

# Lake Okeechobee Operations and Adaptive Protocols

**Semi-annual Update:  
Water Conditions and Operations  
Water Resources Advisory Commission  
*May 5, 2016***

**Calvin J. Neidrauer, P.E.**

Chief Engineer

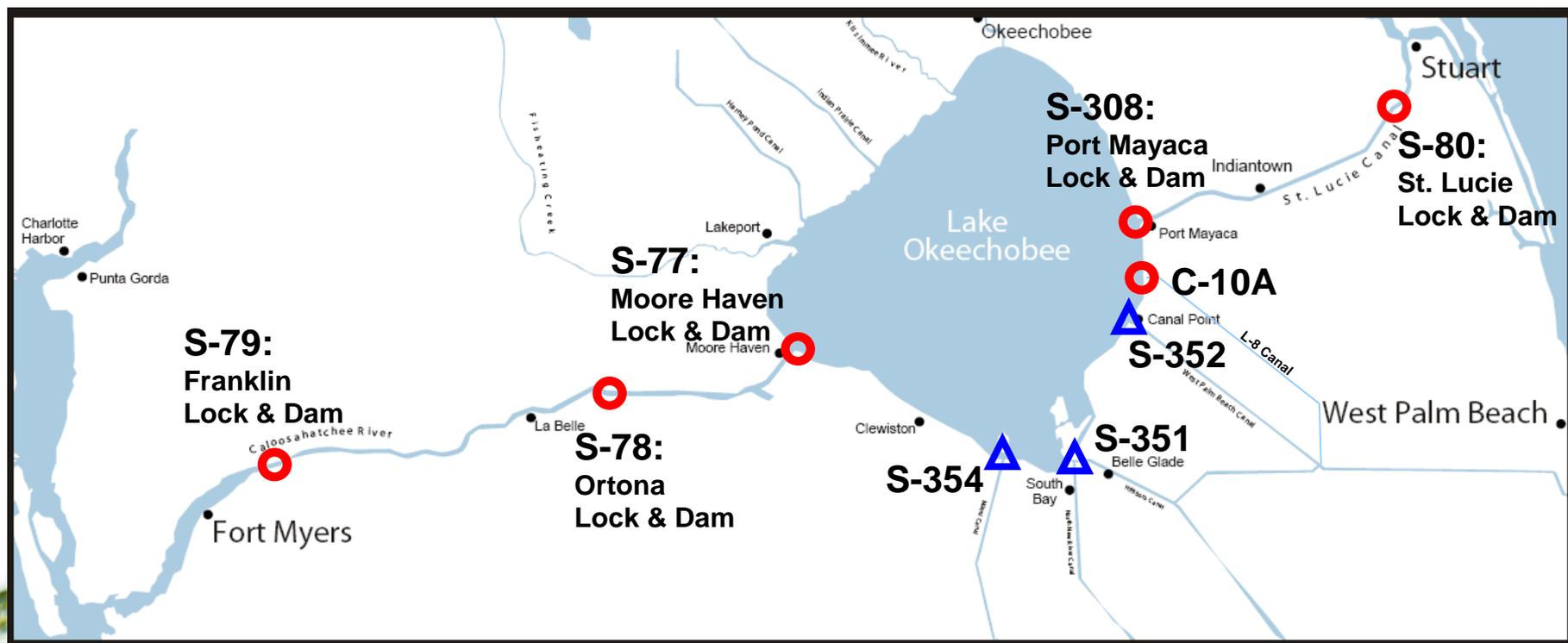
Hydrology & Hydraulics Bureau

# Topics

- 1. Summary of 2015-16 Dry Season Water Conditions & Operations**
- 2. 2016 Wet Season Outlook & Tentatively Planned Operations**

# Lake Okeechobee Outlet Structures

Lake Okeechobee outlet structures managed  
by the USACE (red o) and the SFWMD (blue Δ)



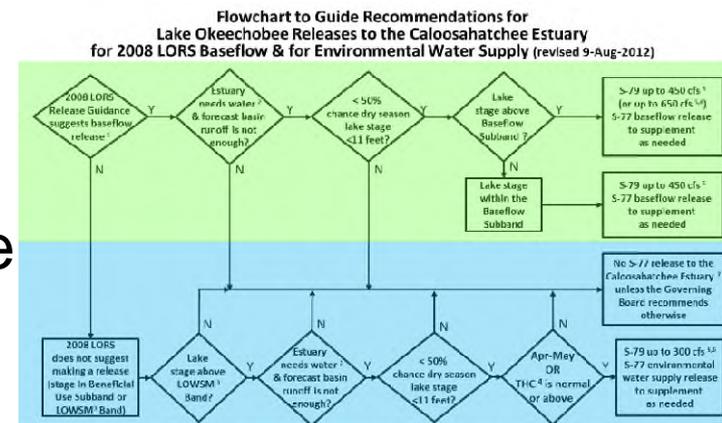
# What are the Lake O Adaptive Protocols (AP)?

- AP document (16-Sep-2010) provides operational guidance to SFWMD and a framework for making Lake O release recommendations to the USACE
- Recommends the USACE make “conservative” regulatory releases in the Low Subband at the beginning of the dry season (if no impact to HHD safety)
- Flowchart used to guide SFWMD recommendations for Lake O Releases to the Caloosahatchee Estuary

- for 2008 LORS Baseflow

- for Environmental Water Supply

- Flowchart designed primarily to achieve SFWMD Governing Board-approved water supply balance between permitted water users, Caloosahatchee Estuary, and the Lake O MFL



<sup>1</sup>The 2008 LORS Release Guidance (Part D) can suggest baseflow releases in the Intermediate, Low, or Baseflow Subbands

<sup>2</sup>Estuary “needs” water when the 30-day moving average salinity at I-75 bridge is projected to exceed 5 practical salinity units (psu) within 2 weeks.

<sup>3</sup>LOWSM = Lake Okeechobee Water Shortage Management.

<sup>4</sup>Tributary Hydrologic Condition (THC) is based on classification of Lake Okeechobee Net Inflow and Palmer Index.

<sup>5</sup>Can’t release less than the “up to” limit if lower release is sufficient to reach or sustain desired estuary salinity; cfs = cubic feet per second.

<sup>6</sup>After reviewing conditions in Water Conservation Areas (WCAs), Stormwater Treatment Areas (STAs), ETP, St. Lucie Estuary and Lake Okeechobee.

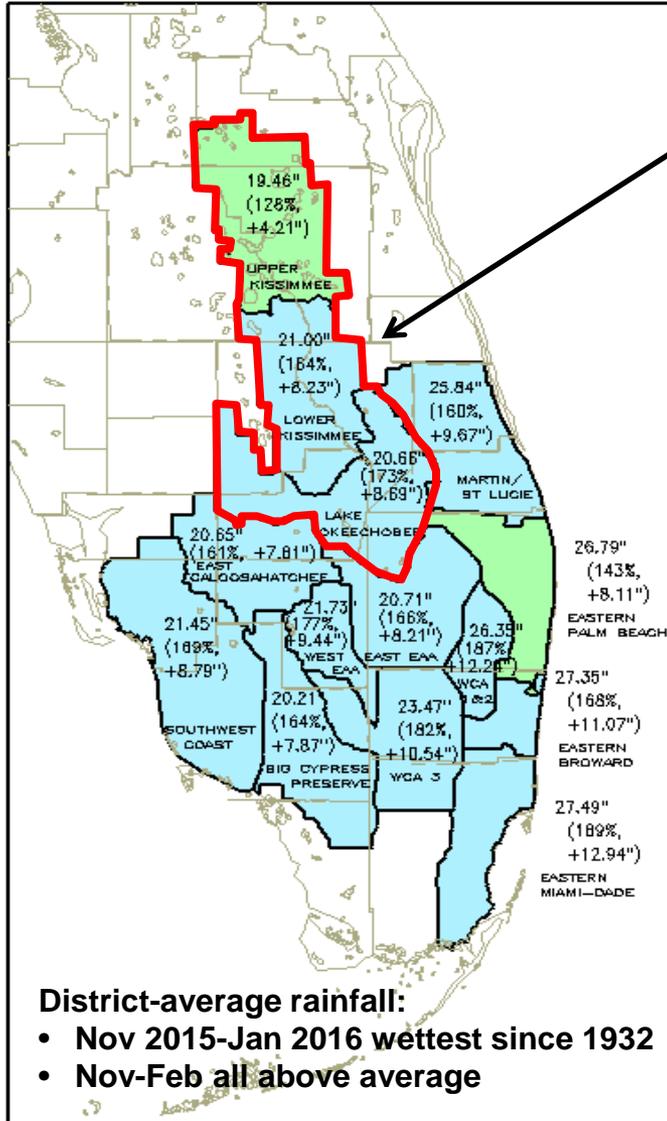
<sup>7</sup>Should this condition be reached, the Governing Board will be briefed at their next regularly scheduled meeting as part of the State of the Water Resources agenda item.

2015-16 Dry Season

# SFWMD RAINFALL

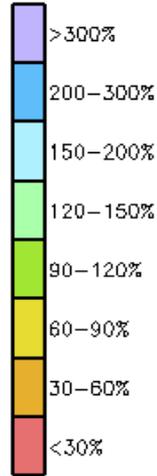
April 2016

SFWMD Rainfall  
02-NOV-2015 to 01-MAY-2016



All Basins received above-average rainfall

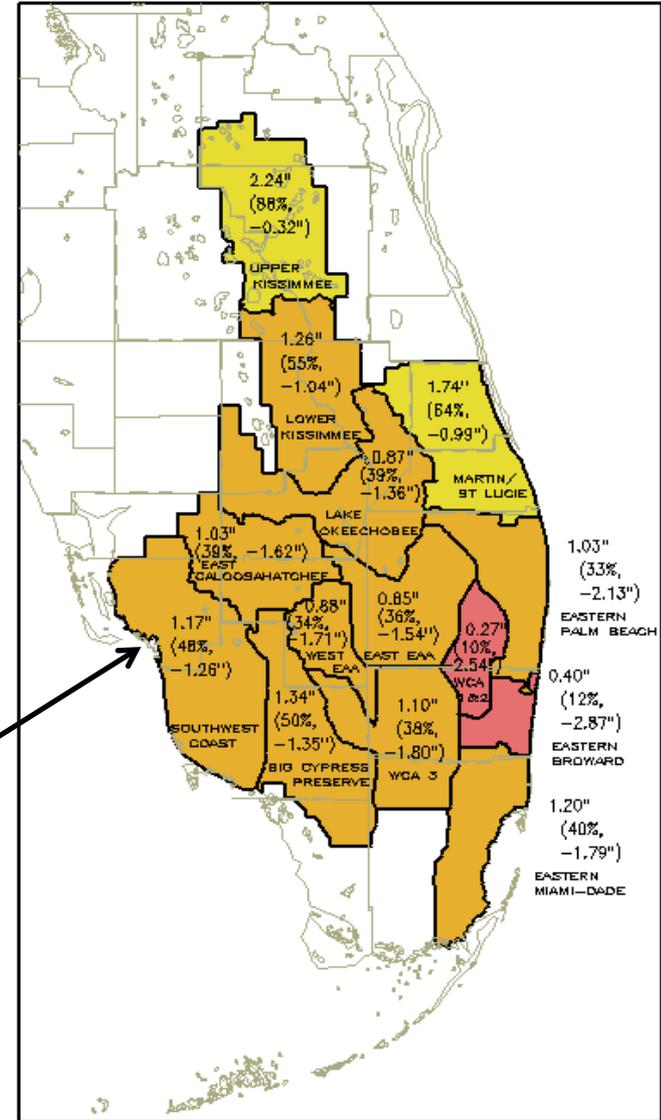
- UKB +4.4"
- All others at least +8"
- Lake O watershed +7.3"
- Others Combined +9.6"
- WCA3 +11"



All Basins received below-average April rainfall

Measured (% of Avg. Diff From Avg.)

SFWMD Rainfall  
02-APR-2016 to 01-MAY-2016



DISTRICT-WIDE: 22.38" (163%, +8.68")



DISTRICT-WIDE: 1.19" (45%, -51.43")

# Lake O Watershed Received Above-Average 2015-16 Winter Rainfall Consistent with Strong El Niño Years

## SFWMD Rainfall Statistics for the Lake Okeechobee Watershed

(Combined UK, LK and Lake O Rain Areas)

Lake Okeechobee Watershed Rainfall (in)									Departures from 1986-2015 Average (in)								#yrs>avg
	AvgRF(in)	65-66	72-73	82-83	87-88	97-98	02-03	15-16		65-66	72-73	82-83	87-88	97-98	02-03	15-16	
Nov	1.99	0.6	3.4	3.3	8.2	4.9	3.1	2.8	Nov	-1.4	1.4	1.3	6.2	2.9	1.1	0.8	6/7
Dec	1.90	1.3	1.8	1.0	0.4	7.3	8.0	2.3	Dec	-0.6	-0.1	-0.9	-1.5	5.4	6.1	0.4	3/7
Jan	1.94	4.2	3.8	3.4	2.4	3.5	0.1	7.9	Jan	2.2	1.9	1.4	0.5	1.6	-1.8	5.9	6/7
Feb	1.90	4.3	2.1	8.8	2.3	7.5	1.4	2.6	Feb	2.4	0.2	6.9	0.4	5.6	-0.5	0.7	4/7
Mar	3.11	1.0	3.0	5.0	5.2	5.5	4.5	3.3	Mar	-2.1	-0.2	1.9	2.1	2.4	1.4	0.2	5/7
Apr	2.26	2.1	2.3	2.2	1.0	1.2	2.2	1.5	Apr	-0.2	0.0	0.0	-1.2	-1.0	0.0	-0.8	0/7
Nov-Mar	10.84	11.4	14.0	21.5	18.5	28.8	17.2	18.9	Nov-Mar	0.5	3.2	10.6	7.6	17.9	6.3	8.1	7/7
Nov-Apr	13.10	13.5	16.3	23.7	19.5	30.0	19.4	20.4	Nov-Apr	0.4	3.2	10.6	6.4	16.9	6.3	7.3	7/7
									Rank(Nov-Mar)	7	6	2	4	1	5	3	
									Rank(Nov-Apr)	7	6	2	4	1	5	3	

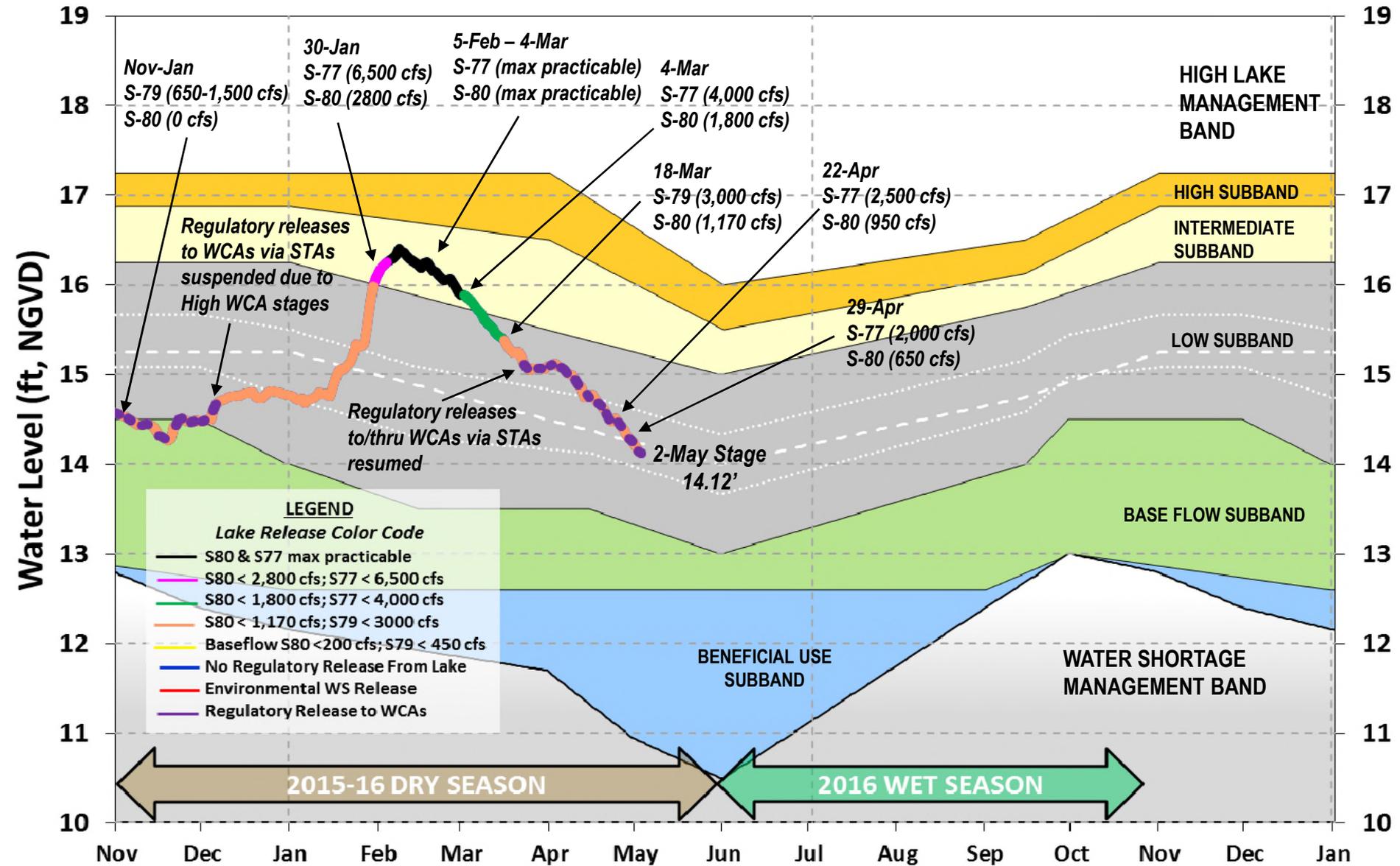
- **2015-16 was 3<sup>rd</sup> wettest El Niño Winter for the Lake O Watershed (75% above-average for Nov-Mar)**
- **4<sup>th</sup> wettest since 1965**

**occurred during the 2015-16**

## **~~What can likely occur during an El Niño winter?~~**

- Above-normal rainfall
- Less ET - more cloudy skies and cooler temps
- Reduced irrigation demand
- Increased basin runoff
- Above normal inflows to Lake Okeechobee
- Reduced capacity to discharge excess Lake O water south
- Higher Lake O releases to the coastal estuaries

# 2015-2016 Lake Okeechobee Water Level and Releases



# Lake O Release Summary

## Nov 2015 – Apr 2016

(provisional flow data)

- 112 kaf Lake O regulatory releases south
  - 88 kaf to STAs and FEBs + 24 kaf to tide via WPB Canal
  - Less than same period in 2015 (150 kaf) and 2014 (207 kaf)
  - WCA water levels above regulation most of the 2015-16 dry season
- 713 kaf Lake O regulatory releases from S-77 to the Caloosahatchee Estuary (began 23-Oct-2015)
  - Total Flow to CE was 1,450 kaf  
(49% Lake O; 35% C-43 basin runoff; 16% tidal basin runoff)
- 329 kaf Lake O regulatory releases from S-308 to the St. Lucie Estuary (began 30-Jan-2016)
  - Total Flow to SLE was 823 kaf  
(40% Lake O; 14% C-44 basin runoff; 46% other basin runoff)
- No Environmental Water Supply Releases were made to the Caloosahatchee Estuary per the Lake O Adaptive Protocols
  - Lake stage above Baseflow Subband of LORS
  - salinity was below the threshold defined by the AP release guidance

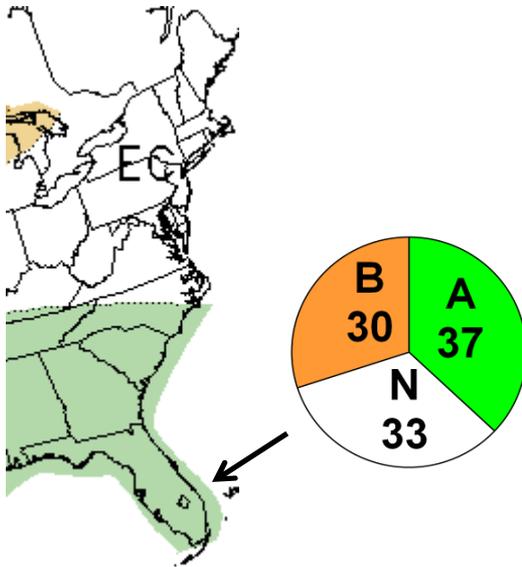
# Lake Okeechobee: Current Operations

- **USACE's Lake O Regulation Schedule (2008 LORS)**
  - Stage (~14.1 feet, NGVD) receding in middle of Low Subband
  - Current release guidance outcome:
    - S-79: up to 3,000 cfs
    - S-80: up to 1,170 cfs
    - WCAs: up to maximum practicable to the WCAs if desirable or with minimum Everglades impacts
  - USACE current operations: S-79: 2000 cfs; S-80: 650 cfs
  - SFWMD has been releasing 3,000 – 7,000 ac-ft/week to STAs & FEBs during the past 4 weeks in preparation for wet season
- **SFWMD's Lake O Adaptive Protocols Guidance (2010)**
  - AP currently not applicable
  - Lake stage has low chance of receding into the Baseflow Subband before the wet season typically starts in late May
  - If LORS guidance specifies Baseflow releases, the AP release guidance would be used to make SFWMD recommendations

# U. S. Seasonal Precipitation Outlook

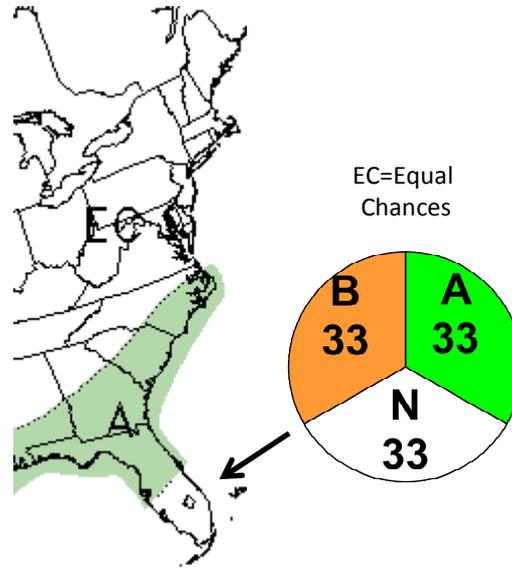
National Climate Prediction Center (CPC)

May-Jul 2016



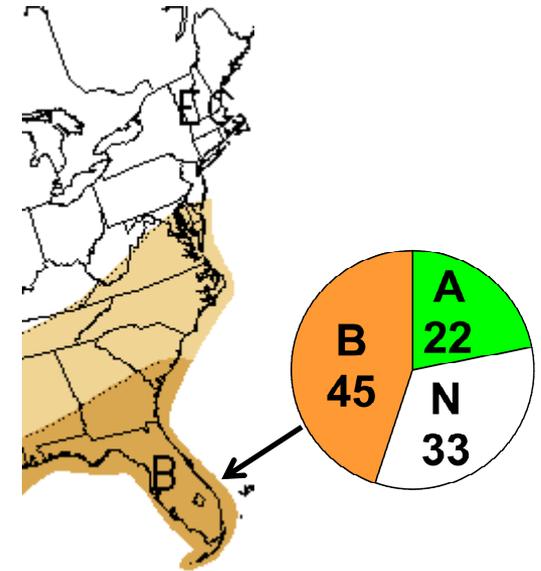
Posted 21-Apr-2016

Aug-Oct 2016



Posted 21-Apr-2016

Nov 2016-Jan 2017



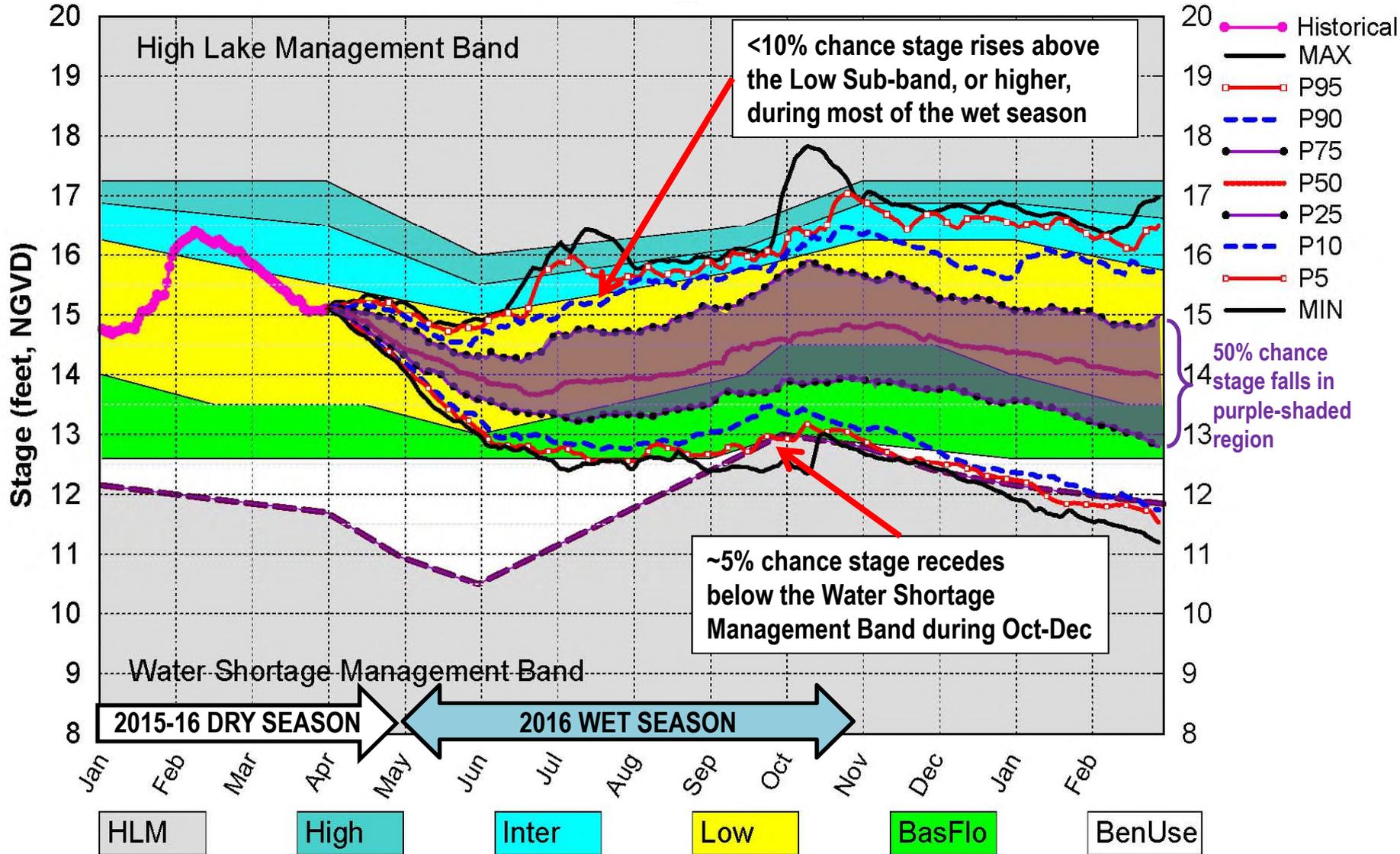
Posted 21-Apr-2016

The most-recent CPC precipitation outlooks for central & southern Florida indicate:

- 33-40% chance for Above-Normal (A) rainfall for May-Jul 2016
- Equal Chances for A, N, B rainfall for Aug-Oct 2016
- 46% chance of Below-Normal (B) rainfall for Nov 2016 – Jan 2017
- Increased chances of B due to the outlook for a winter La Niña

# Lake Okeechobee SFWMM Apr 2016 Dynamic Position Analysis

Percentiles based on 41 equally-likely outcomes starting with Oct 1<sup>st</sup> initialization



(See assumptions on the Position Analysis Results website)

# Tentatively Planned Lake O Operations 2016 Wet Season

- **SFWMD to continue weekly Lake O release recommendations to the USACE based on**
  - Recommendations from SFWMD scientists
  - Adaptive Protocols Release Guidance (if applicable)
  - Findings from model projections and operations analyses
  
- **USACE plans to continue releases per the 2008 LORS guidance within the allowable operating flexibility**
  - USACE decisions based on best available information and input from various government agencies and the public
  - Operations to be consistent with design and intent of LORS per 2007 EIS & the associated balance of multiple project purposes

# Questions??

