

Water Conditions Summary

South Florida Water Management District Governing Board Meeting

April 11, 2013

Tommy B. Strowd, P.E., Assistant Executive Director
Operations, Maintenance & Construction Division

SFWMD

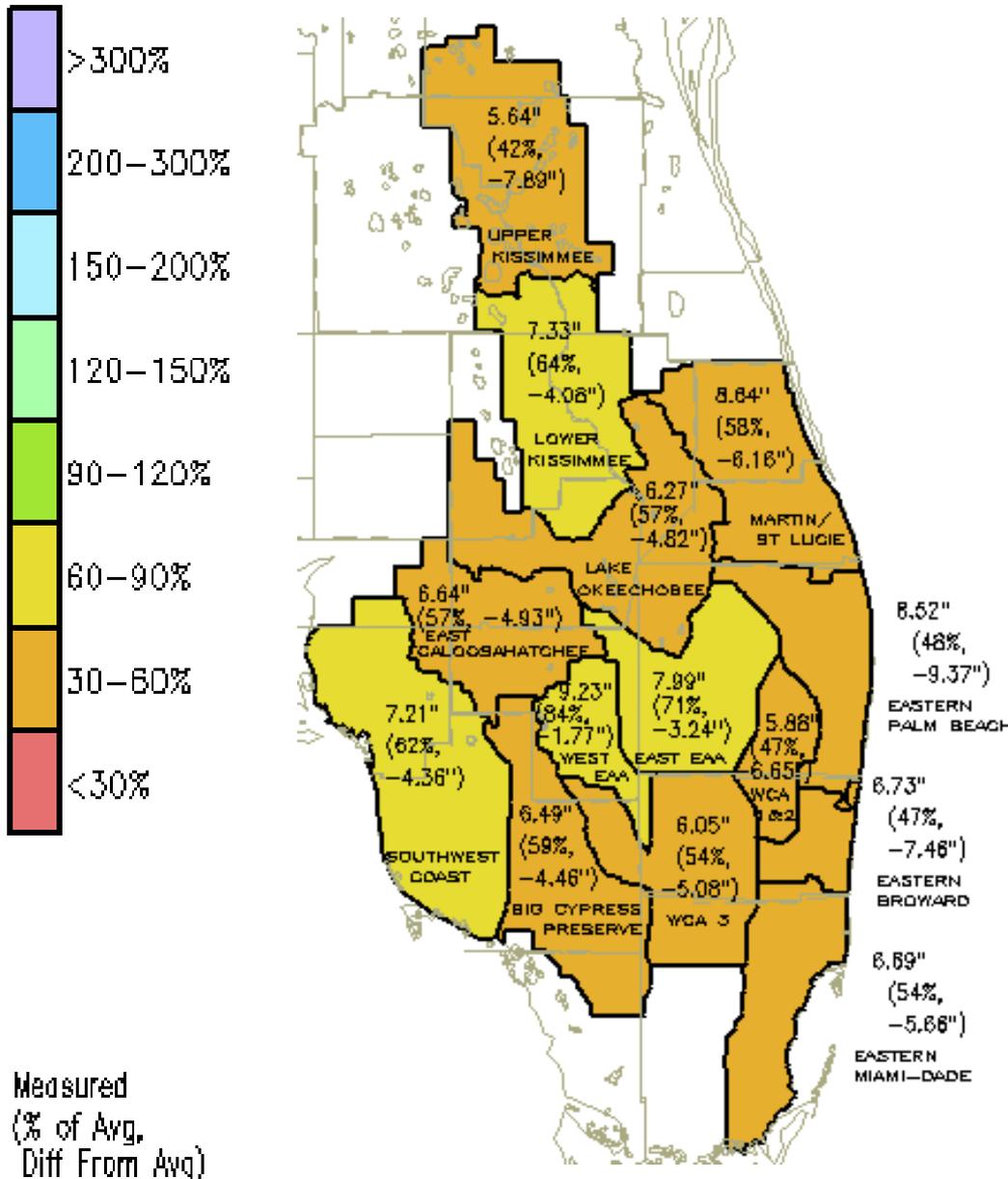
Dry Season Rainfall

2 Nov 2012 – 9 Apr 2013

**DISTRICT-WIDE: 7.06"
(58% of Avg, or -5.20")**

All basins below average:

- **Lowest**
 - Upper Kissimmee with 42% of average
 - WCA-1, WCA-2 and Broward with 47% of average
- **Closest to average**
 - West EAA with 84% of average
 - East EAA with 71% of average



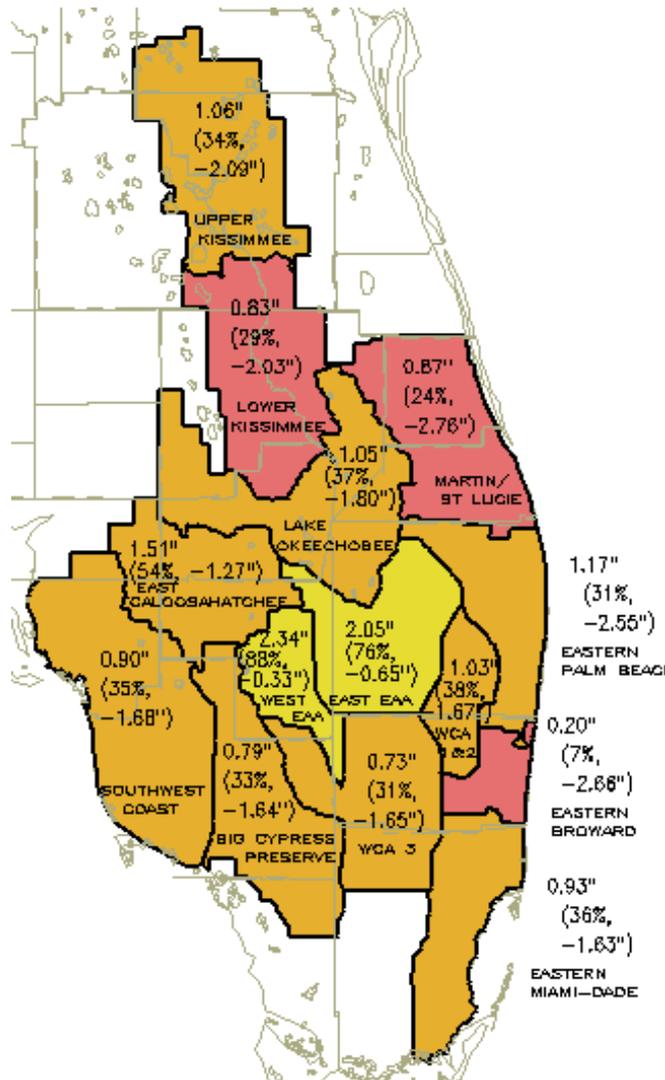
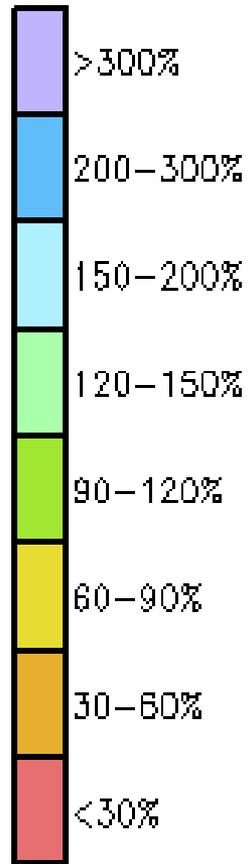
SFWMD

March 2013 Rainfall

(Mar 2 2013 – Mar 1 2013)

DISTRICT-WIDE: 1.10"
(39% of Avg or 1.74")

- All basins are below normal
- Lower Kissimmee, Martin/St. Lucie and Eastern Broward show the largest deficit
- The best positioned basin is West EAA with 88% of average, followed by East EAA with 76%



Measured
(% of Avg,
Diff From Avg)

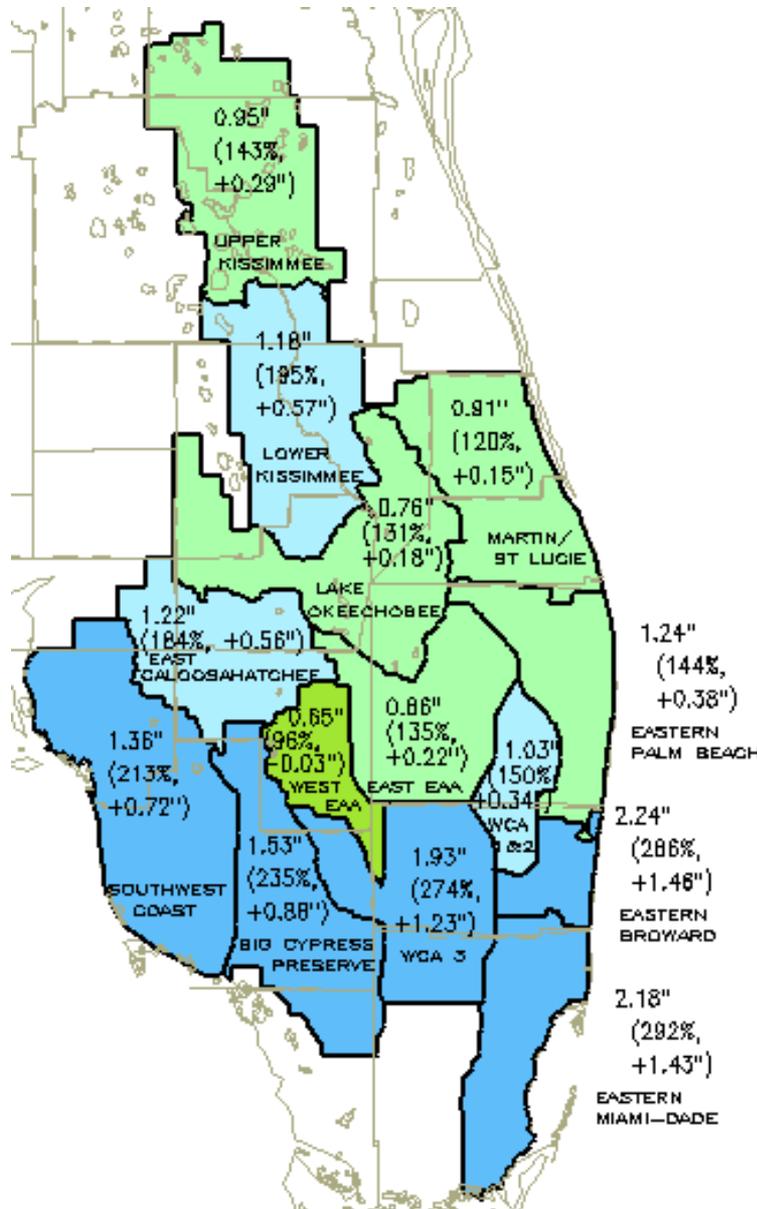
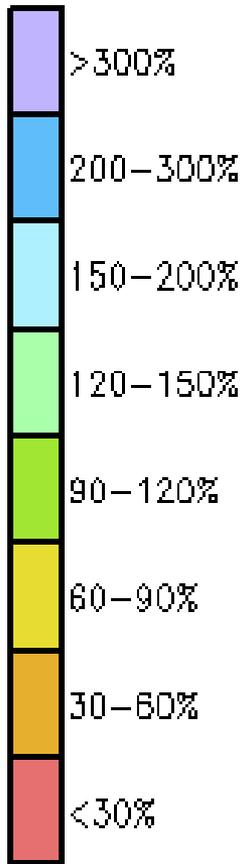
SFWMD

April 2013 Rainfall

(Apr 2 - 9, 2013)

DISTRICT-WIDE: 1.24"
(185% of Avg, or 0.57")

- Most of the rain for April was recorded on April 4-5
- This rain event was beneficial for the District
- Basins in the south are above 200% of average
- Only one basin, West EAA is below average with 96%

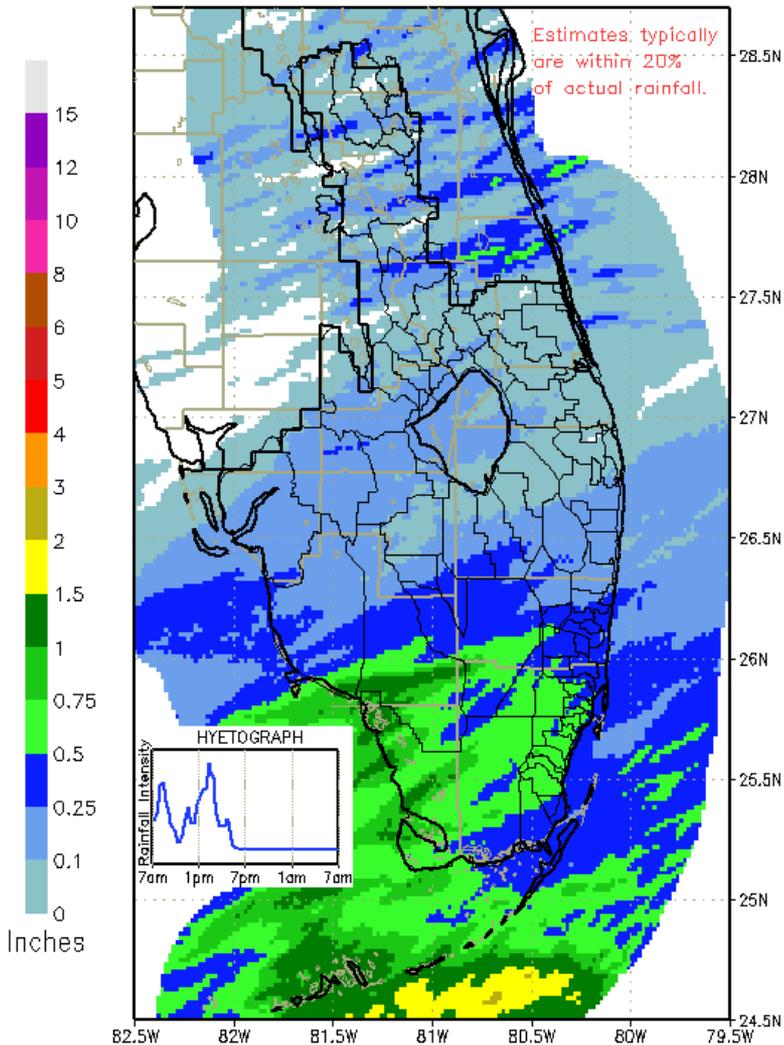


Measured
 (% of Avg,
 Diff From Avg)

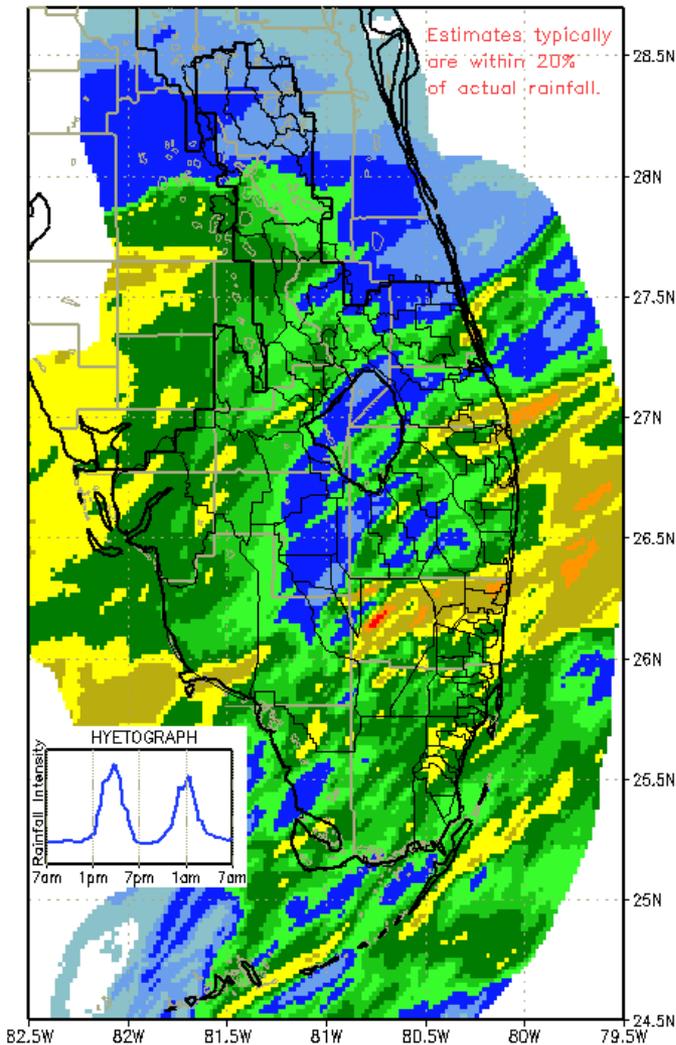
Rainfall Event April 4-5, 2013

SFWM D RAINDAR EOD DAILY RAINFALL ESTIMATES
 FROM: 0700 EST, 04/05/2013 THROUGH: 0700 EST, 04/06/2013

SFWM D RAINDAR EOD DAILY RAINFALL ESTIMATES
 FROM: 0700 EST, 04/04/2013 THROUGH: 0700 EST, 04/05/2013

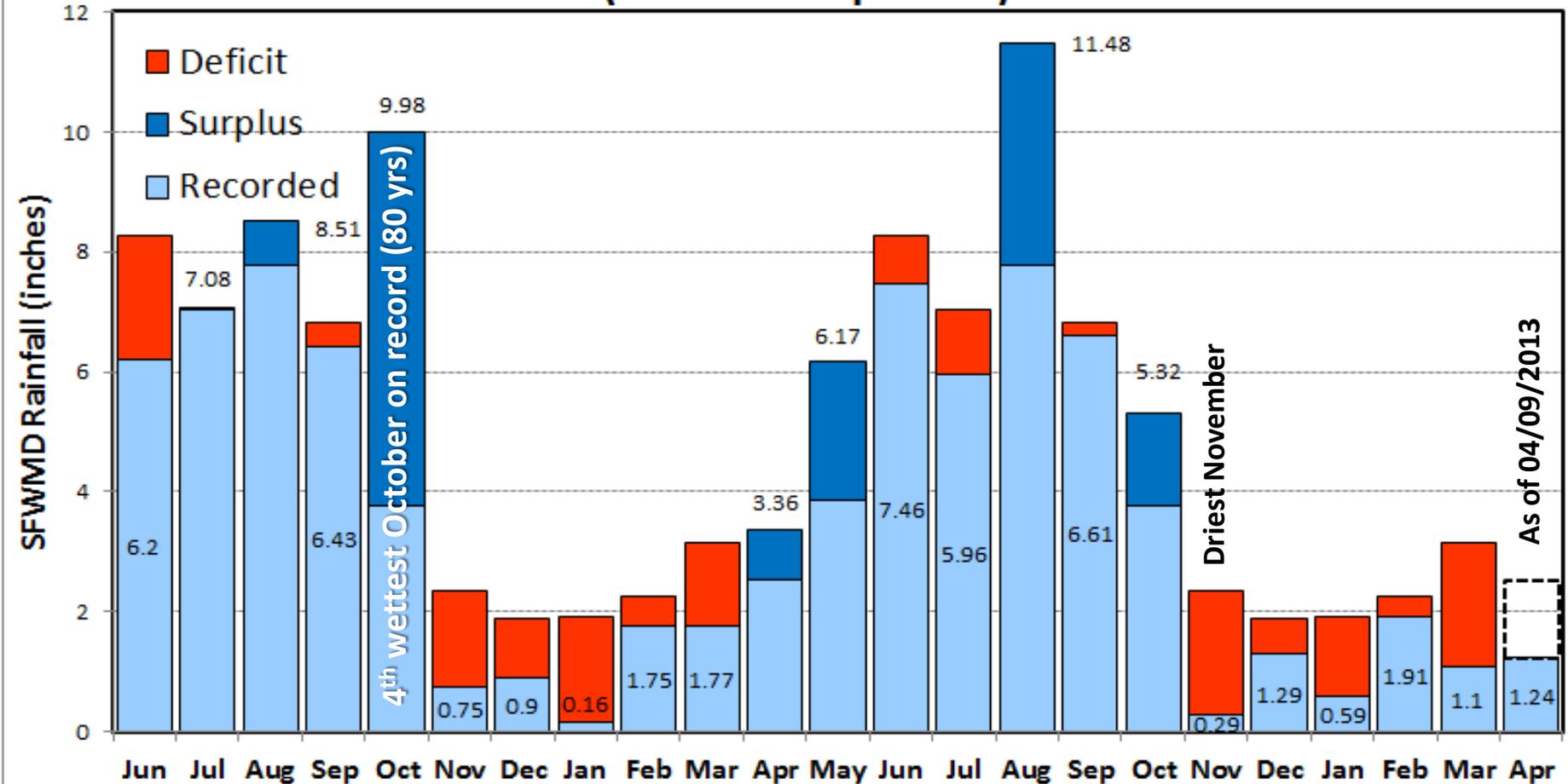


DISTRICT-WIDE RAINFALL ESTIMATE: 0.221"



DISTRICT-WIDE RAINFALL ESTIMATE: 0.936"

SFWMD Rainfall Distribution Comparison (Jun 2011 - Apr 2013)



2011-12 DRY SEASON:

- Record dry in Upper Kissimmee (98 yrs)
- Ended up close to average

2012-13 DRY SEASON:

- Driest November since 1932
- Below average so far

2011 WET SEASON:

- Latest start (June 12) in at least 20 years
- 3 Big Rain Days in October (2.3", 2.3" & 1.7")

2012 WET SEASON:

- Started early with wet May, followed by dry June and July . TS Isaac brought August rainfall high above average.
- Ended up above average.

U.S. Drought Monitor

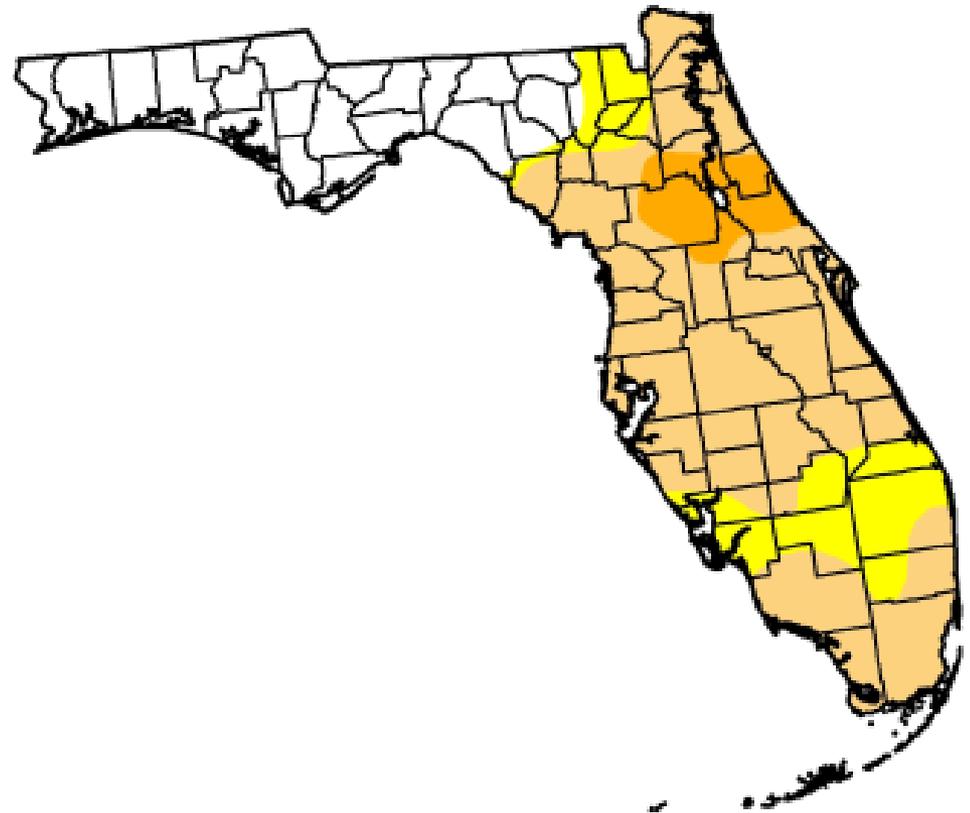
April 2, 2013

Valid 7 a.m. EST

Florida

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	27.13	72.87	58.23	6.23	0.00	0.00
Last Week (03/26/2013 map)	27.10	72.90	48.61	6.23	0.00	0.00
3 Months Ago (01/01/2013 map)	56.86	43.14	3.13	0.00	0.00	0.00
Start of Calendar Year (01/01/2013 map)	56.86	43.14	3.13	0.00	0.00	0.00
Start of Water Year (09/25/2012 map)	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago (03/27/2012 map)	0.00	100.00	97.81	52.28	15.18	0.00

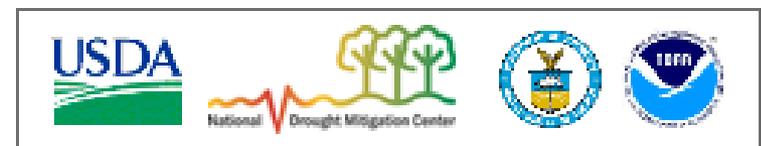


Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu>



Released Thursday, April 4, 2013
National Drought Mitigation Center,

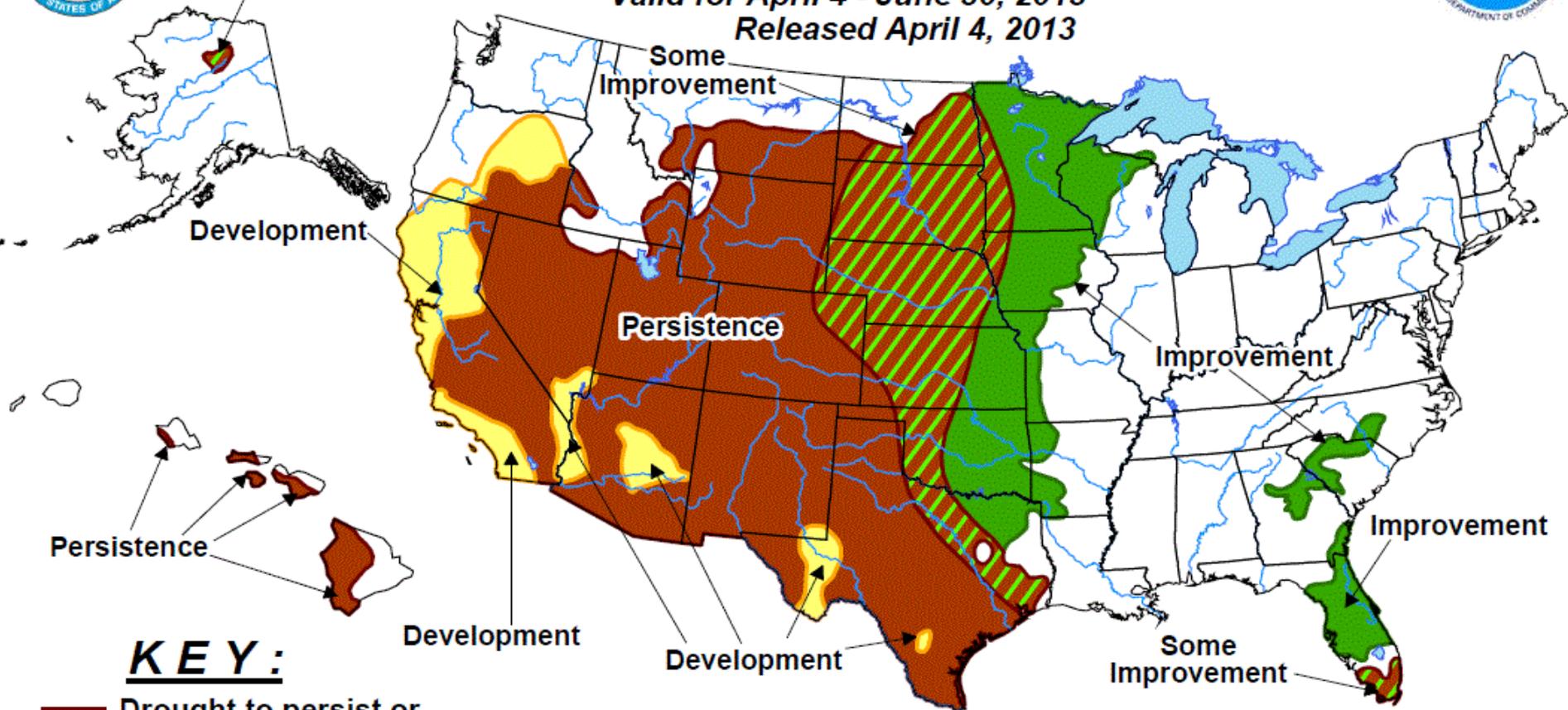


U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for April 4 - June 30, 2013

Released April 4, 2013

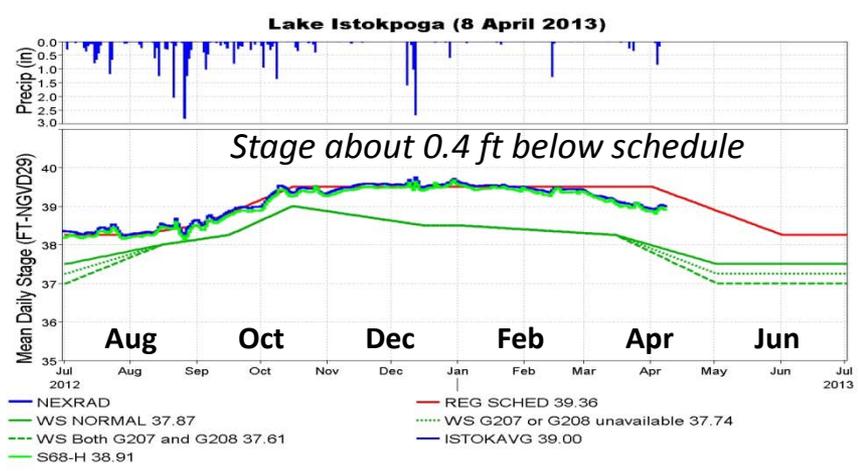
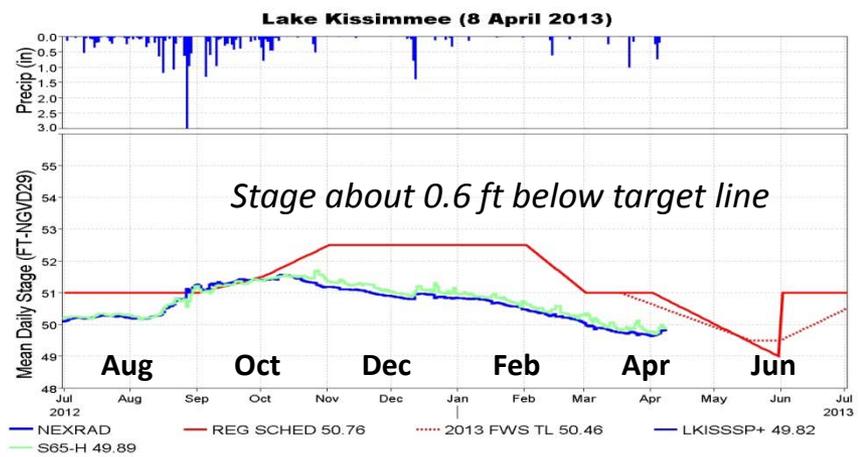
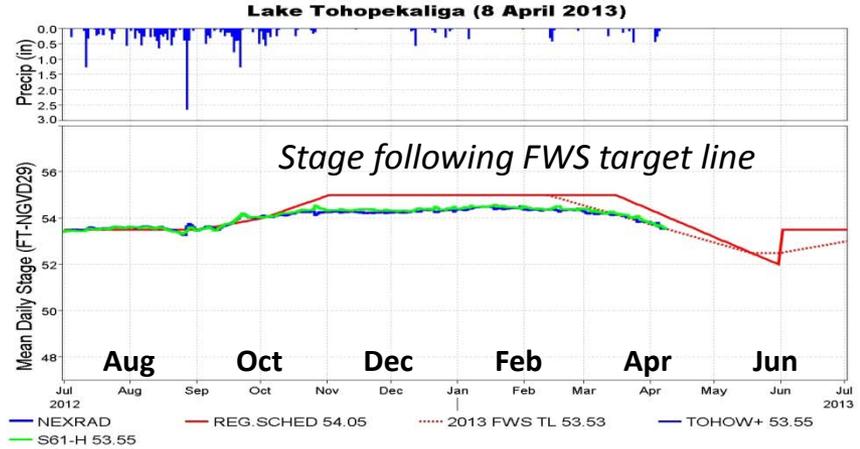
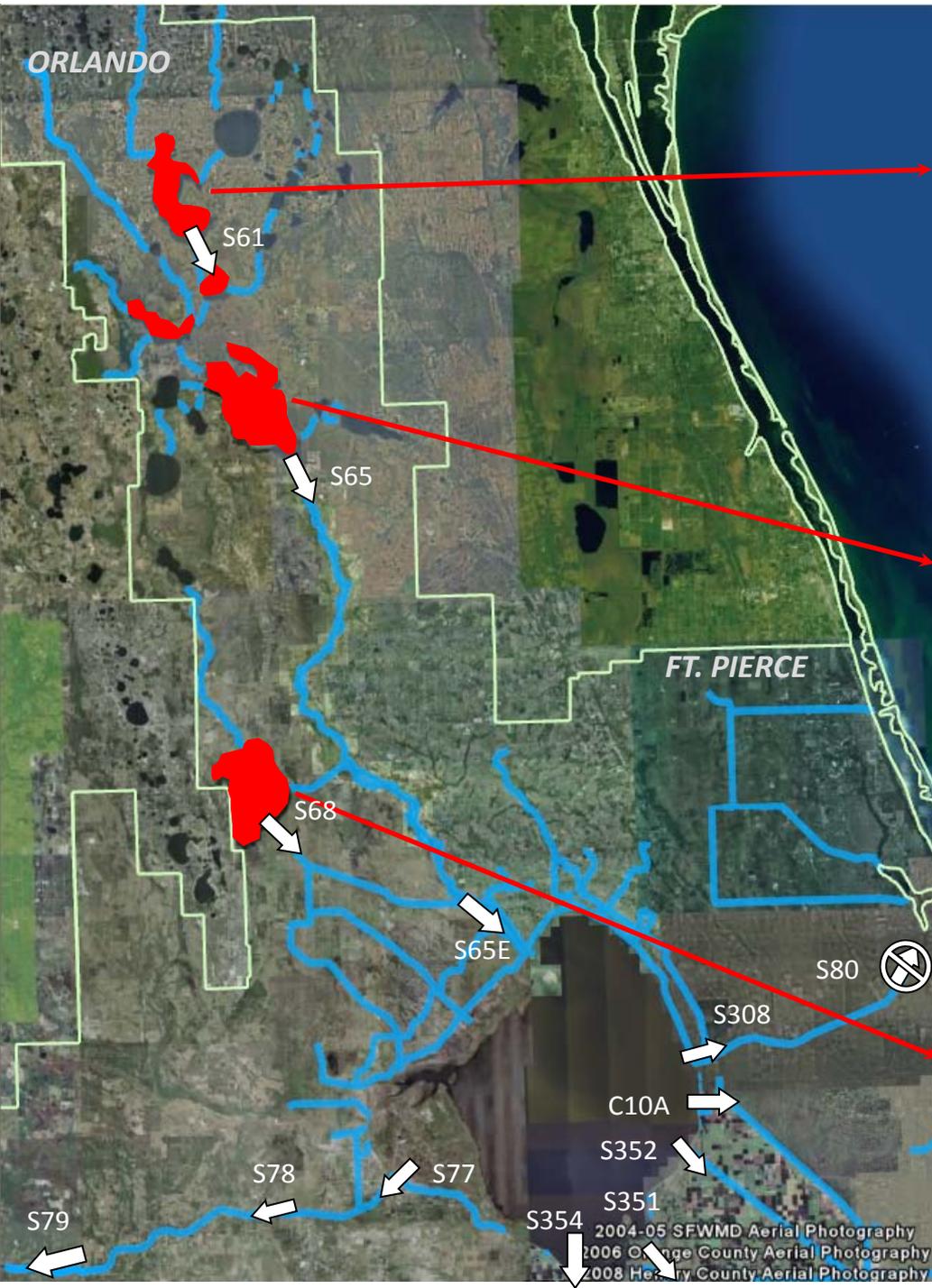


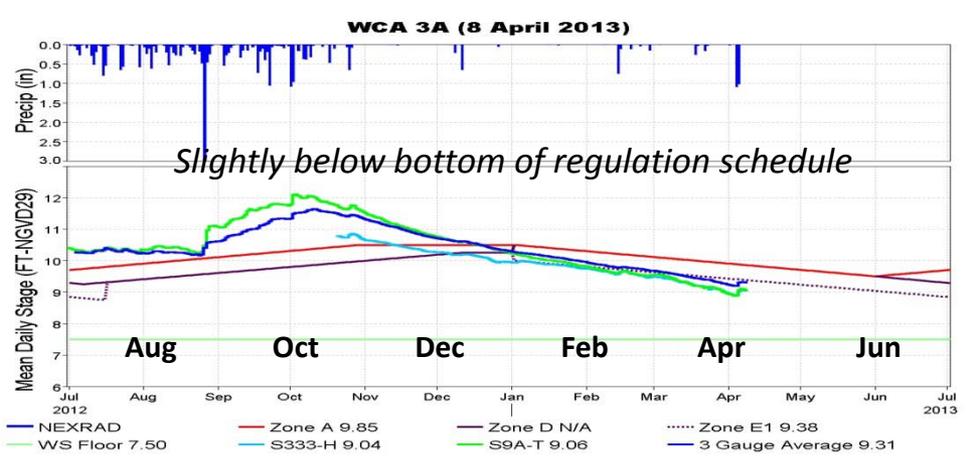
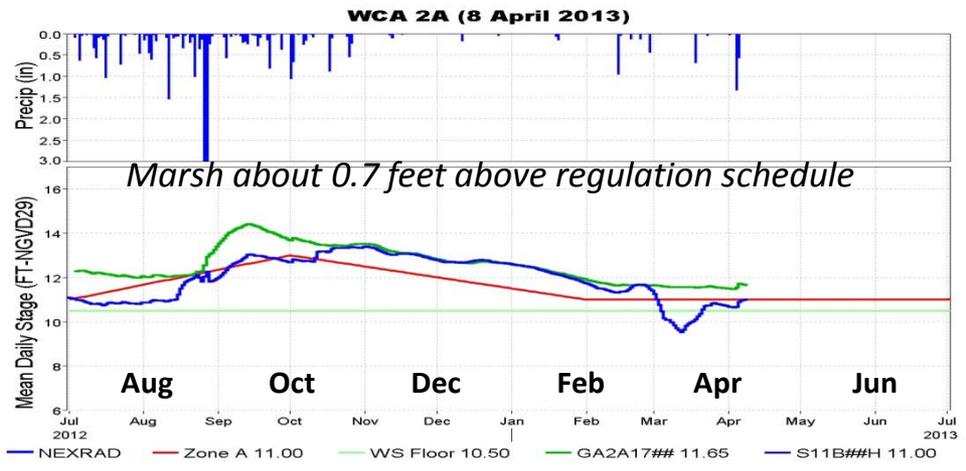
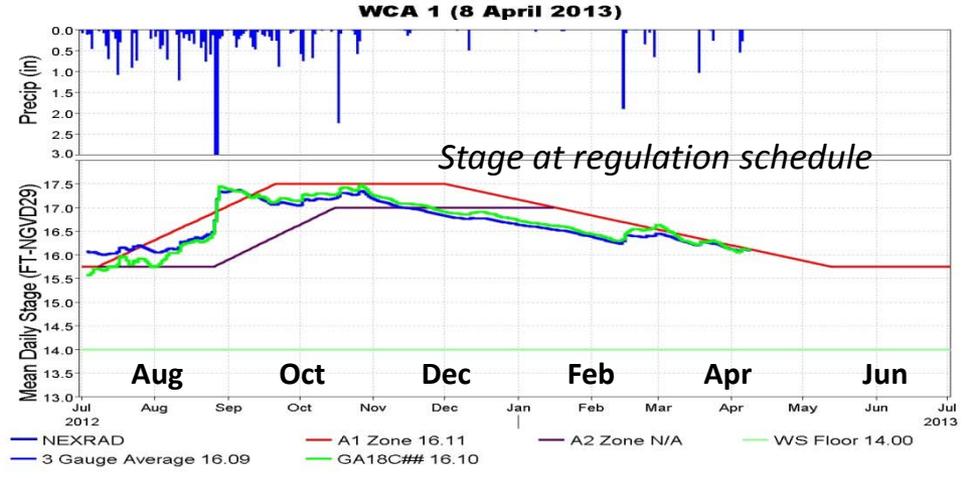
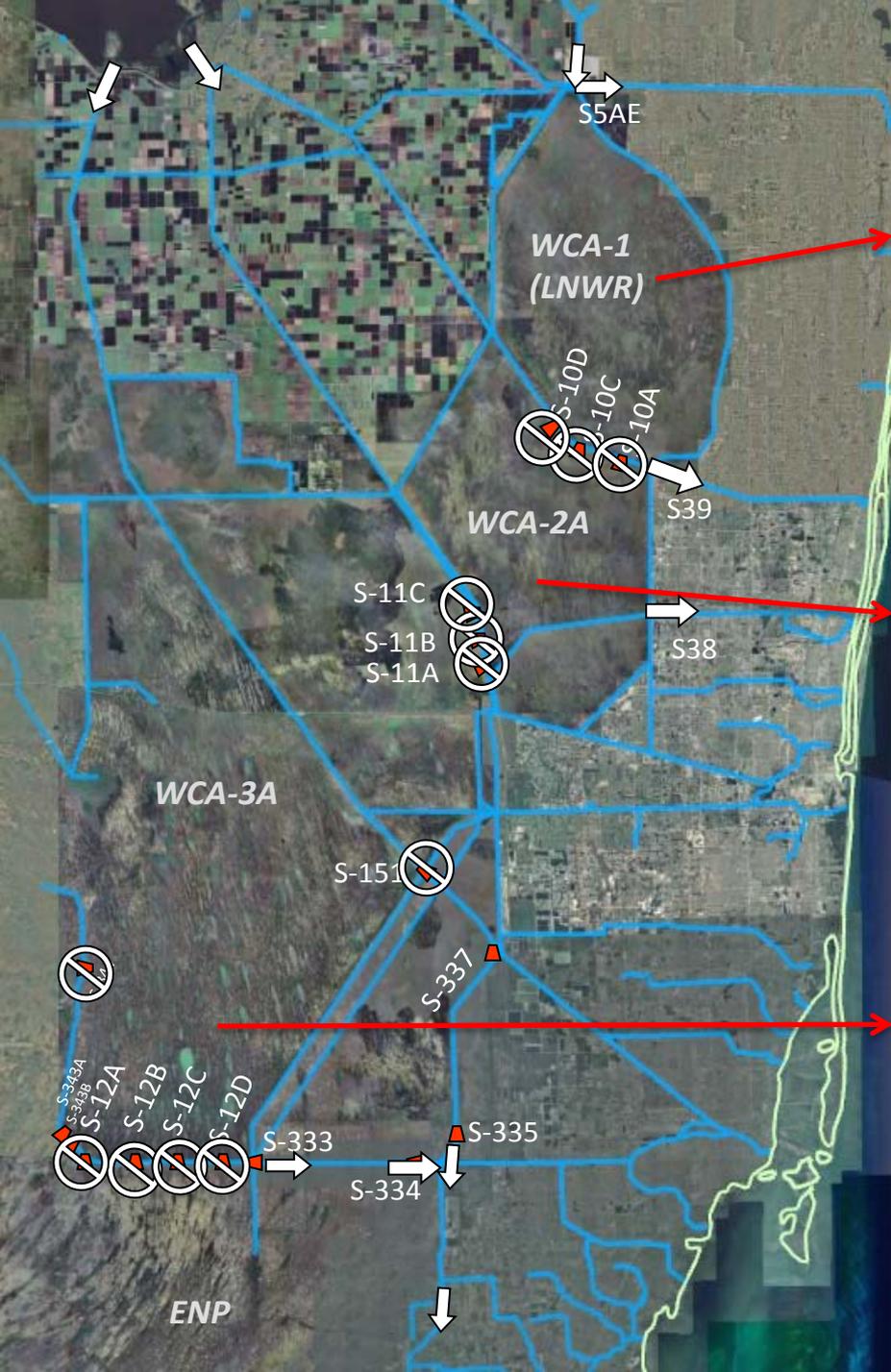
KEY:

-  Drought to persist or intensify
-  Drought ongoing, some improvement
-  Drought likely to improve, impacts ease
-  Drought development likely

No Drought Posted/Predicted 

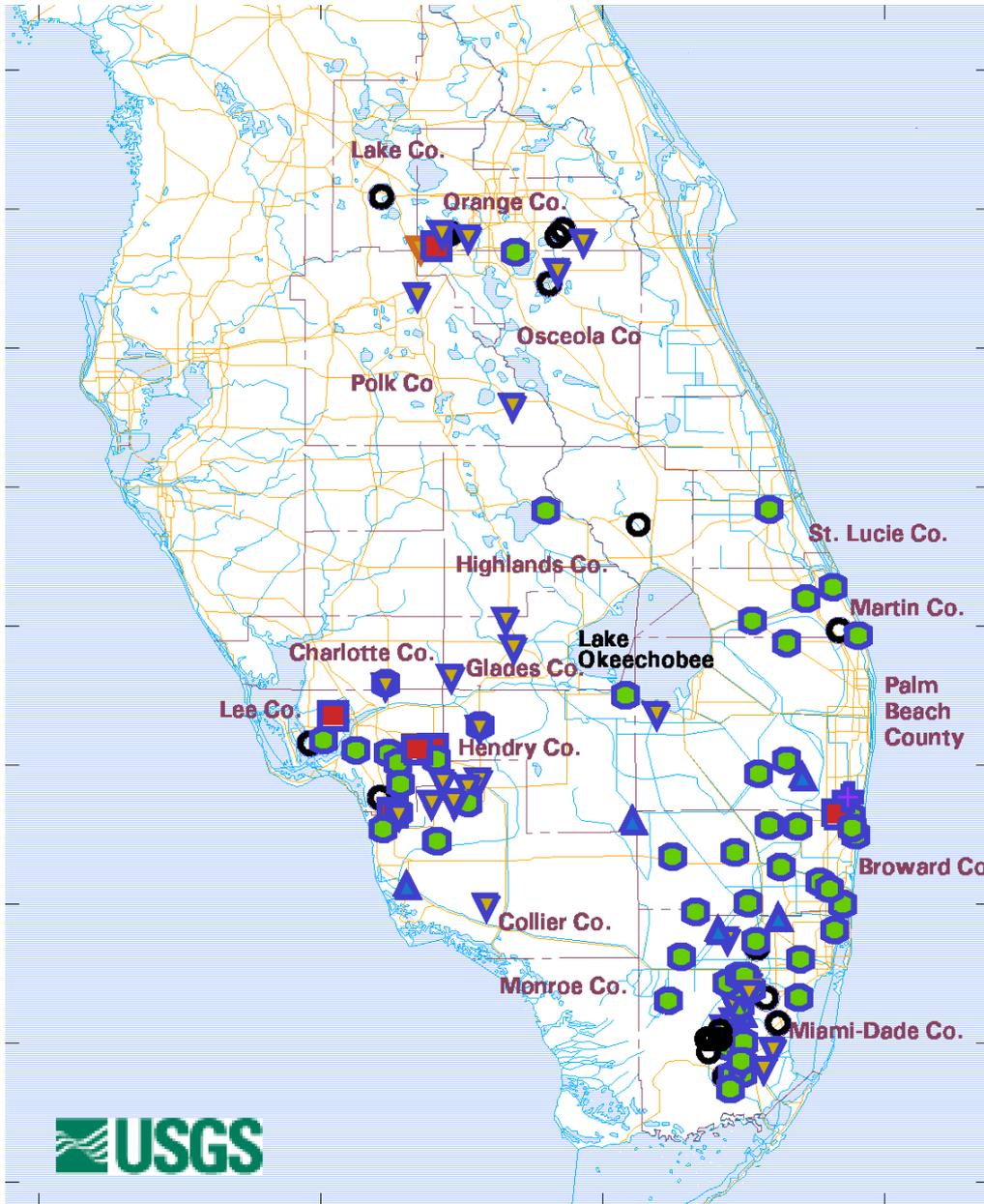
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.





Groundwater Levels

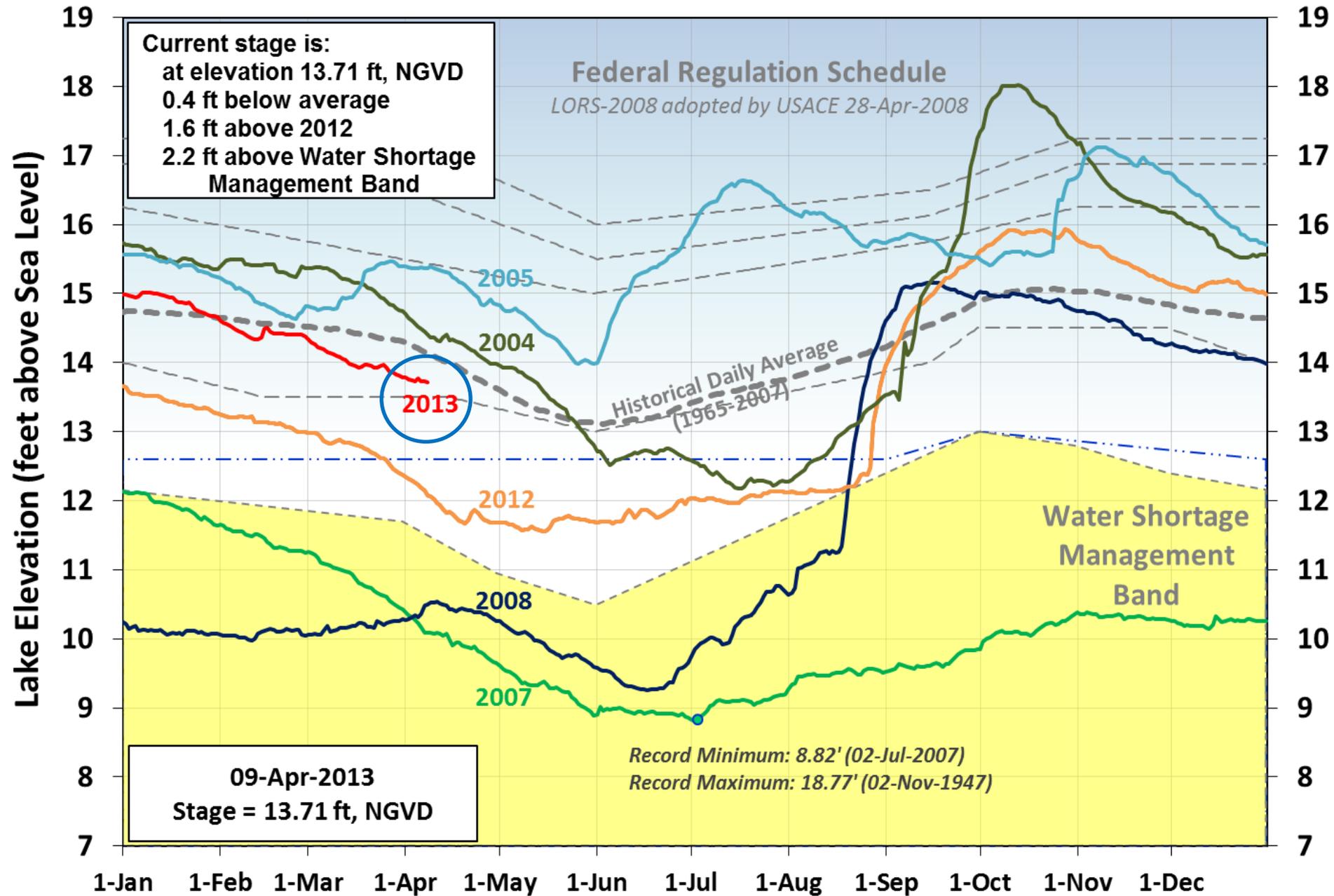
Water levels at selected sites in South Florida
Based on PROVISIONAL DATA, as Of April 8th, 2013



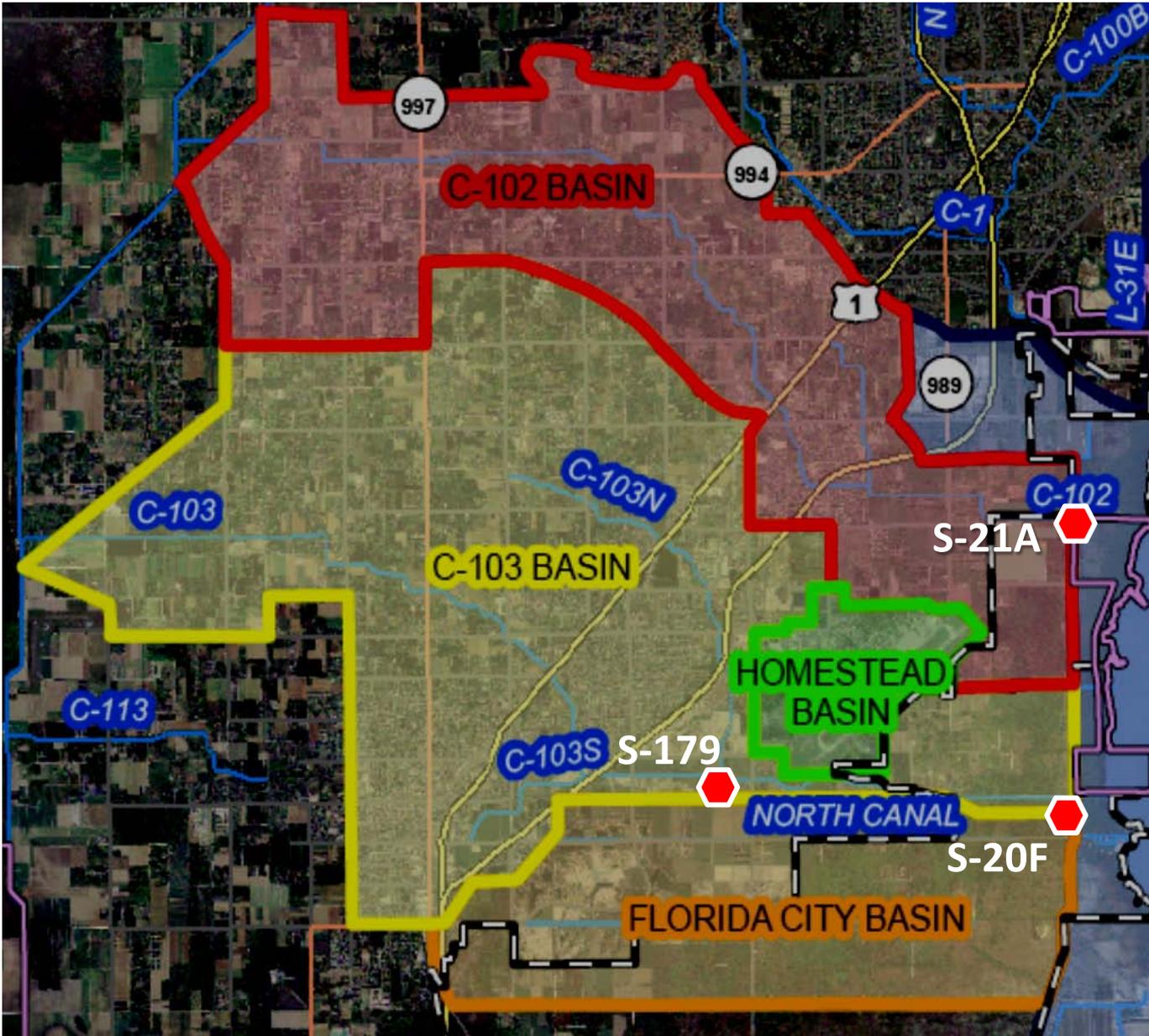
Water level compared to historical data, without trend analysis:

-  Insufficient information available to compute water-level statistics
-  In lowest 10 percent of past water elevations
-  Within lowest 10 to 30 percent of past water elevations
-  Within 20 percent of the median of past water elevations
-  Within highest 10 to 30 percent of past water elevations
-  In highest 10 percent of past water elevations

Lake Okeechobee Water Level Comparison



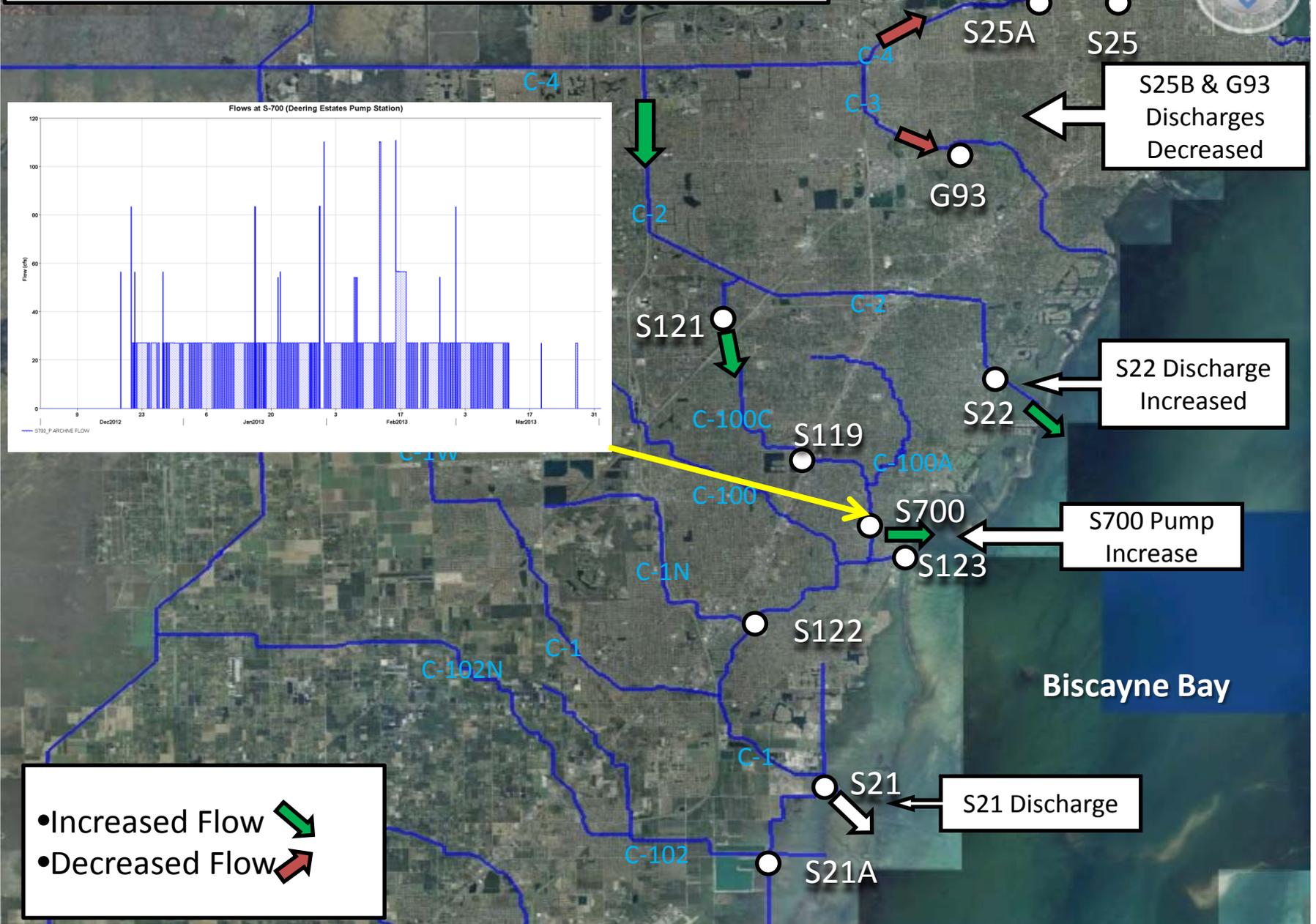
2012-2013 Seasonal Agricultural Drawdown



South Miami-Dade Current Operations

- Seasonal Agricultural Drawdown is proceeding normally
 - Initiated on October 15, 2012
 - S-21A structure (C-102 Canal) operational changes:
 - from low to intermediate operating range by the middle of January
 - to a customized higher setting to decrease releases to tide by the middle of February
 - To high settings by the beginning of April (temporary lowered for April 4-5 rain event)
 - S-20F and S-179 (C-103 Canal) remain in the low operating range
 - Currently expected to extend to the end of April 2013
- Special operations to divert excess water from the C-2/C-3/C-4 canals to Biscayne Bay were discontinued on March 12, but started again after the April 4-5 rain event

Redirection of Flows from C-2/C-3, C-4 to Biscayne Bay December 2012 – March 2013



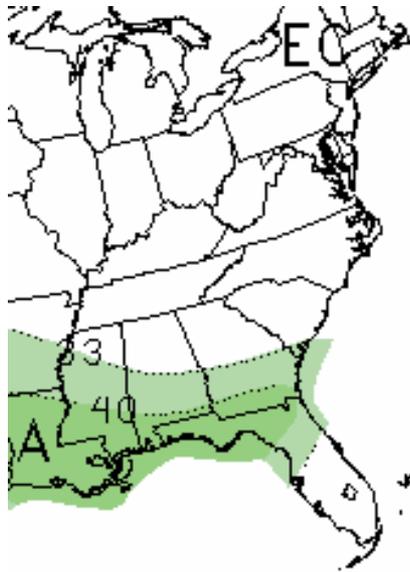
Lake Okeechobee: Current Operations

- **USACE's Lake O Regulation Schedule (2008 LORS)**
 - Stage (~13.71 ft, NGVD) is within the bottom 1/3 of the Low Subband
 - Tributary Hydrologic Condition (THC) moved to the normal classification this week (THC was in the dry classification for the past 4 weeks)
 - Release Guidance and Water Control Plan currently suggests
 - up to 2000 cfs at S-79, and up to 730 cfs at S-80
 - releases to the WCAs can be made if needed to manage the Lake stage
 - 8-Apr-2013: USACE initiated another 650 cfs average 10-day baseflow pulse release through S-79, no releases planned for S-80
 - Lake regulatory discharge to northwest WCA-3A via STA-3/4 discontinued in mid-Feb due to rain.
- **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
 - AP environmental water supply releases (if Lake stage falls into the Beneficial Use Subband or LORS 2008) are not constrained by the THC in April or May (Aug '12 SFWMD Governing Board guidance)

U. S. Seasonal Precipitation Outlook

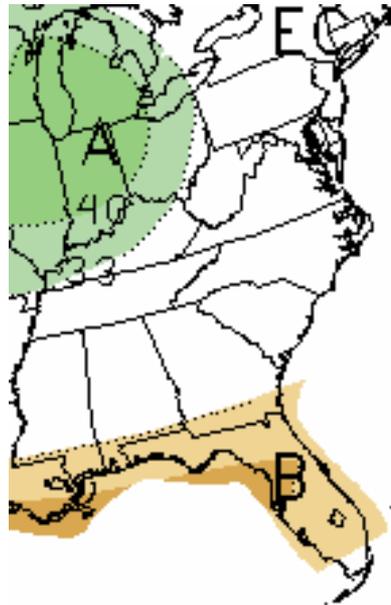
National Climate Prediction Center (CPC)

Apr 2013



Made 31-Mar-2013

Apr – Jun 2013



Made 21-Mar-2013

Jun-Oct 2013

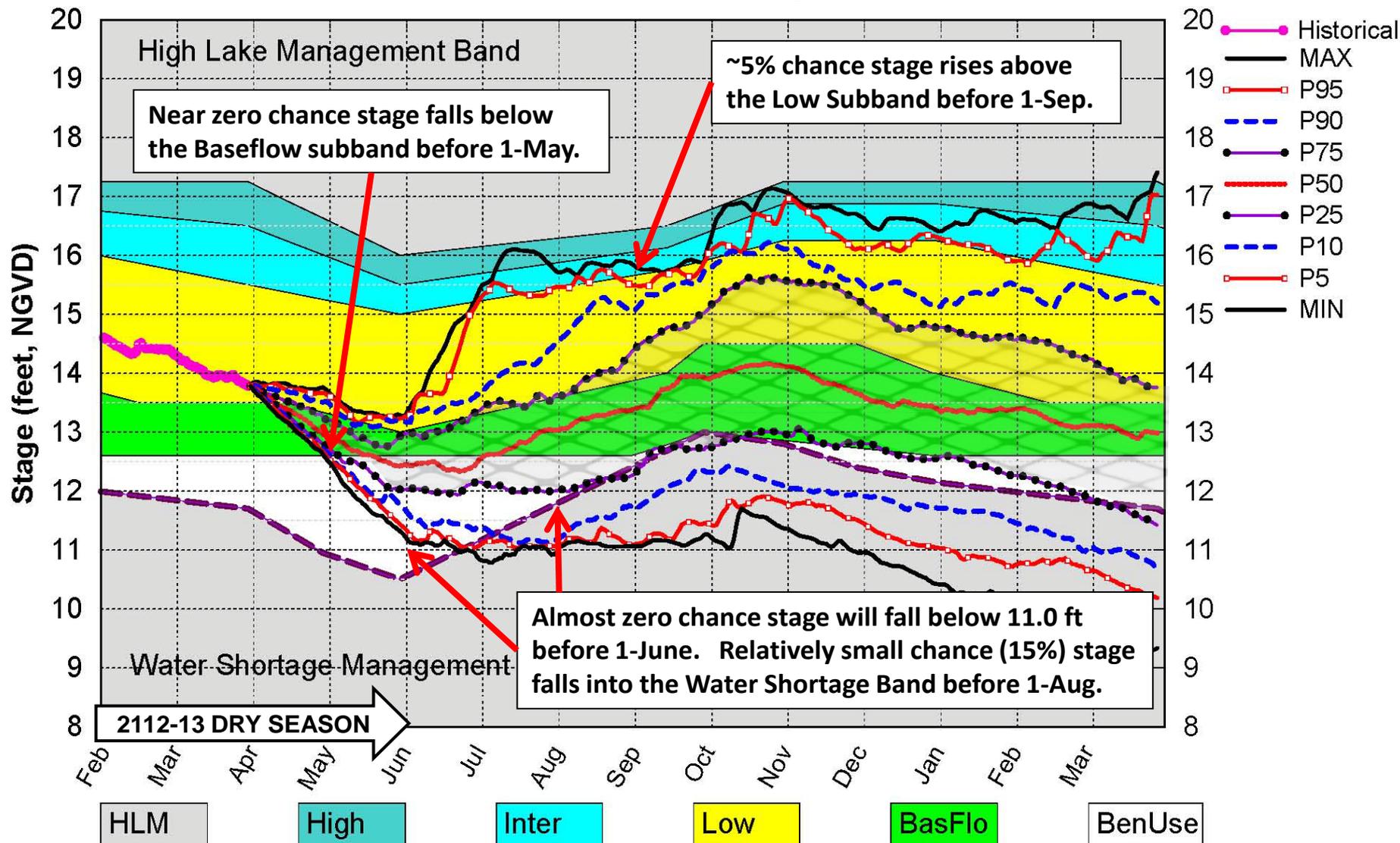


Made 21-Mar-2013

The recent CPC precipitation outlooks for the 2013 wet season indicate equal chances of Above-Normal (A), Below-Normal (B), and Normal rainfall for central and southern Florida. The remainder of the 2012-13 dry season shows Equal Chances of Above-Normal-Below for April, and about a 40% chance of Below-Normal (B) rainfall for Apr-Jun.

Lake Okeechobee SFWMM April 2013 Position Analysis

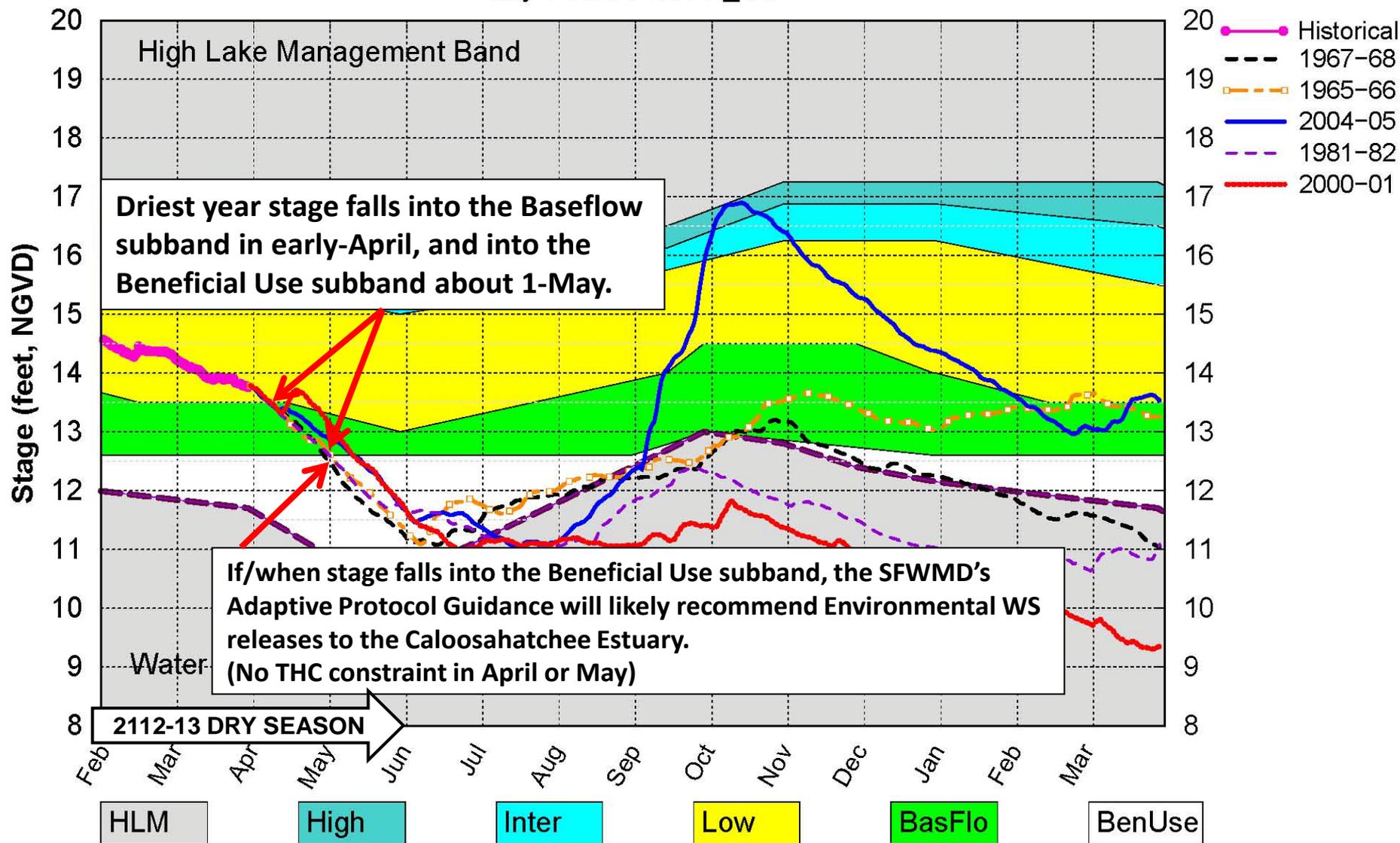
Percentiles based on 41 possible outcomes starting with Apr 1st initialization



(See assumptions on the Position Analysis Results website)

Lake Okeechobee SFWMM April 2013 Position Analysis

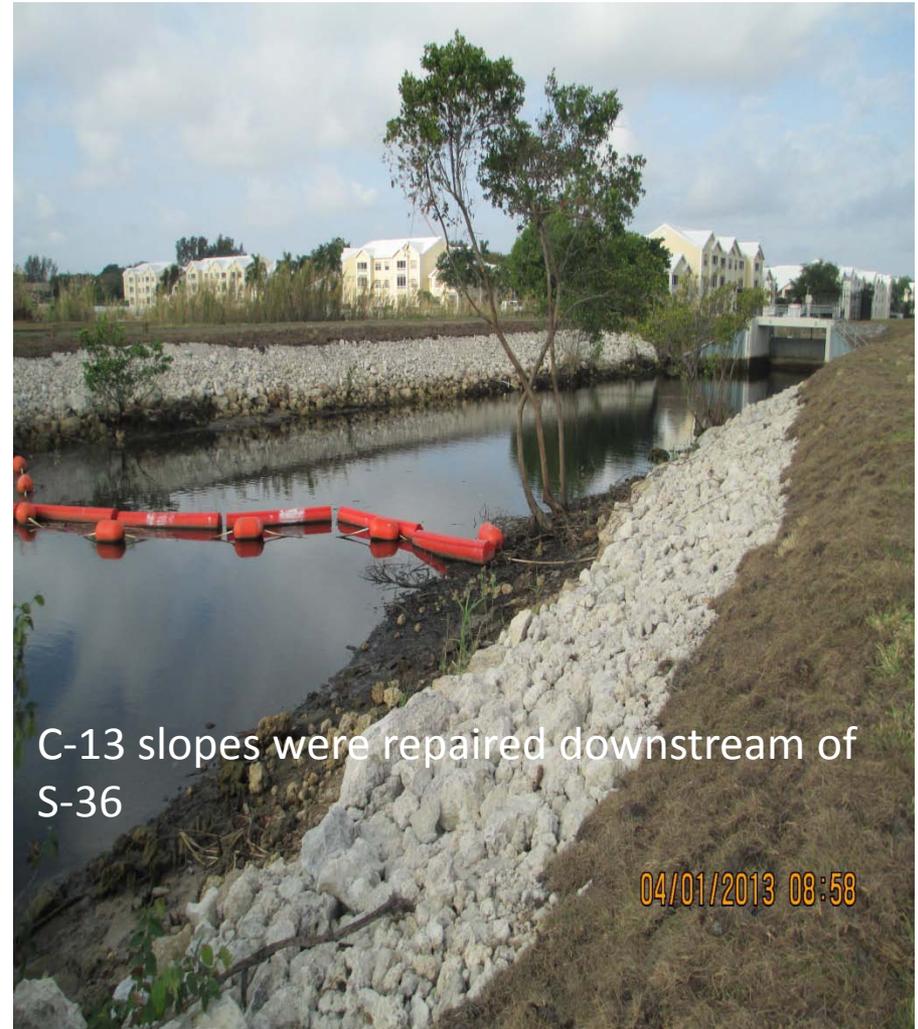
Dry Years Plot PA_V8



(See assumptions on the Position Analysis Results website)

Questions ?

C-13 exotic trees and debris were removed



C-13 slopes were repaired downstream of S-36

BACKUP SLIDES

Meteorological Summary March 2013

Figure 1

DISTRICT DAILY RAINFALL
March 2013

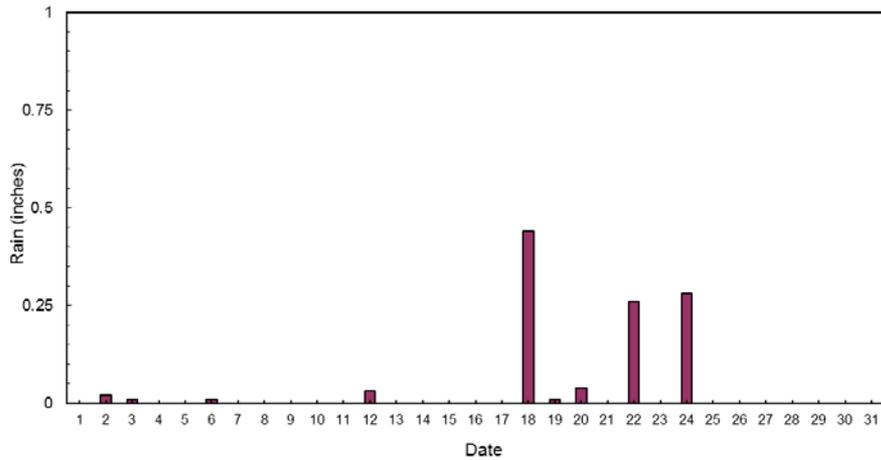


Figure 2

BASIN MONTHLY RAINFALL
March 2013

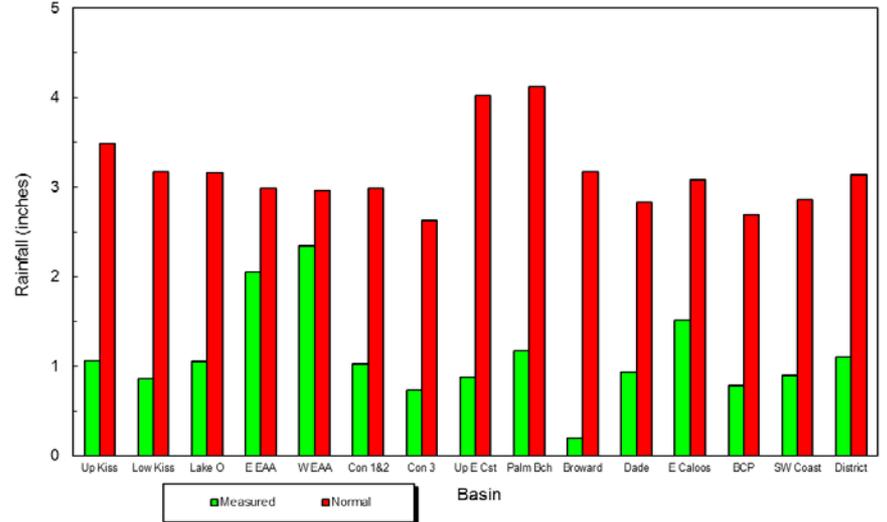
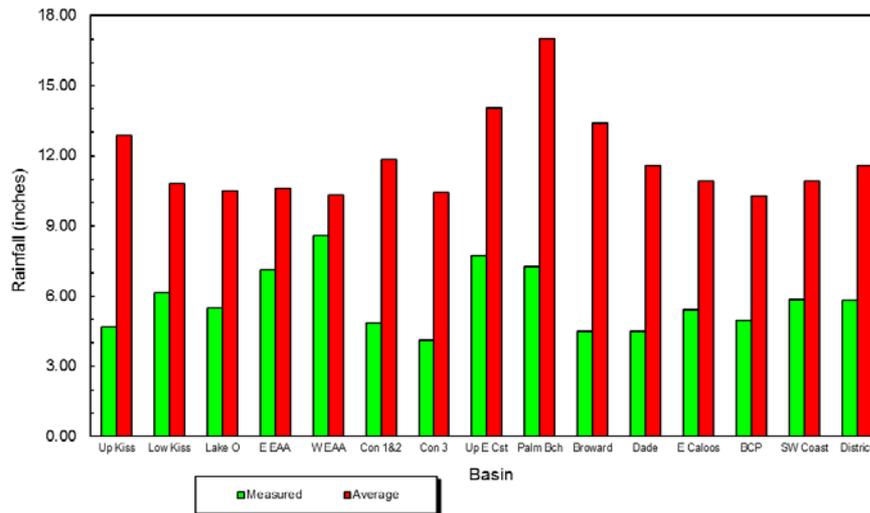


Figure 3

DRY SEASON RAINFALL
November 2012 - March 2013



SFWMD

Wet Season Rainfall

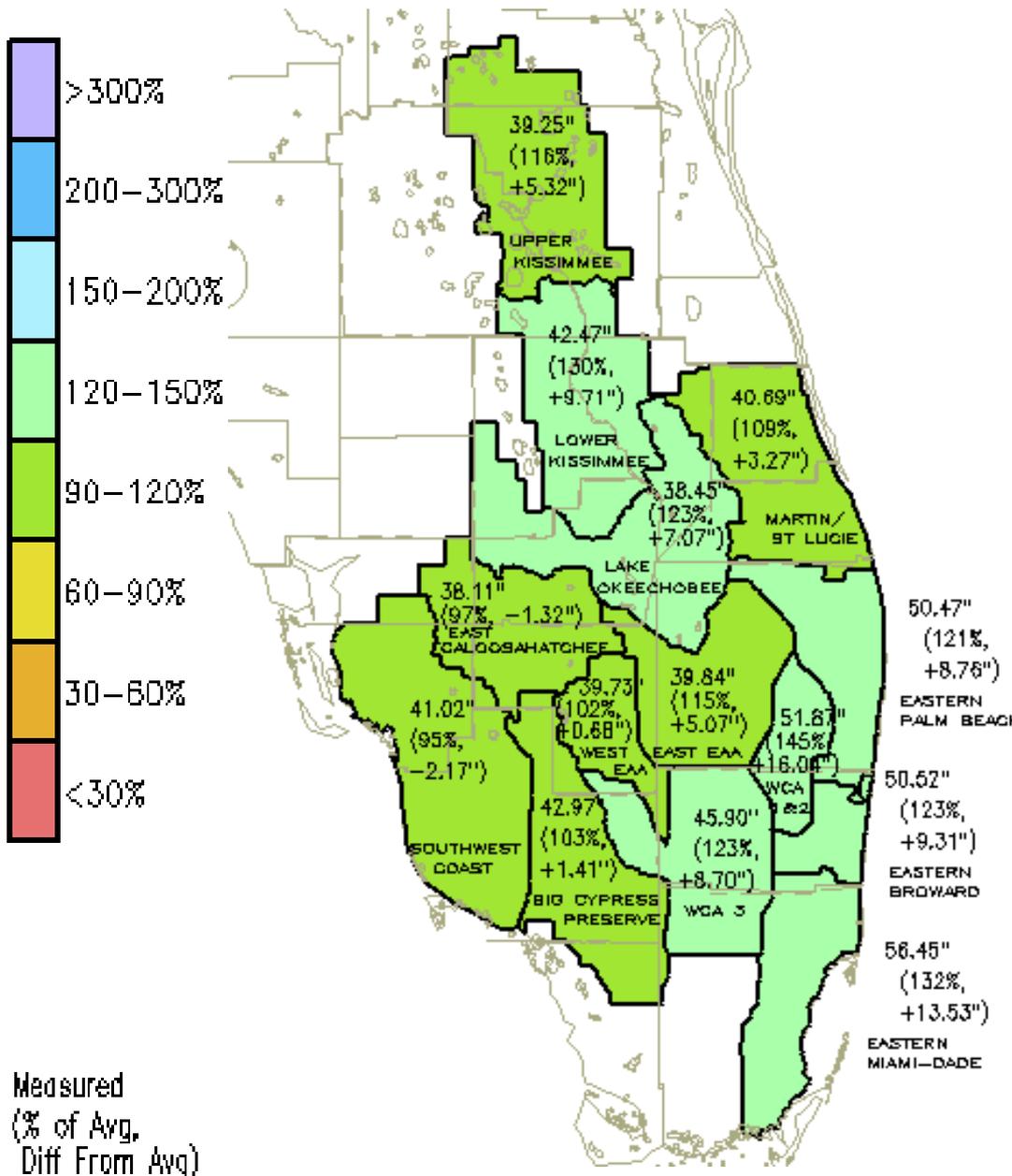
8 May – 9 November 2012**

**DISTRICT-WIDE: 42.87"
(115% of Avg, or +5.46")**

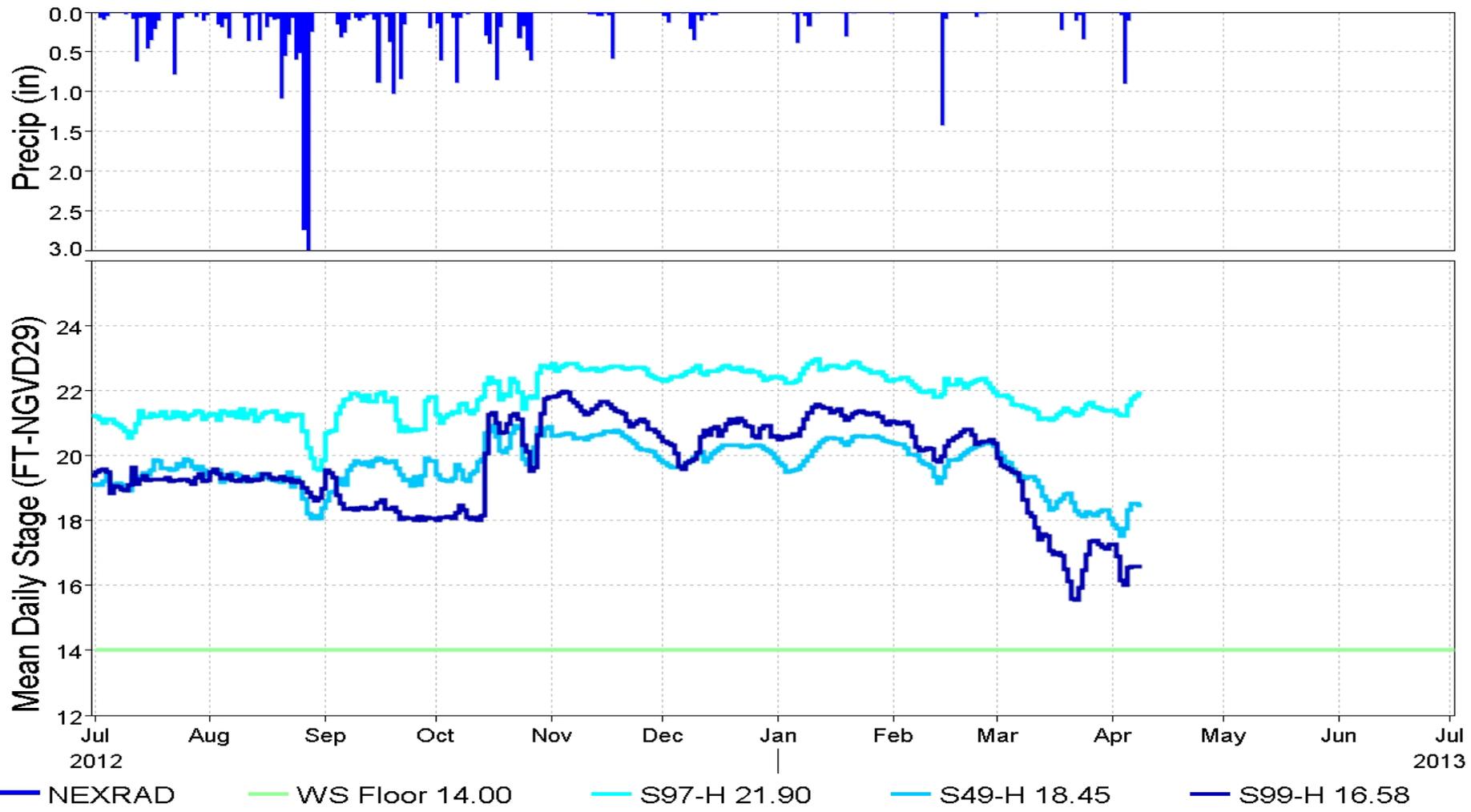
Most basins above average:

- Upper Kissimmee + 5.3"
- Lower Kissimmee + 9.7"
- Lake Okeechobee + 7.1"
- WCA 1 & 2 + 16.0"
- Eastern PB Co + 8.8"
- Miami-Dade + 13.5"

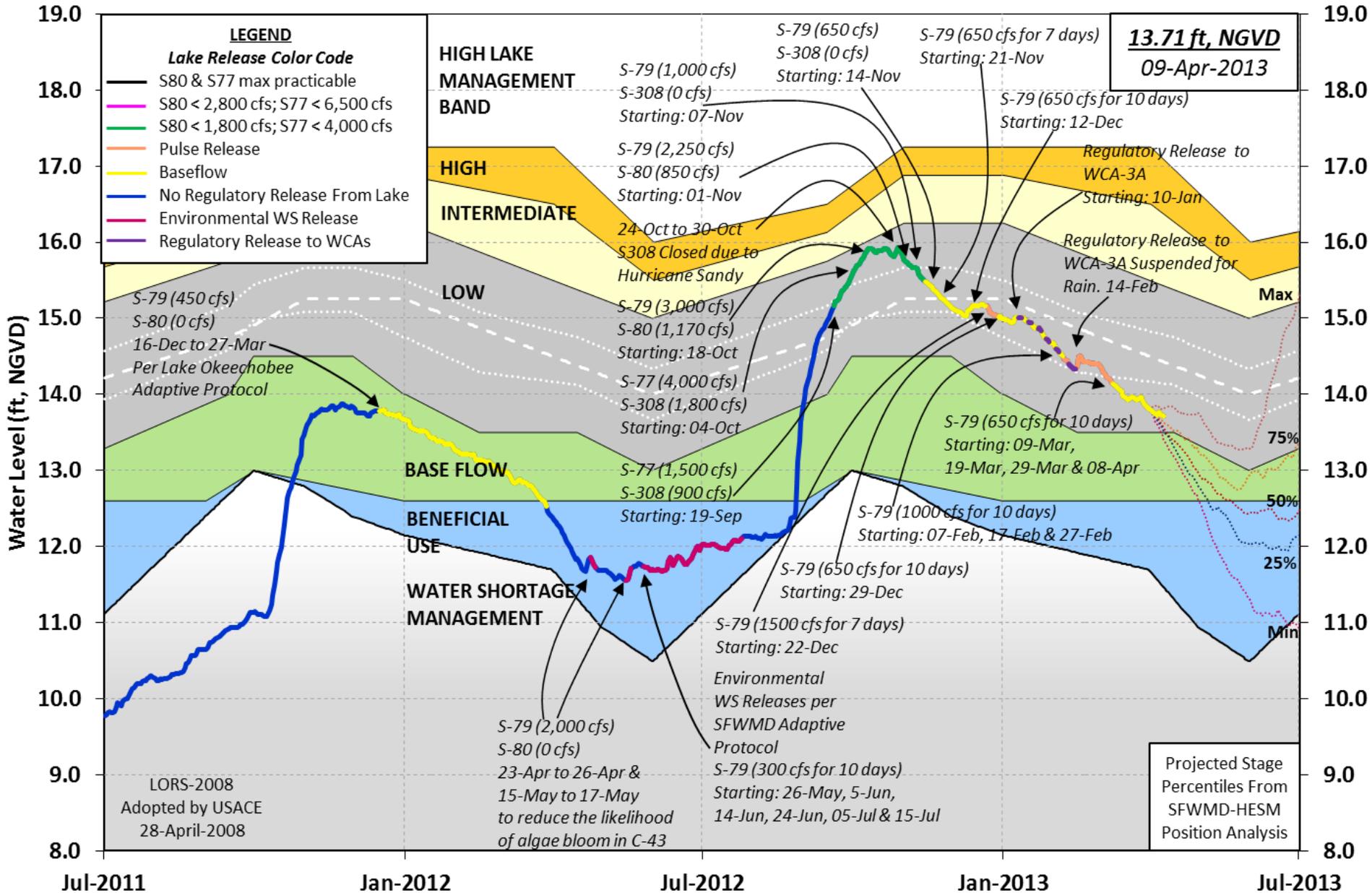
Southwest Coast and East Caloosahatchee are below average



SAINT LUCIE STRUCTURES (8 April 2013)



Lake Okeechobee Water Level History and Projected Stages



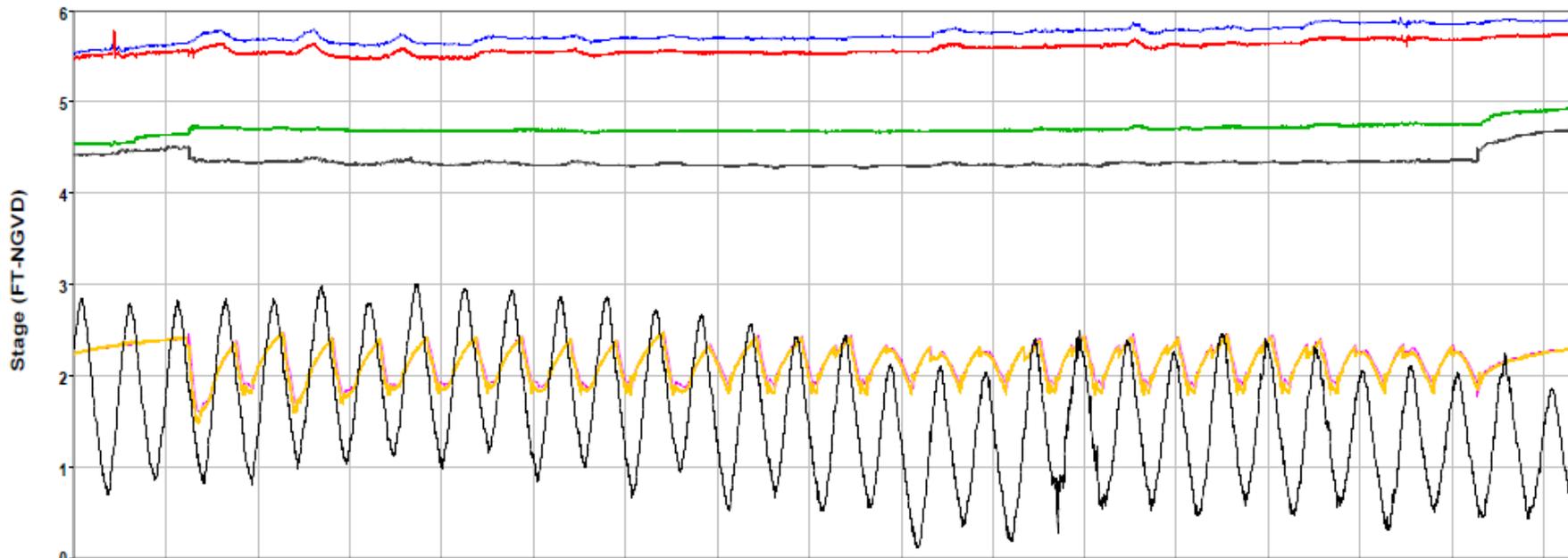
2012 Pilot Test

Fresh Water Releases to Biscayne Bay

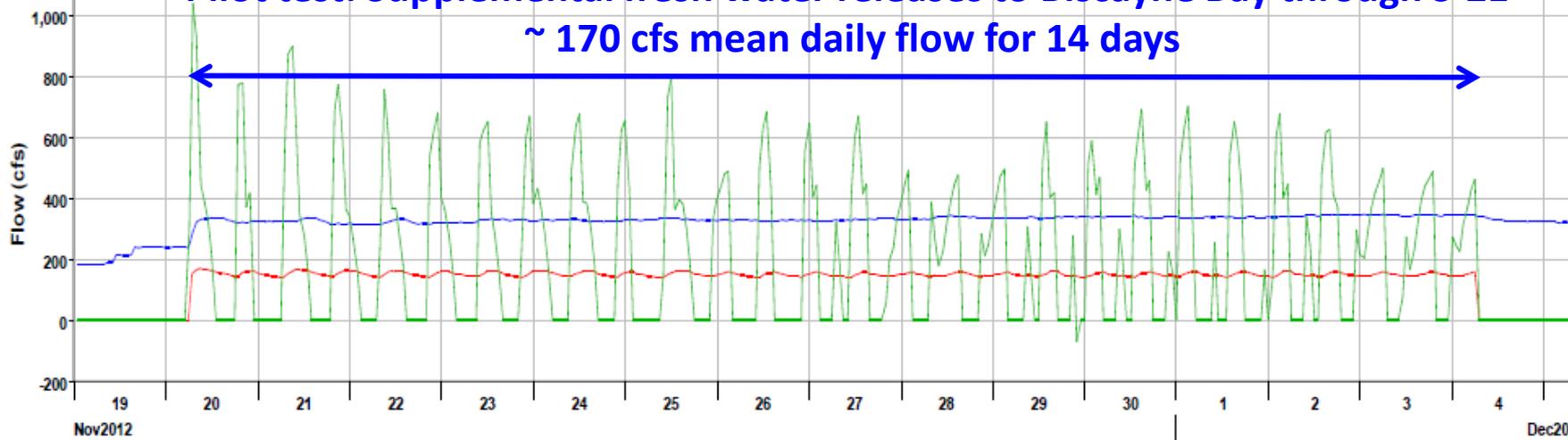
- SFWMD developed a process to conduct a pilot test
- Steps:
 - SFWMD staff held first internal meeting
 - SFWMD met with staff from ENP and BBNP to discuss release priorities
 - ENP agreed to the deliveries to BBNP as long as WCA-3A stage is in the flood control zone of the regulation schedule or releases through a previously closed WCA-3A structure could be used (e.g. S-12B closure)
 - WCA-3A recession rate favorable
- Test conducted Nov 20 – Dec 4



C-1W/C-1 Canals

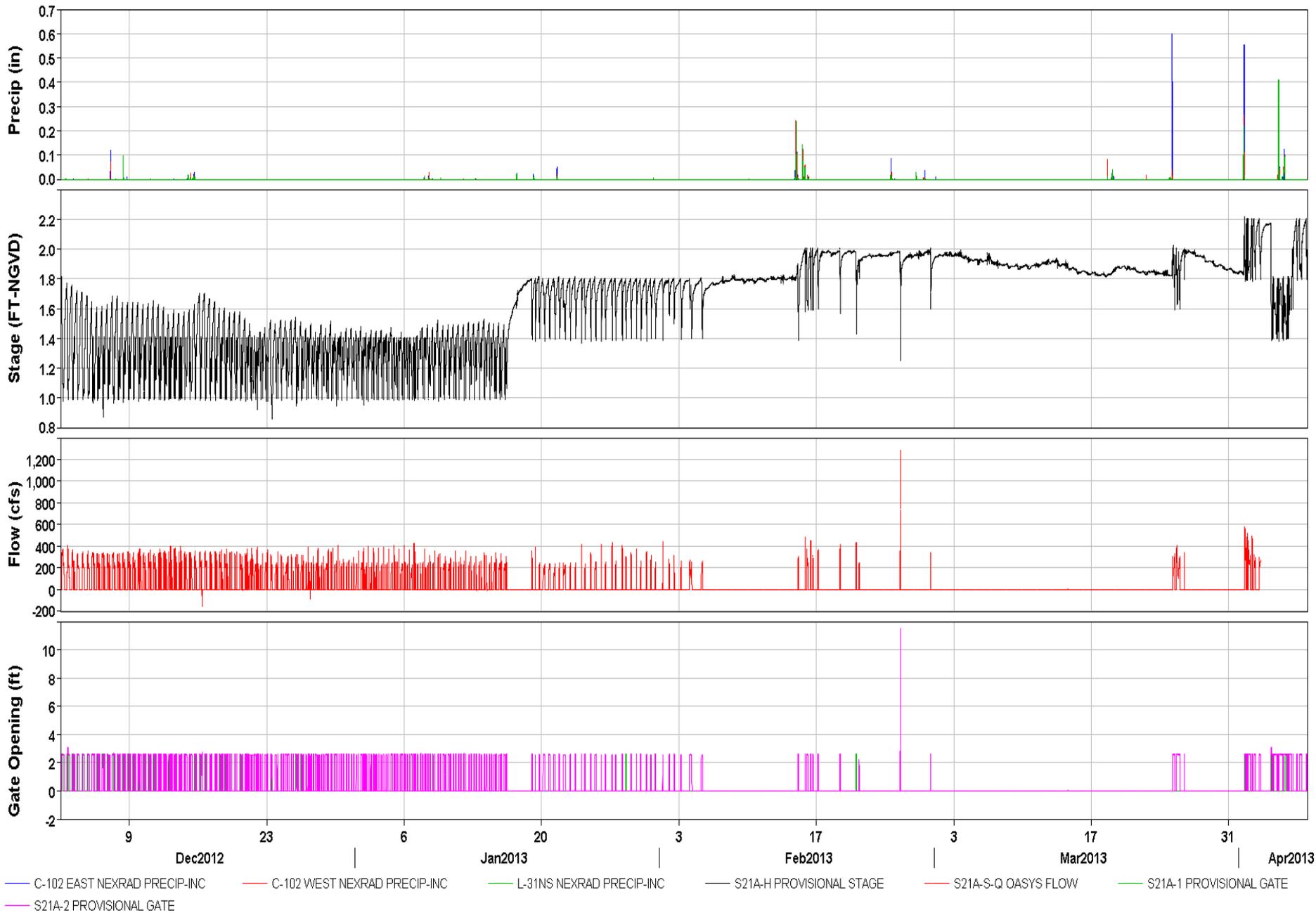


Pilot test: Supplemental fresh water releases to Biscayne Bay through S-21
 ~ 170 cfs mean daily flow for 14 days

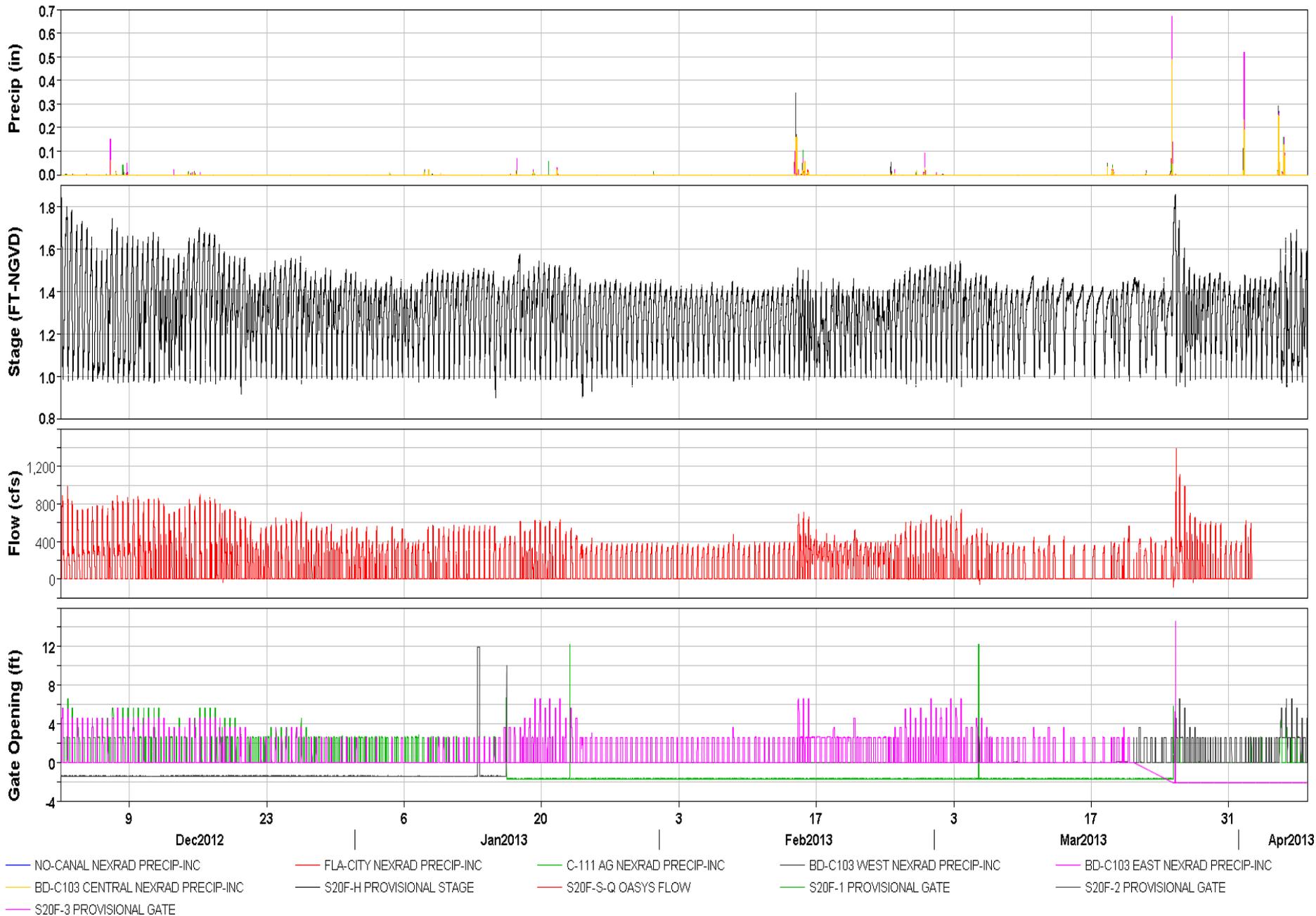


- G211-H PROVISIONAL STAGE — S338-H PROVISIONAL STAGE — S338-T PROVISIONAL STAGE — S148-H PROVISIONAL STAGE — S148-T PROVISIONAL STAGE — S21-H PROVISIONAL STAGE — S21-T PROVISIONAL STAGE
- S338-C-Q OASYS FLOW — S148-S-Q OASYS FLOW — S21-S-Q OASYS FLOW

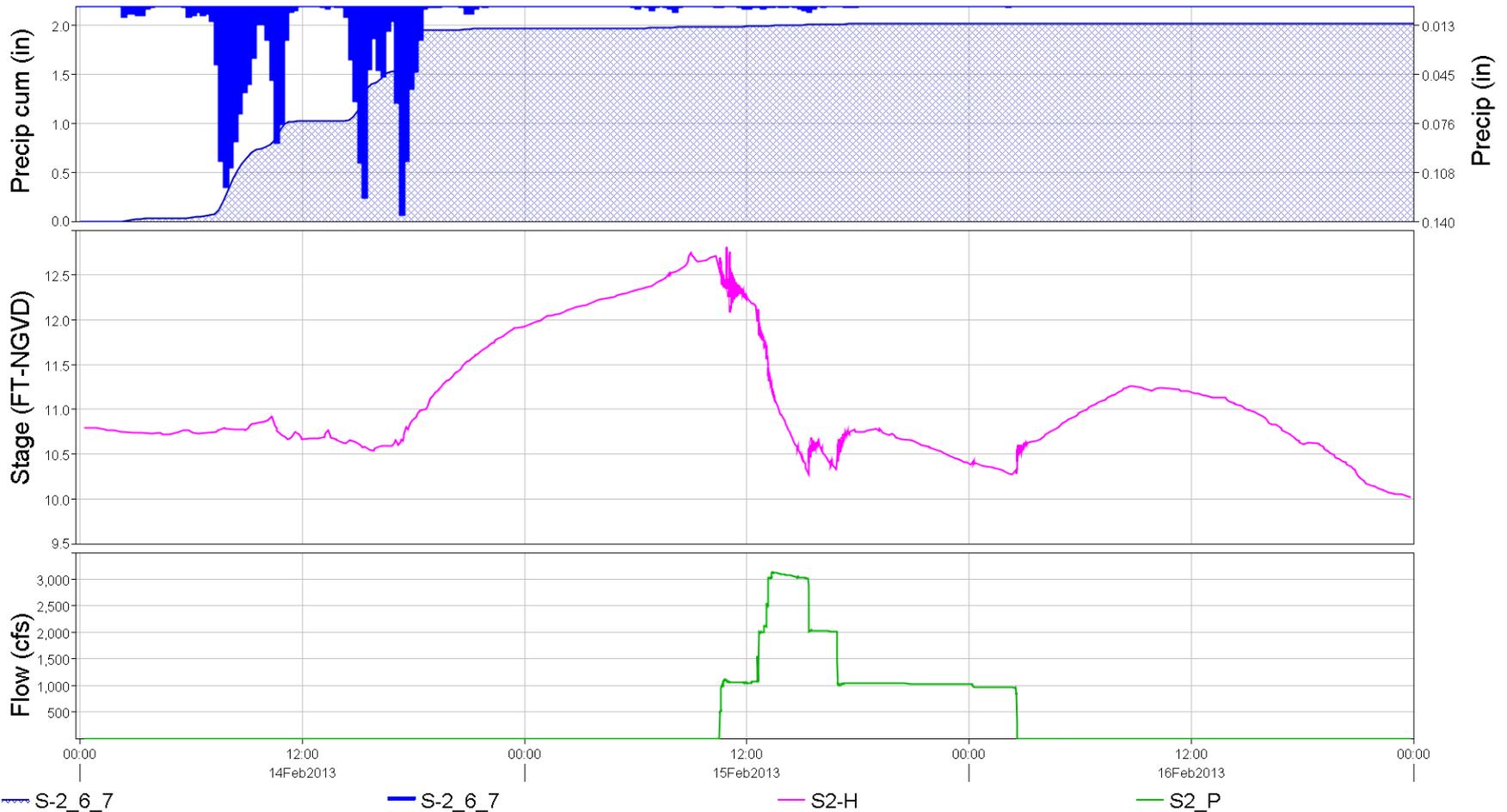
S21-A



S20-F

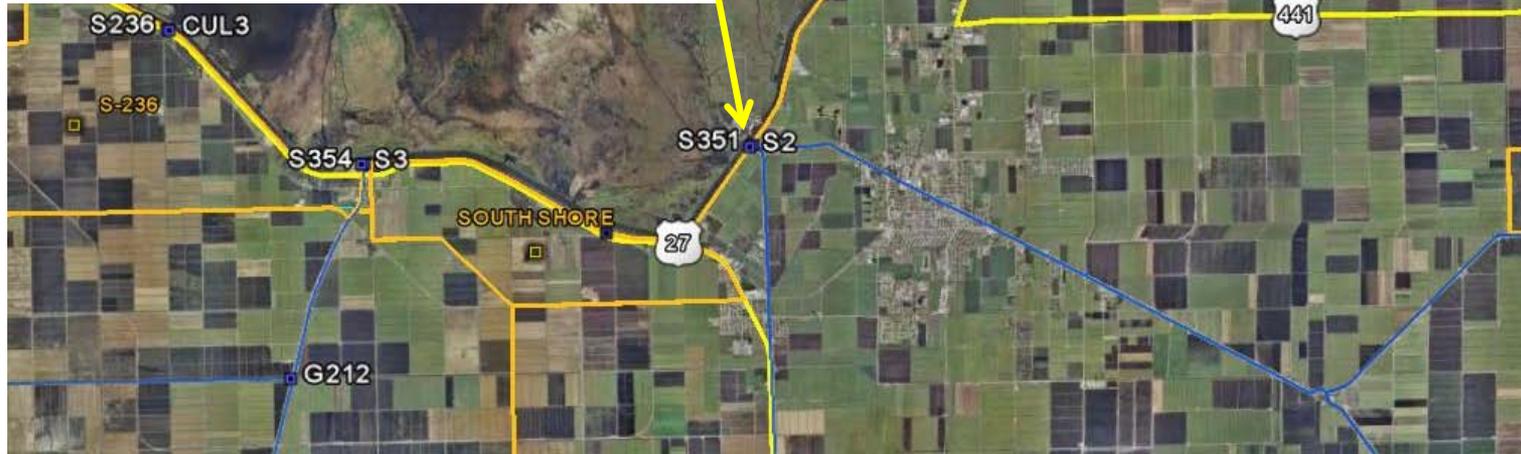
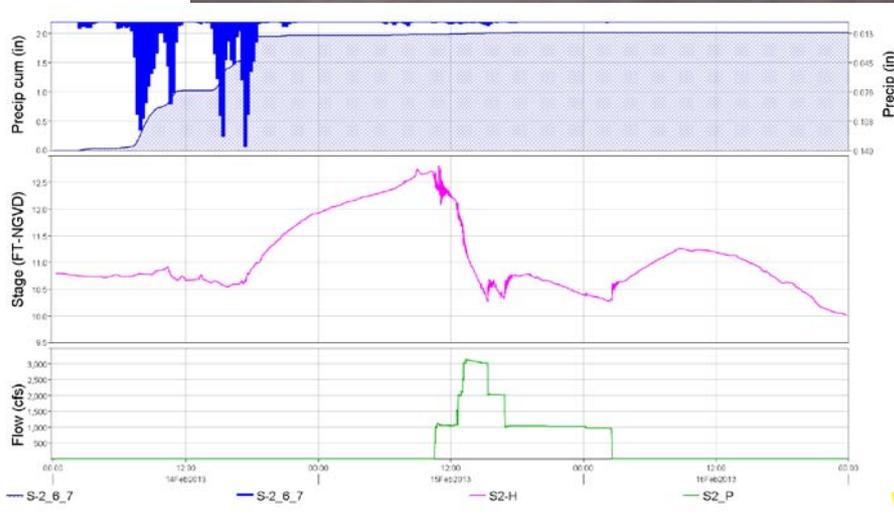


February 2013 S-2 Pumping Event



- As a result of the rainfall event on Feb. 14th, headwater elevations at S-2 rose above 12.5 ft NGVD. S-2 pumped approximately 1900 ac-ft into Lake Okeechobee (16 hrs). 1900 ac-ft is equal to about 0.004 feet on Lake O. Other pump stations in the EAA , S-5A, S-6, G-370 and G-372 pumped during the same period.

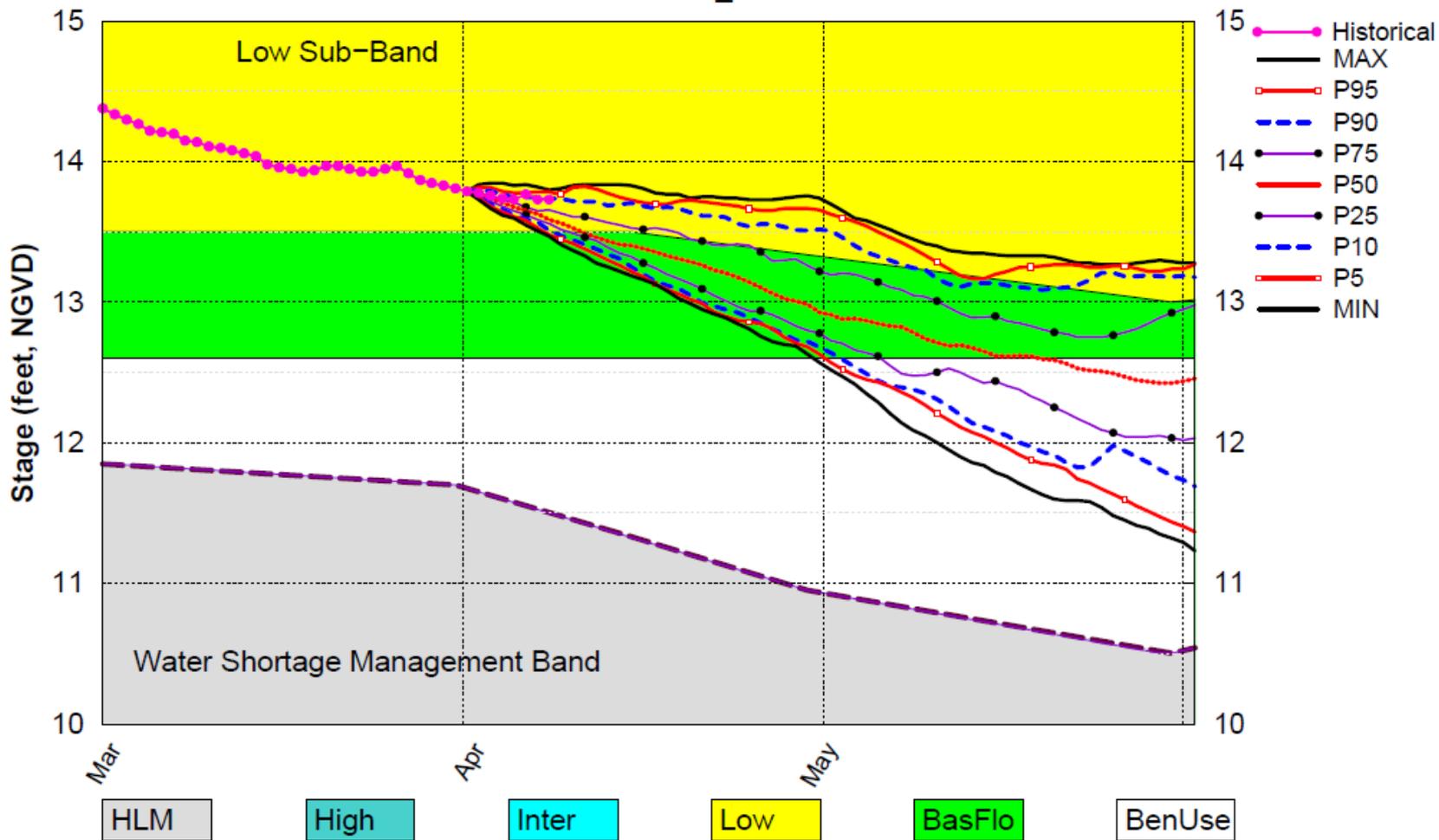
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Lake Okeechobee SFWMM April 2013 Position Analysis

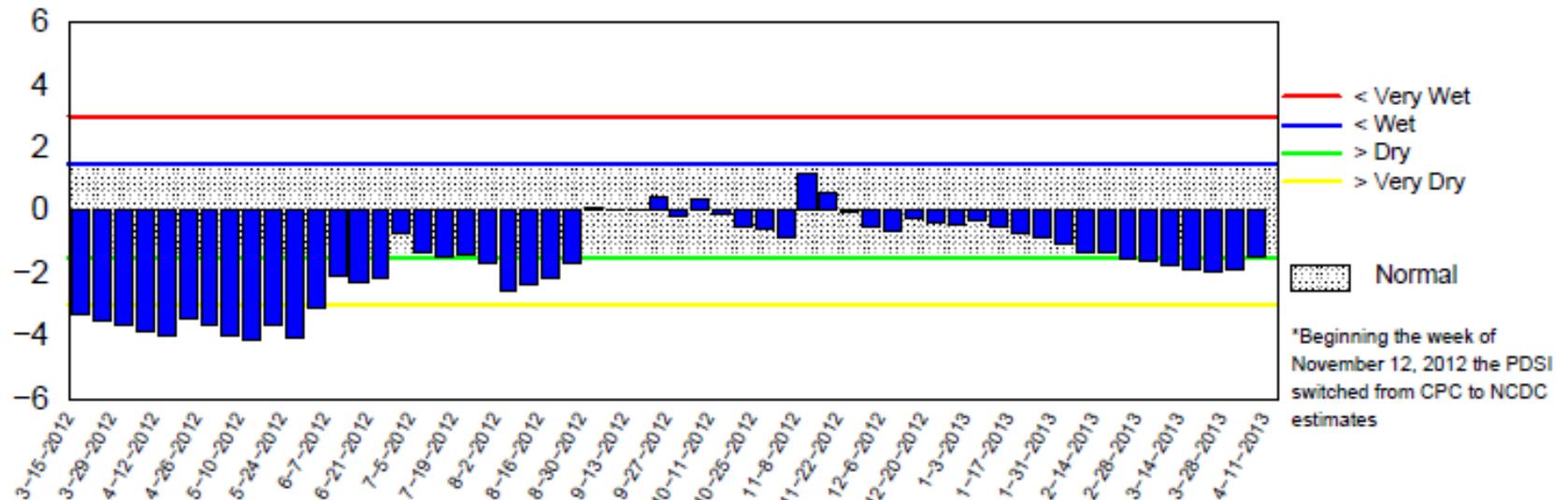
Percentiles PA_V8



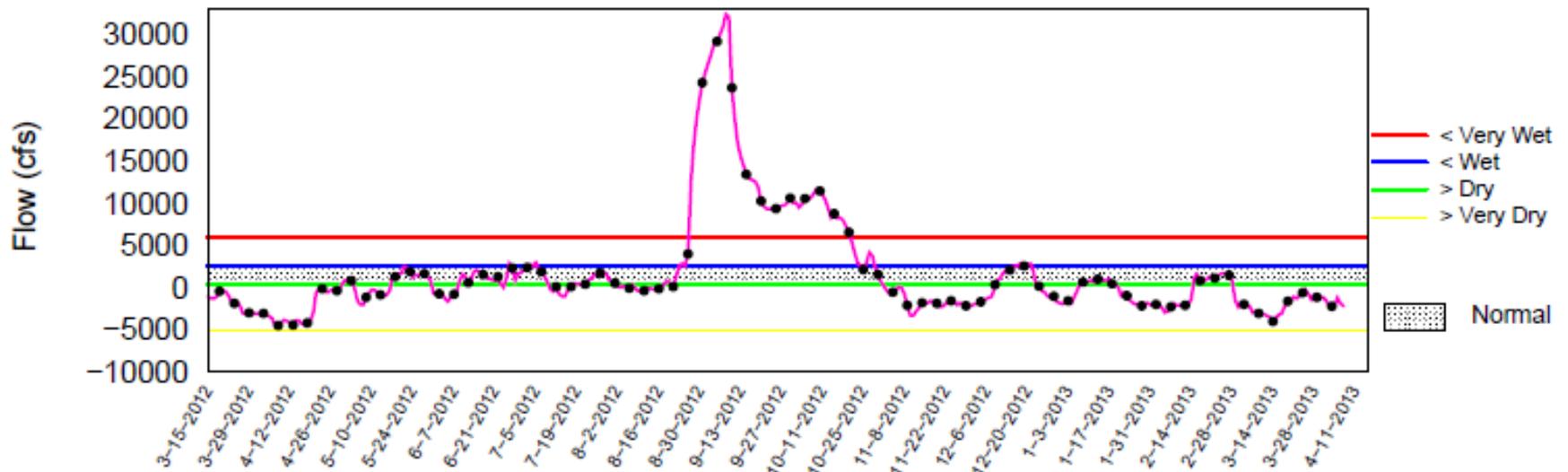
(See assumptions on the Position Analysis Results website)

Tributary Basin Condition Indicators as of April 8 2013

Palmer Index*



Lake Okeechobee Net Inflow (LONIN) 14-day Running Average



Water Resources Advisory Commission
April 4, 2013

Adaptive Protocols for Lake Okeechobee Operations

Water Conditions and Operations: Past, Present and 2013 Wet Season Outlook

Calvin J. Neidrauer, P.E., Chief Engineer
Water Control Operations Bureau

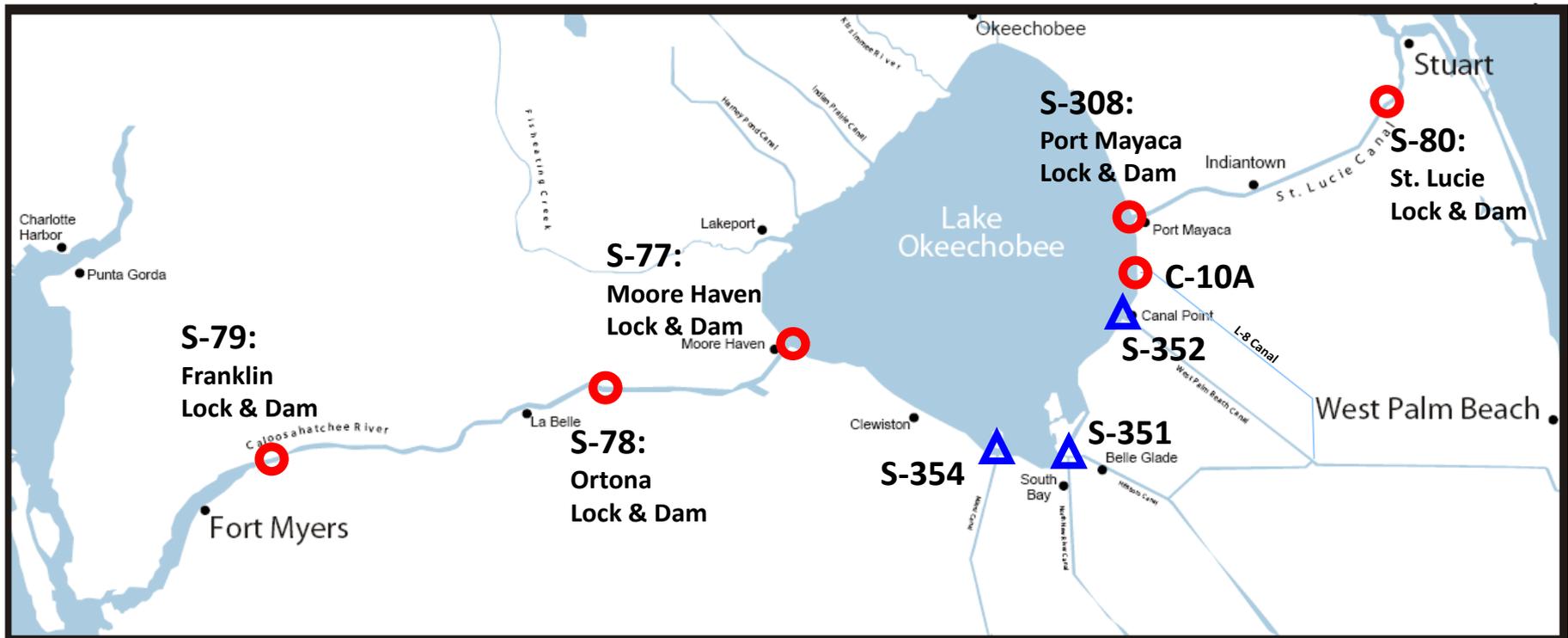
Topics

- 1. Brief Background**
- 2. Summary of 2012-13 Dry Season Water Conditions & Operations**
- 3. Current Water Conditions & Operations**
- 4. 2012-13 Wet Season Outlook**
- 5. 2012-13 Wet Season Tentatively Planned Operations (USACE)**

Part 1. Brief Background on Lake O Operations

Lake Okeechobee Outlet Structures

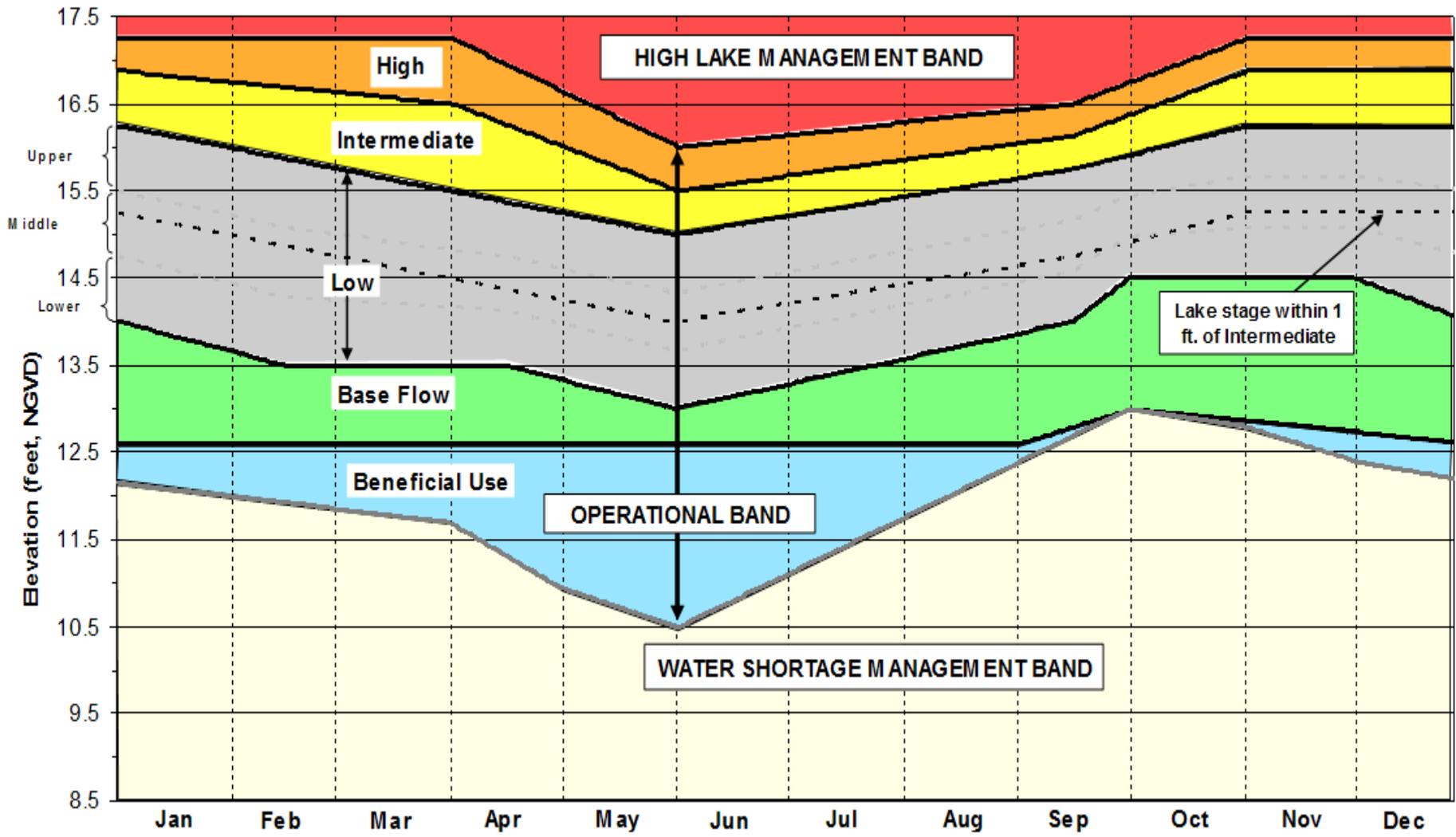
Lake Okeechobee outlet structures managed
by the USACE (red) and the SFWMD (blue Δ)



What is a Regulation Schedule?

- Tool used by water managers to regulate water levels in a reservoir/lake
- Triggers regulatory discharges (aka flood control discharges)
- Does not trigger water supply deliveries
- Designed to balance multiple objectives (flood control, navigation, water supply, enhancement of fish & wildlife, and recreation)

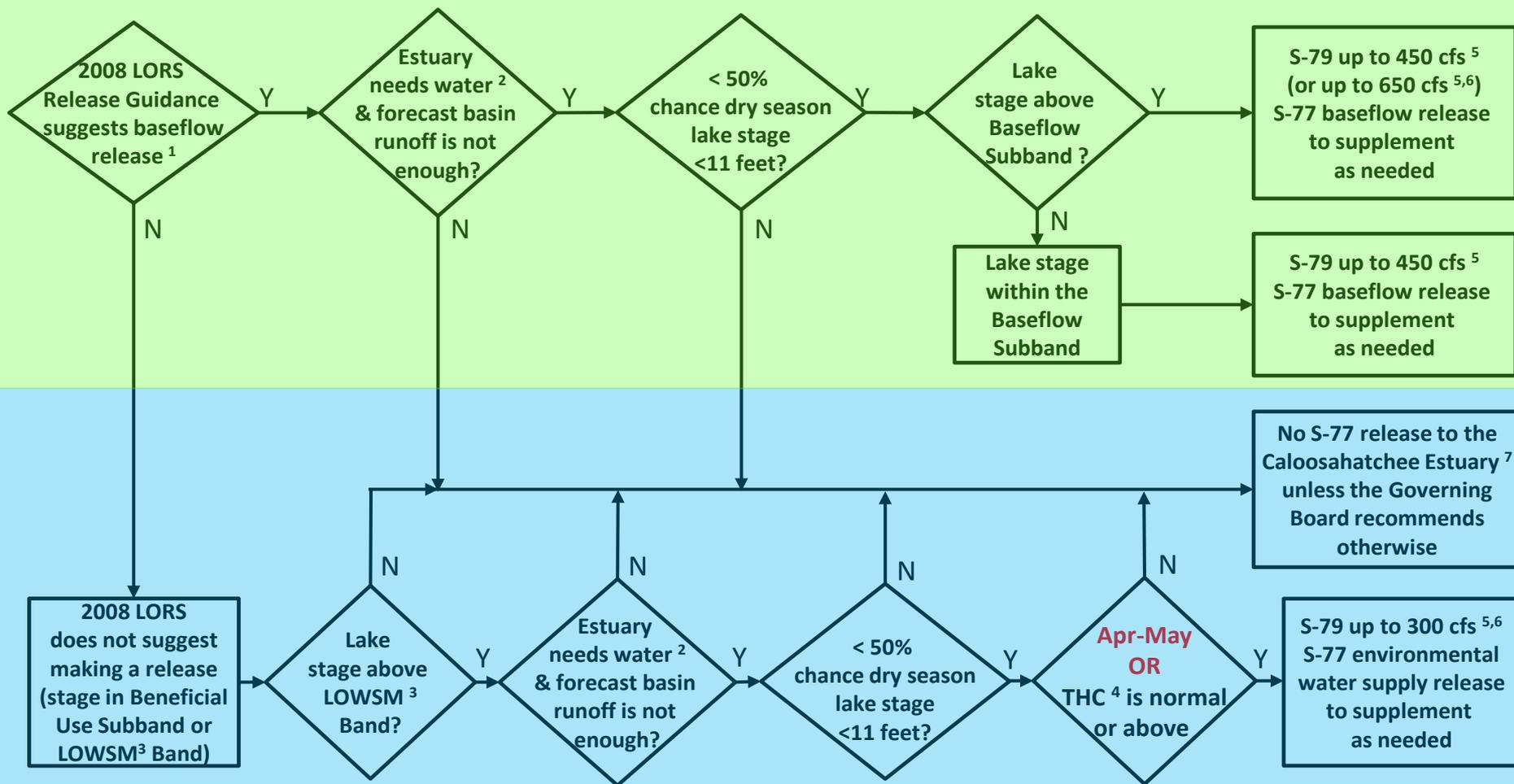
2008 Lake Okeechobee Interim Regulation Schedule (aka LORS-2008)



What are the Lake O Adaptive Protocols (AP)?

- AP document (16-Sep-2010) provides operational guidance to SFWMD staff and Governing Board for making Lake O release recommendations to the USACE.
- Flowchart used to guide SFWMD recommendations for Lake O Releases to the Caloosahatchee Estuary
 - for 2008 LORS Baseflow
 - for Environmental Water Supply
- Flowchart was designed primarily to achieve the Governing Board-approved water supply balance between Caloosahatchee Estuary, permitted water users, and other water supply purposes of the water control system.

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



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

²Estuary “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.

³LOWSM = Lake Okeechobee Water Shortage Management.

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

⁵Can release less than the “up to” limit if lower release is sufficient to reach or sustain desired estuary salinity; cfs = cubic feet per second.

⁶After reviewing conditions in Water Conservation Areas (WCAs), Stormwater Treatment Areas (STAs), ENP, St. Lucie Estuary and Lake Okeechobee.

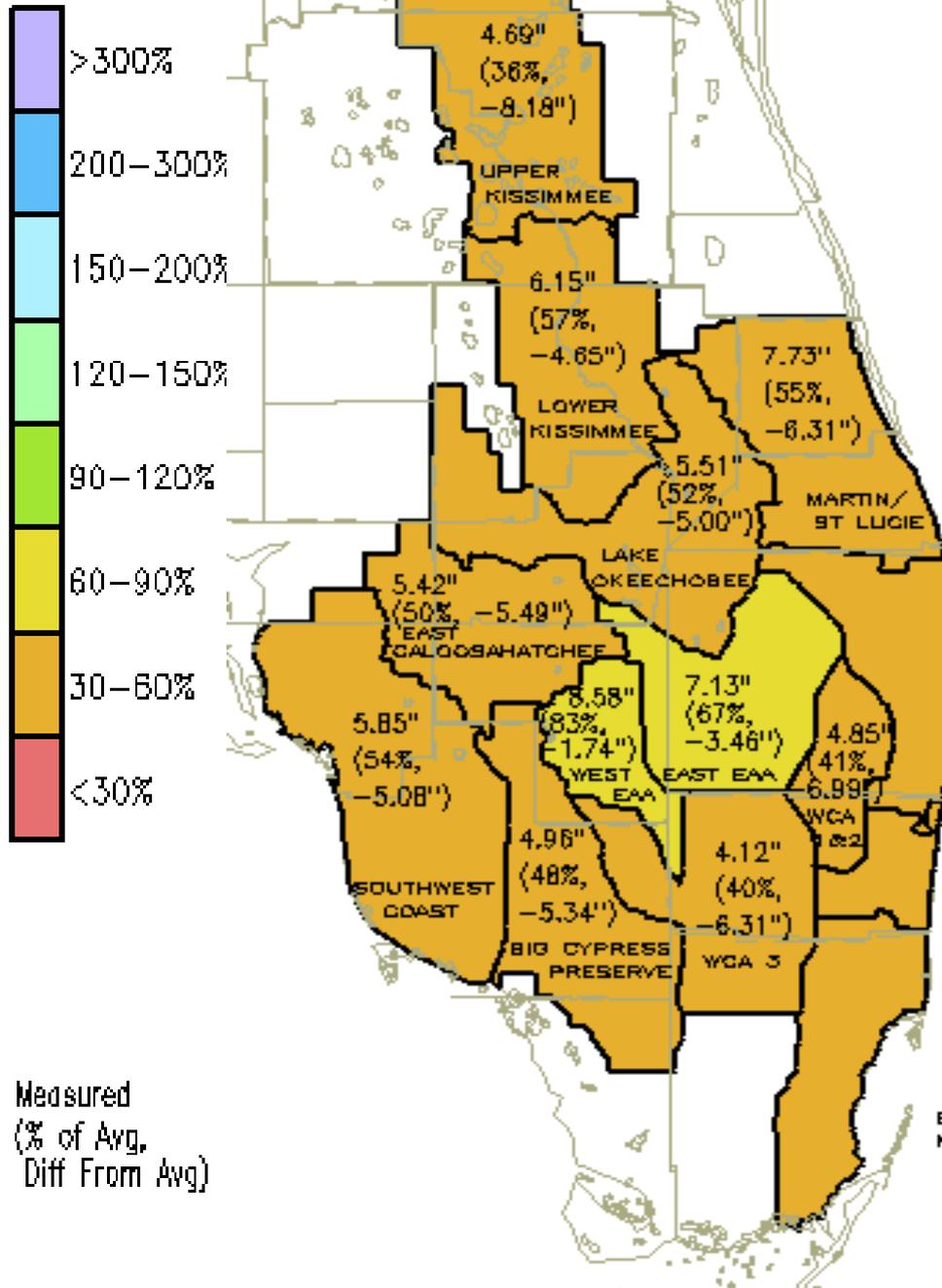
⁷Should this condition be reached, the Governing Board will be briefed at their next regularly scheduled meeting as part of the State of the Water Resources agenda item.

Part 2. 2012-13 Dry Season Water Conditions & Operations

SFWMD 2012-13 Dry Season Rainfall

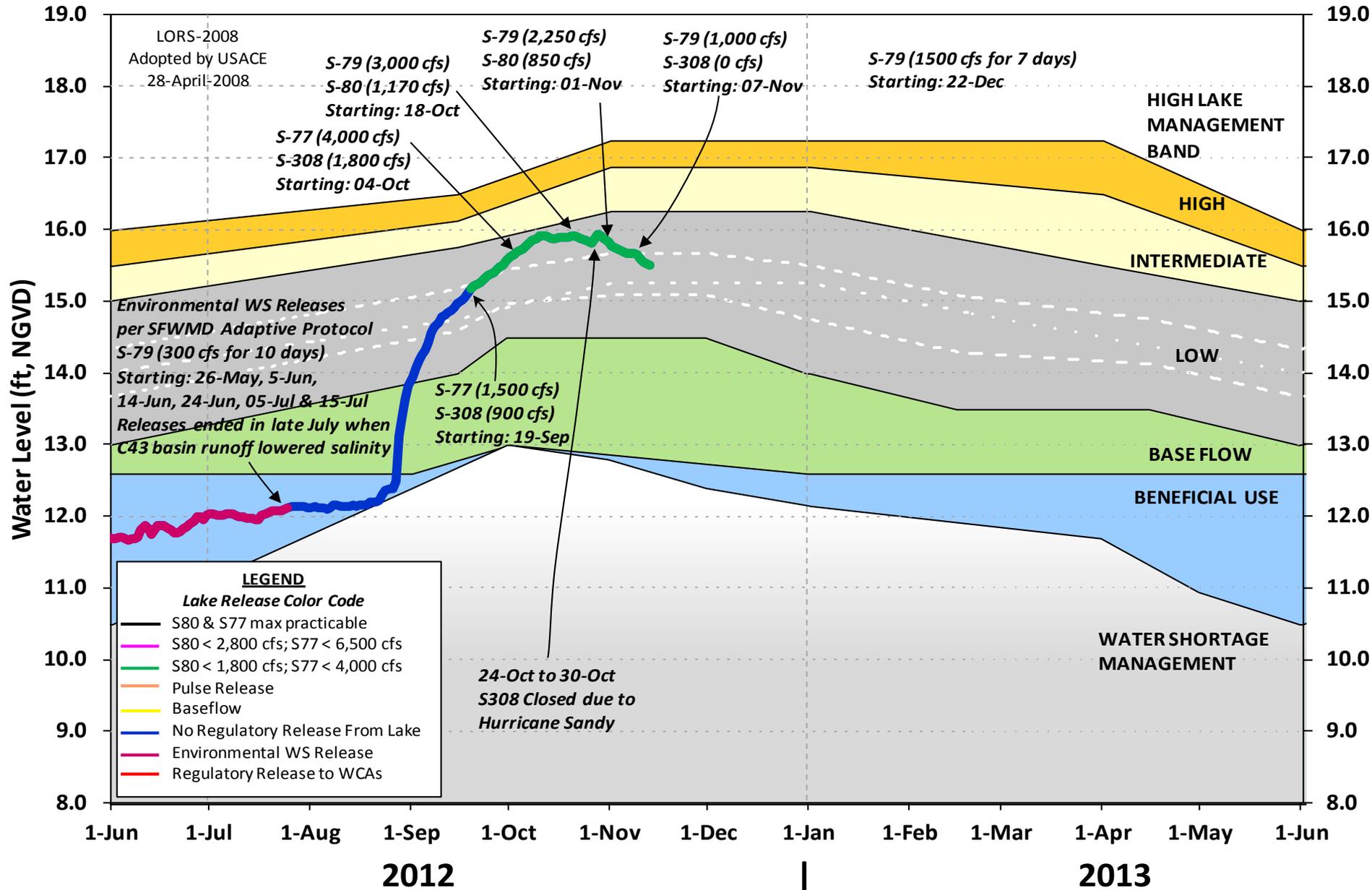
Nov 2 – Apr 1

DISTRICT-WIDE: 5.82" (50% of Avg, or -5.77")

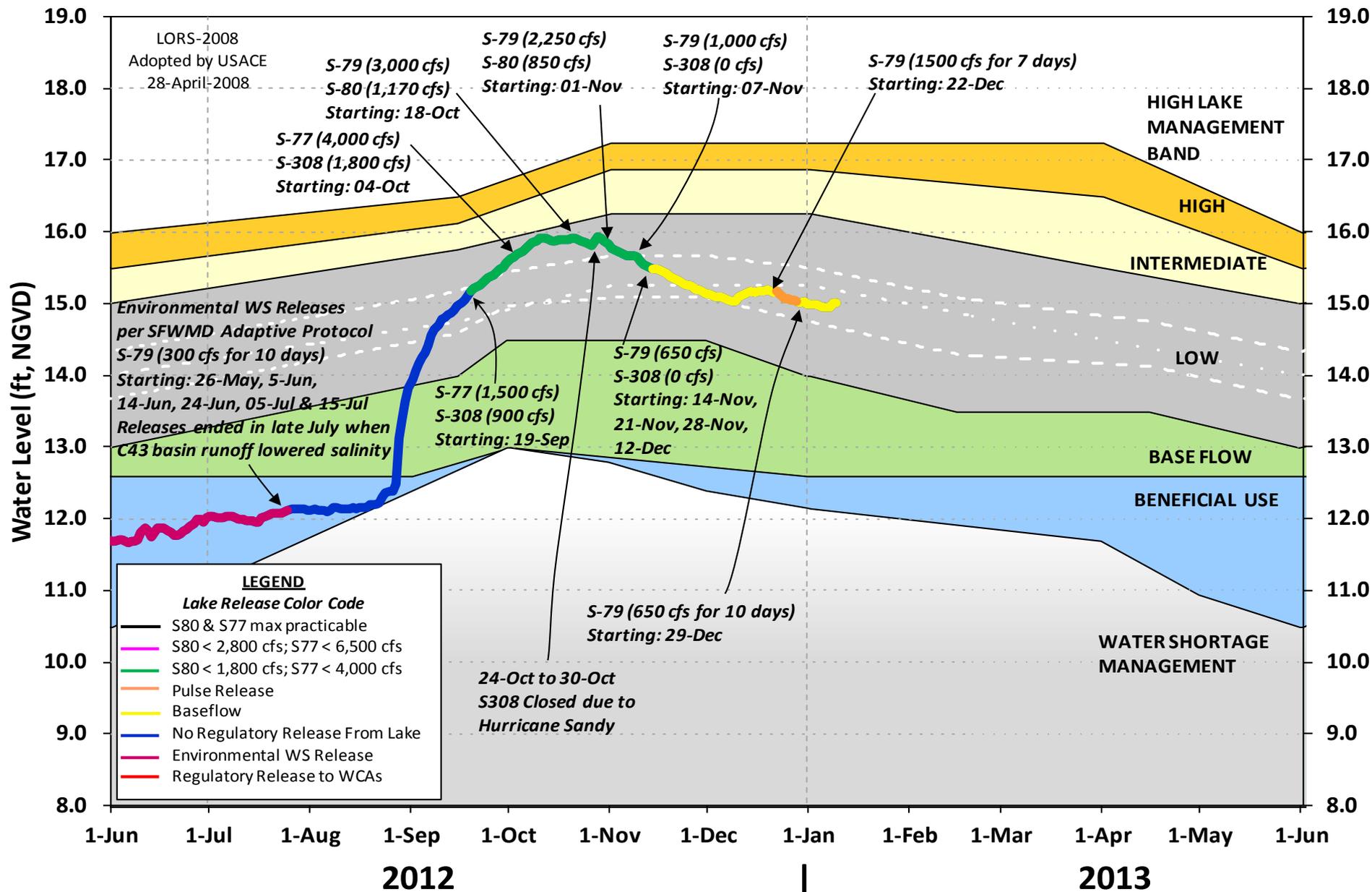


- **Nov rain 0.29" (2" below average)**
- **Driest Nov in the District's record which begins in 1932**
- **El Nino faded this year**

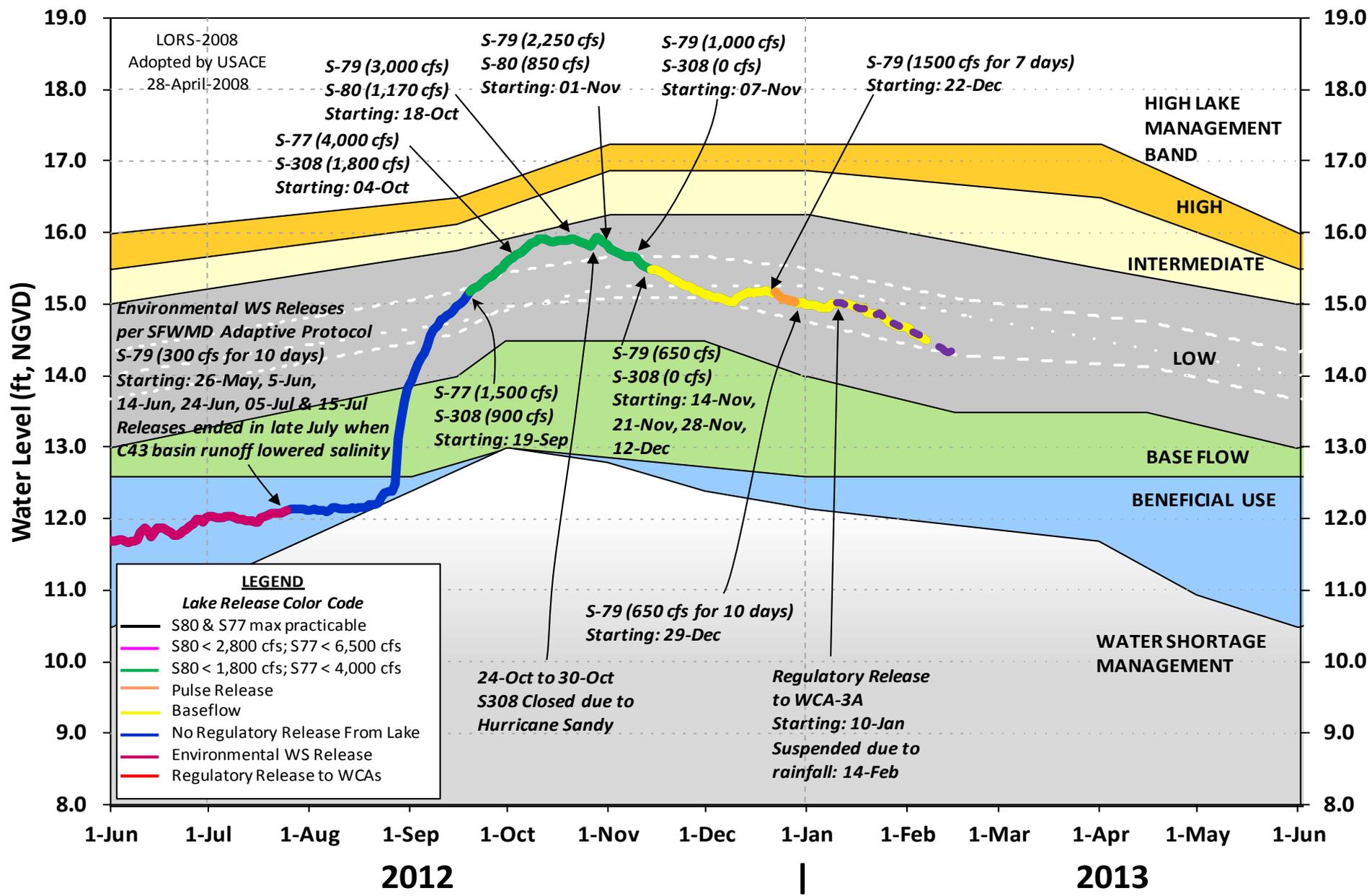
Lake Okeechobee Water Level and Release History



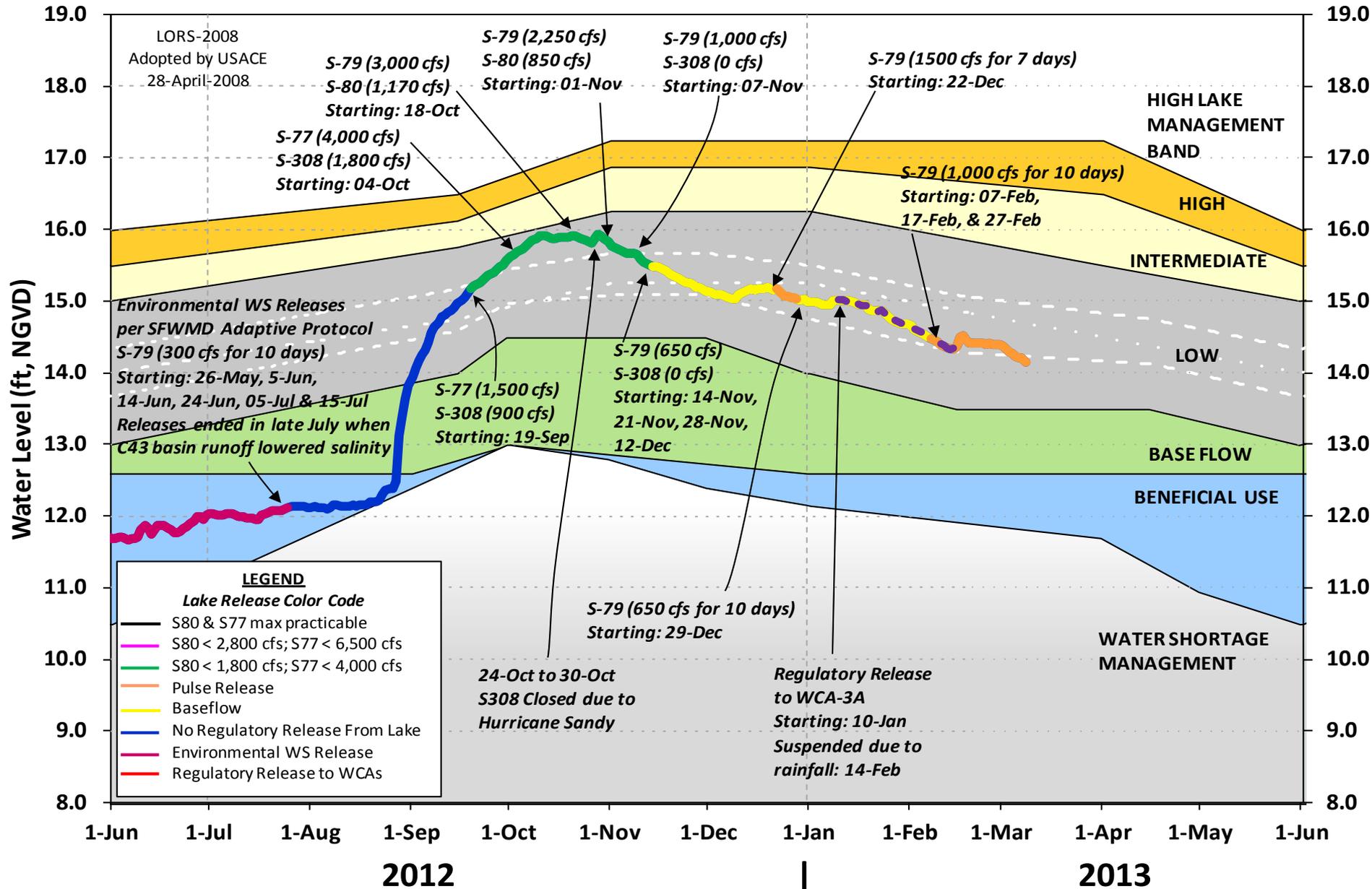
Lake Okeechobee Water Level and Release History



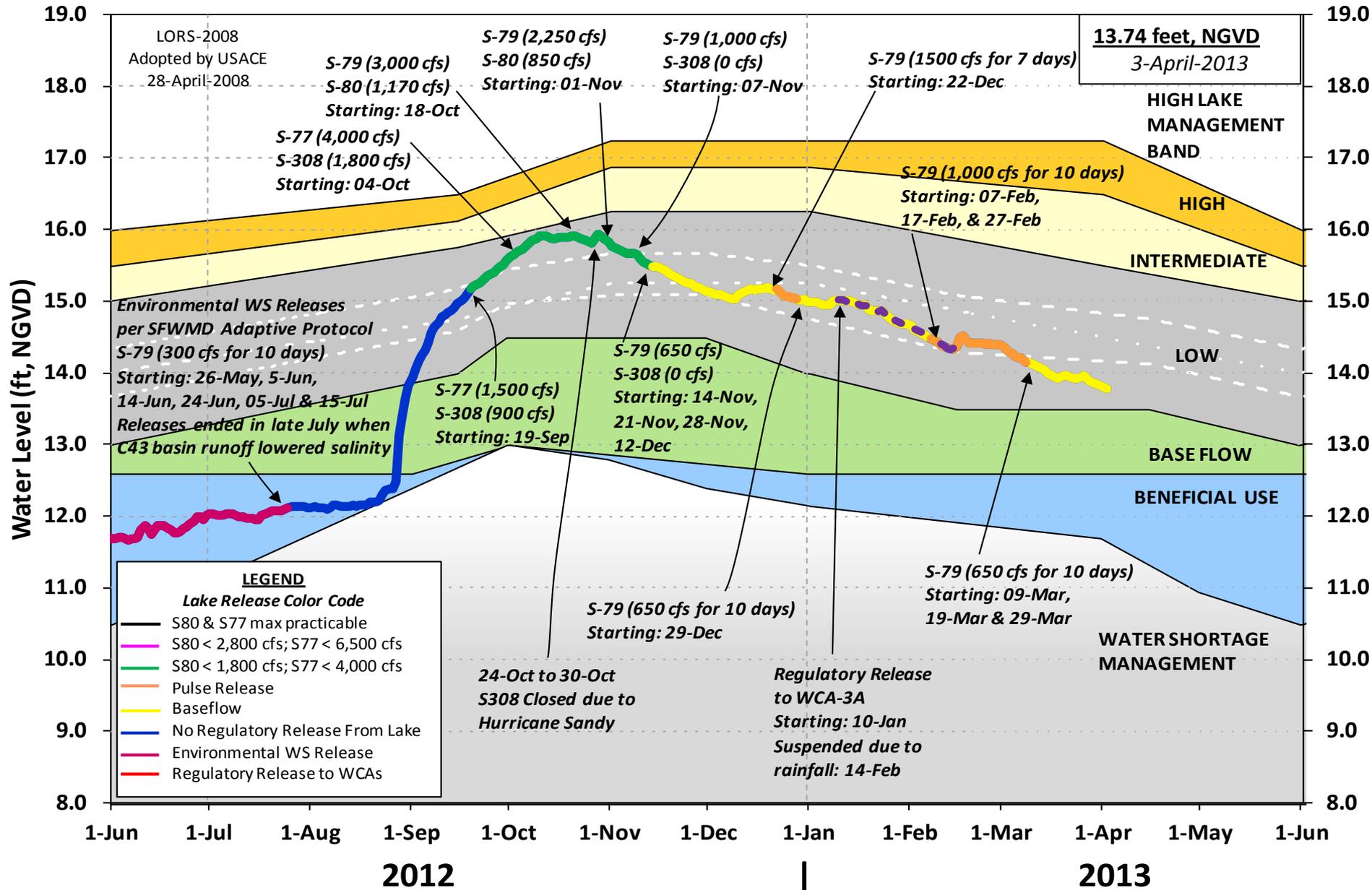
Lake Okeechobee Water Level and Release History



Lake Okeechobee Water Level and Release History

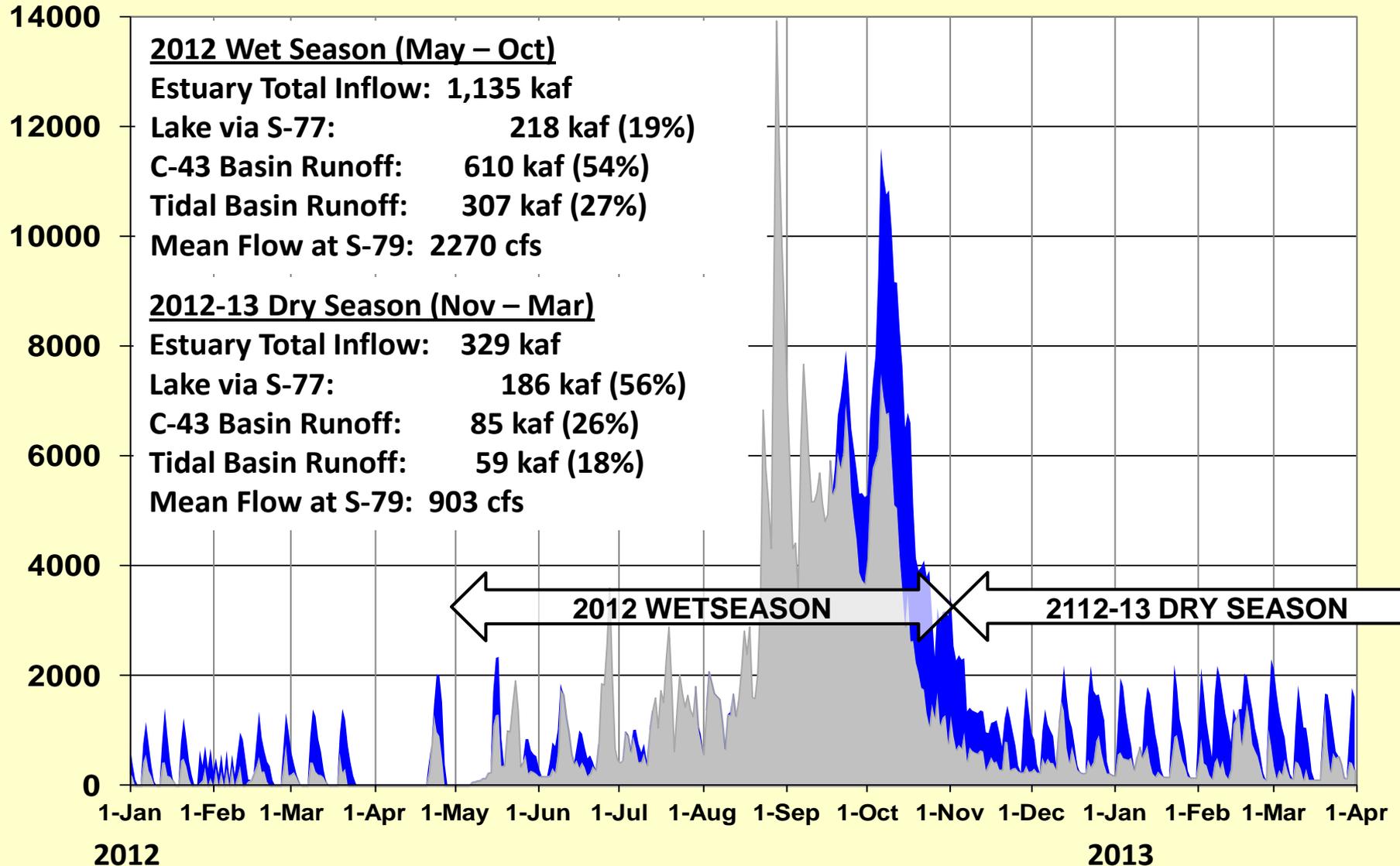


Lake Okeechobee Water Level and Release History



Total Flow to Caloosahatchee Estuary

showing contributions from C-43 & Tidal Basins and Lake Okeechobee



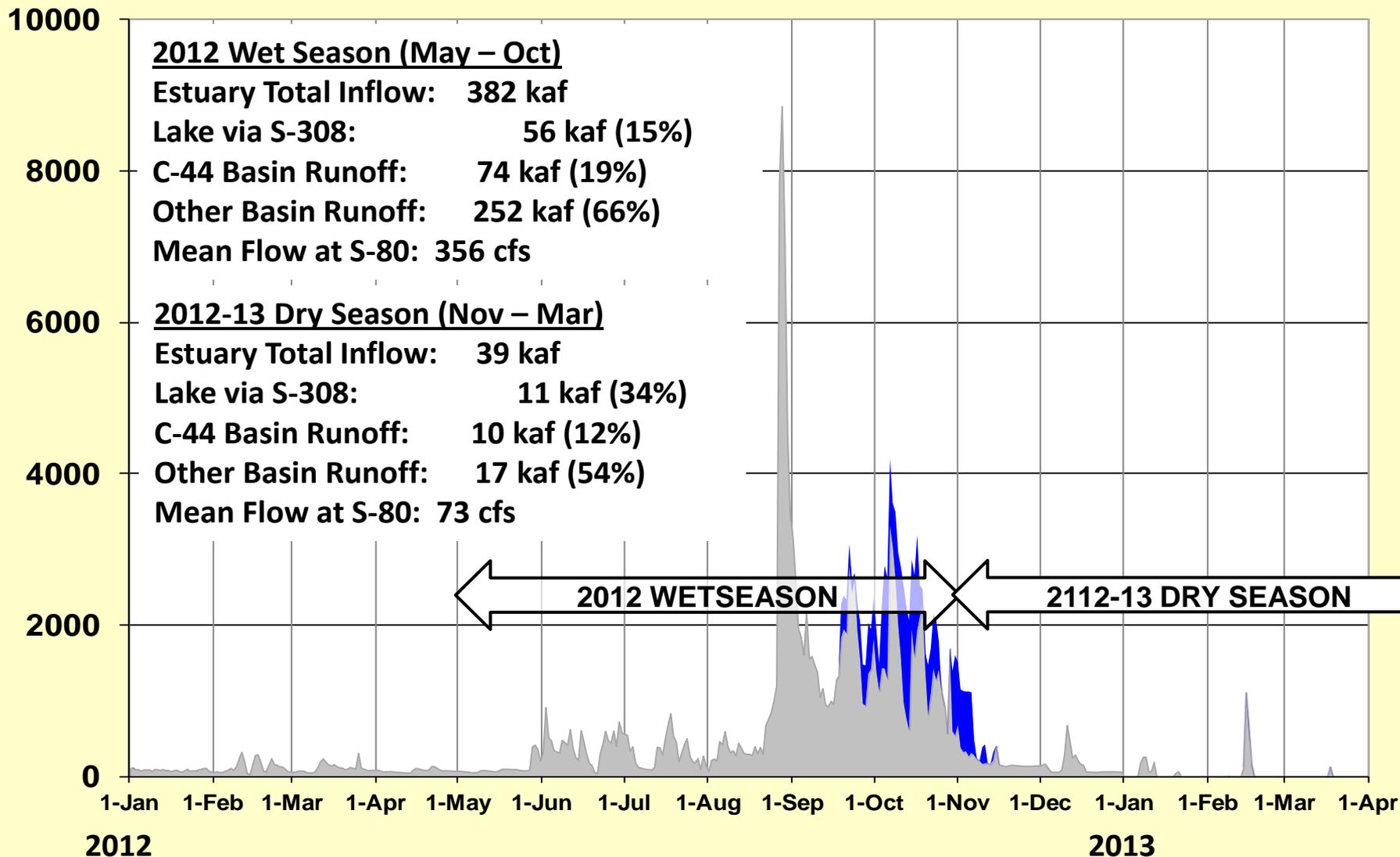
■ Total Inflow from C-43 and Tidal Basins*

■ Inflow from Lake

USACE provisional data and subject to change

Total Flow to St. Lucie Estuary

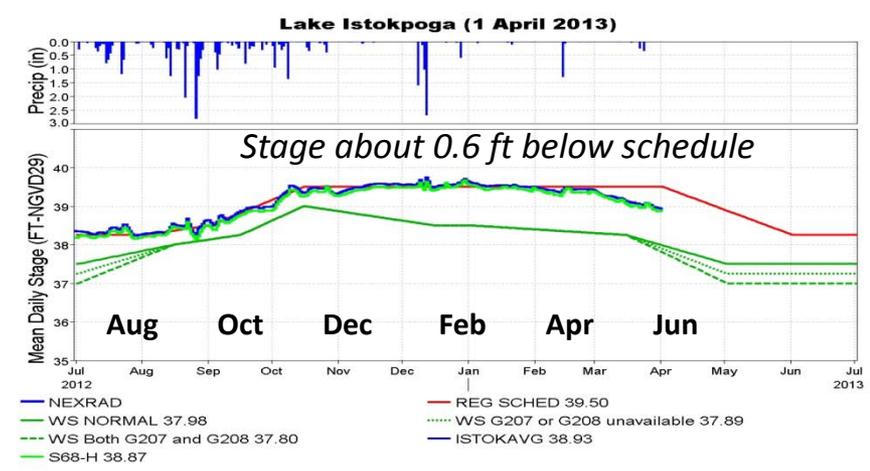
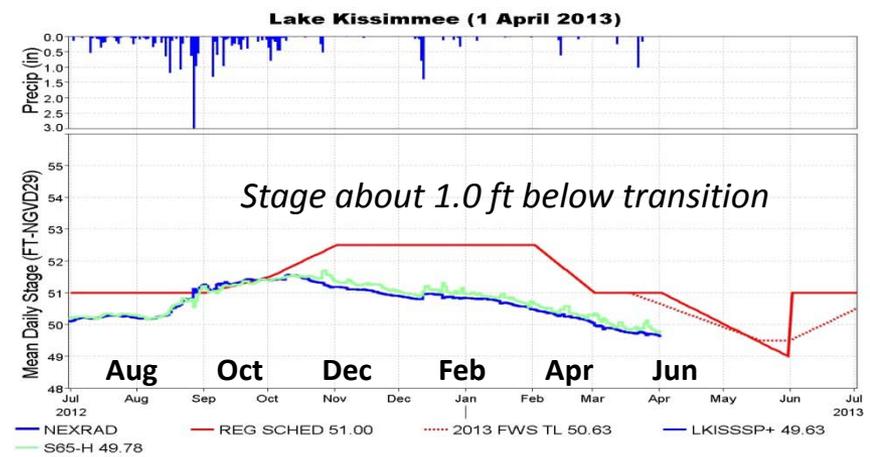
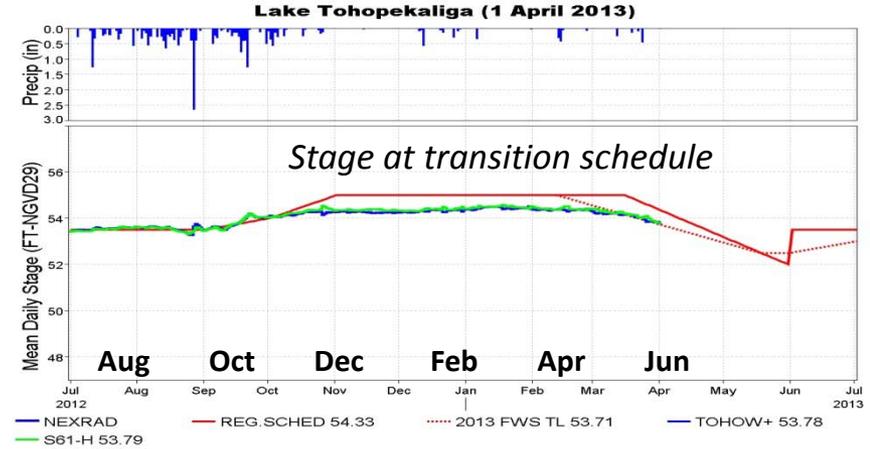
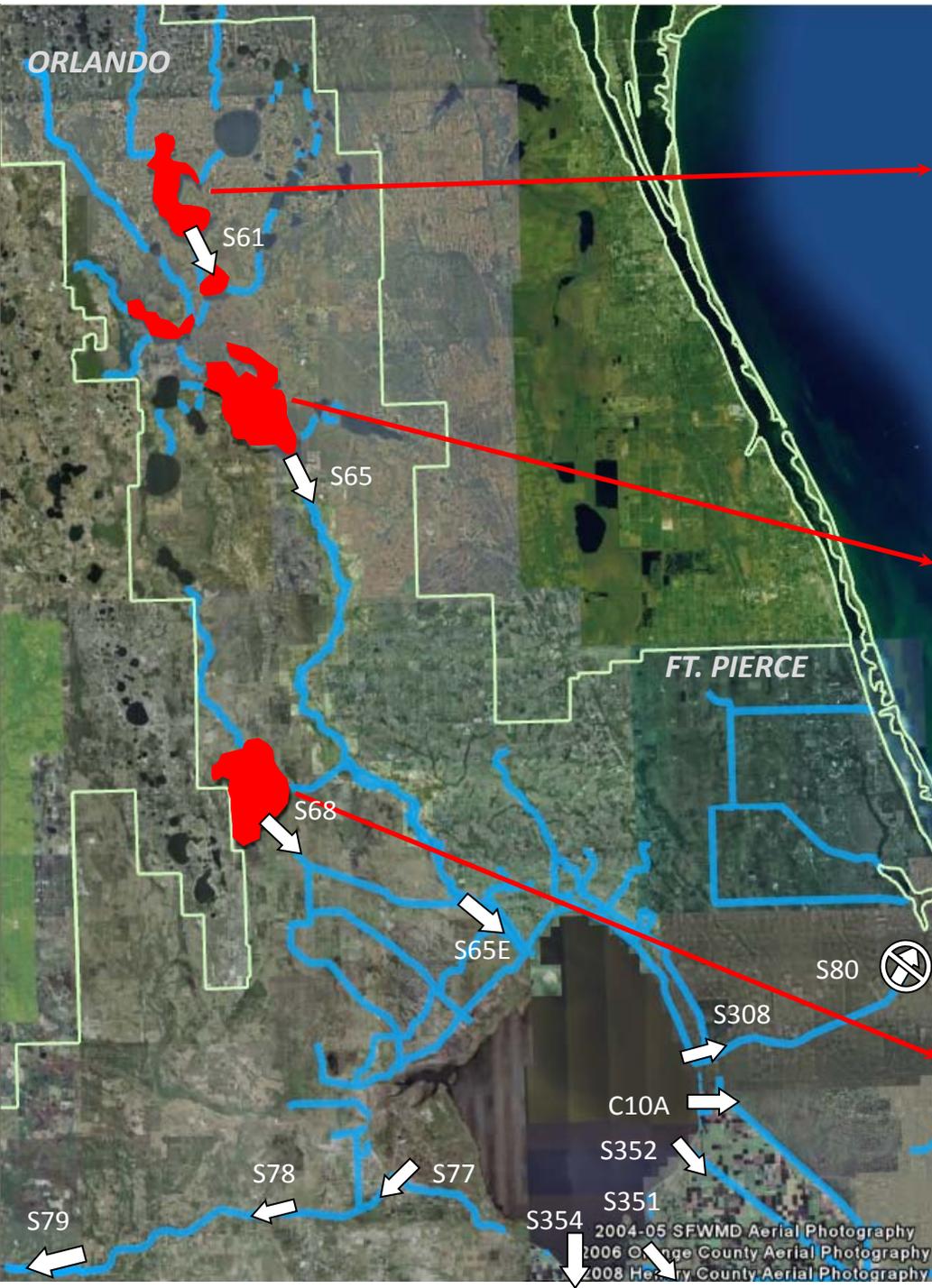
showing contributions from C-44, C-24, C-23, 10-mi Creek & Lake O

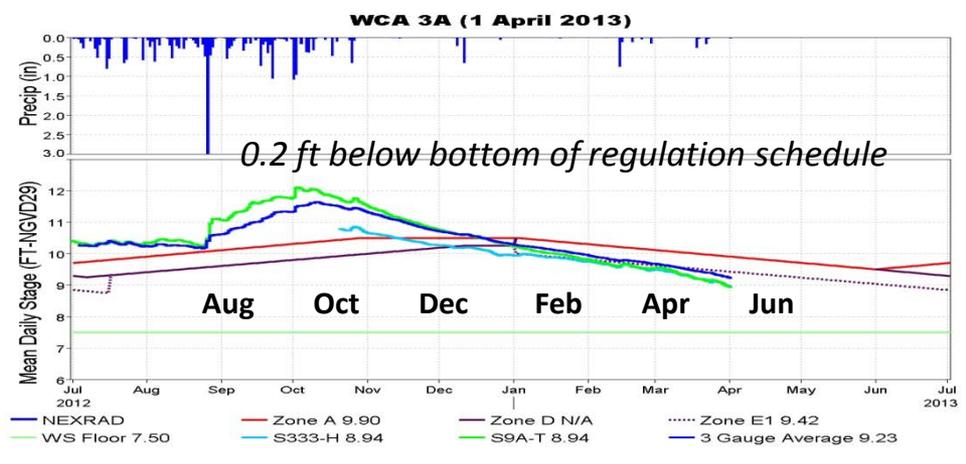
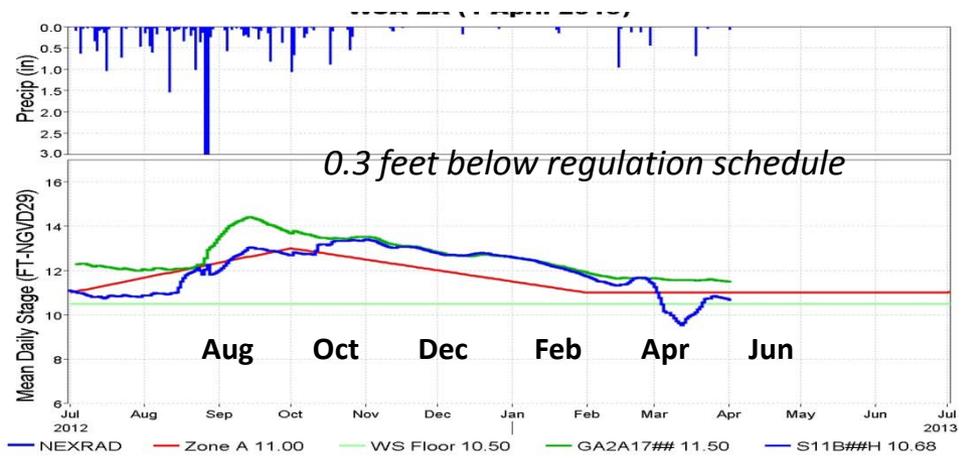
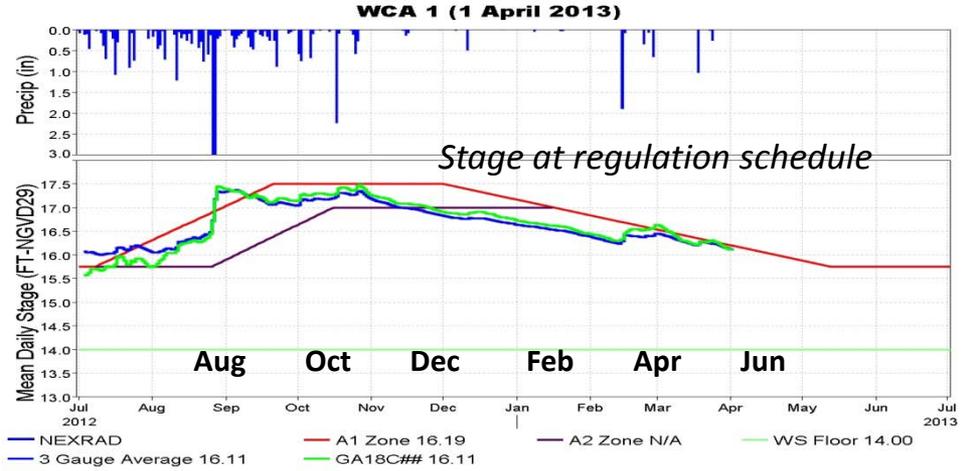
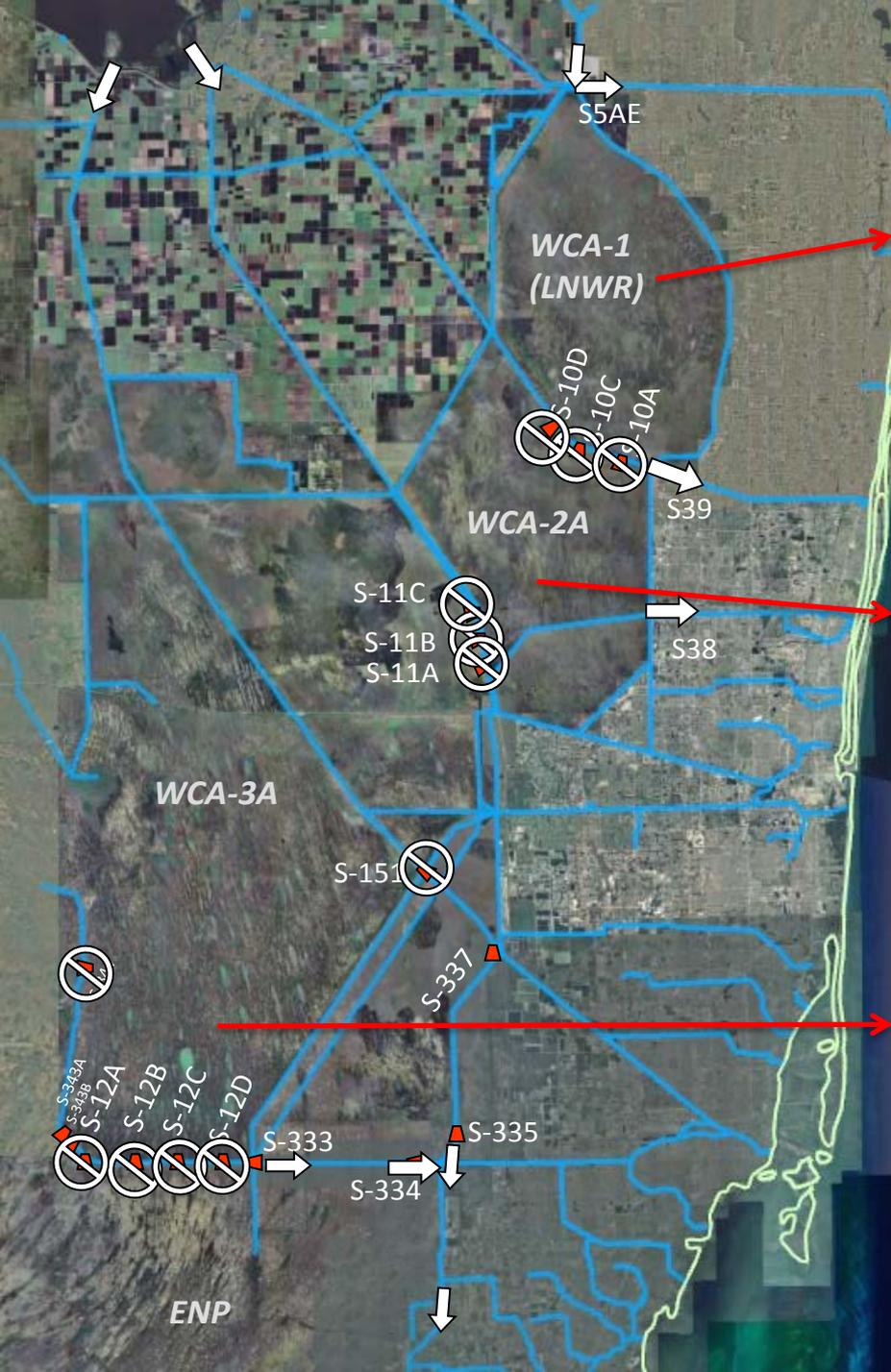


USACE provisional data and subject to change

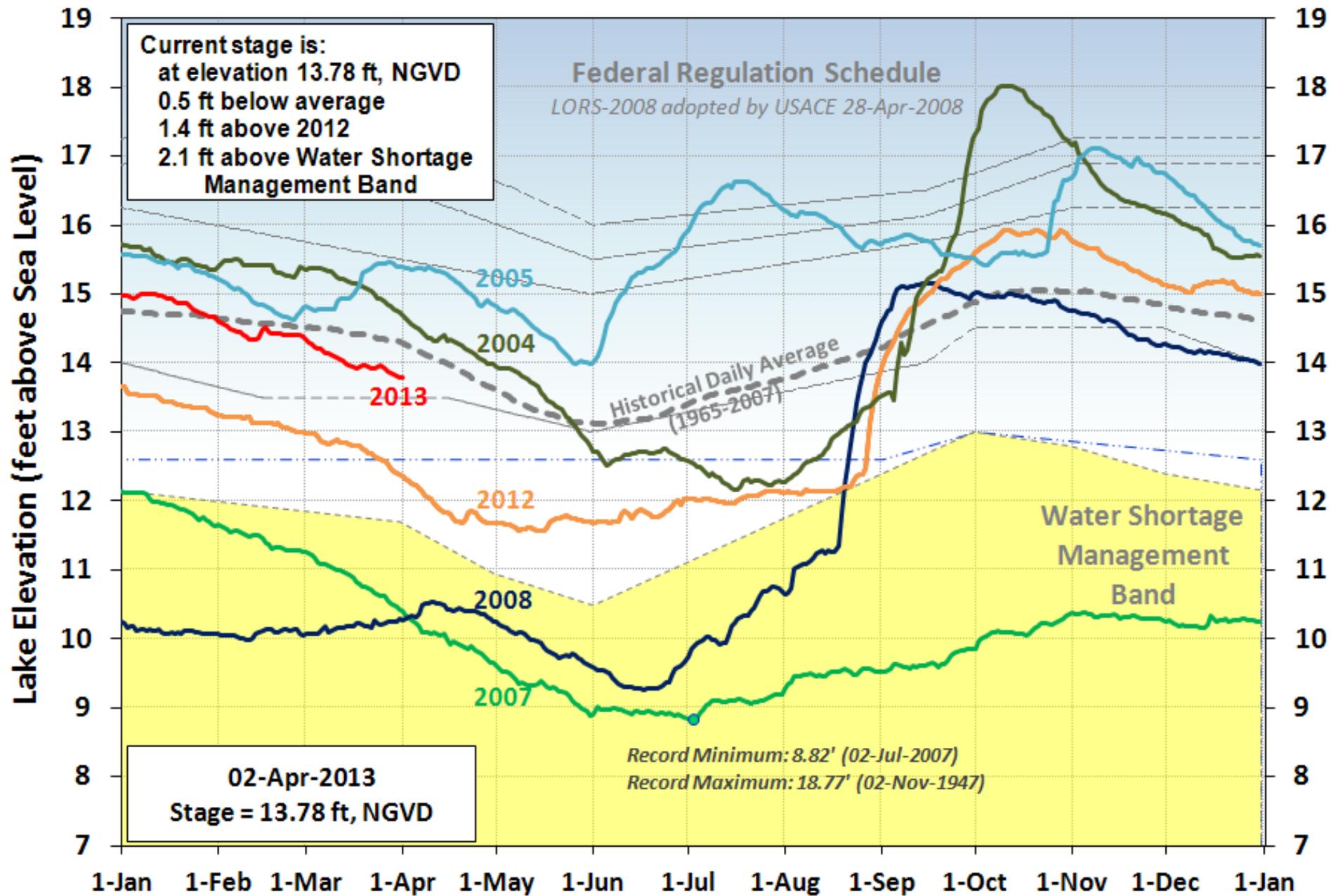
■ Inflow from Lake
 ■ Inflow from C-44, C-24, C-23, and Tenmile Creek Basins*

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 (~13.75 ft, NGVD) is within the bottom 1/3 of the Low Subband
 - Tributary Hydrologic Condition is in the dry classification
 - Release Guidance currently suggests
 - up to 450 cfs at S-79, and up to 200 cfs at S-80 to manage the Lake stage
 - no releases to the WCAs are needed to manage the Lake stage
 - 29-Mar-2013: USACE initiated another 650 cfs average 10-day baseflow pulse release through S-79, no releases planned for S-80
 - Lake regulatory discharge to northwest WCA-3A via STA-3/4 discontinued in mid-Feb due to rain. Will not resume per release guidance
- **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
 - AP environmental water supply releases not constrained by THC in April or May (Aug '12 SFWMD Governing Board)

2008 LORS

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

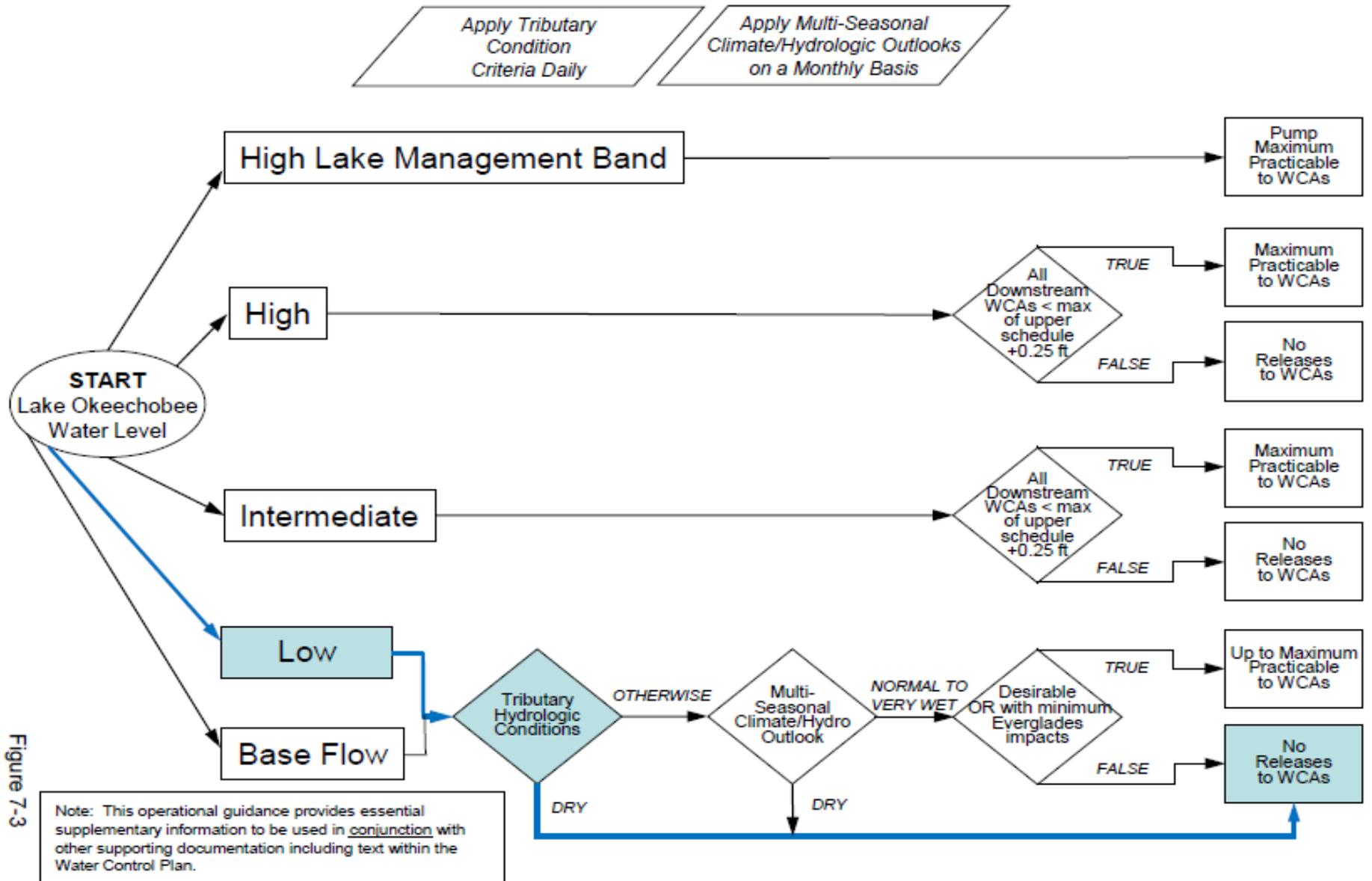


Figure 7-3

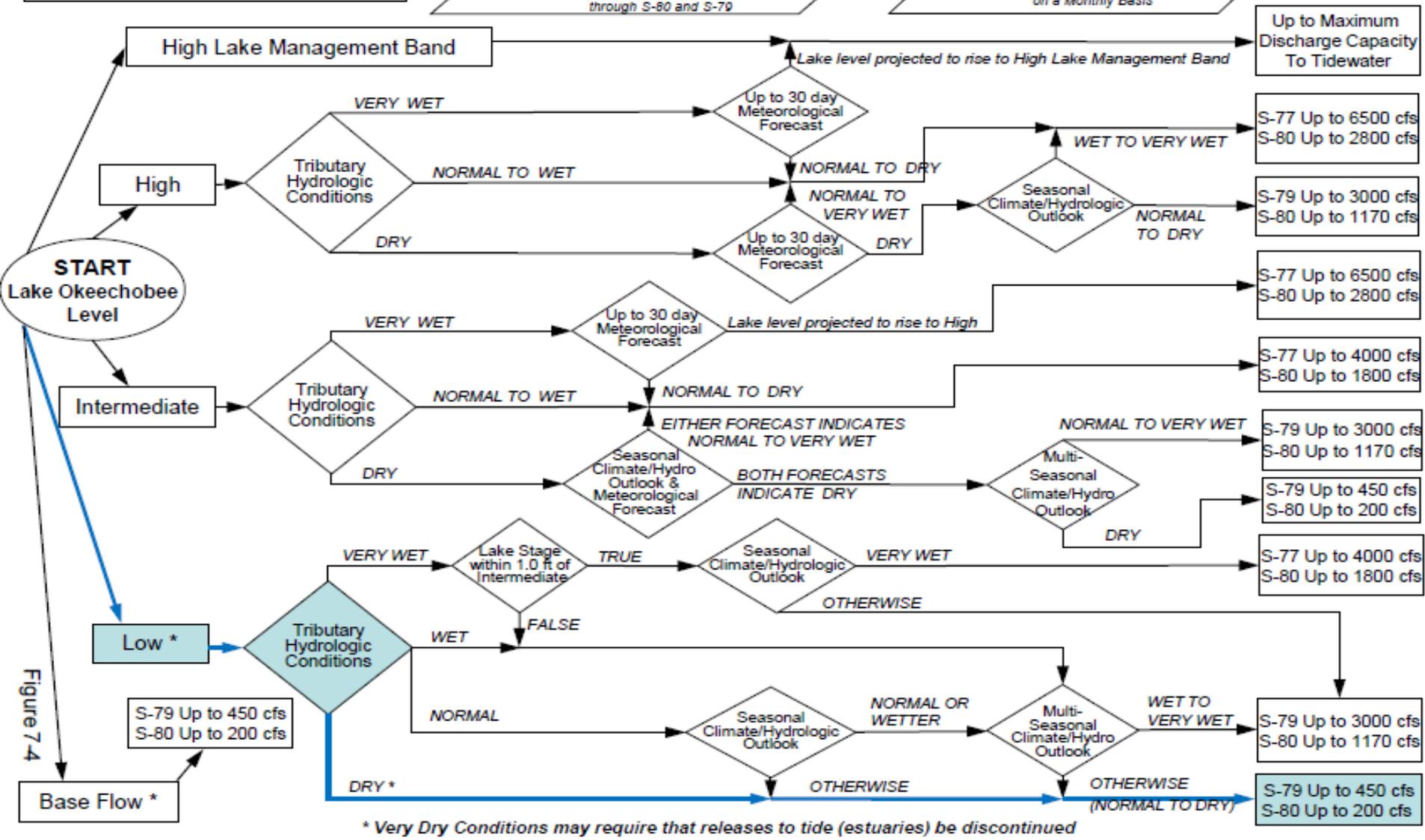
2008 LORS

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

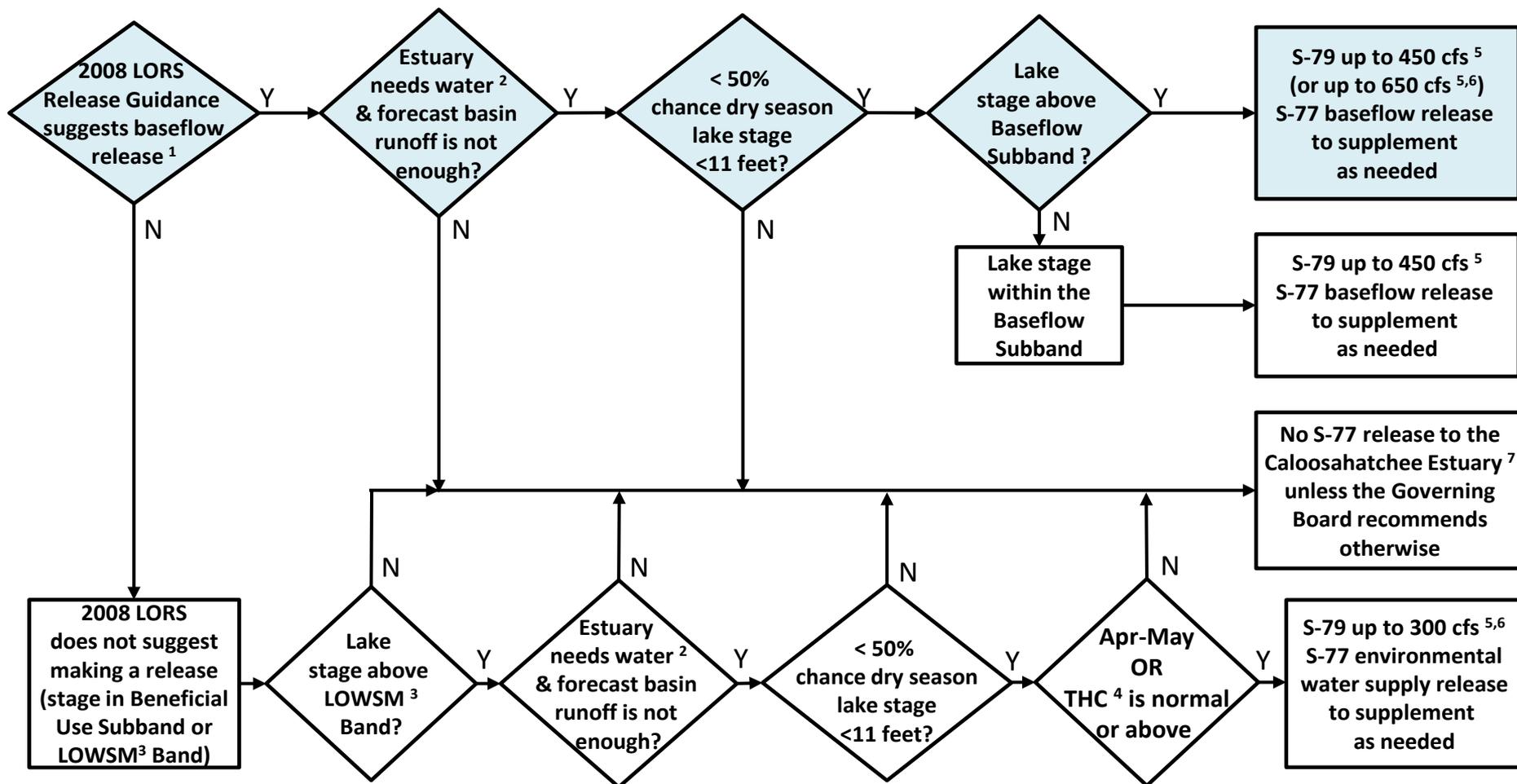
Apply Meteorological Forecasts on a Weekly Basis; apply Seasonal and Multi-Seasonal Climate/Hydrologic Outlooks on a Monthly Basis



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

Figure 7.4

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



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

²Estuary “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.

³LOWSM = Lake Okeechobee Water Shortage Management.

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

⁵Can release less than the “up to” limit if lower release is sufficient to reach or sustain desired estuary salinity; cfs = cubic feet per second.

⁶After reviewing conditions in Water Conservation Areas (WCAs), Stormwater Treatment Areas (STAs), ENP, St. Lucie Estuary and Lake Okeechobee.

⁷Should 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.

Water Supply Risk Evaluation

2-April-2013

Area	Indicator	Value	Color Coded Scoring Scheme
LOK	Projected LOK Stage for the next two months	Base Flow Sub-Band	M
	Palmer Index for LOK Tributary Conditions	-1.90 (Dry)	M
	CPC Precipitation Outlook	1 month: Normal	L
		3 months: Below Normal	M
	LOK Seasonal Net Inflow Forecast	2.73 ft (Normal to Extremely Wet)	L
	AMO warm/ENSO Neutral		
	LOK Multi-Seasonal Net Inflow Forecast	3.53 ft (Wet)	L
AMO warm/ENSO Neutral			
WCAs	WCA 1: 3 Station Average (Site 1-7, 1-8T, 1-9)	Above Line 1 (16.12 ft)	L
	WCA 2A: Site 2-17 HW	Above Line 1 (11.50 ft)	L
	WCA-3A: 3 Station Average (Site 63, 64 and 65)	Above Line 1 (9.24 ft)	L
LEC	Service Area 1	Year-Round Irrigation Rule in effect	L
	Service Area 2	Year-Round Irrigation Rule in effect	L
	Service Area 3	Year-Round Irrigation Rule in effect	L

Note: The water supply risk classification based on the Palmer index, as well as the LOK seasonal and multi-seasonal net inflow forecasts use slightly different classification intervals than those used by the 2008-LORS for classifying the tributary hydrologic condition (THC).

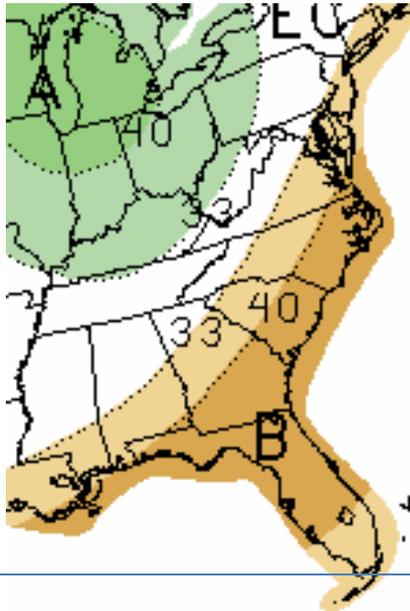
Part 4.

2013 Wet Season Outlook

U. S. Seasonal Precipitation Outlook

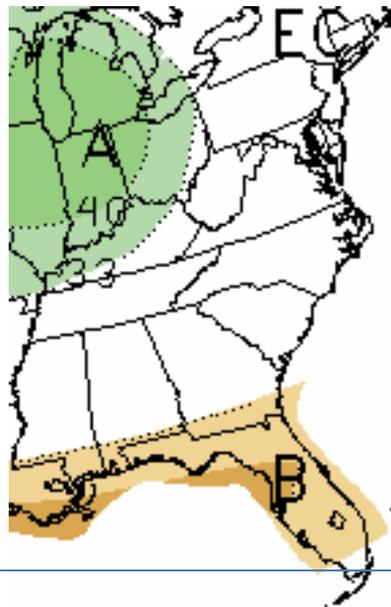
National Climate Prediction Center (CPC)

Apr 2013



Made 21-Mar-2013

Apr – Jun 2013



Made 21-Mar-2013

Jun-Oct 2013



Made 21-Mar-2013

The recent CPC precipitation outlooks for the 2013 wet season indicate equal chances of Above-Normal (A), Below-Normal (B), and Normal rainfall for central and southern Florida. The remainder of the 2012-13 dry season shows about a 40% chance of Below-Normal (B) rainfall.

Lake Okeechobee Stage Forecast

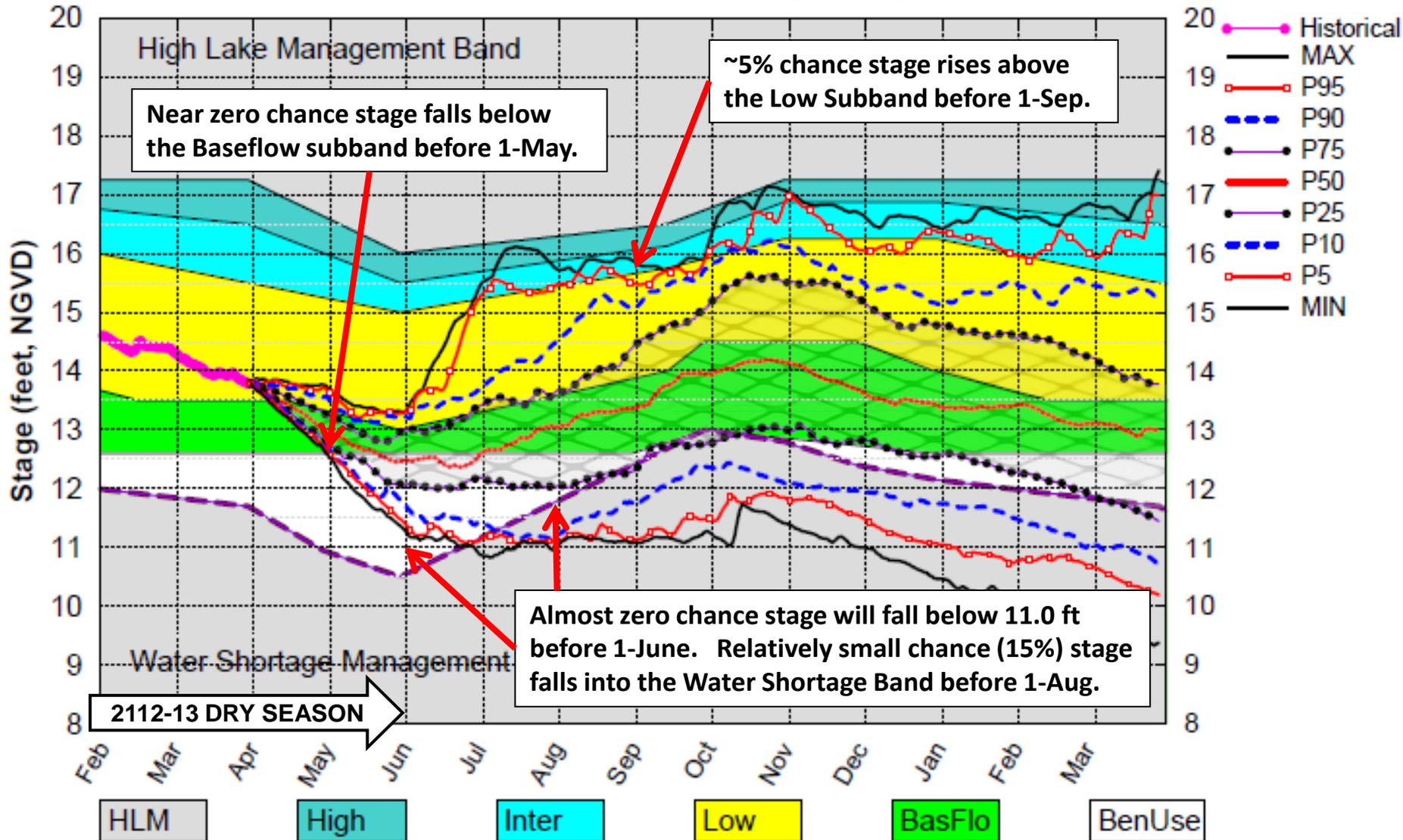
- **Future Lake stage depends on future rainfall**
- **Projections provided monthly by SFWMD Hydrologic and Environmental Systems Modeling (HESM) Department**

Danielle Morancy, Paul Trimble, Walter Wilcox

- **Position Analysis**
 - **Each year starts with current hydrologic conditions**
 - **41 1-yr simulations of system response to historical rainfall conditions**
 - **Statistical summaries used to display projections**

Lake Okeechobee SFWMM April 2013 Position Analysis

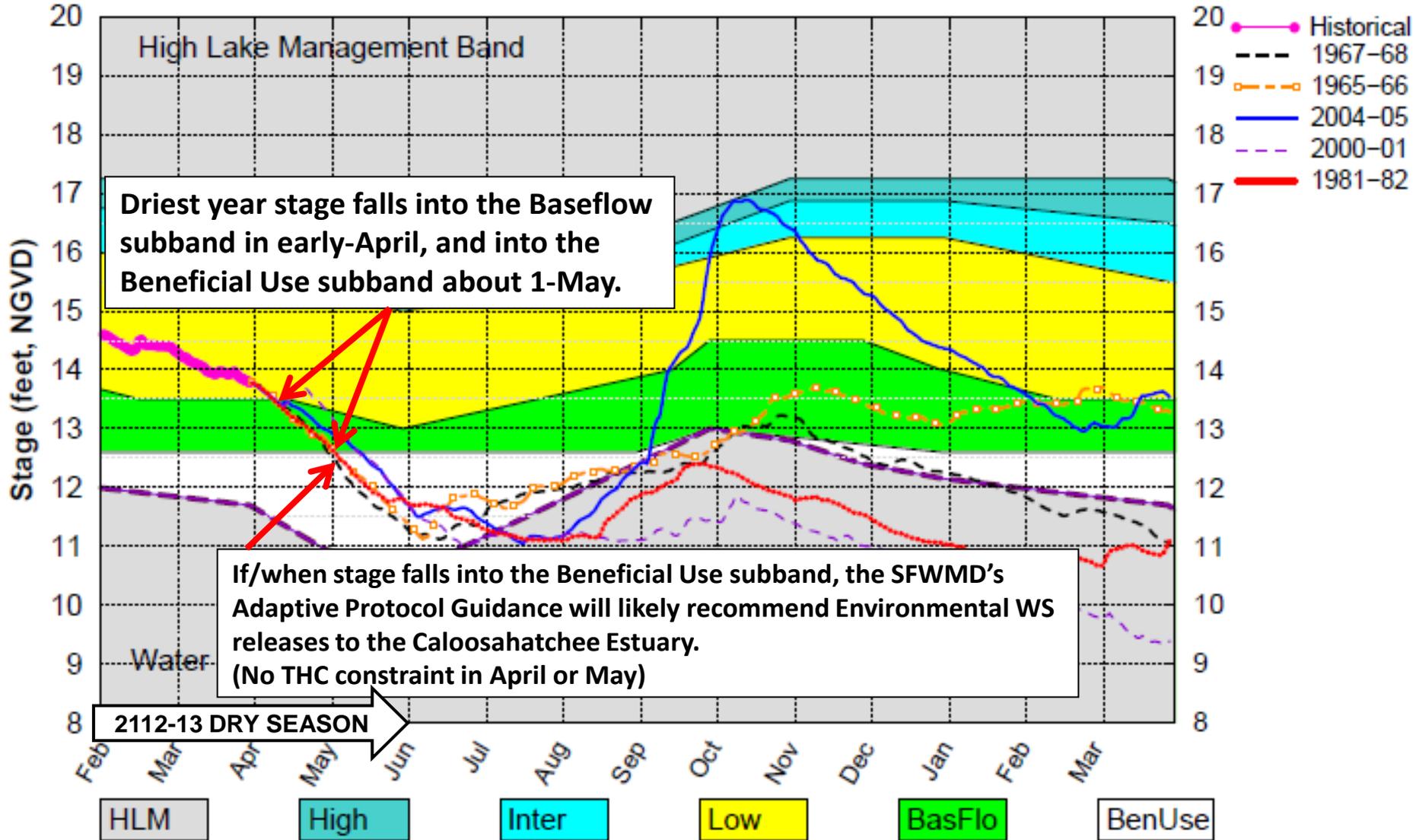
Percentiles based on 41 possible outcomes starting with Apr 1st initialization



(See assumptions on the Position Analysis Results website)

Lake Okeechobee SFWMM April 2013 Position Analysis

Dry Years Plot PA



(See assumptions on the Position Analysis Results website)

Part 5. 2013 Wet Season Tentatively Planned Operations

LOK Release Plan for April-May

- Based on LORS 2008, currently 10-day pulse releases averaging 650 cfs at S-79, and 0 cfs at S-80
- If dry conditions persist, Lake levels will likely recede into the baseflow sub-band in April. – SFWMD's Adaptive Protocol applies and will likely suggest 450 cfs at S-79
- If recession rates decrease, it is possible that lake levels will remain above the baseflow subband, and 650 cfs regulatory discharges may continue into the wet season
- Use of Additional Operational Flexibility (AOF) is not expected

LOK Release Plan for 2013 Wet Season

- Conditions are evaluated daily, when seasonal or multi-seasonal outlooks change, the release decision may change from current guidance
- SFWMD to use the Lake Okeechobee Adaptive Protocol Release Guidance as basis for recommendations to the USACE when stage is within or below the Baseflow Subband of LORS 2008
- USACE to continue to consider and evaluate pertinent information and follow LORS 2008 Release Guidance unless there are legitimate reasons to do otherwise

Questions??

