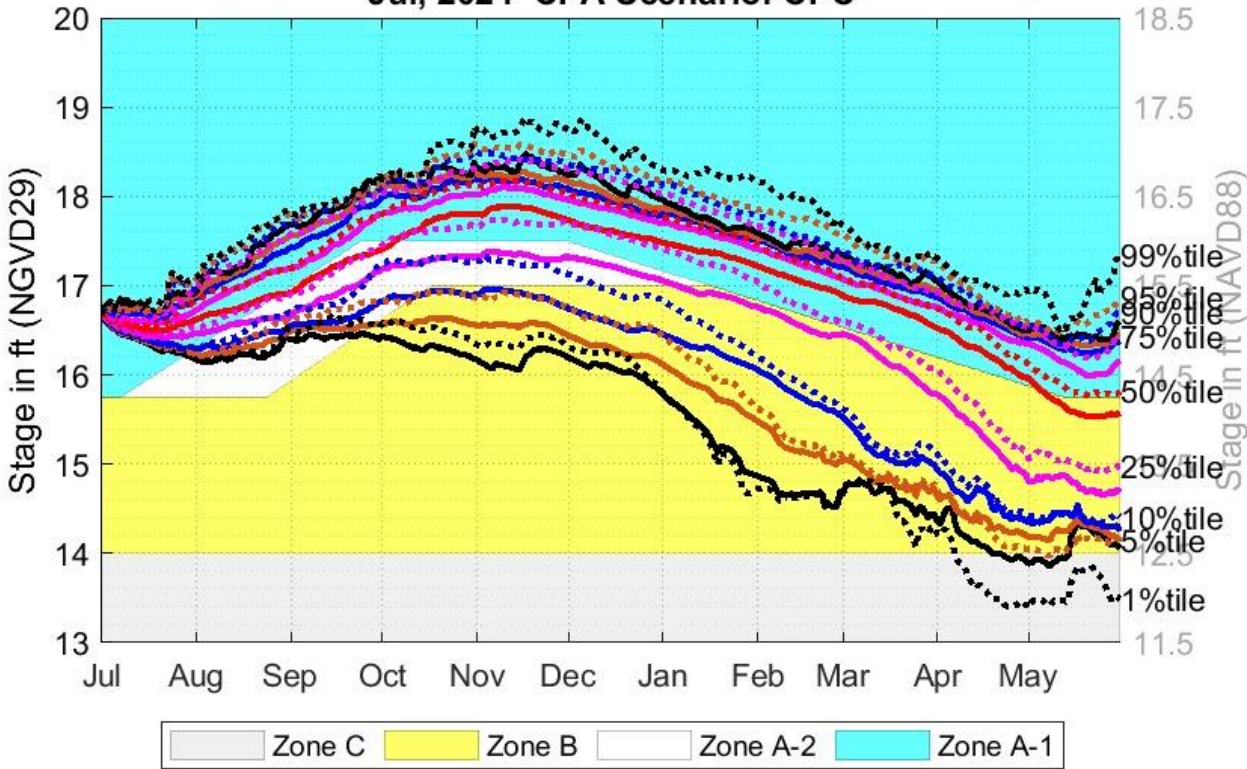
PrefSce

WCA1 Site 8-C

WCA1 Site 8-C

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: 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).

# July 2024 CPA: WCA2A under LOSOM



CPC

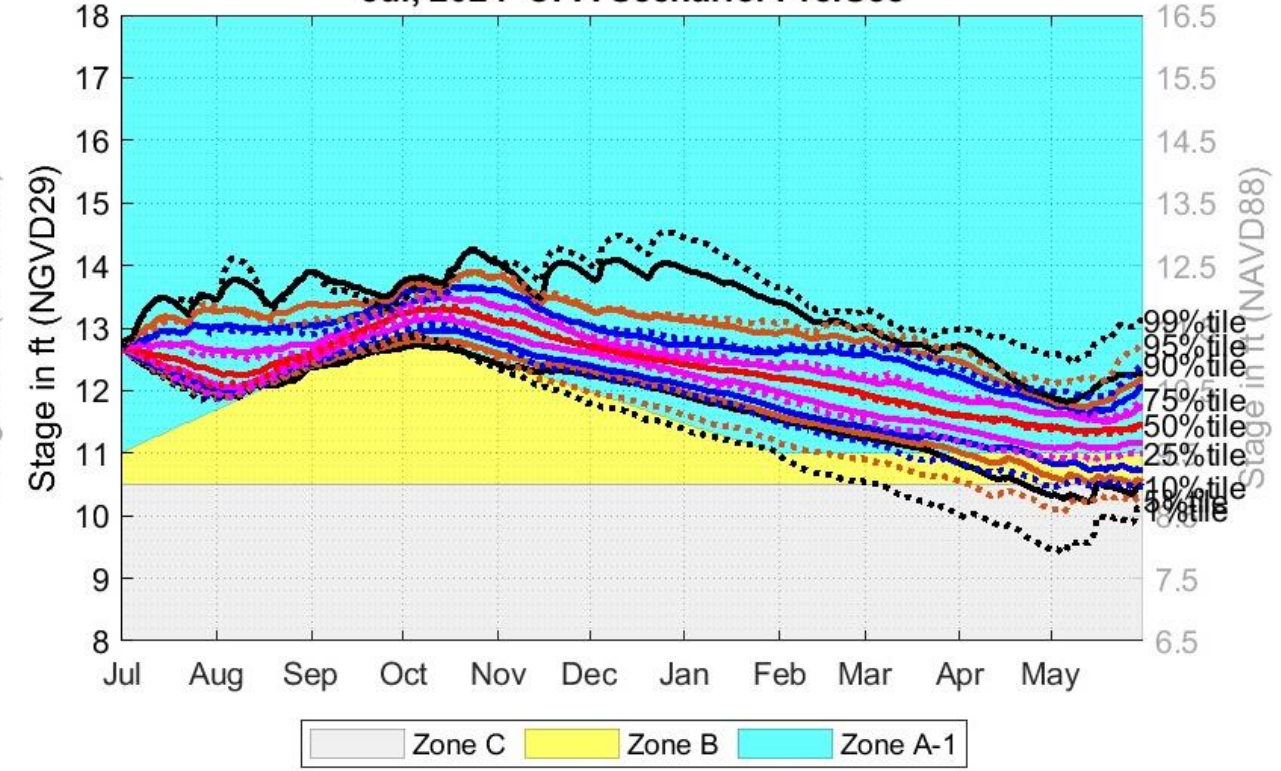
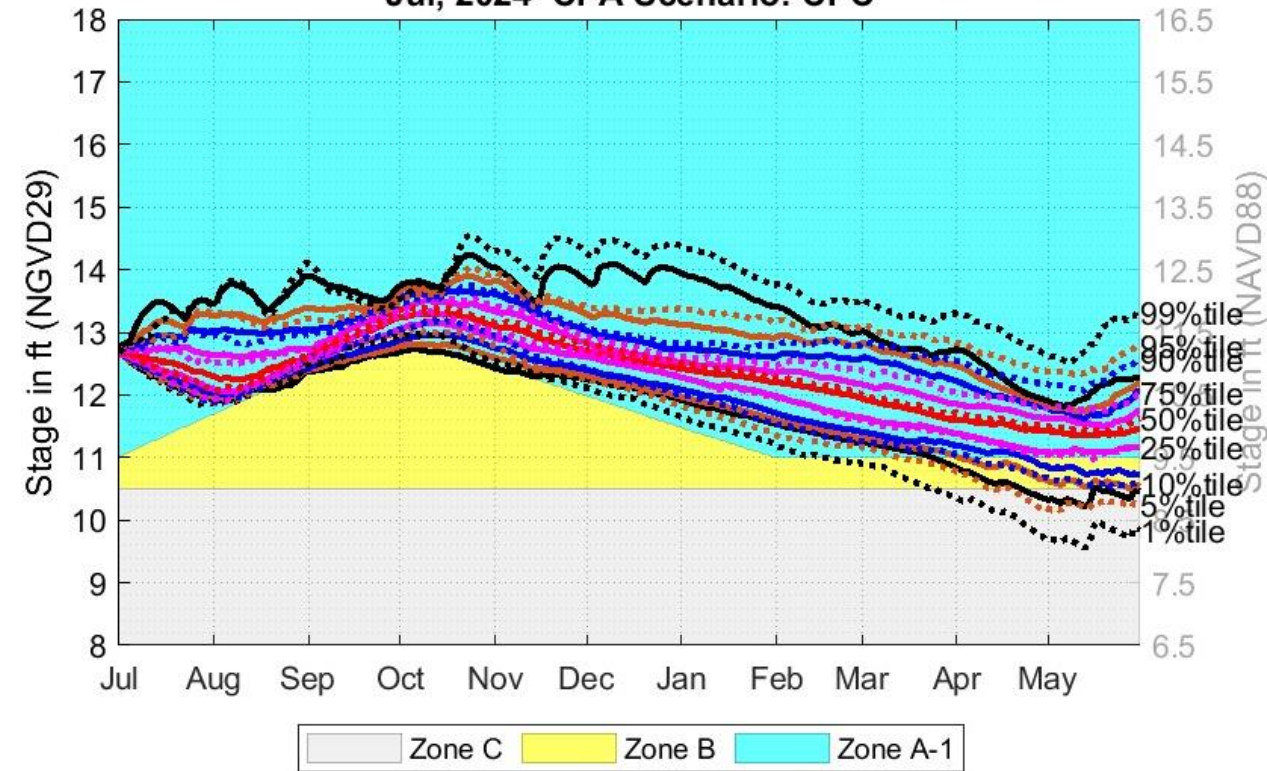
PrefSce

WCA2A Site-17

WCA2A Site-17

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: 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).

# July 2024 CPA: WCA2A under LOSOM



CPC

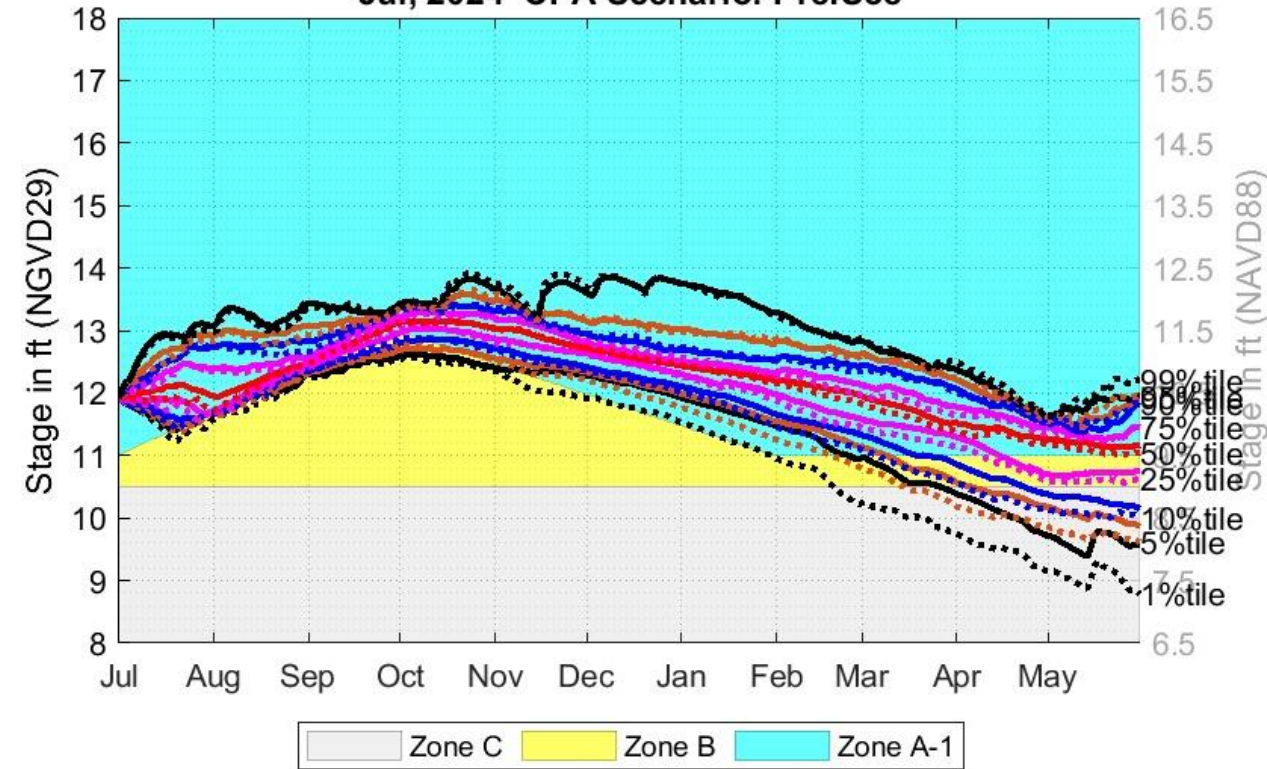
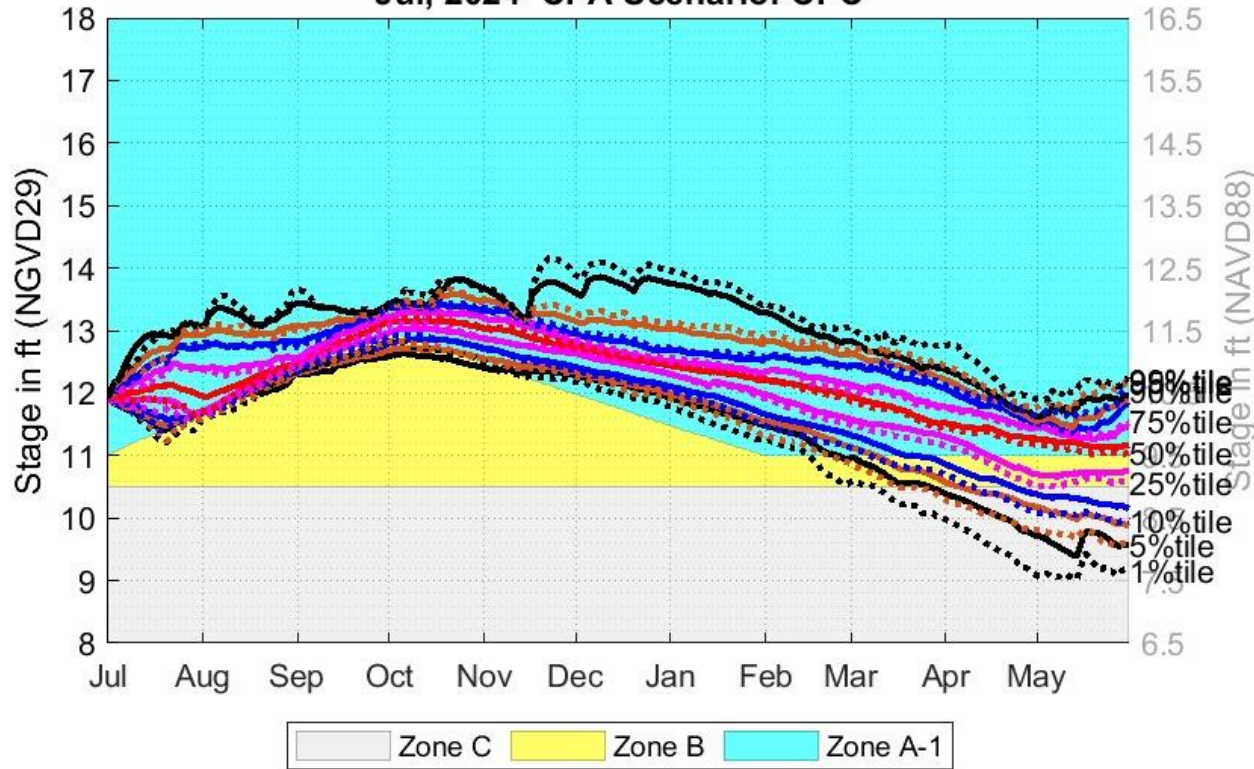
PrefSce

WCA2A S11B\_H

WCA2A S11B\_H

Jul, 2024 CPA Scenario: CPC

Jul, 2024 CPA Scenario: 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).

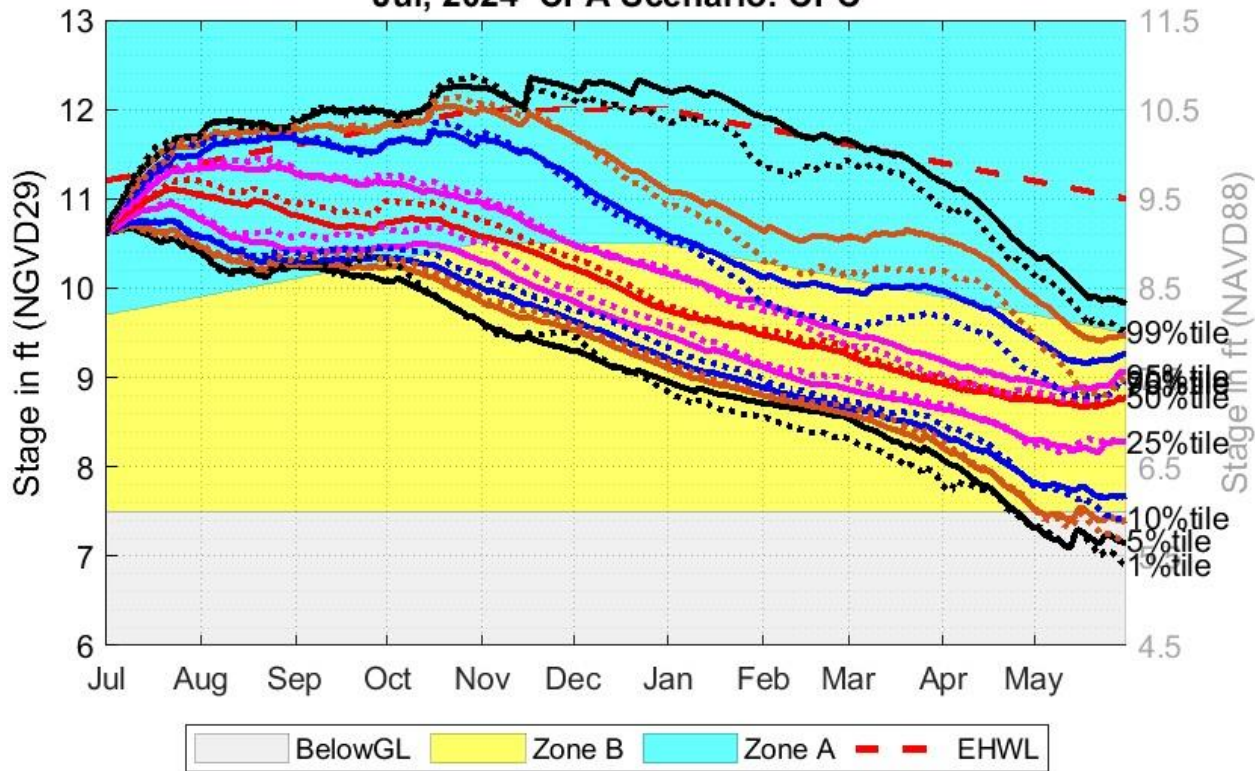
# July 2024 CPA: WCA3A under LOSOM



CPC

WCA3AAvg

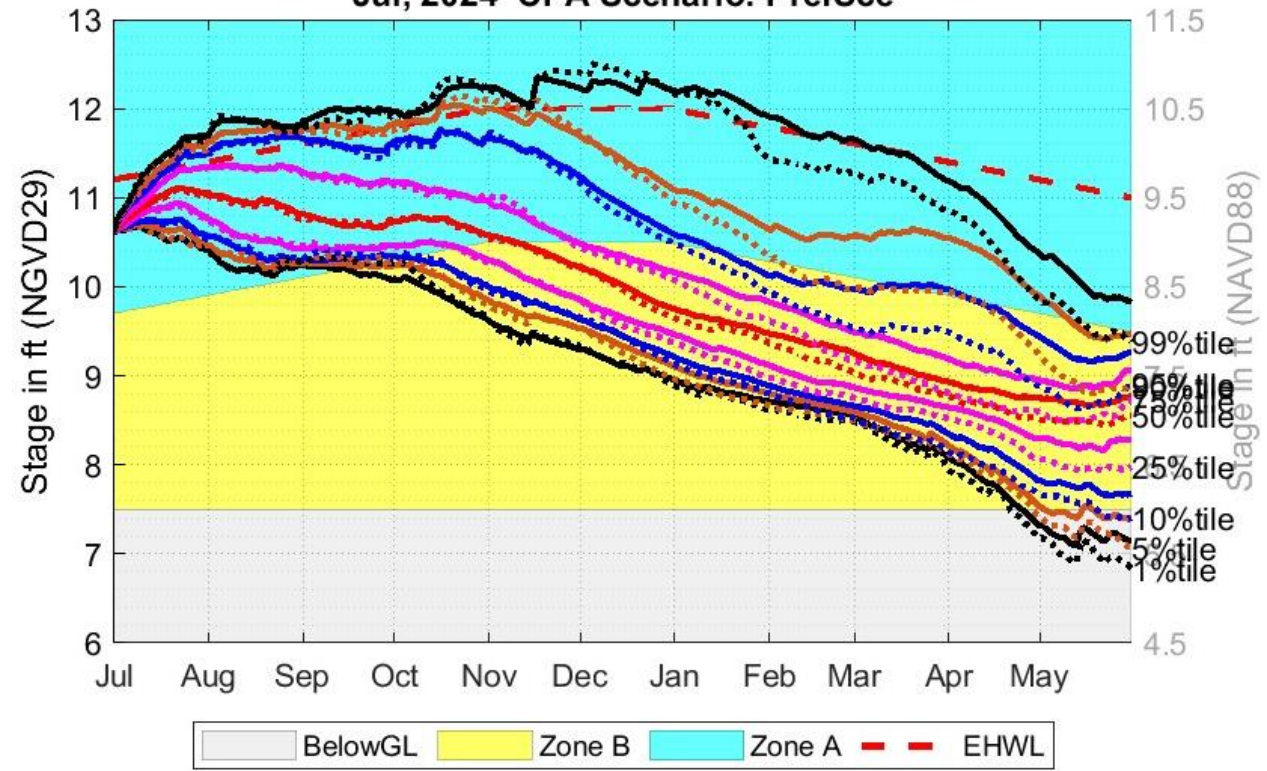
Jul, 2024 CPA Scenario: CPC



PrefSce

WCA3AAvg

Jul, 2024 CPA Scenario: 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 WCA3A).



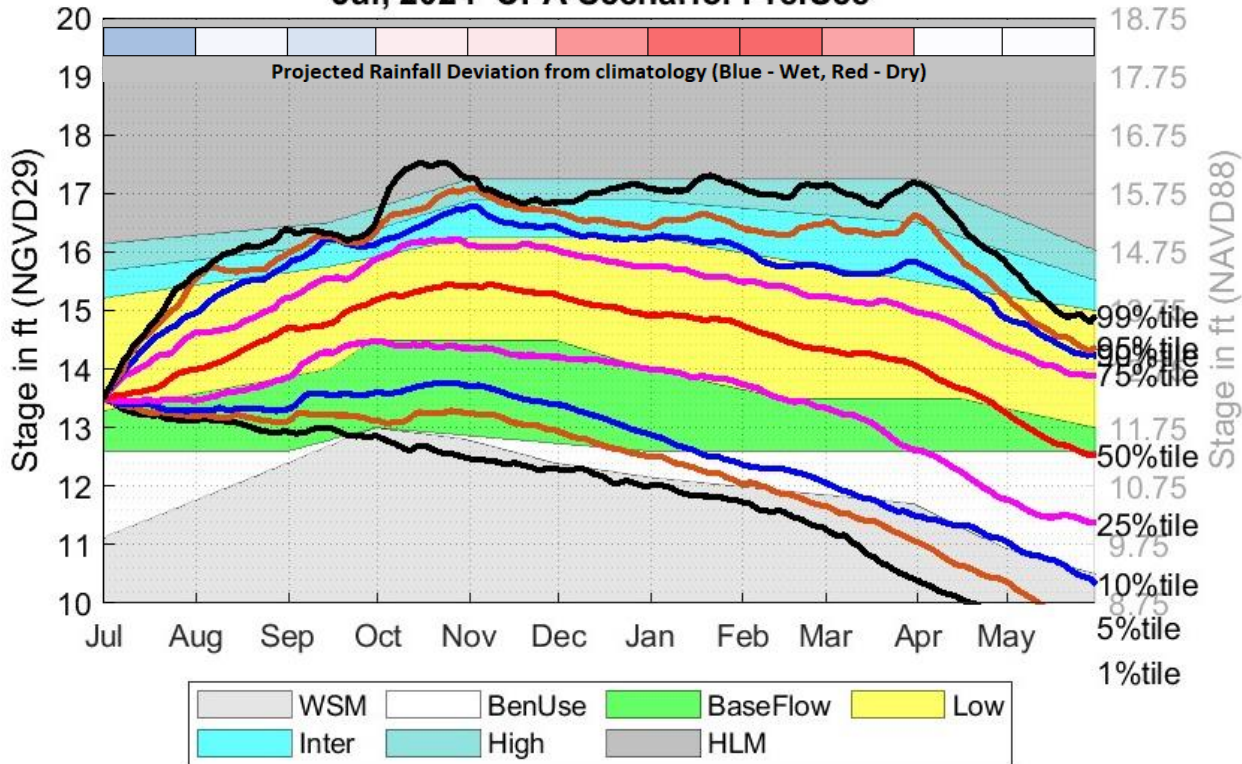
# LORS VS LOSOM FOR LOK

# July 2024 CPA: LORS vs LOSOM



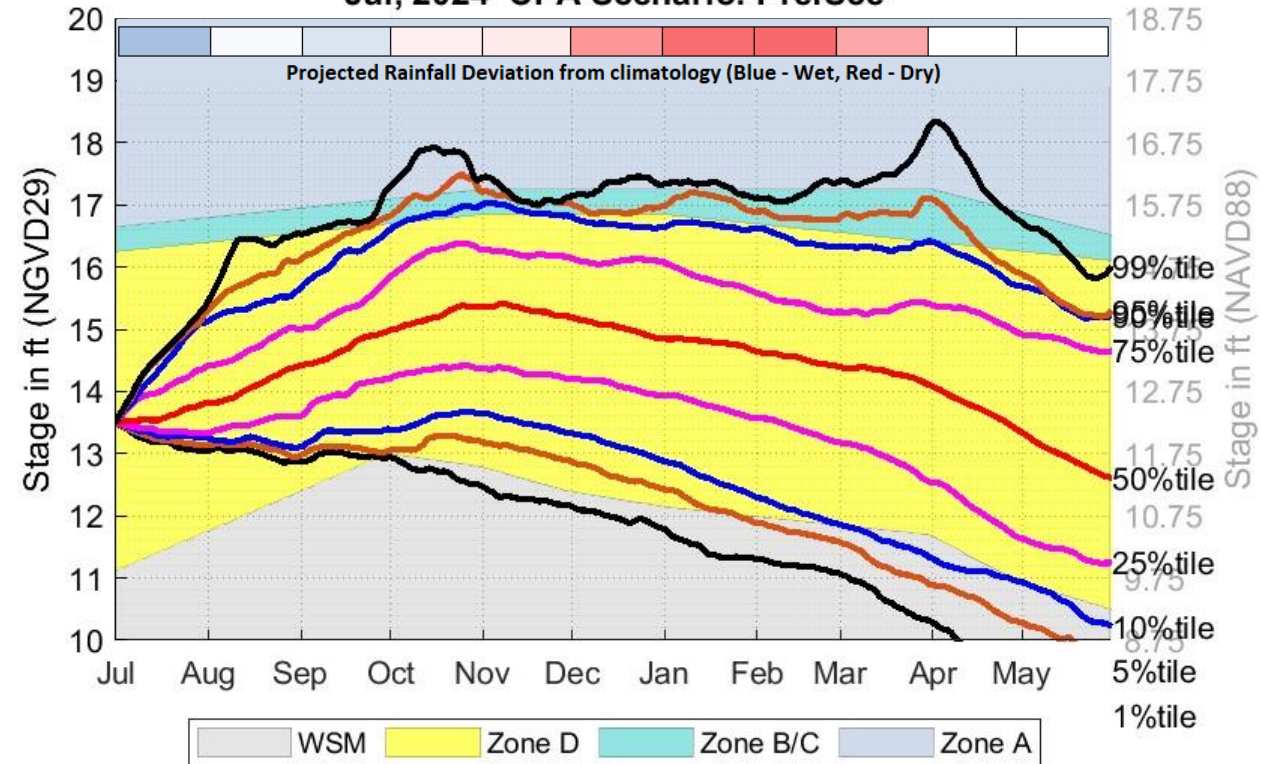
LOK

Jul, 2024 CPA Scenario: PrefSce



LOK

Jul, 2024 CPA Scenario: PrefSce



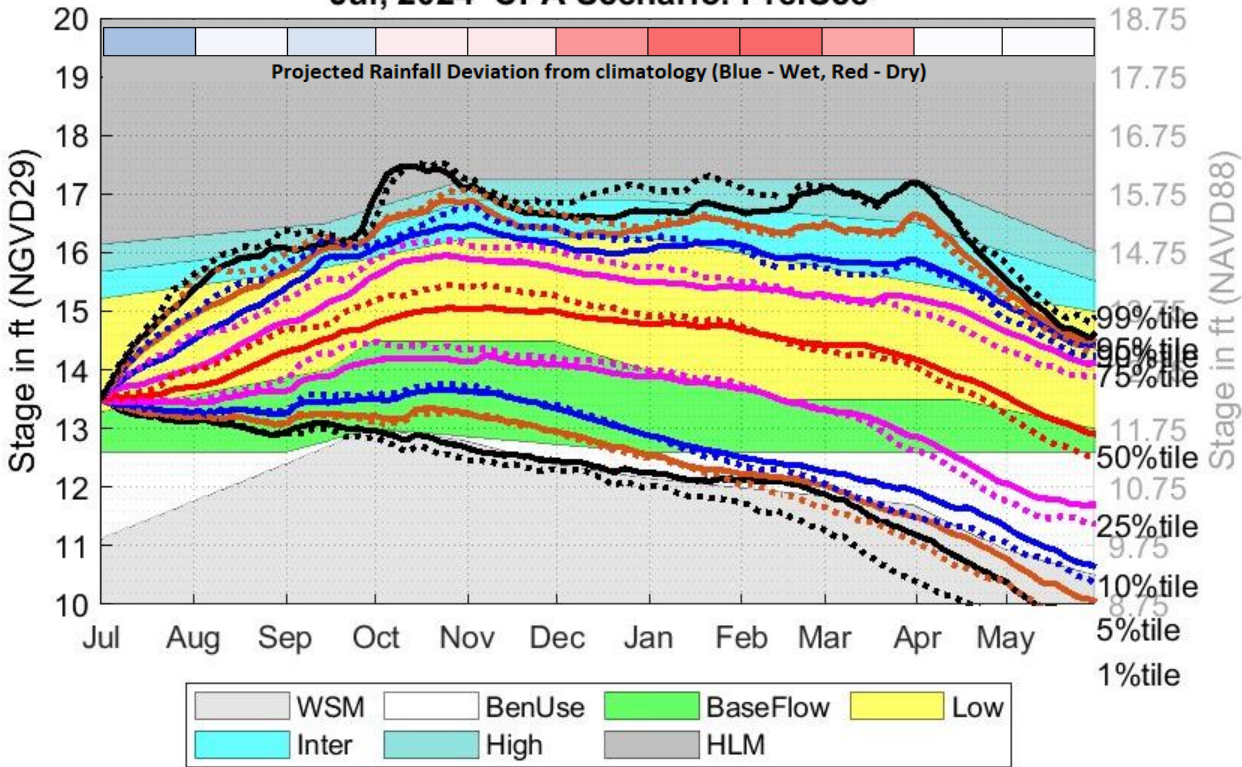
Secondary vertical axes show stages in NAVD88. These stages are based on Agreed Upon Regulation Schedule Conversion Offsets between NGVD29 and NAVD88 (1.25 ft for Lake Okeechobee).

# July 2024 CPA: LORS vs LOSOM



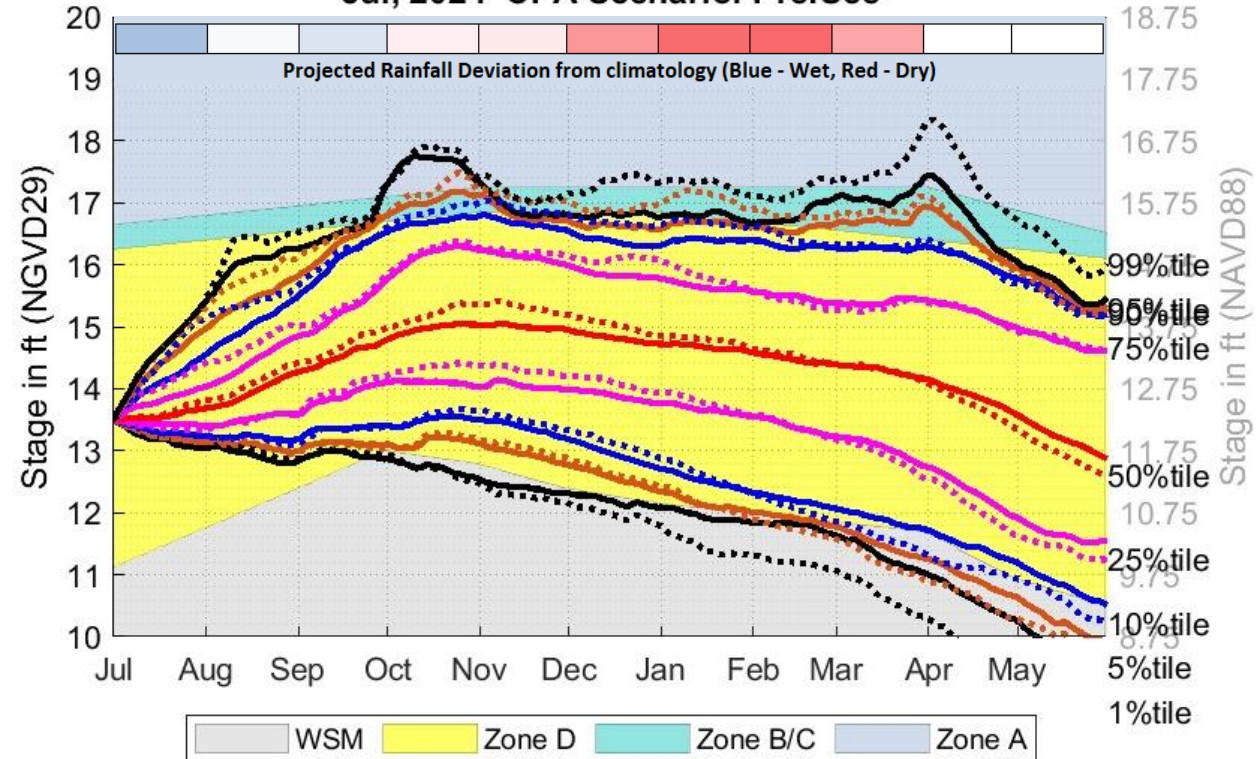
LOK

Jul, 2024 CPA Scenario: PrefSce



LOK

Jul, 2024 CPA Scenario: PrefSce



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