

*Water Resources Advisory Commission  
November 7, 2013*

# Adaptive Protocols for Lake Okeechobee Operations

## **Water Conditions and Operations: Past, Present and 2013-14 Dry Season Outlook**

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Water Control Operations Bureau*

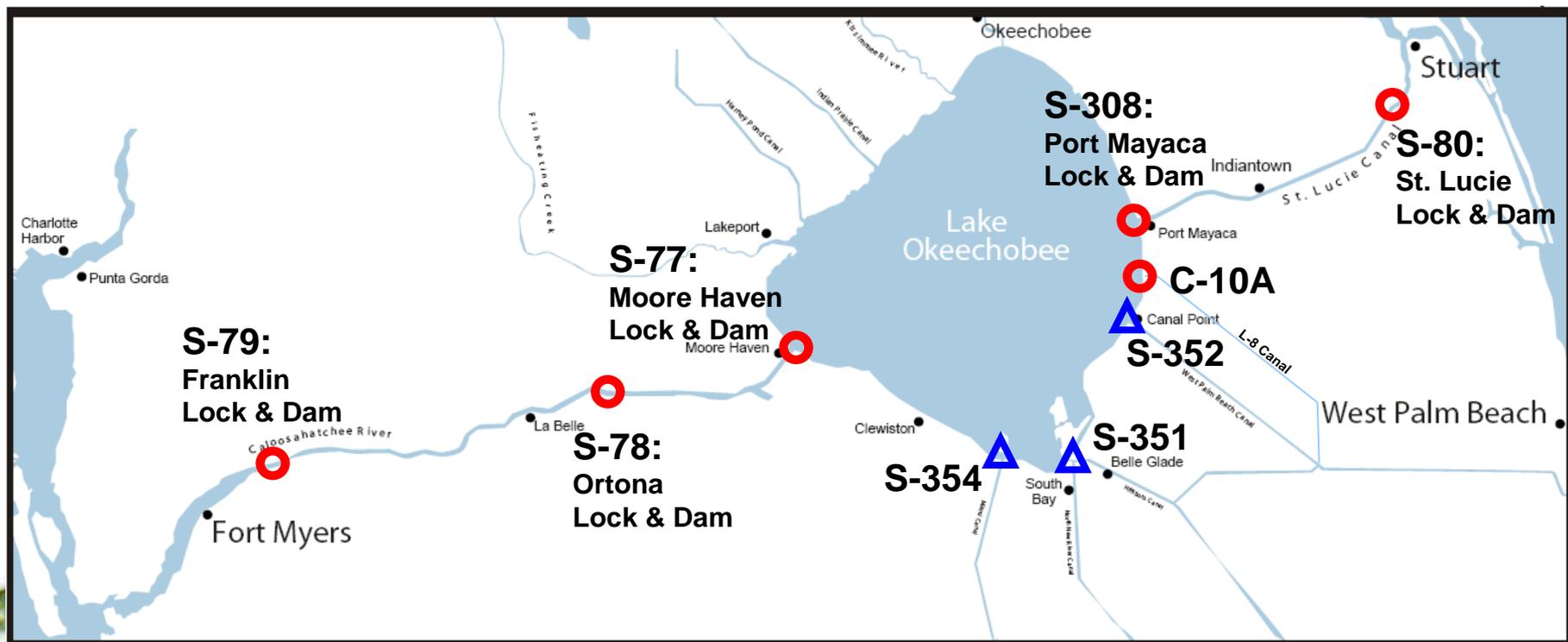
# Topics

- 1. Brief Background**
- 2. Summary of 2013 Wet Season Water Conditions & Operations**
- 3. Current Water Conditions & Operations**
- 4. 2013-14 Dry Season Outlook and Tentatively Planned Operations**

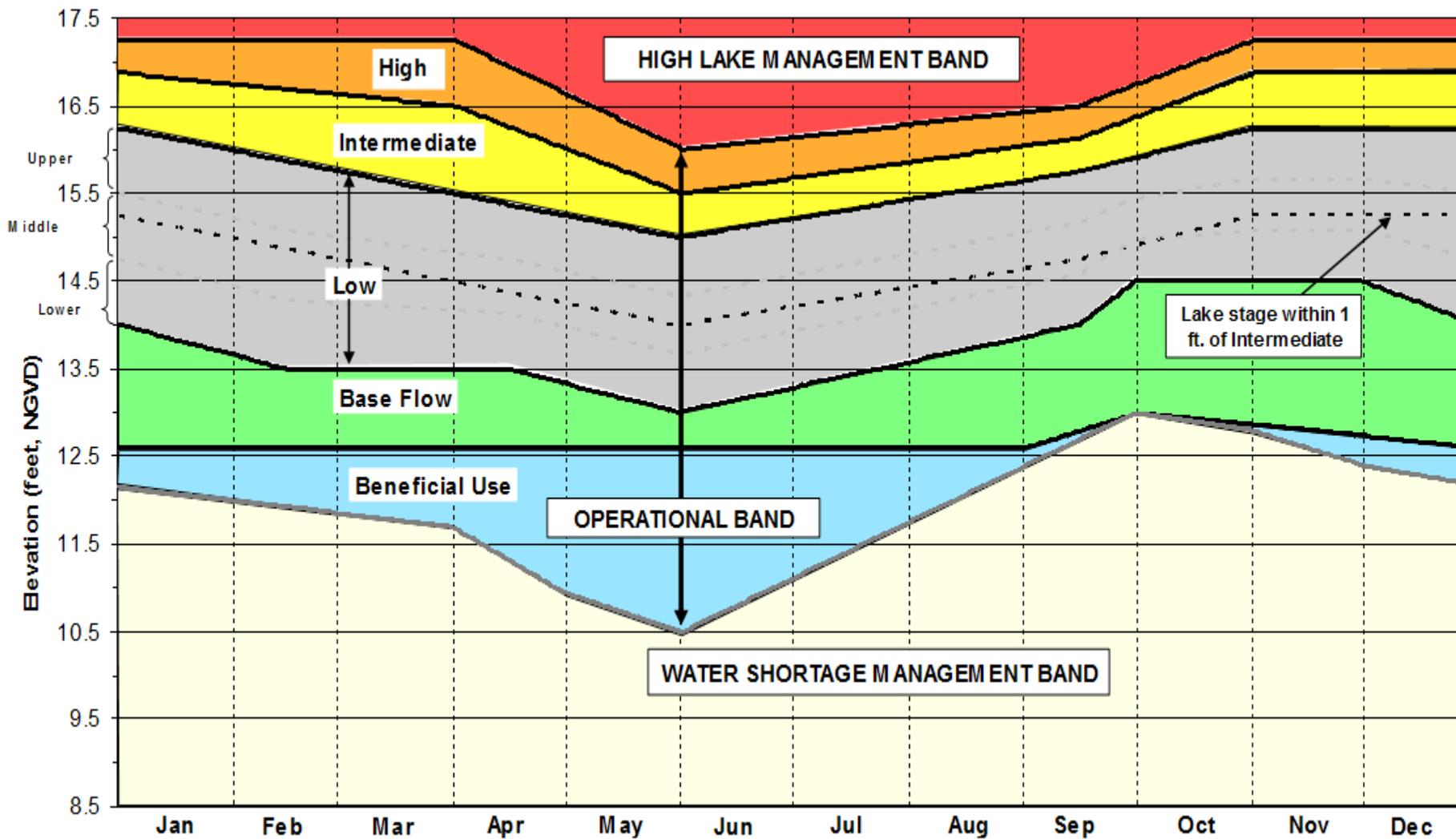
# Part 1. Brief Background on Lake O Operations

# Lake Okeechobee Outlet Structures

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



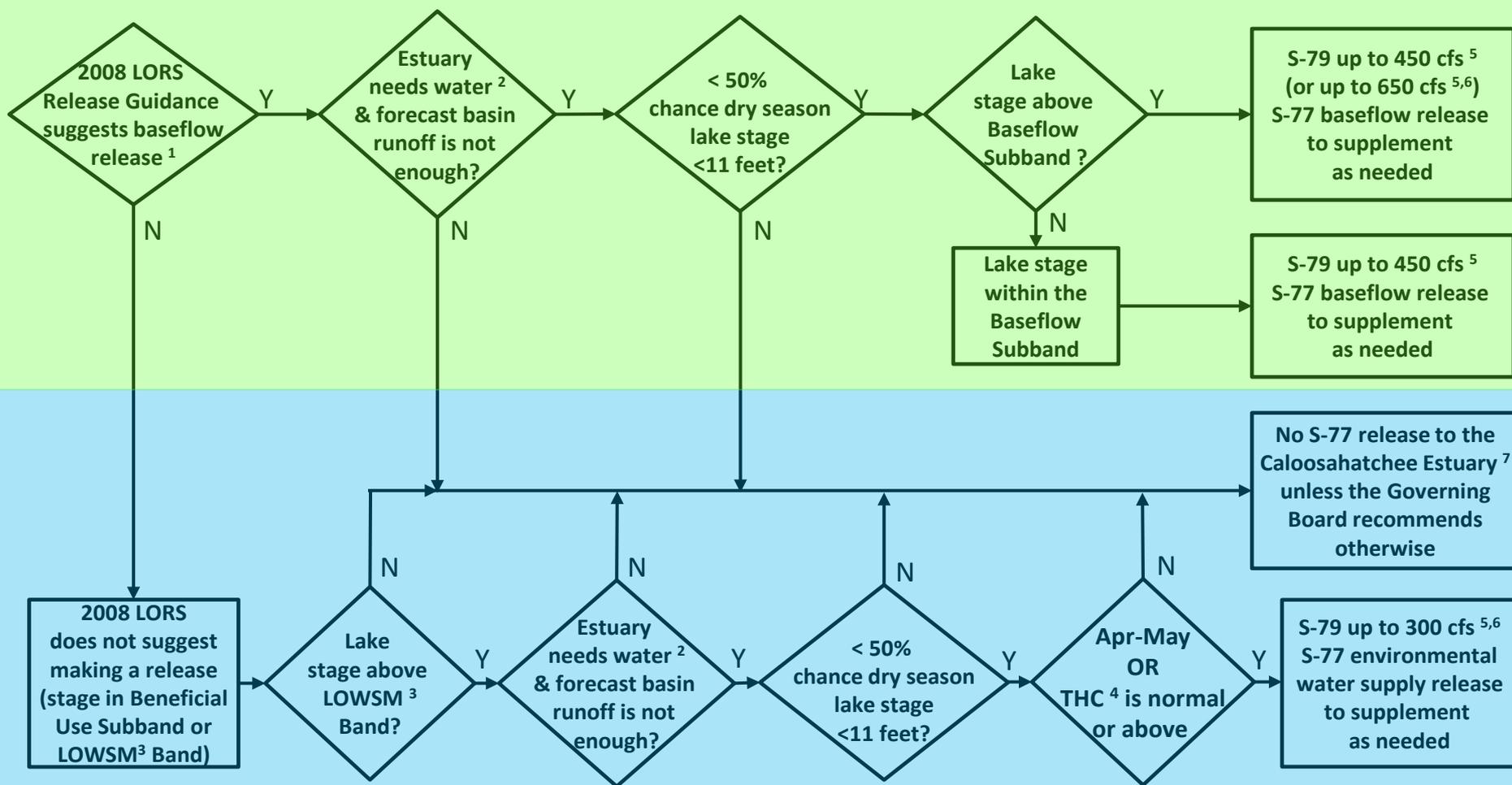
# 2008 Lake Okeechobee Interim Regulation Schedule (aka LORS-2008)



# 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” 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

# Flowchart to Guide Recommendations for Lake Okeechobee Releases to the Caloosahatchee Estuary for 2008 LORS Baseflow & for Environmental Water Supply (revised 9-Aug-2012)



<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 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), ENP, 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.

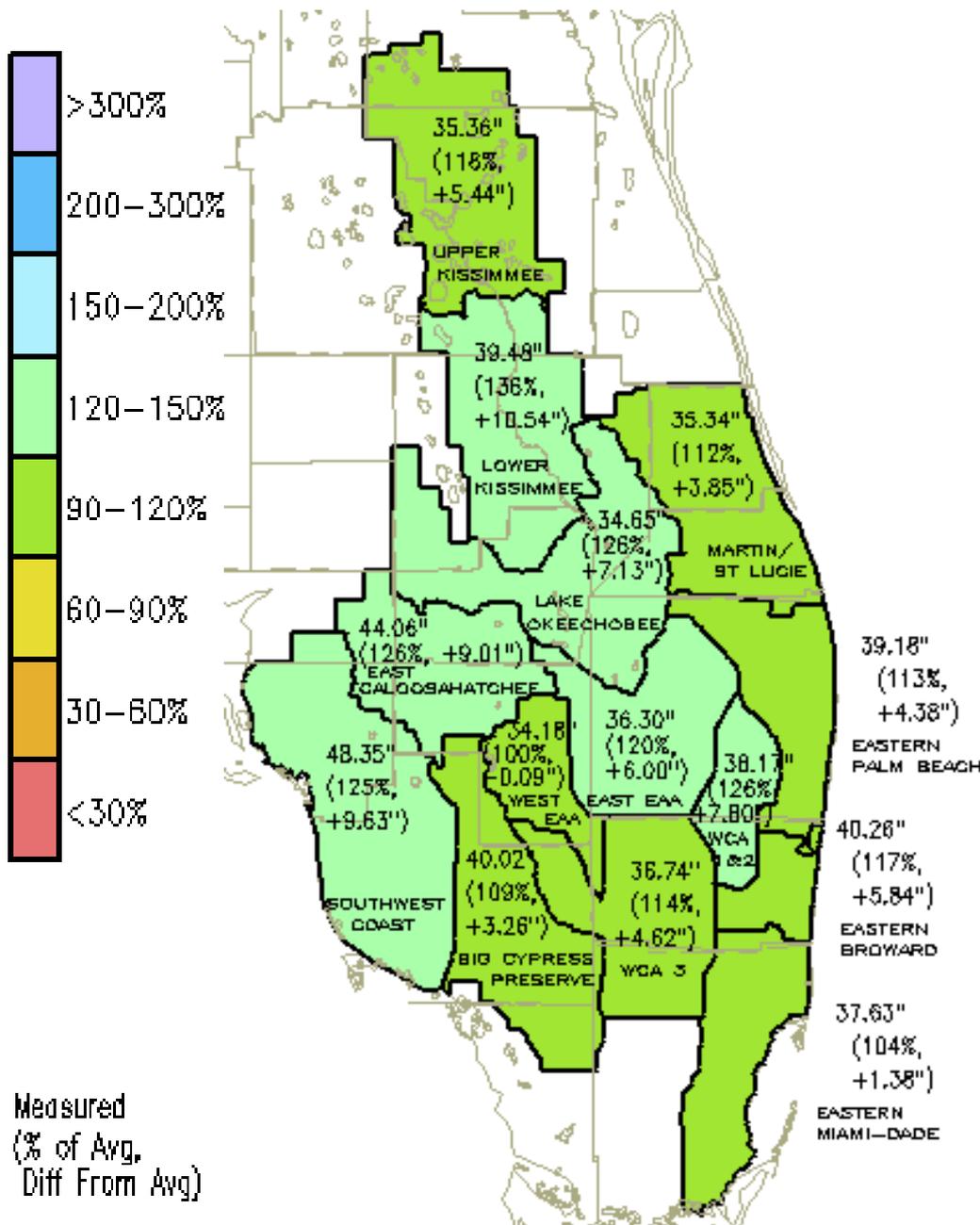
# Part 2. 2013 Wet Season Water Conditions & Operations

## Wet Season Rainfall

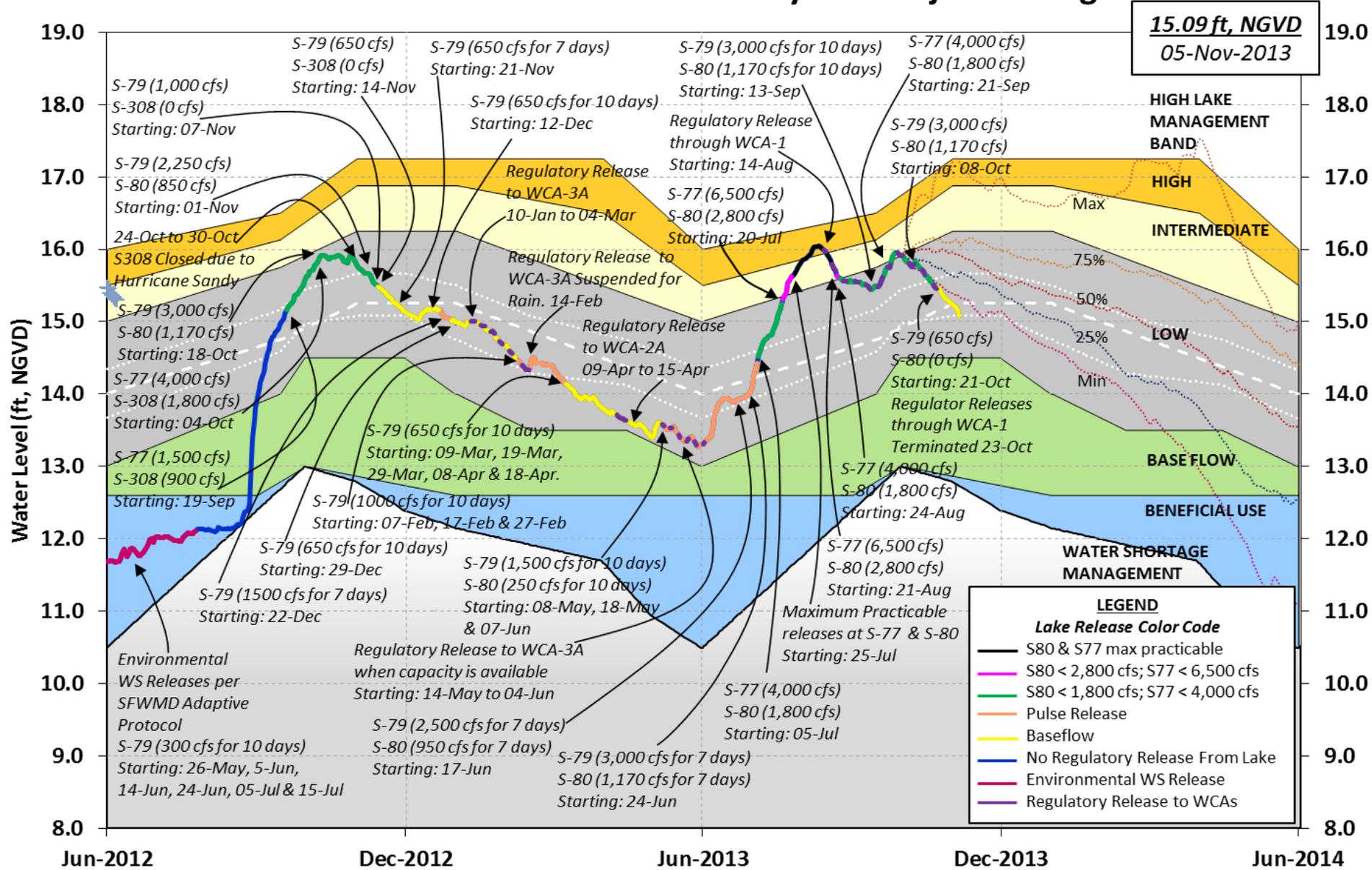
May 18 2013 – Oct 8 2013

**DISTRICT-WIDE: 38.99"**  
**(120% of Avg, or +6.37")**

- Wet Season Started Early and Ended Early  
 ~ May 18<sup>th</sup> – Oct 8<sup>th</sup>
- All basins > average
- April-July was record high (9-10" > average)
- August was dry (2" < average)  
 September was near average
- April-September period with 45.2" was the wettest since 1960 (53-yr period)
- October was 2.4" < average



# Lake Okeechobee Water Level History and Projected Stages



LORS-2008

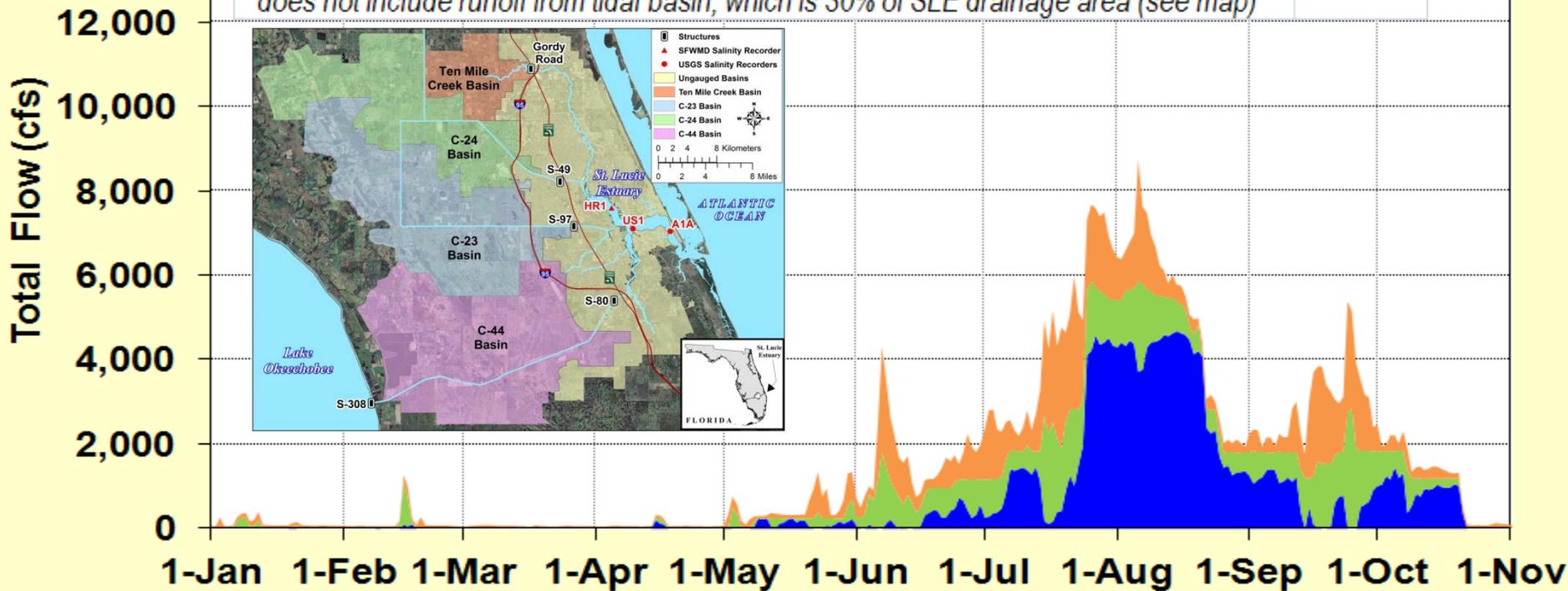
Adopted by USACE 28-April-2008

Projected Stage Percentiles From  
SFWMD-HESM Position Analysis

# 2013 Discharges: St. Lucie Estuary

SLE Inflows* [1000 ac-ft]	Jan-May	June	July	Aug	Sep	Oct	Jun-Oct
C23, C24 & Tenmile Creek:	33 (59%)	44 (45%)	97 (36%)	42 (14%)	69 (40%)	13 (18%)	265 (29%)
C44 Basin Runoff:	18 (32%)	41 (43%)	75 (28%)	51 (17%)	55 (32%)	17 (25%)	239 (26%)
Lake Okeechobee:	5 (9%)	12 (13%)	99 (37%)	215 (70%)	49 (28%)	40 (57%)	414 (45%)
<b>Total*</b>	<b>56</b>	<b>97</b>	<b>270</b>	<b>308</b>	<b>173</b>	<b>70</b>	<b>918</b>

\* does not include runoff from tidal basin, which is 30% of SLE drainage area (see map)



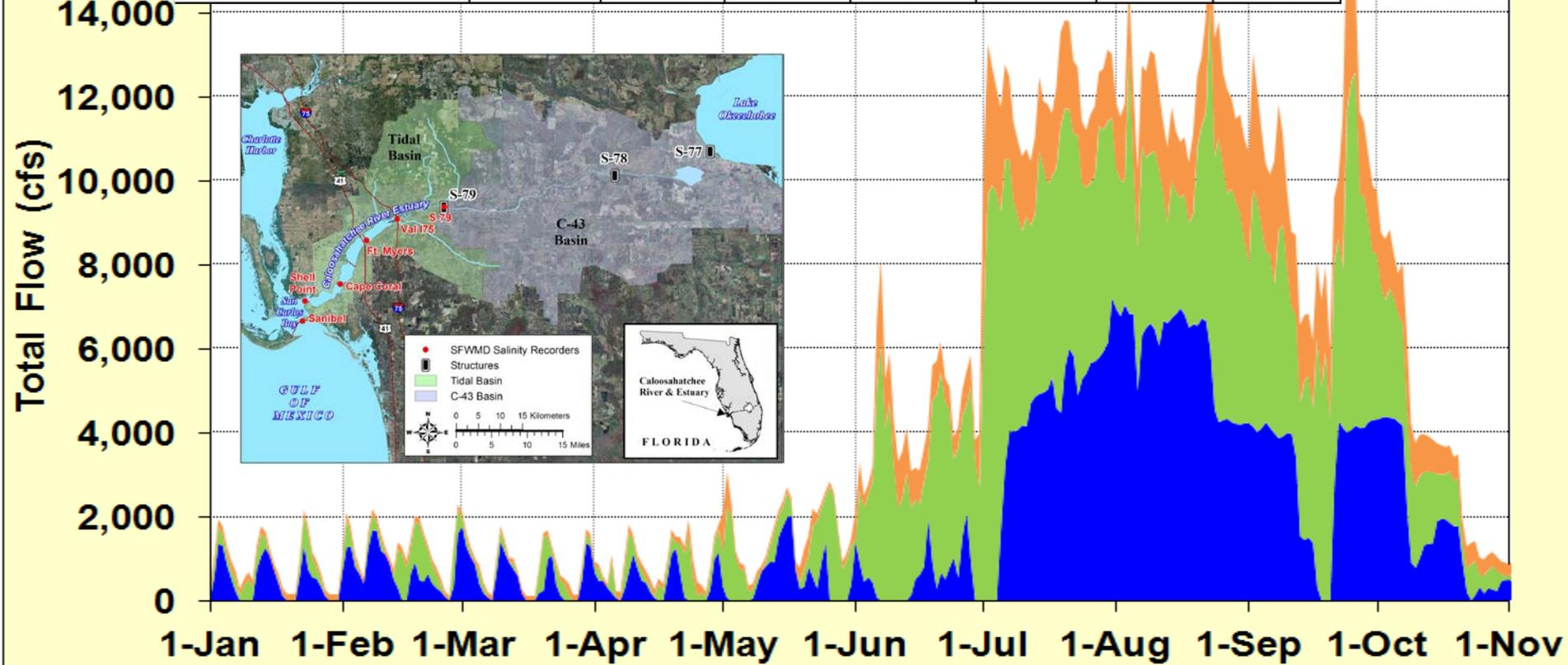
- Inflow from C-24, C-23, and Tenmile Creek Basins\*  
*Does not include runoff from tidal basin or groundwater*
- C-44 Basin Runoff
- Inflow from Lake

*Data through Oct 31<sup>st</sup>*

Data are provisional and subject to change

# 2013 Discharges: Caloosahatchee Estuary

CRE Inflows [1000 ac-ft]	Jan-May	June	July	Aug	Sep	Oct	Jun-Oct
Tidal Basin (estimated):	49 (14%)	49 (19%)	120 (17%)	121 (16%)	129 (21%)	49 (20%)	469 (18%)
C43 Basin Runoff:	124 (36%)	173 (67%)	338 (47%)	252 (34%)	287 (48%)	92 (37%)	1142 (45%)
Lake Okeechobee	170 (50%)	34 (13%)	257 (36%)	369 (50%)	187 (31%)	106 (43%)	953 (37%)
<b>Total</b>	<b>343</b>	<b>256</b>	<b>715</b>	<b>742</b>	<b>603</b>	<b>248</b>	<b>2563</b>

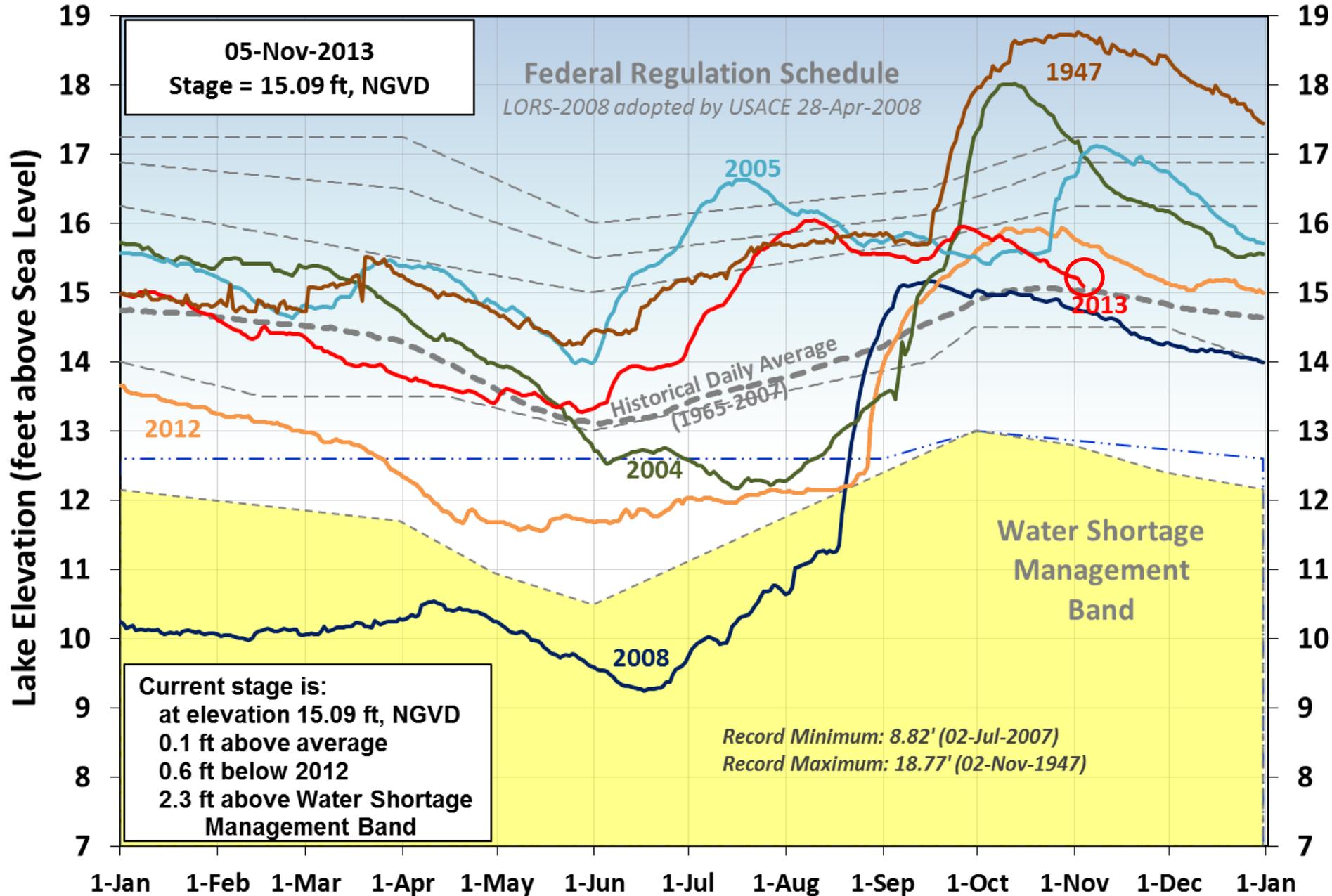


■ Inflow from Lake      *Data through Oct 31<sup>st</sup>*  
■ C-43 Basin Runoff  
■ Tidal Basin Runoff (downstream of S-79)

Data are provisional and subject to change

# Part 3. Current System Water Conditions & Operations

# Lake Okeechobee Water Level Comparison



# **Lake Okeechobee: Current Operations**

- **USACE's Lake O Regulation Schedule (2008 LORS)**
  - Stage (~15.1 feet, NGVD) and receding in the lower third of the Low Subband
  - Tributary Hydrologic Condition (THC) is in the normal classification
  - Seasonal Lake O Net Inflow Outlook is in the dry classification
  - Current week release guidance outcome:
    - S-79: up to 450 cfs
    - S-80: up to 200 cfs
  - Up to maximum practicable to the WCAs if desirable or with minimum Everglades impacts
  - USACE current operations: S-79: 650 cfs; S-80: 0 cfs
  - No Lake O regulatory releases to the WCAs
- **SFWMD's Lake O Adaptive Protocol (2010)**
  - Will be the basis for SFWMD recommendations as the Lake stage recedes into the Baseflow Subband of the 2008 LORS

**Part 4.**  
**2013-14 Dry Season Outlook &  
Tentatively Planned Operations**

# U. S. Seasonal Precipitation Outlook

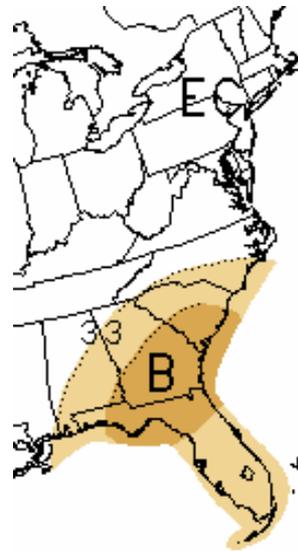
National Climate Prediction Center (CPC)

**Oct 2013**



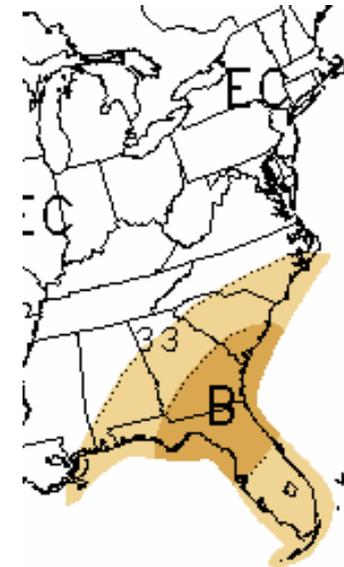
*Posted 31-Oct-2013*

**Nov-Jan 2013**



*Posted 17-Oct-2013*

**Jan - Mar 2014**



*Posted 17-Oct-2013*

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

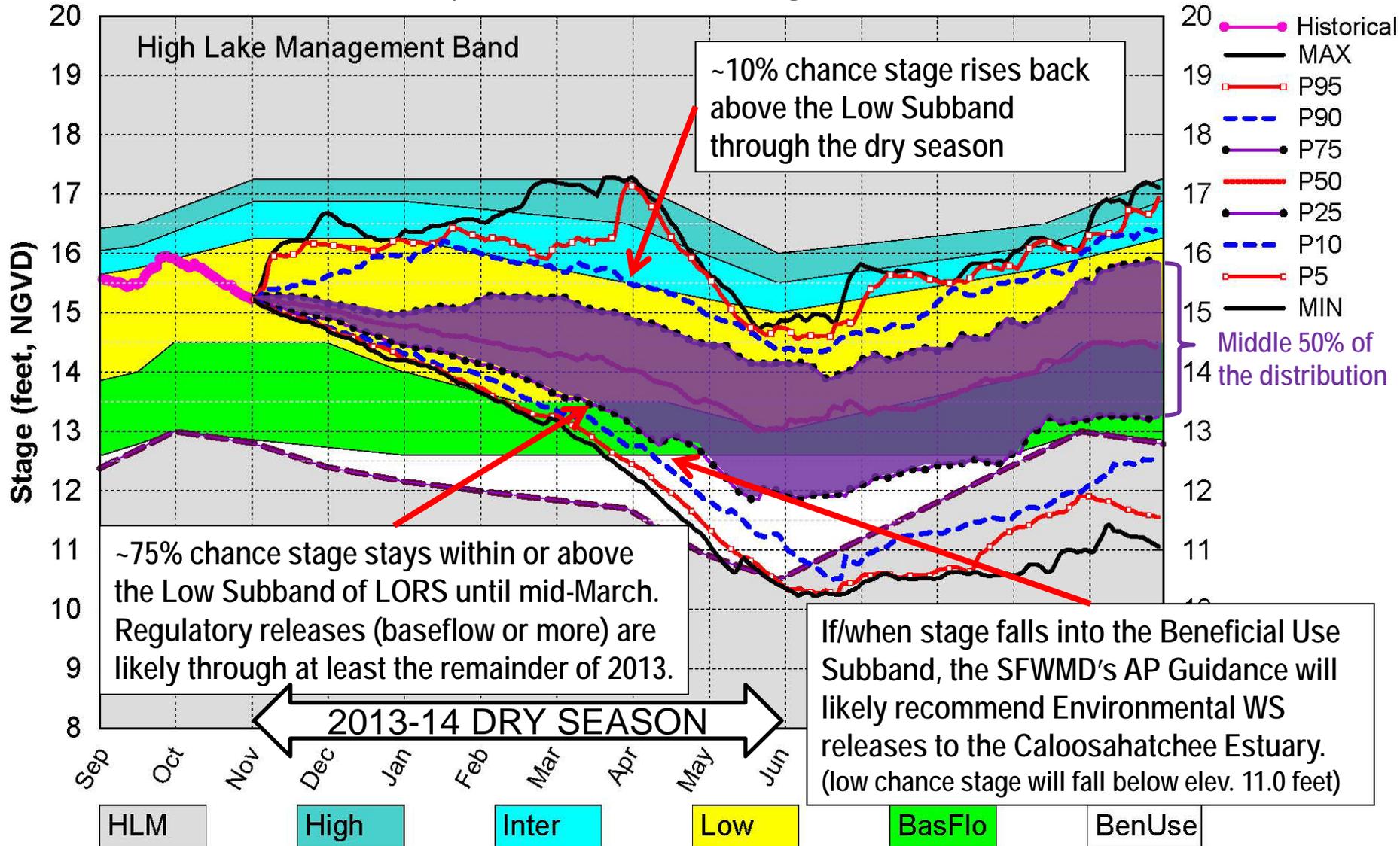
- Equal Chances (EC) of Above-Normal (A), Normal, and Below-Normal (B) rainfall for November,
- Increased chances of Below-Normal (B) rainfall for all 3-month windows starting with November and ending with March

# ***Lake Okeechobee Stage Forecast***

- **Future Lake stage depends on future rainfall**
- **Projections provided monthly by SFWMD Hydrologic and Environmental Systems Modeling (HESM) Section**
- **Position Analysis**
  - **Each 1-year simulation starts with current hydrologic conditions (e.g, 1-November)**
  - **41 1-yr simulations of system response to historical rainfall conditions**
  - **Statistical summaries used to display projections**

# Lake Okeechobee SFWMM November 2013 Position Analysis

Percentiles based on 41 possible outcomes starting with Nov 1<sup>st</sup> initialization



(See assumptions on the Position Analysis Results website)

# **Tentatively Planned Operations (Nov-May)**

- **The USACE plans to continue releases per the 2008 LORS**
- **Currently, releases through S-79 combines baseflow levels (650 cfs) for both Caloosahatchee and St. Lucie Estuaries**
- **If Lake O stage recedes below the Low Subband, consideration will be given to the SFWMD's Adaptive Protocol recommendations**



# Questions??



# 2008 LORS

## Part C: Establish Allowable Lake Okeechobee Releases to the Water Conservation Areas

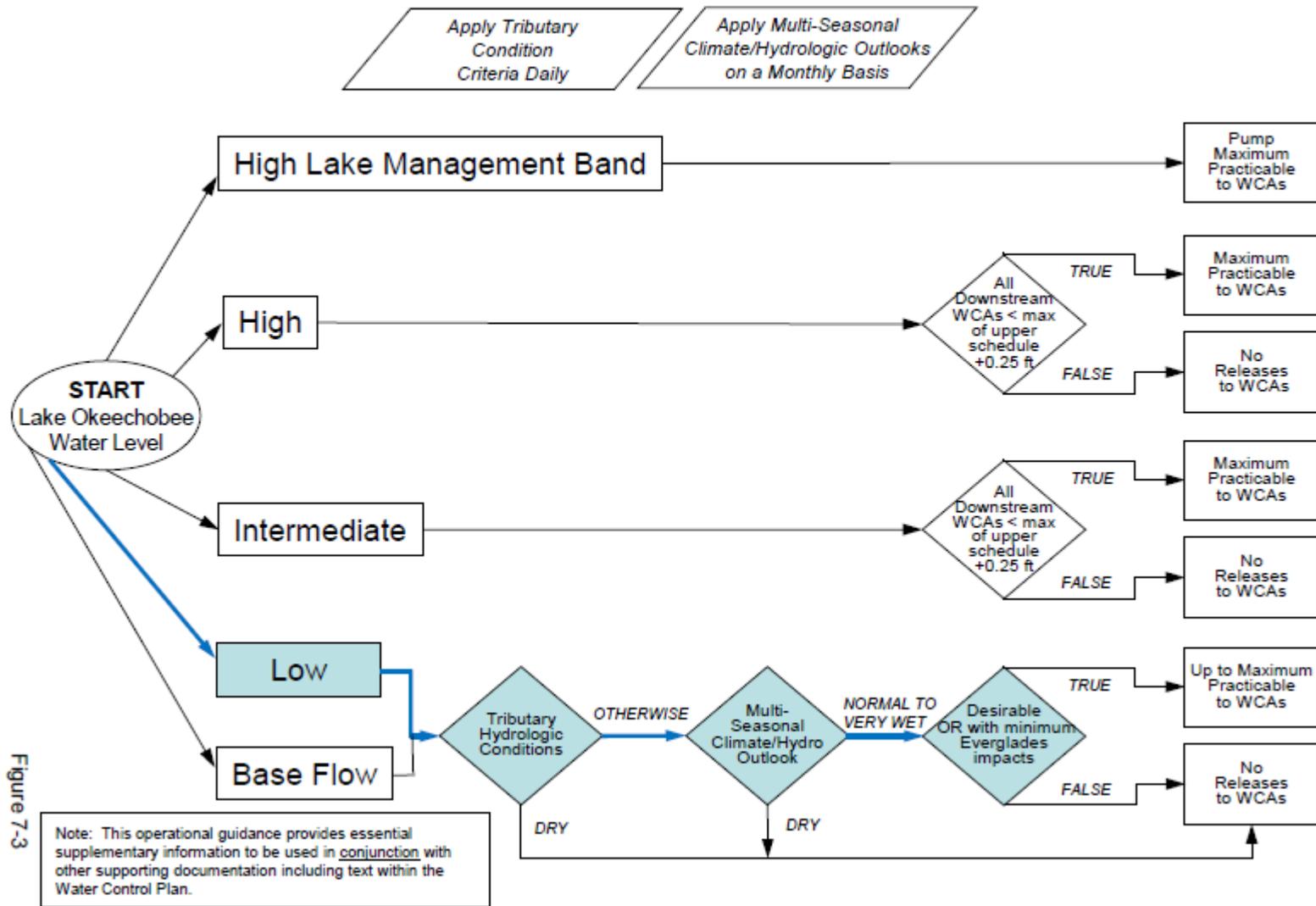


Figure 7-3

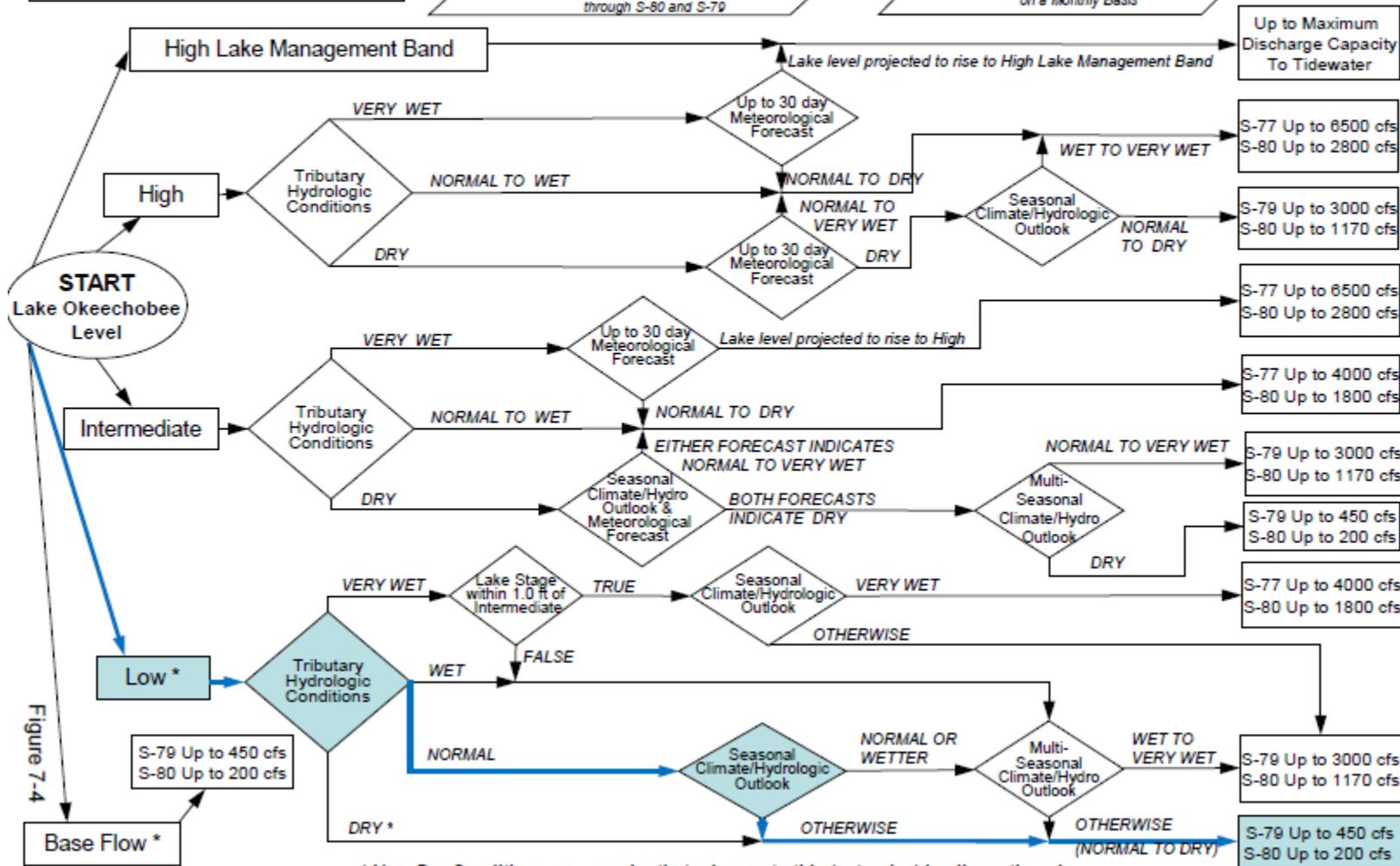
# 2008 LORS

## Part D: Establish Allowable Lake Okeechobee Releases to Tide (Estuaries)

Note: This operational guidance provides essential supplementary information to be used in conjunction with other supporting documentation including text within the Water Control Plan.

When conducting Base Flow releases, flows can be distributed East and West up to 650 cfs as needed to minimize impacts or provide benefits through S-80 and S-79

Apply Meteorological Forecasts on a Weekly Basis; apply Seasonal and Multi-Seasonal Climate/Hydrologic Outlooks on a Monthly Basis

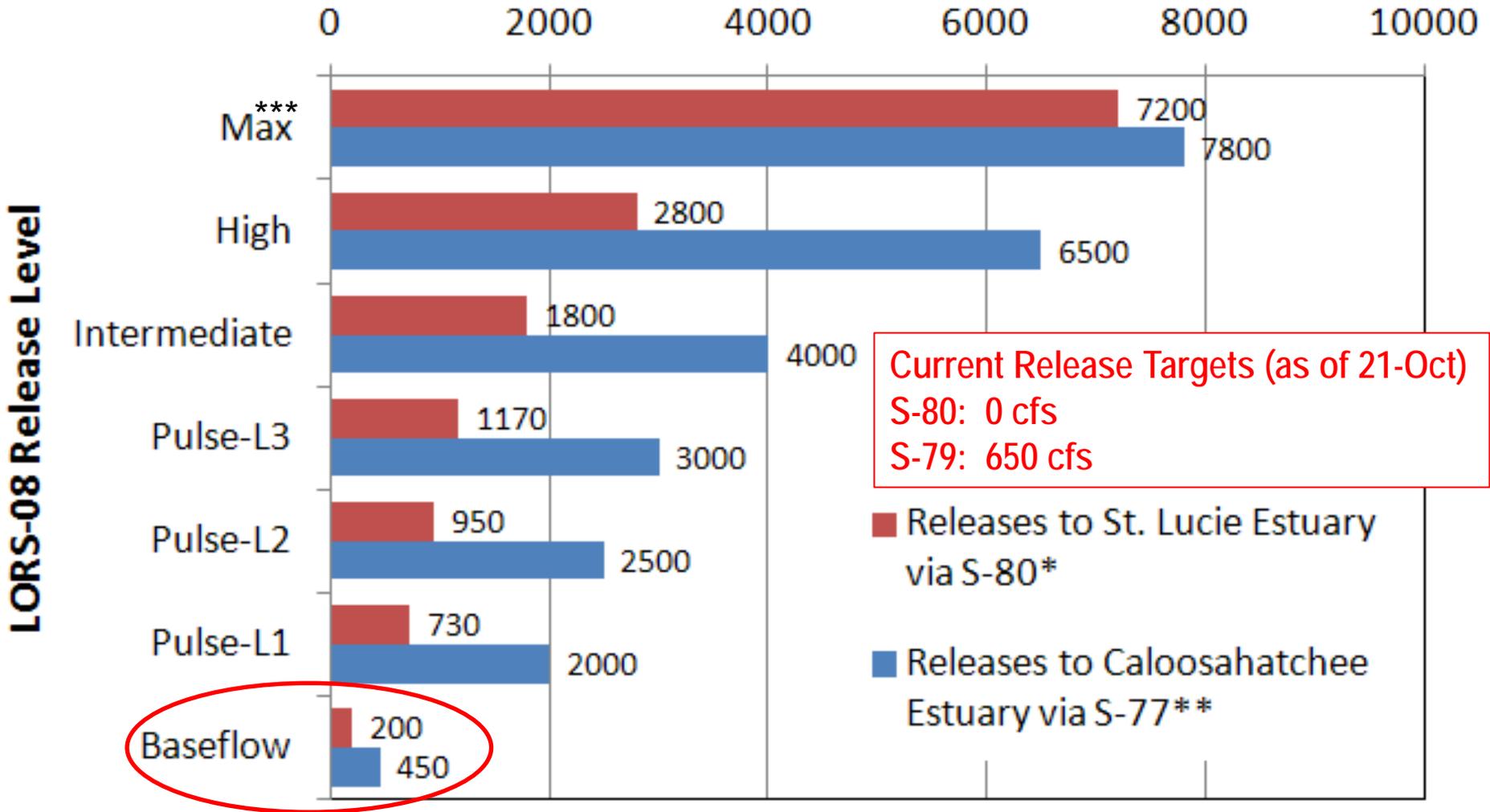


\* Very Dry Conditions may require that releases to tide (estuaries) be discontinued

Figure 7-4

# Lake Okeechobee Regulation Schedule 2008

## Release Rates (cfs)



\* Releases at S-308 are limited by C-44 basin runoff

\*\* Baseflow Releases and Pulse Releases at S-77 are limited by C-43 basin runoff

\*\*\* Maximum Release rates depend on Lake and canal stages

# Special Operations

## Aug – Oct 2013

Lake Okeechobee – L-8 – C-51 to tide: Continues

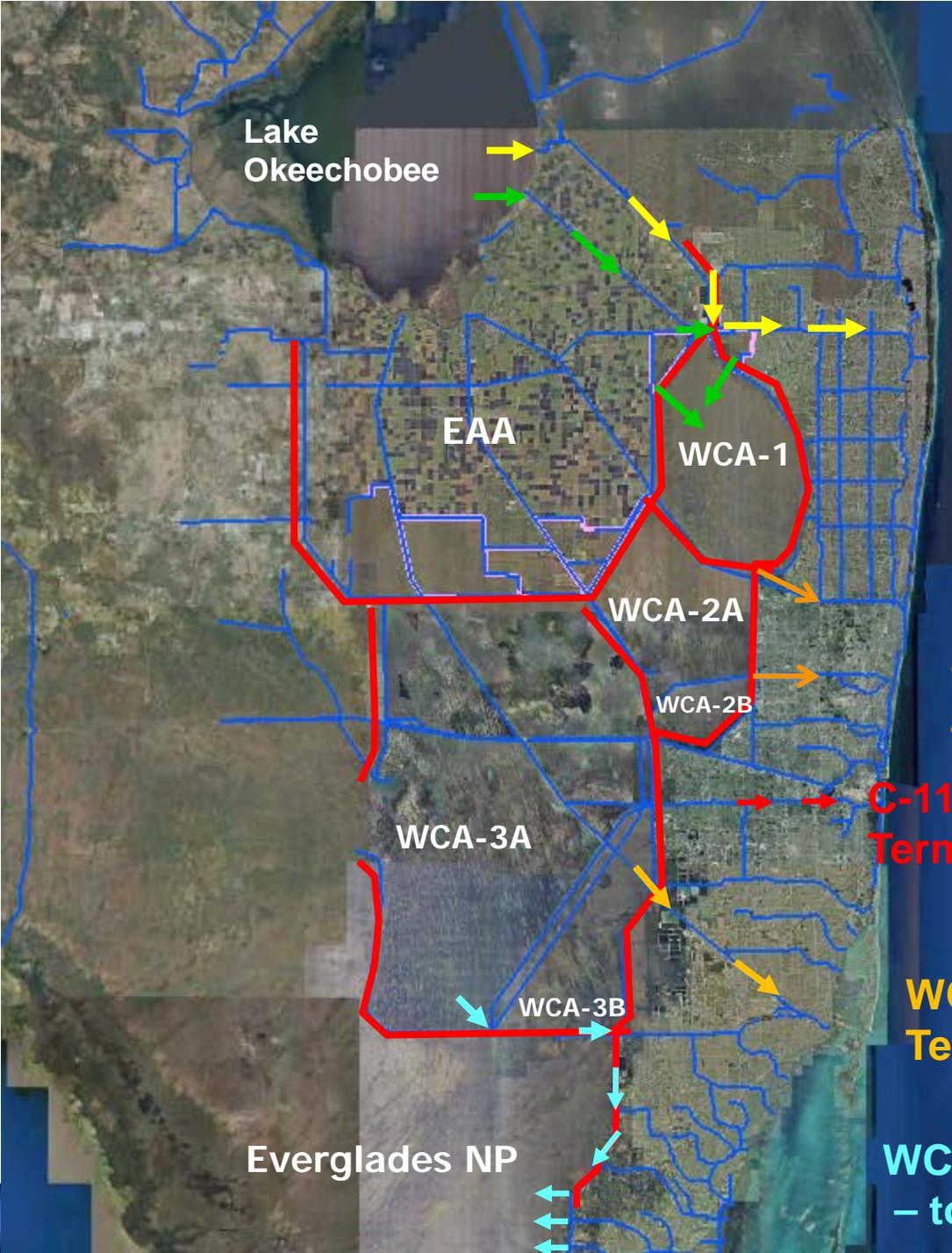
Lake Okeechobee – WPB Canal to STA1 (Pump) - WCA-1 (Pump): Terminated on 10/23/2013

Normal Regional Operations – WCA-1 & 2 to tide: Transitioned to water supply operations

C-11 West – S13A – S13 (Pump) – to tide: Terminated on 10/22/2013

WCA-3 – C-6 – S-26 (Pump) – to tide: Terminated 10/13/2013

WCA3 – Tamiami Canal – SDCS (Pump) – to ENP: terminated 10/17/2013



<b>VOLUME in Acre Feet (AF) FROM PUMP STATIONS UNDER SPECIAL OPERATIONS</b>				
	<i>Period</i>	7/15/2013 - 8/21/2013	8/22/2013 - 9/25/2013	9/26/2013 - 10/31/2013
Description	Pump Station	Volume (AF)	Volume (AF)	Volume (AF)
WCA-3A to tide (C-11)	S13-P	15,218	16,248	12,814 (**)
WCA-3A to tide (L-31N)	S331-P	40,727	31,879	20,507
WCA-3A to tide (L-31N)	S332-P		59,913	39,401
WCA-3A to tide (C-6)	S26-P		7,386	9,439 (**)
LOK to WCA-1 (WPB Canal)	S5A-P		20,379	37,610 (*)
LOK to WCA-1 (STA-1E)	S362-P		14,949	2,693
LOK to WCA-1 (STA-1W)	G251+G310		0	29,685 (*)
<b>Total Volume (AC-FT)</b>		55,945	150,754	152,149
<i>(*)</i> : These operations were terminated on Oct. 23, midnight				
<i>(**)</i> : Some data are missing in the report				

Gravity Releases from WCAs		VOLUME in Acre Feet (AF)						
Area	Site	May-2013	Jun-2013	Jul-2013	Aug-2013	Sep-2013	Oct-2013 (1-31)	TOTAL (AF)
WCA 1	S39	11,523	23,381	34,987	32,770	3,695	2,055	108,411
WCA 2A	S34	4,359	6,933	5,452	8,319	8,193	8,270	41,526
WCA 2A	S38	24,214	28,326	28,440	35,575	34,828	26,645	178,027
WCA 3A	S31	16,750	20,333	16,505	20,237	18,423	10,344	102,591
WCA 3A	S333	48,563	45,483	16,157	54,150	15,900	17,950	198,204
WCA-3A to Big Cypress	S343A&B+S344	0	0	18,986	39,055	34,503	32,353	124,898
Total Volume (AF)		105,408	124,456	120,526	190,105	115,544	97,617	753,657
All data was acquired from DBHYDRO unless specified								

Gravity Releases south from Lake Okeechobee		VOLUME in Acre Feet (AF)						
Area	Site	May-2013	Jun-2013	Jul-2013	Aug-2013	Sep-2013	Oct-2013 (1-31)	TOTAL (AF)
S354 via Miami Canal	S354	10,215	102	0	4,388	0	6,219	20,925
S352 via WPB Canal	S352	2,687	0	0	26,051	12,910	45,722	87,370
S351 via HILLSBORO or North New River Canal	S351	5,588	19	1	6,866	0	20,184	32,657
Culvert 10A to the L8 to C51	CV10A	10,431	283	3,405	30,389	18,675	25,758	88,941
Total Volume (AF)		28,921	404	3,407	67,694	31,585	97,883	229,894
All data was acquired from DBHYDRO unless specified								