

# South Florida Ecosystem Restoration Task Force

## Water Conditions and Emergency Operations

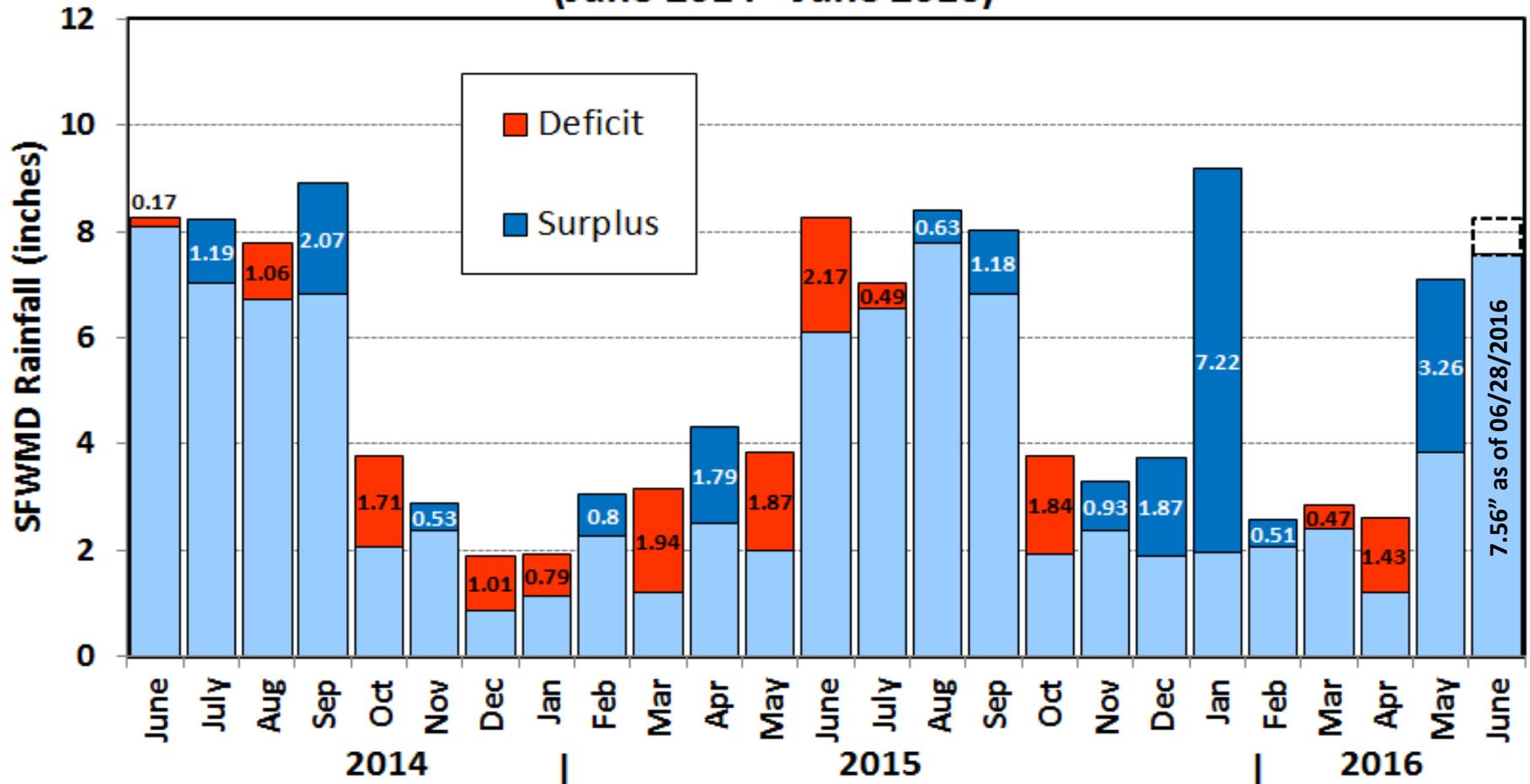
June 29, 2016

John P. Mitnik, P.E.

Director, Operations Engineering and Construction Division  
South Florida Water Management District

# SFWMD Rainfall Distribution Comparison

(June 2014 - June 2016)



**2014 WET SEASON:**

- May 26<sup>th</sup> – Oct 4<sup>th</sup>
- Near average (108%)

**2014-15 DRY SEASON:**

- May was 51% below average
- Dry Season 86% of average

**2015 WET SEASON:**

- Driest May-July since 2004
- Ended below average

**2015-16 DRY SEASON:**

- Nov 2015-Jan 2016 wettest since 1932
- Jan 2016 wettest since 1932
- Dry Season 168% of average

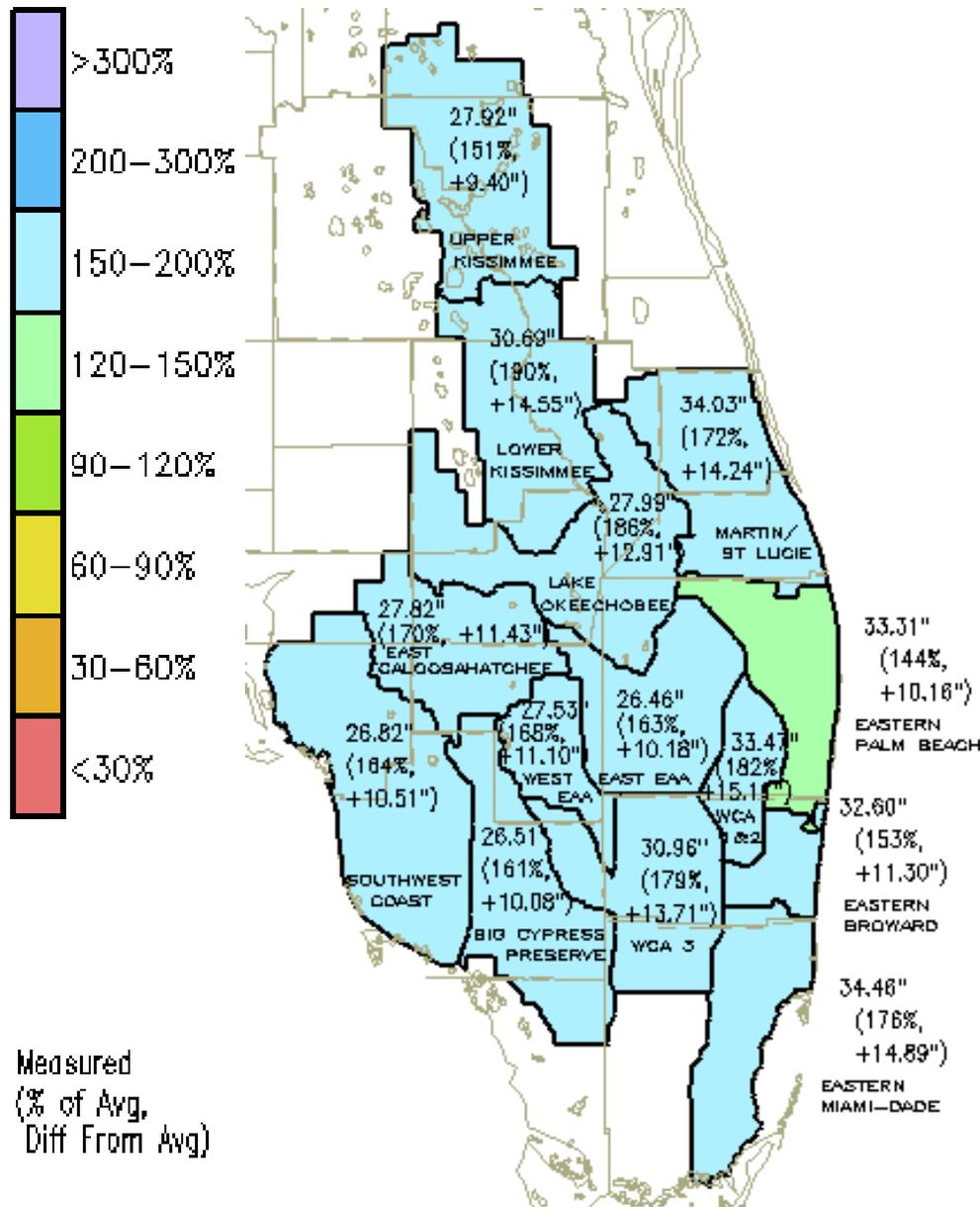
SFWMD

**2015-2016 Dry Season**

**Rainfall**

(02-Nov 2015 to 01-Jun-2016)

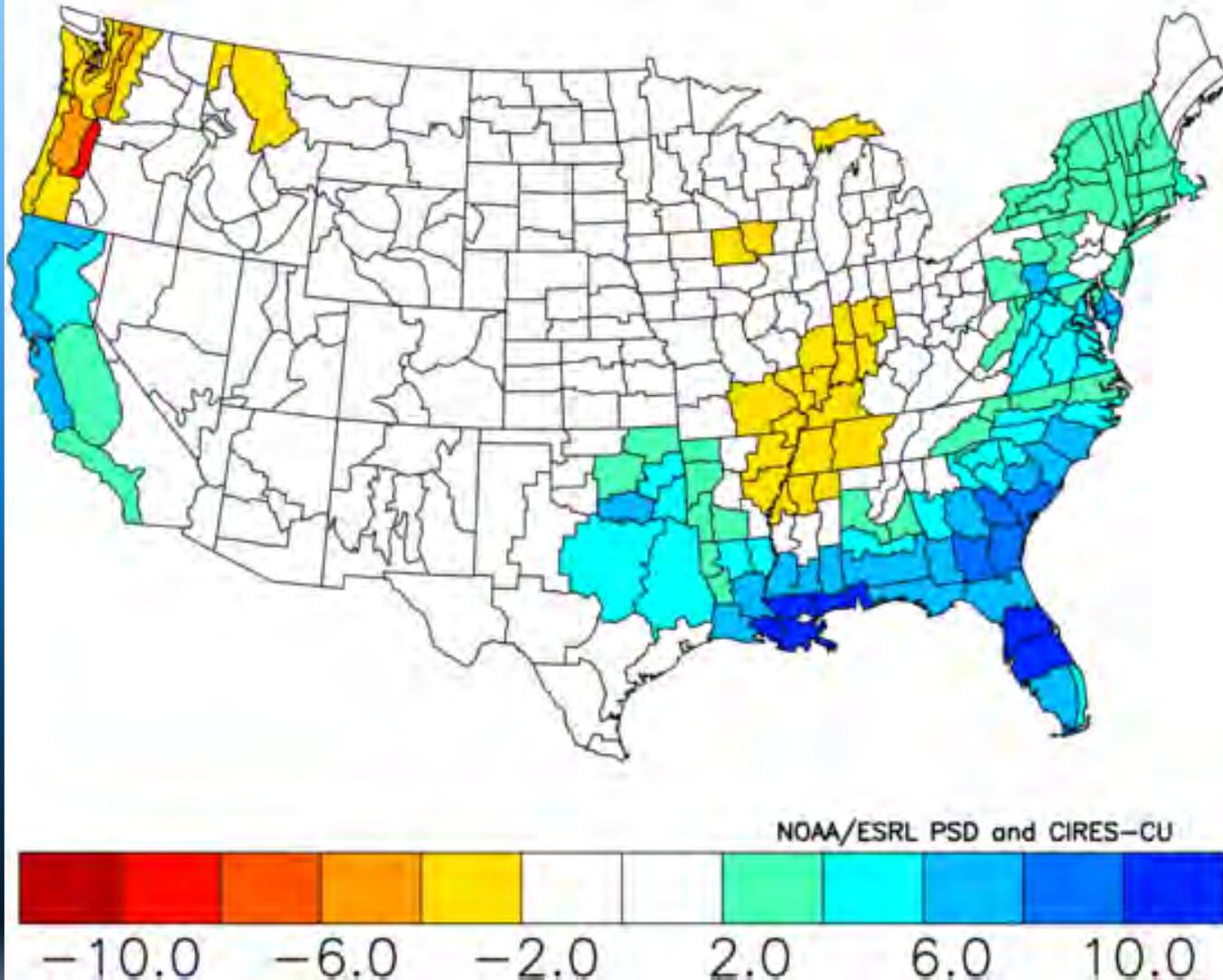
**DISTRICT-WIDE: 29.49"  
168% of Avg, or +11.98"**



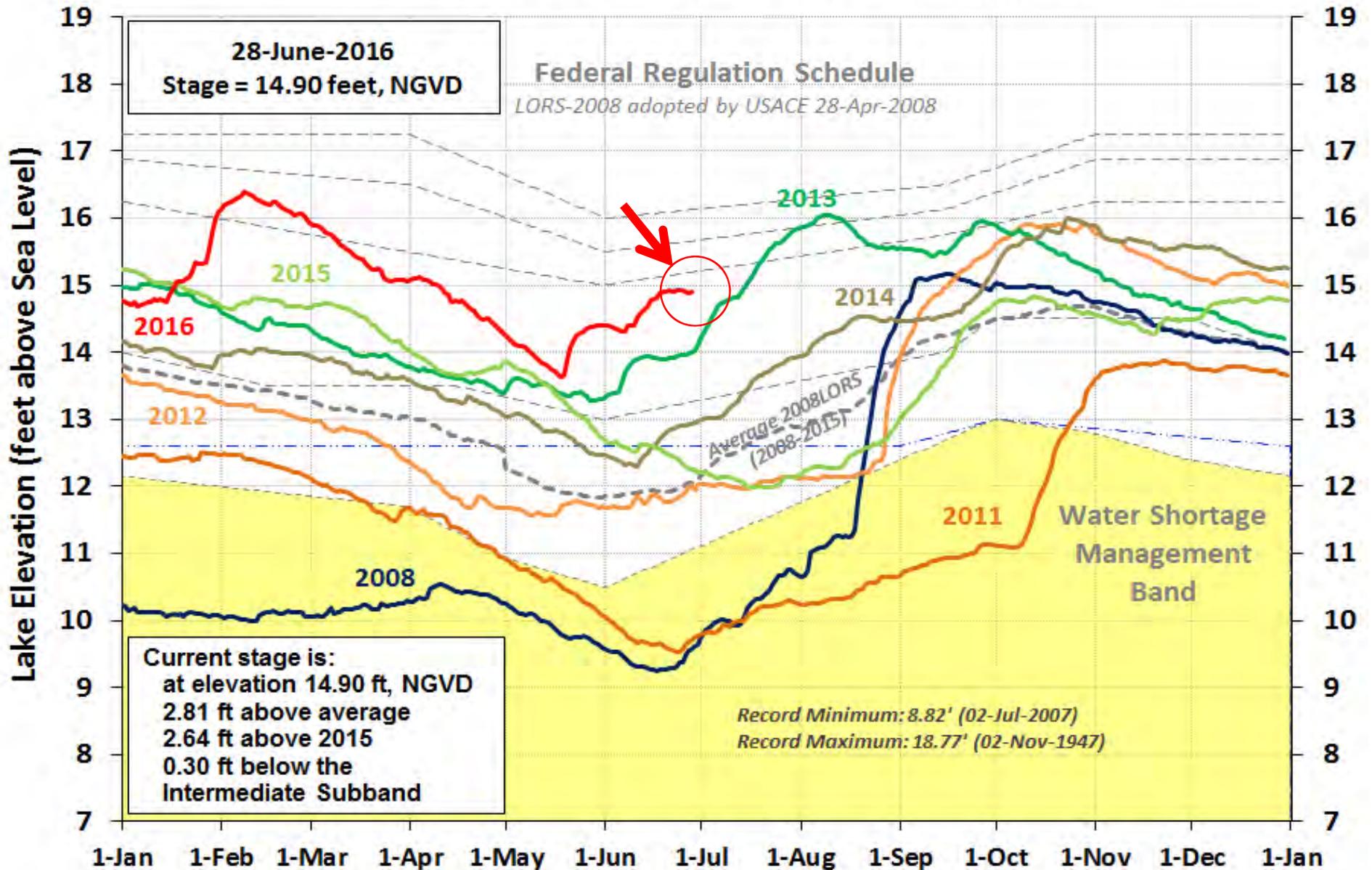
- District rainfall for the 2016 dry season closed above average
- All basins are 150% to 200% above average, with exception of Eastern Palm Beach County with 144%
- November, December and January, was the wettest for this period since record keeping began in 1932
- Wettest Nov-May (dry season) since 1957-58 and second wettest since records began in 1932

# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

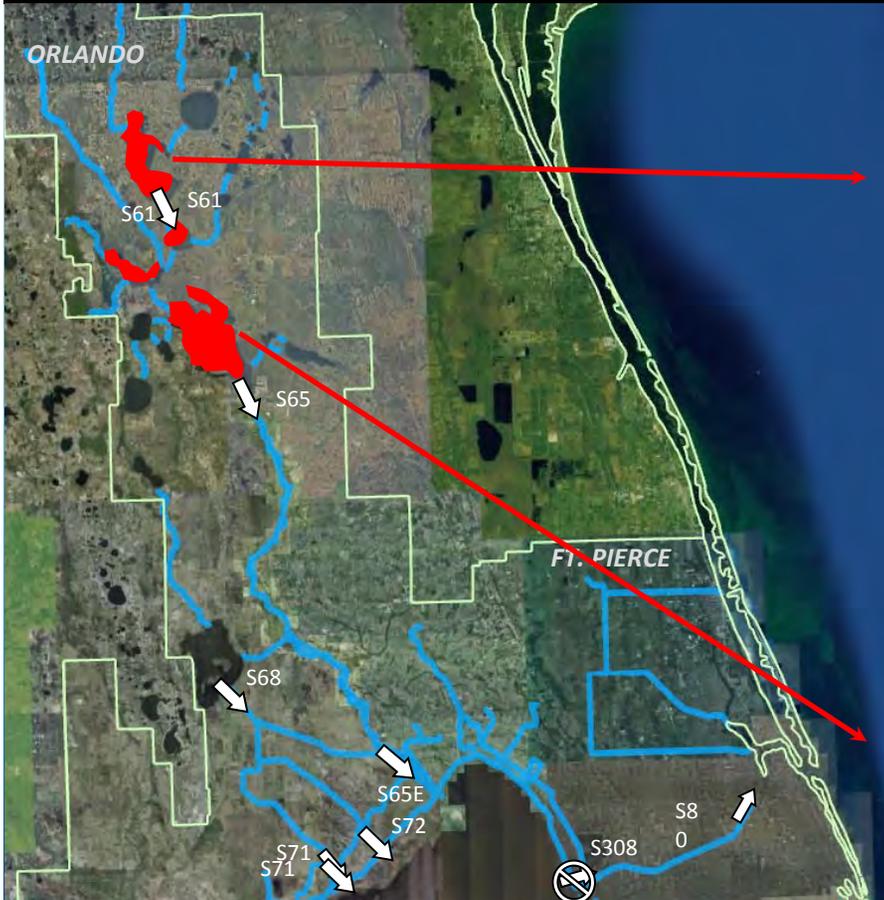
NOAA/NCDC Climate Division Precipitation Anomalies (in)  
Nov to Jan 1997-98  
Versus 1981-2010 Longterm Average



## Lake Okeechobee Water Level Comparison

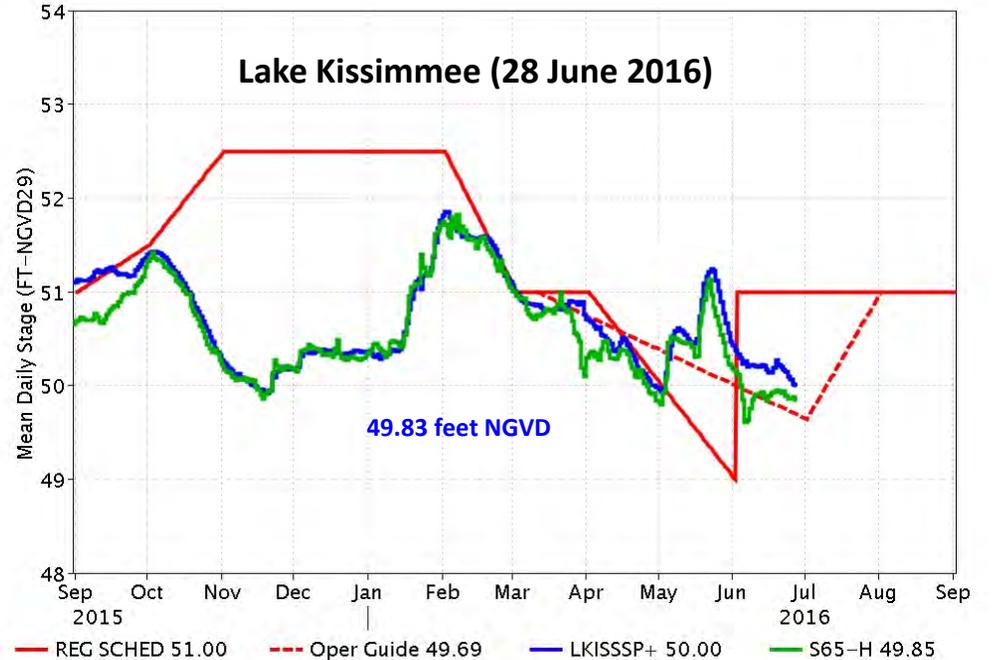
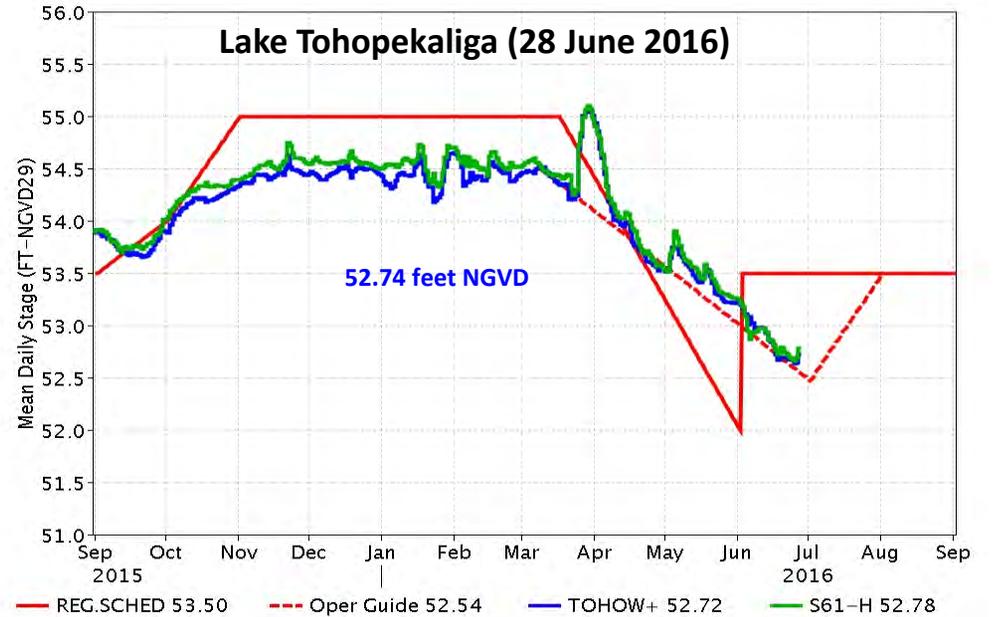


# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

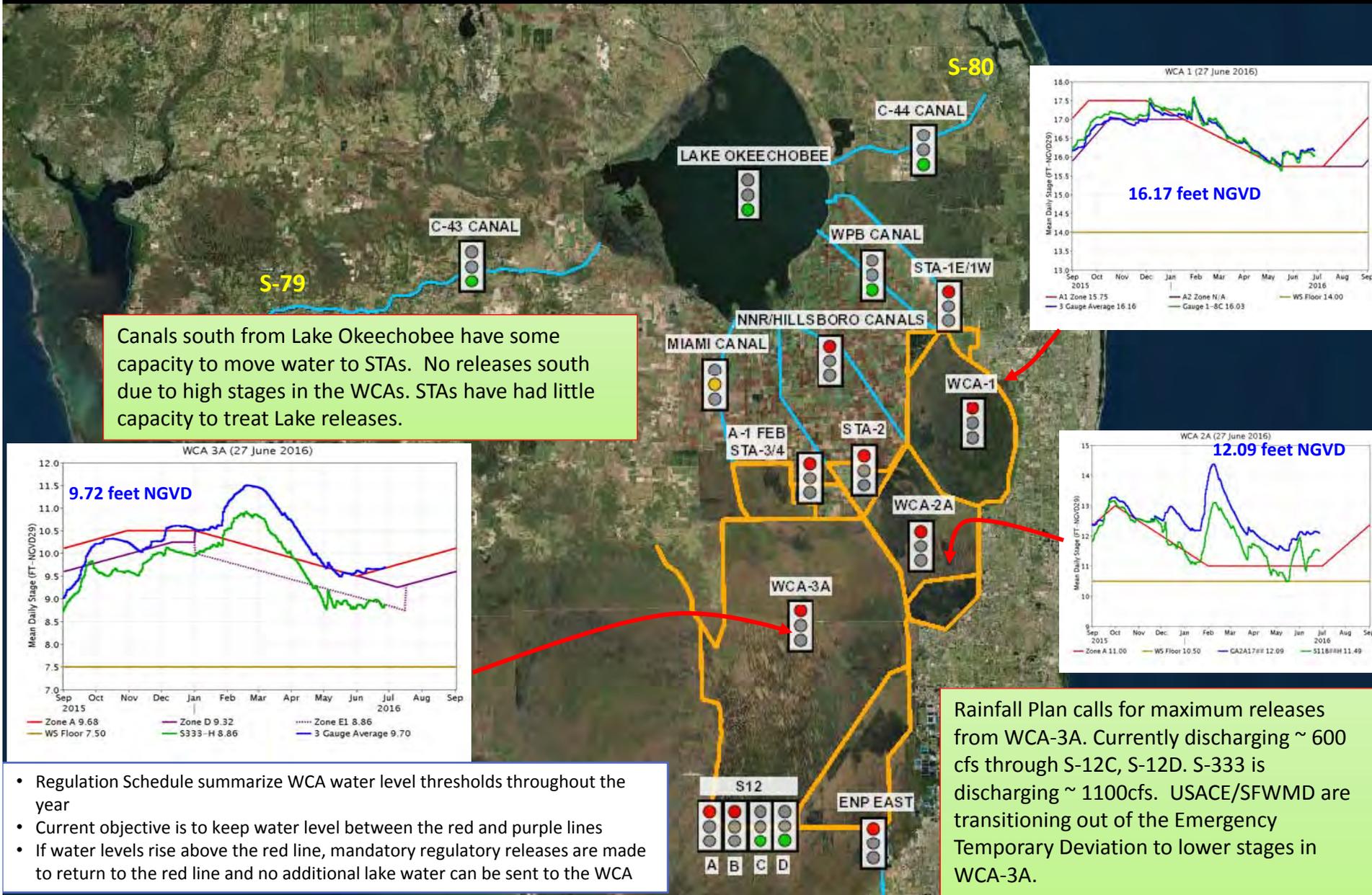


## Kissimmee Basin

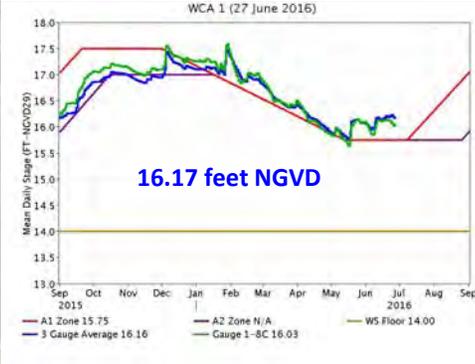
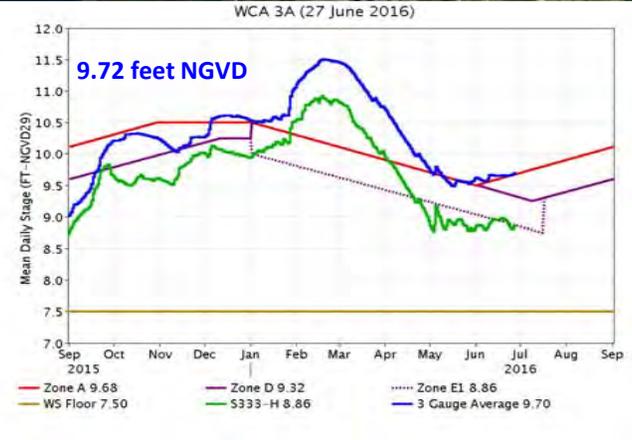
- Stages at East Toho, Toho and Kissimmee are back receding parallel to the 2016 operational guidelines
- Most of the other lakes are at or below regulation schedule. Lake Gentry is slightly above regulation schedule.



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT



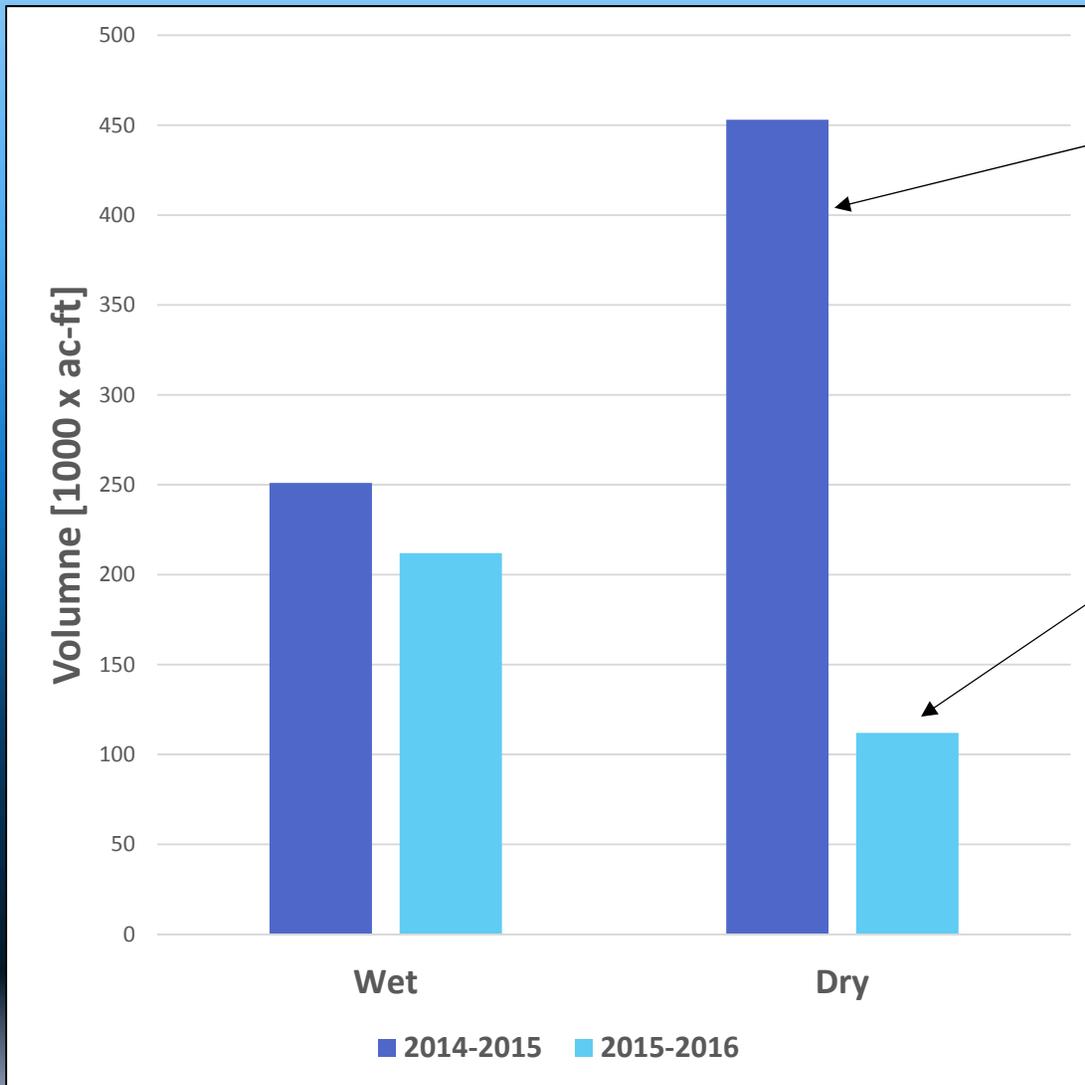
Canals south from Lake Okeechobee have some capacity to move water to STAs. No releases south due to high stages in the WCAs. STAs have had little capacity to treat Lake releases.



- Regulation Schedule summarize WCA water level thresholds throughout the year
- Current objective is to keep water level between the red and purple lines
- If water levels rise above the red line, mandatory regulatory releases are made to return to the red line and no additional lake water can be sent to the WCA

Rainfall Plan calls for maximum releases from WCA-3A. Currently discharging ~ 600 cfs through S-12C, S-12D. S-333 is discharging ~ 1100cfs. USACE/SFWMD are transitioning out of the Emergency Temporary Deviation to lower stages in WCA-3A.

## Lake Releases South



- WCA-3A remained below regulation schedule as releases south were maximized
- Rainfall: 51% of average

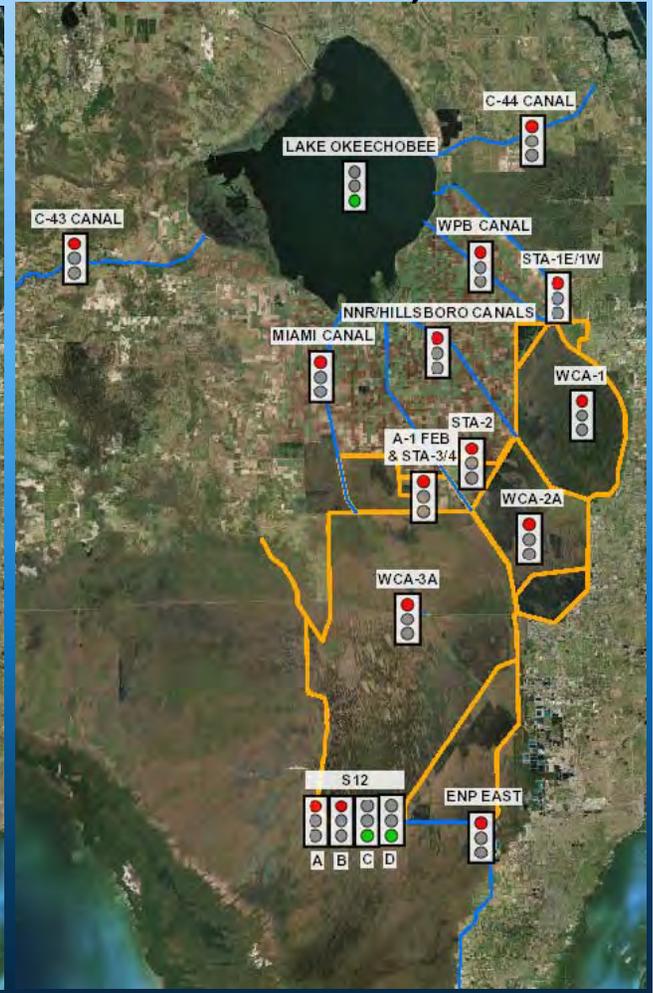
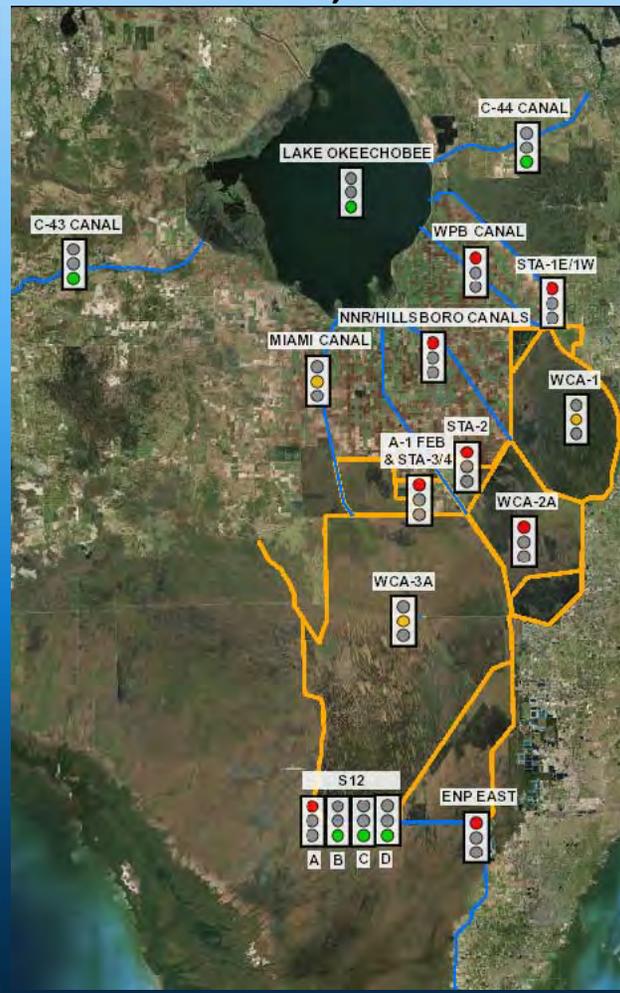
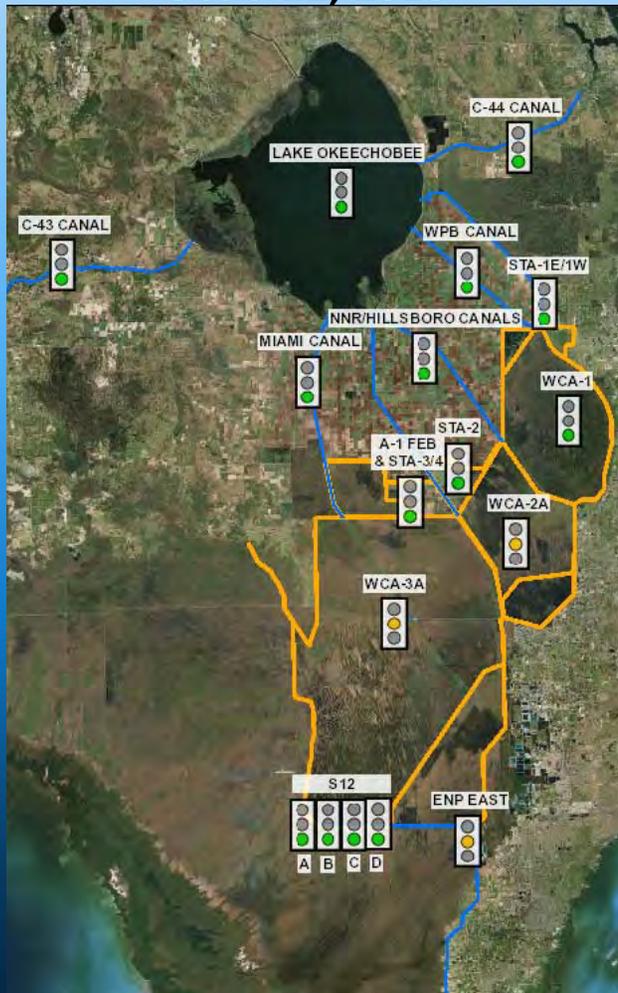
- El Nino conditions during the 2015-2016 Dry Season resulted in high stages in WCA-3A
- WCA-3A above schedule 80% of the time.
- Rainfall at 163% of average

# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Oct 6-12, 2015

Dec 1-7, 2015

Jan 26 – Feb 1, 2016

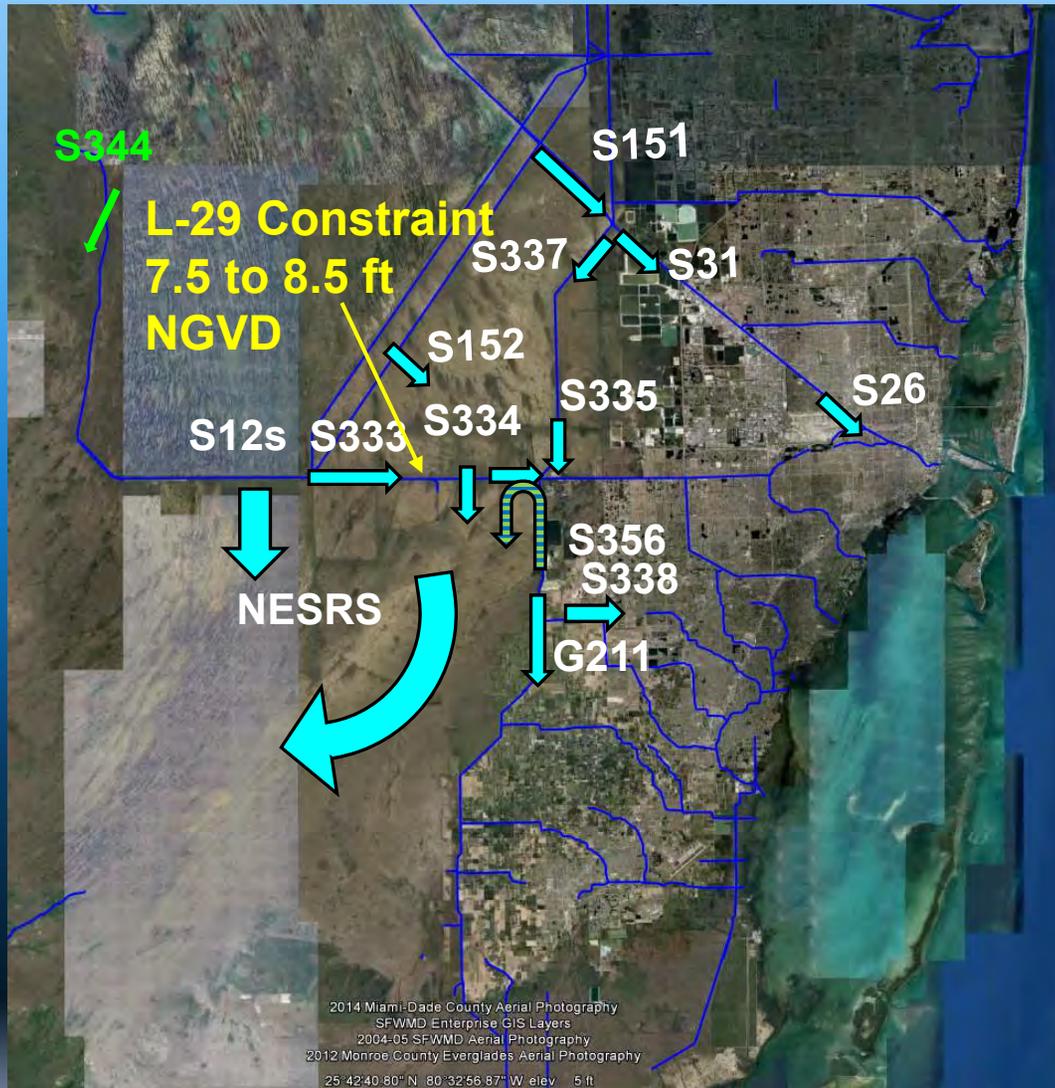


- LO water available
- Green/Yellow
- System unconstrained
- Reflects relatively dry conditions at the end of the wet season

- LO water available
- Yellow/Red
- System mostly constrained
- Reflects 1.5 months of El Niño-induced rains

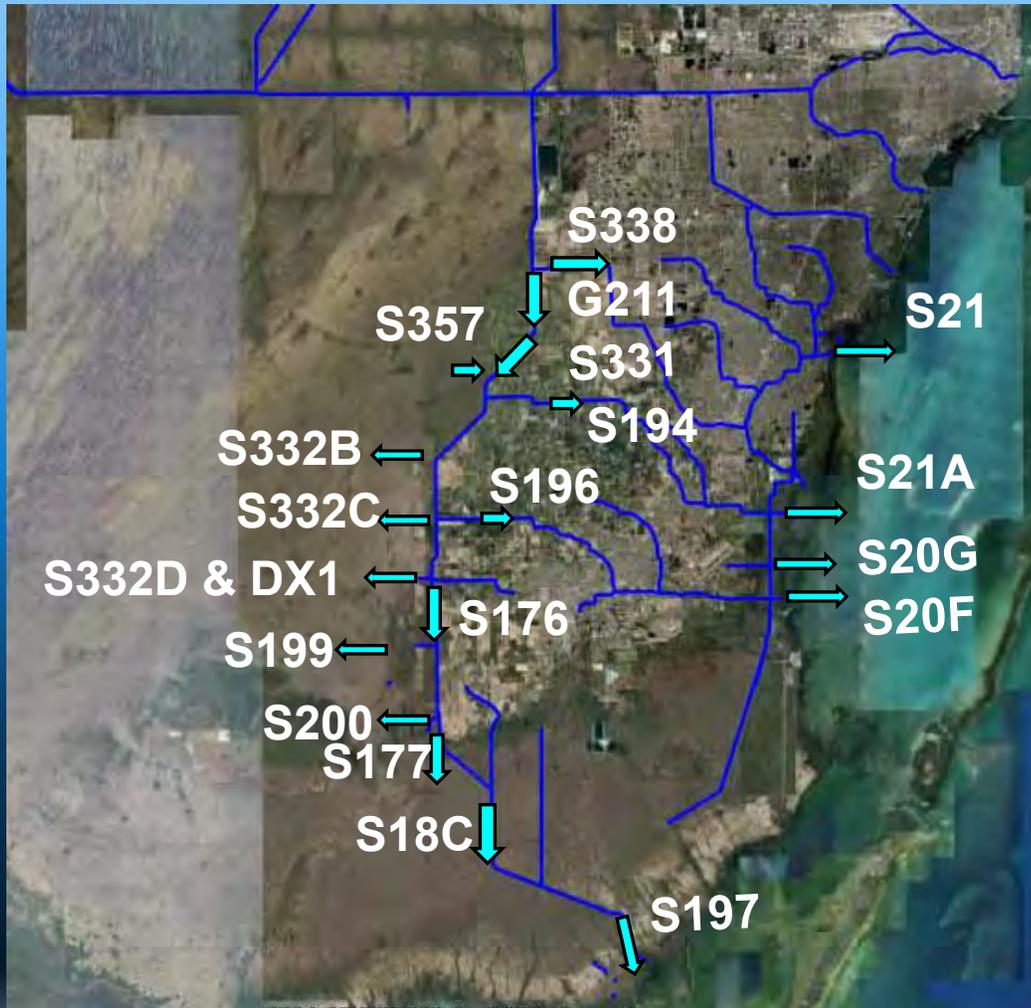
- LO water available
- Red
- System fully constrained
- Reflects the effect of a historical wet January and dry season

# High Water Stages in Water Conservation Area 3A



- Water Conservation Area 3A releases through the L-30 canal (S-337, S-335)
- Raise L-29 stage limit from 7.5 to 8.5 feet
- Higher flows through S-333 into L-29
- Increase flows to Northeast Shark River Slough
- Use S-334 to moderate L-29
- Temporary pumps at S-355B
- District requested and was approved by U.S. Army Corps of Engineers for deviation to increase discharge through the L-28 at S-344

# Flood Protection in South Dade Conveyance System



- Canals maintained at lower stages
- Flow diversions to the coast through canals such as C-1, C-102 and C-103 have been reduced
- Pumping towards Everglades National Park and the headwaters of Taylor Slough using the S-332s and S-199
- S-197 has been operated as necessary to provide additional flow getaway capacity

# Release through L-28 at S-344

Photo #1: Plug #6, complete, aerial view from the north.

Photo #2: Plug #6, view from the southeast.

- District requested and was approved by U.S. Army Corps of Engineers for a deviation to increase discharge from Water Conservation Area 3A through the L-28 at S-344 during the Everglades Restoration Transition Plan closing period
- Requires the rehabilitation of 6 canal plugs in the L-28
- Construction work is substantially complete
- S-344 is currently open

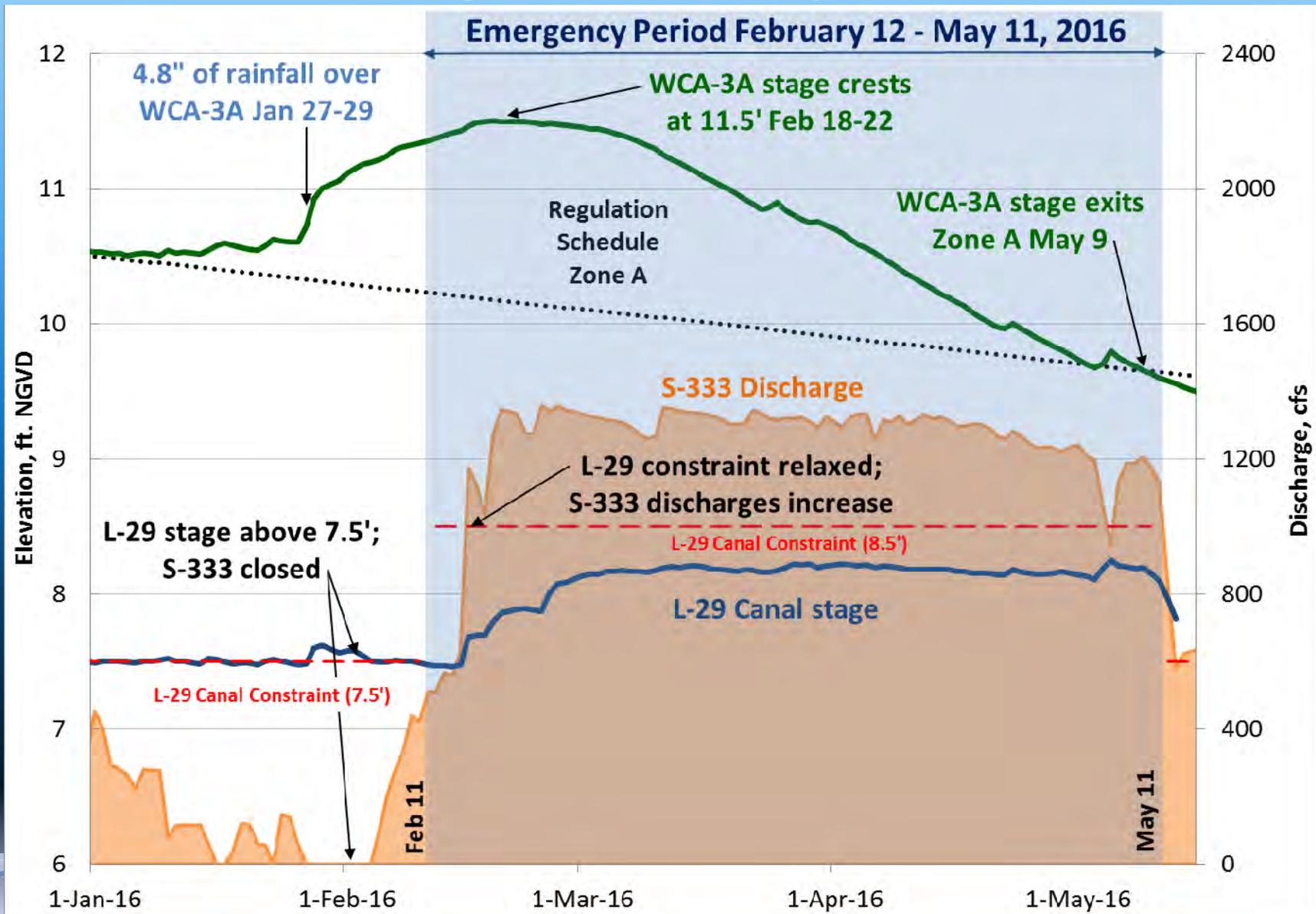
Imagery Date: 1/17/2014

2012 Monroe County Everglades Aerial Photography  
 SFWMD Enterprise GIS Layers  
 2014 Miami-Dade County Aerial Photography  
 2014 Miami-Dade County Aerial Photography  
 25°50'31.72"N 80°44'20.67"W elev 6 ft

# S-355B Temporary Pumps



# Water Conservation Area 3A Water Level and S-333 Discharge: Jan. 1 – May 31, 2016

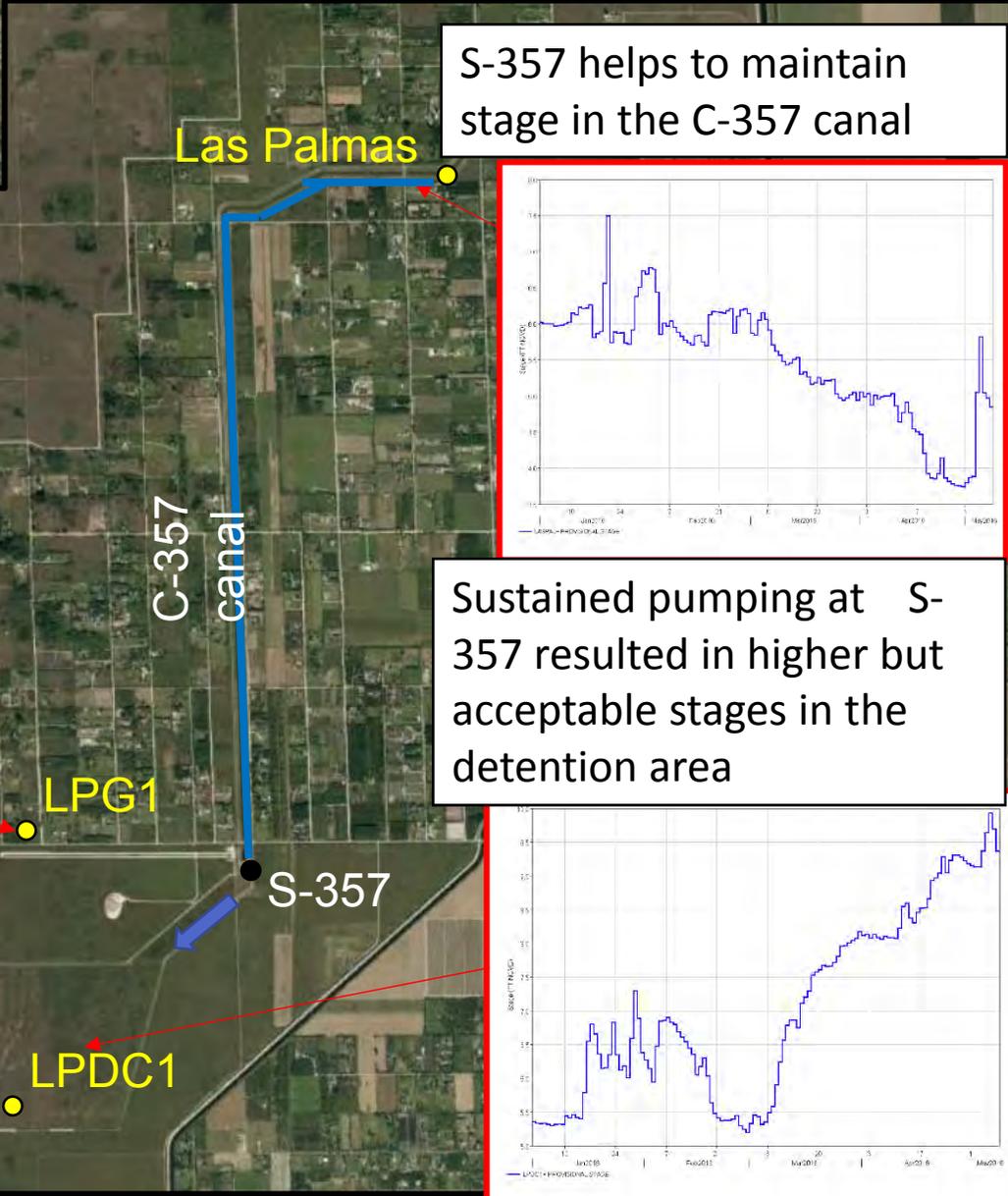
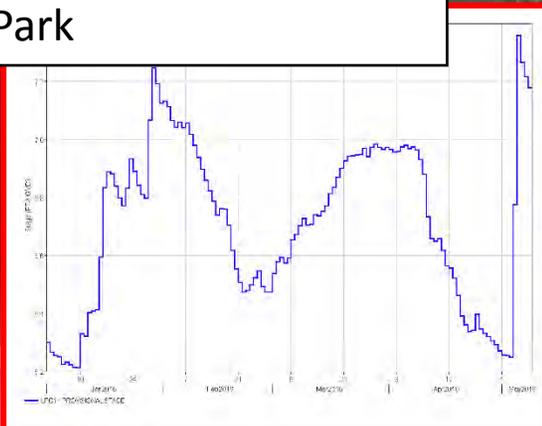


# Water Levels



L-29 stage allowed up to 8.3 feet

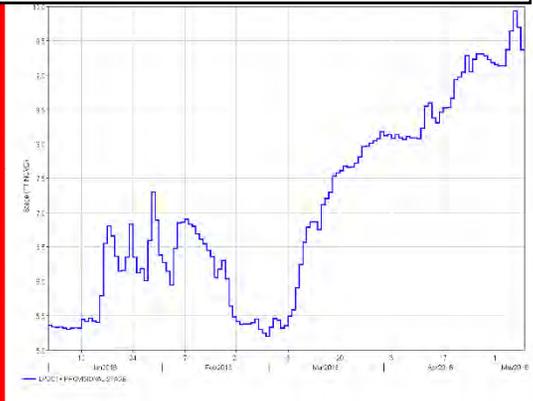
LPG1 experience higher stages due to storm event and high waters in the Everglades National Park



S-357 helps to maintain stage in the C-357 canal



Sustained pumping at S-357 resulted in higher but acceptable stages in the detention area



# Airboat Concessionaires



# Airboat Concessionaires

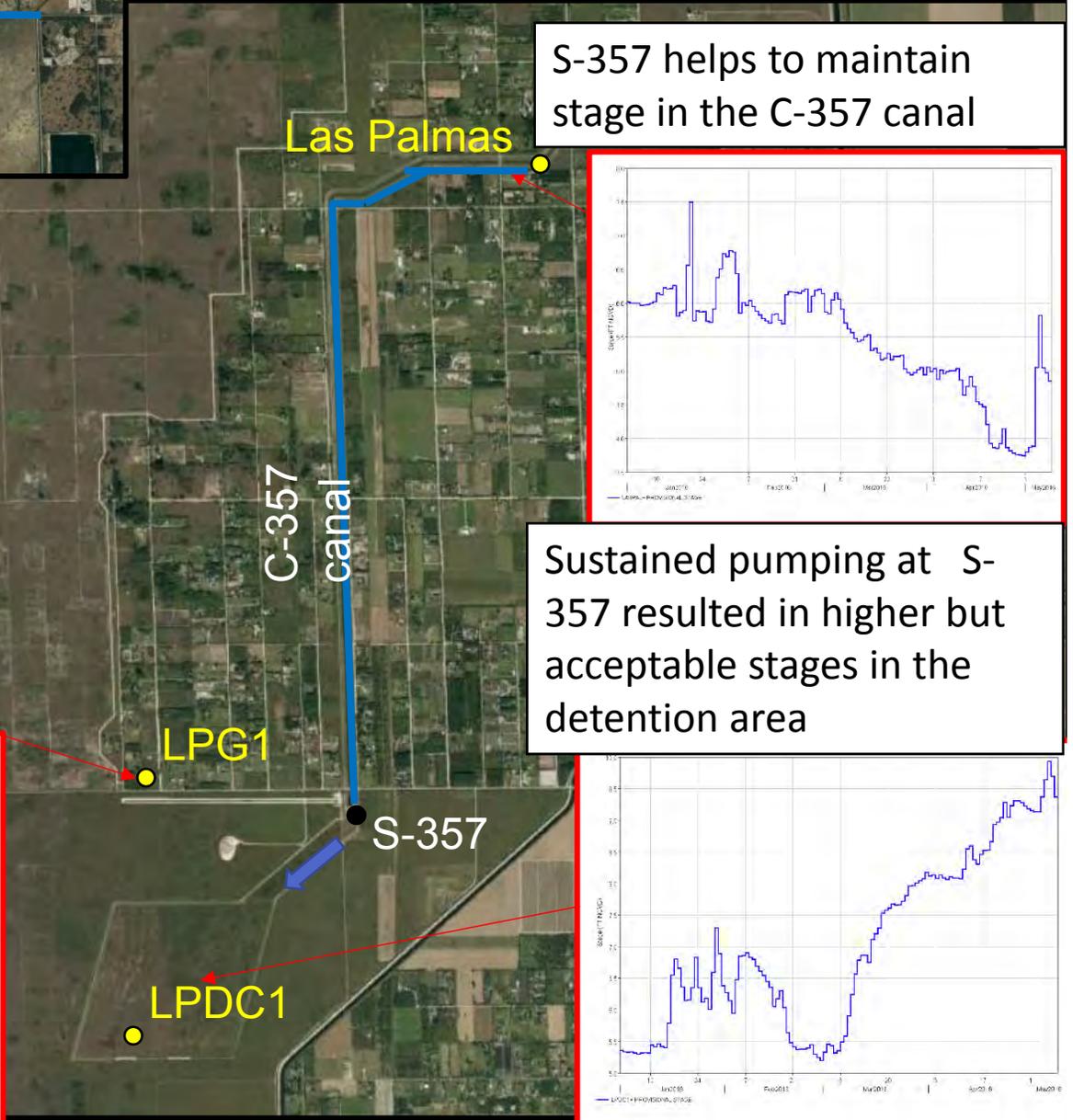
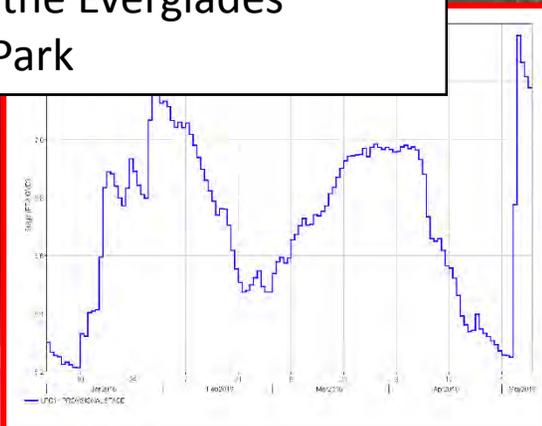


# Water Levels



L-29 stage allowed up to 8.3 feet

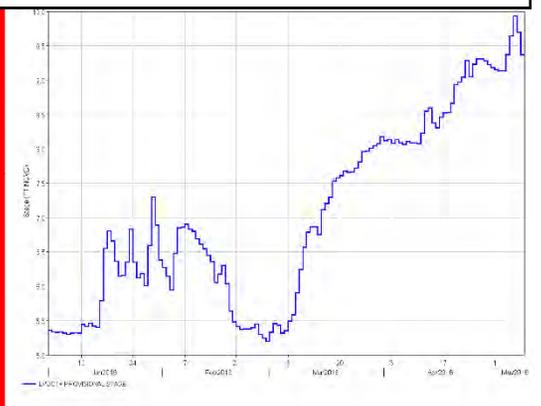
LPG1 experience higher stages due to storm event and high waters in the Everglades National Park



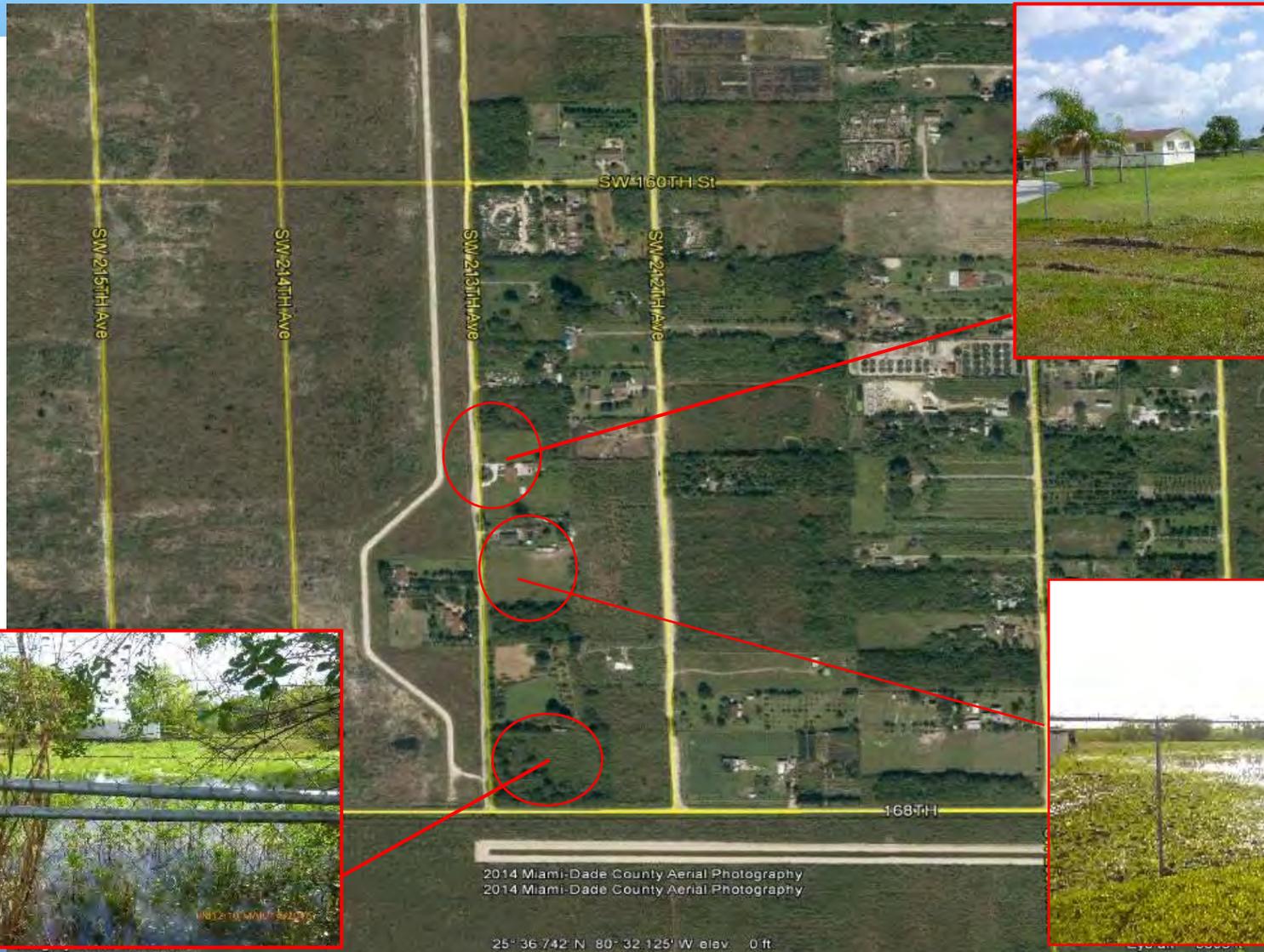
S-357 helps to maintain stage in the C-357 canal



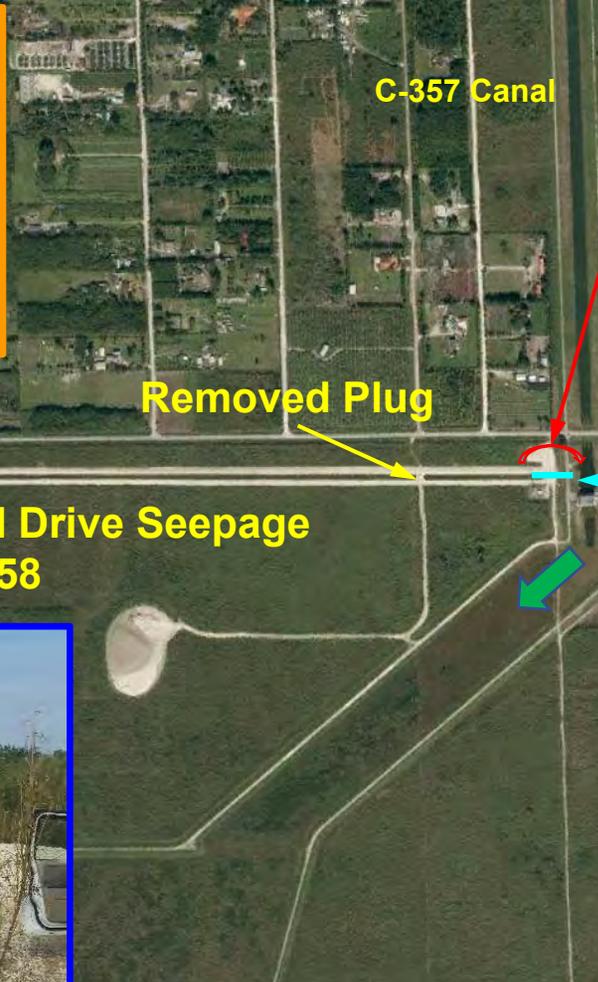
Sustained pumping at S-357 resulted in higher but acceptable stages in the detention area



# Water Conditions in 8.5 Square Mile Area



# S-357N Temporary Mitigations in Place



# Culverts at 8.5 Square Mile Detention Area



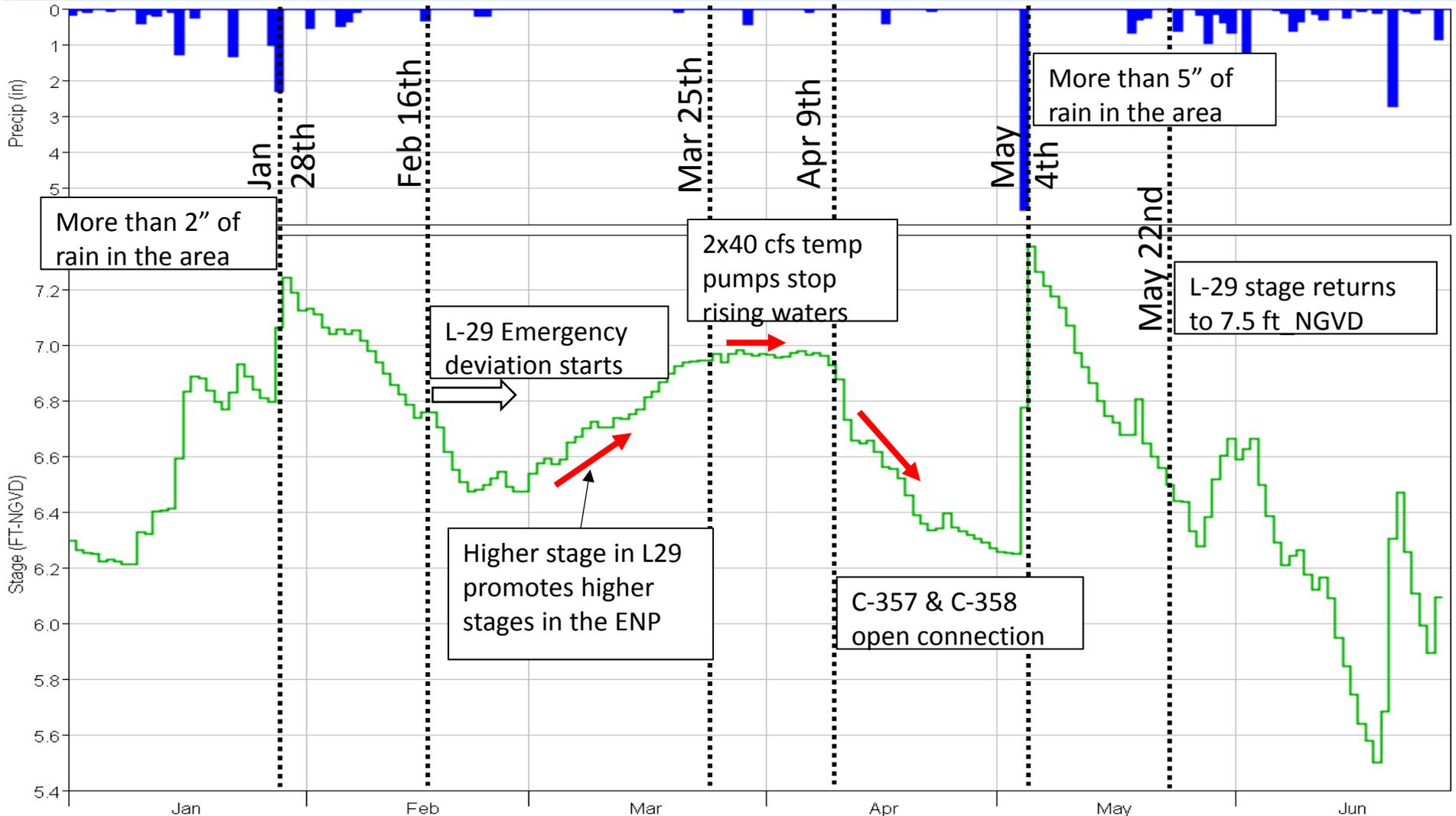
Three 36-inch Corrugated metal pipes with raisers



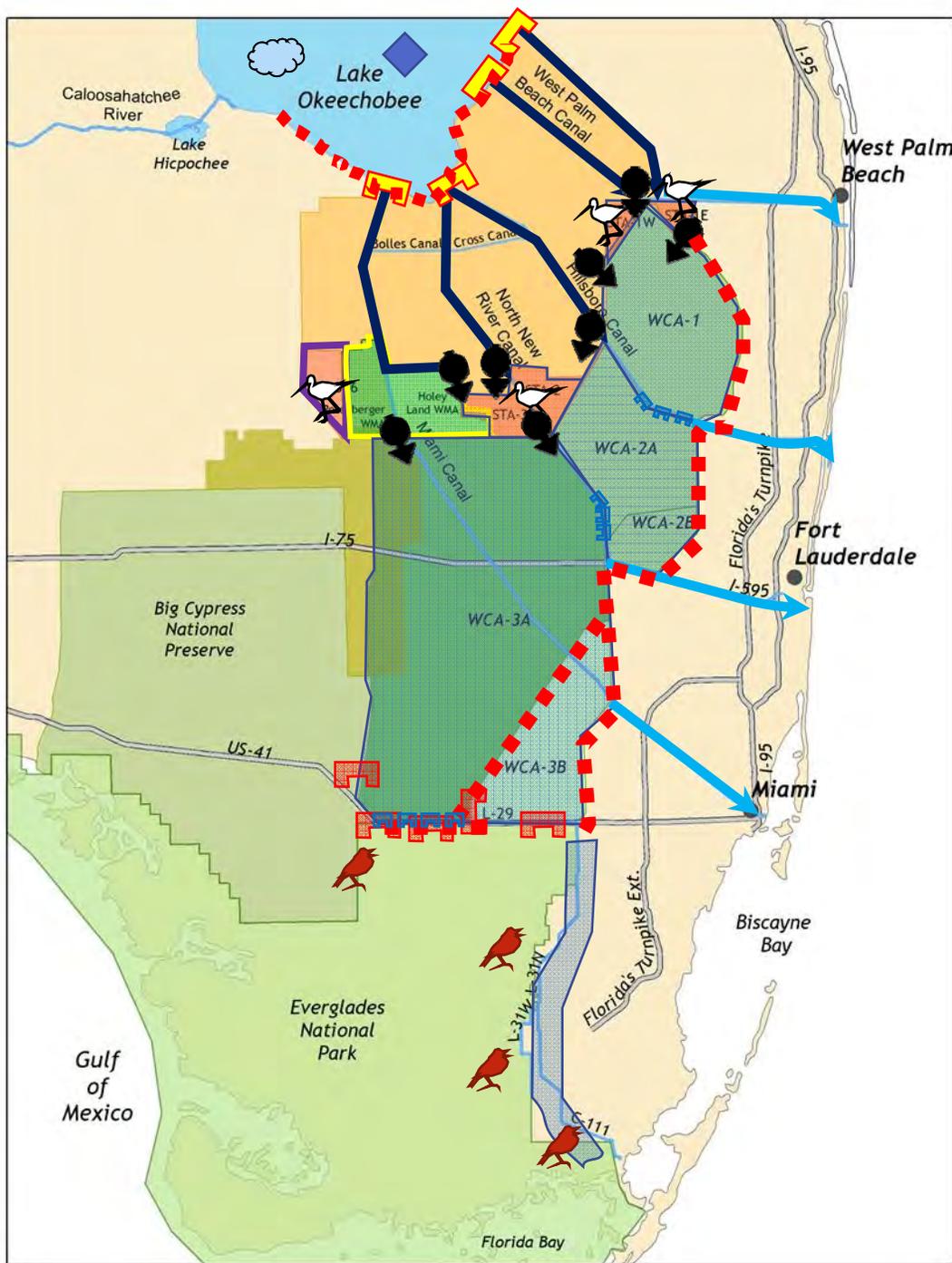
Existing Weir

Culverts

# 8.5 Square Mile Area Groundwater Condition Along Richmond Drive



# Questions



Symbol	Factors to Consider in Operations
	Weather Patterns
	Herbert Hoover Dike
	2008 LORS
	Structure Capacity
	Canal Conveyance
	Species protection
	STA Treatment Capability
	Pump Capacity
	STA 5 / 6 Connectivity
	Wildlife Management Area
	Water Level Limitation (Tree Islands & Wildlife)
	LEC Canal Conveyance
	Levee Safety
	Flow Limitation
	Flood Risk (G3273, SDCS)

# WCA-3A/3B Discharge Destinations

Feb. 12 – May 11, 2016

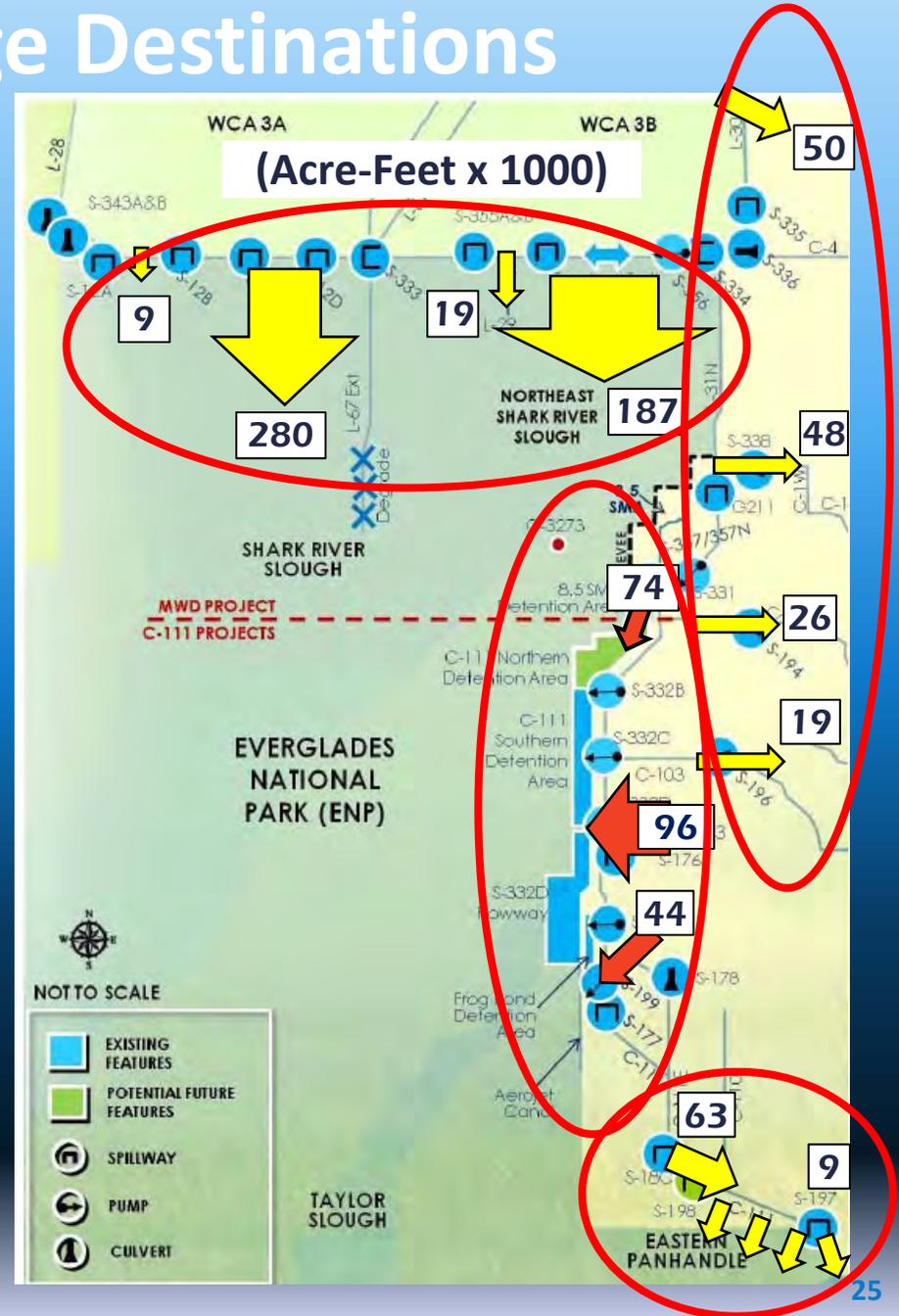
Preliminary flow estimates to:

- East Coast Basins: 143,000 Acre-feet
- Everglades National Park:
  - Shark River Slough: 495,000 Acre-feet
  - Detention Areas (Hydraulic Ridge / Seepage for Taylor Slough)\*: 214,000 Acre-feet
  - S-18C (toward Eastern Panhandle and Barnes Sound): 63,000 Acre-feet
- Barnes Sound (S-197): 9,000 Acre-feet

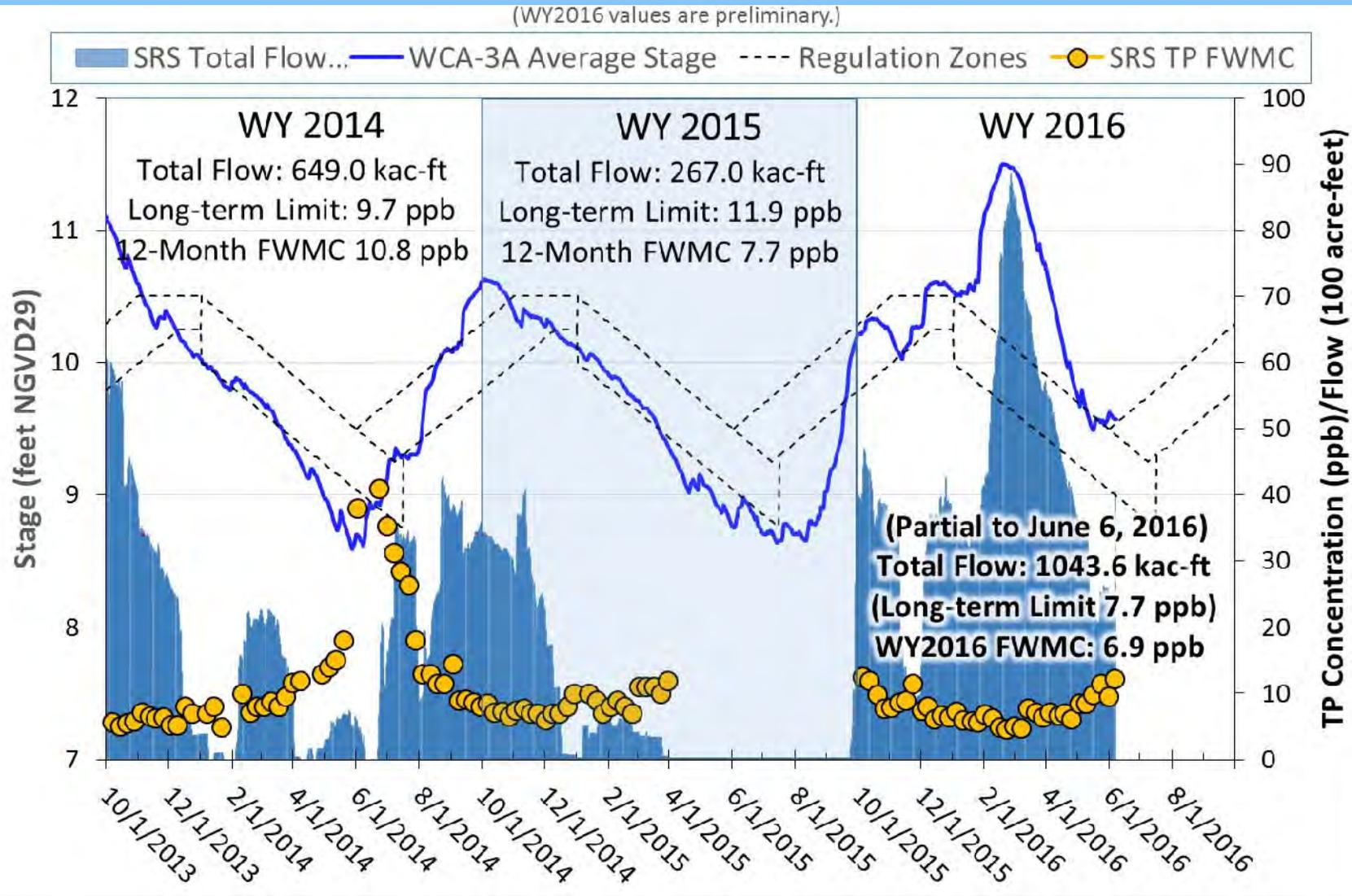
*Includes provisional flow data*

\*Volumes include seepage return pumping

[sfwmd.gov](http://sfwmd.gov)



# Water Level, Flow & Total Phosphorus Trends Shark River Slough Water Years 2014 – 2016



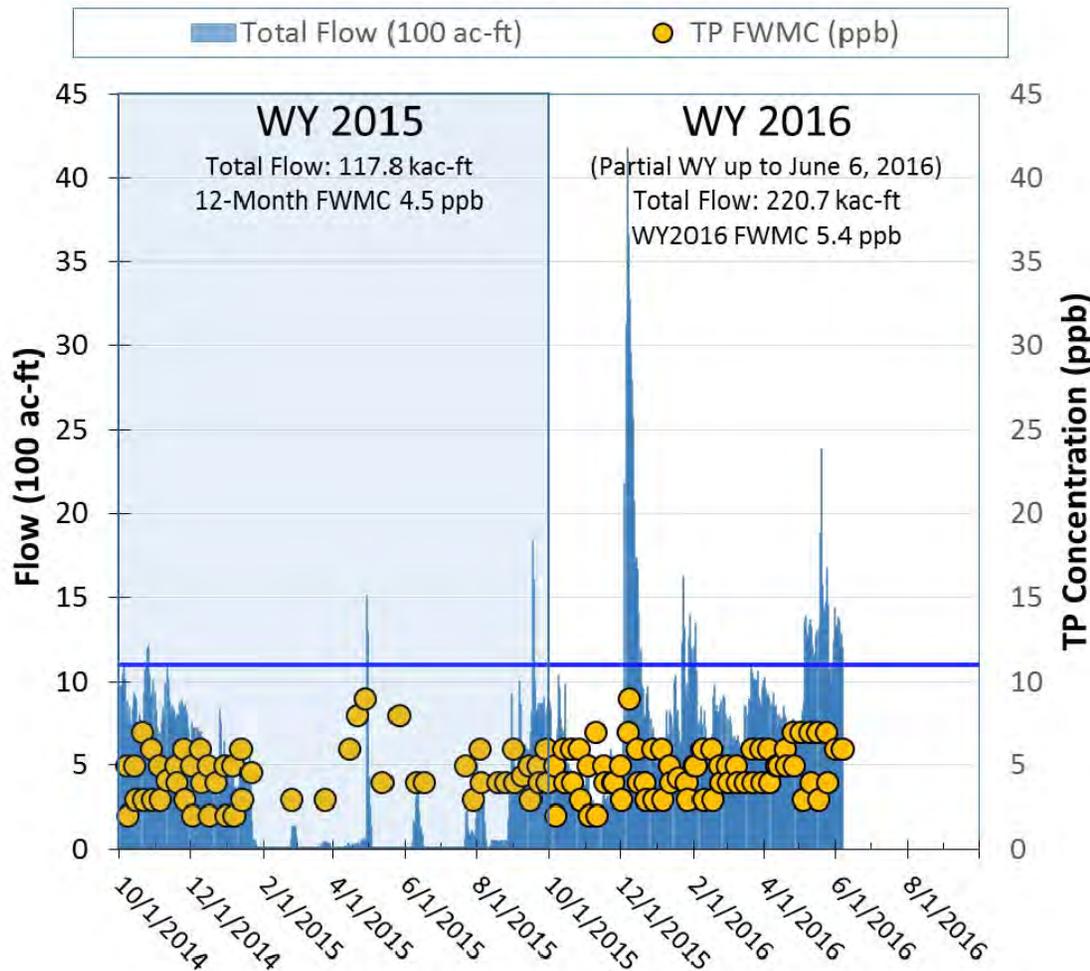
Kac-ft = Acre-feet x 1000

WY2016 Provisional data included – Subject to change

# Taylor Slough/Coastal Basins

## Flow and TP Trends WY2015 – WY2016

Flow and TP Flow-weighted Mean Concentration to Taylor Slough and Coastal Basins



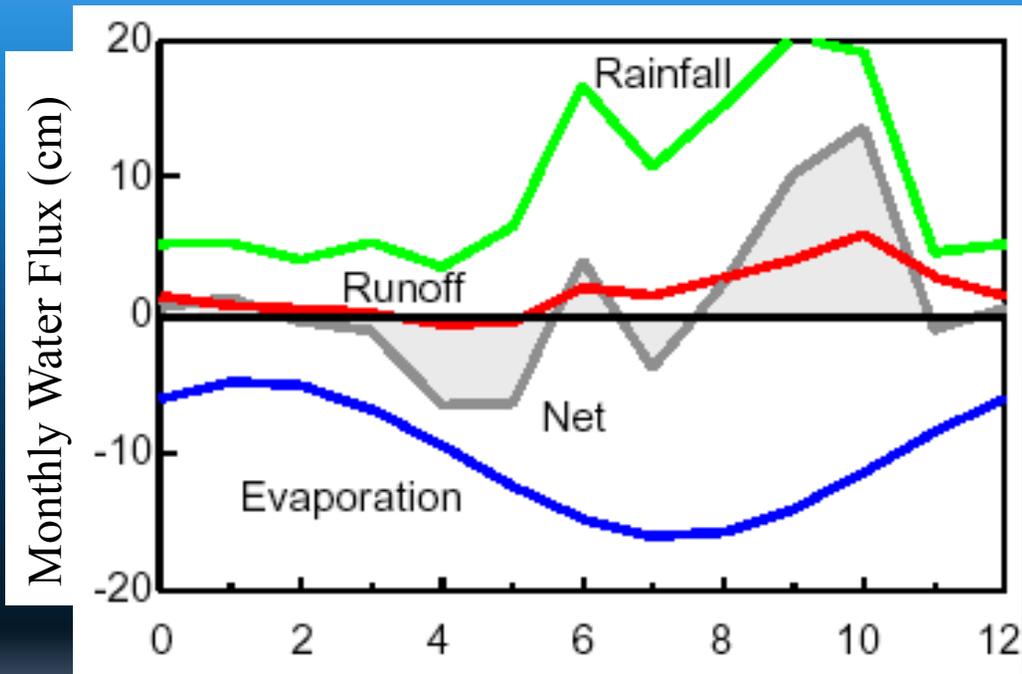
- Consent Decree compliance for Taylor Slough and Coastal Basins based on annual flow-weighted mean TP concentration
- The TP limit fixed at 11 ppb
- TP concentrations appear to be on trajectory for 5 - 6 ppb
- Federal WY2016 ends September 30, 2016 (four months remain in compliance period)

WY2016 Provisional data included – Subject to change  
 1 ppb = 1 µg/L = 0.001 mg/L  
 ac-ft = acre-feet, 1 kac-ft = 1,000 ac-ft

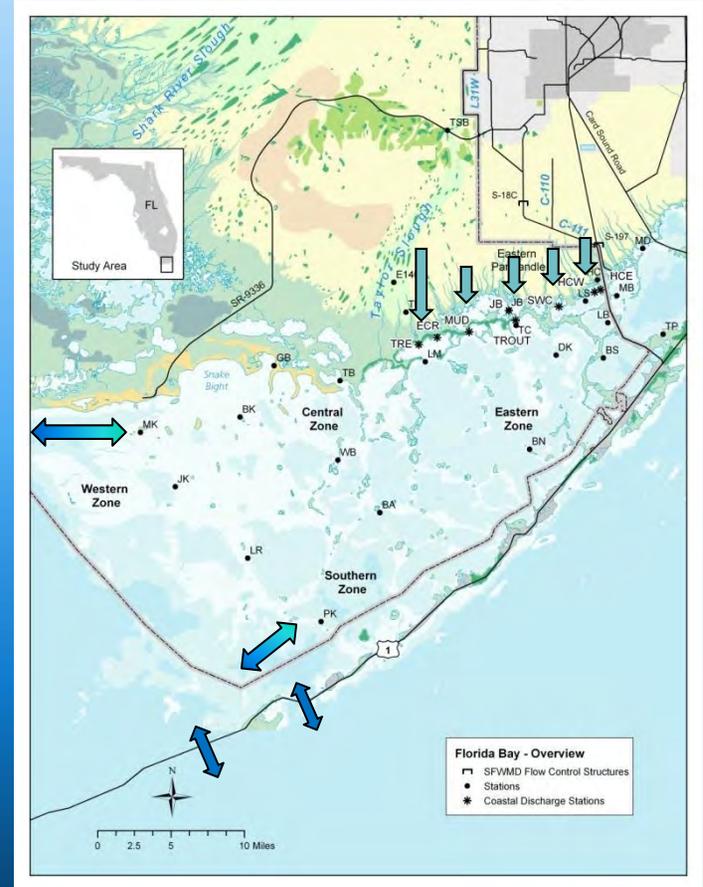
# Factors affecting salinity in Florida Bay

## Freshwater budget

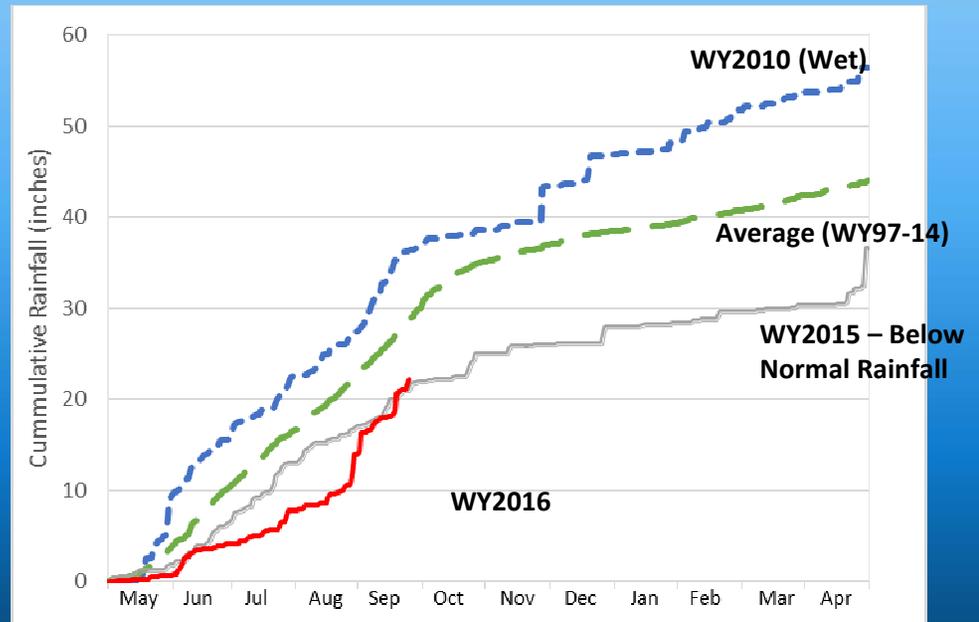
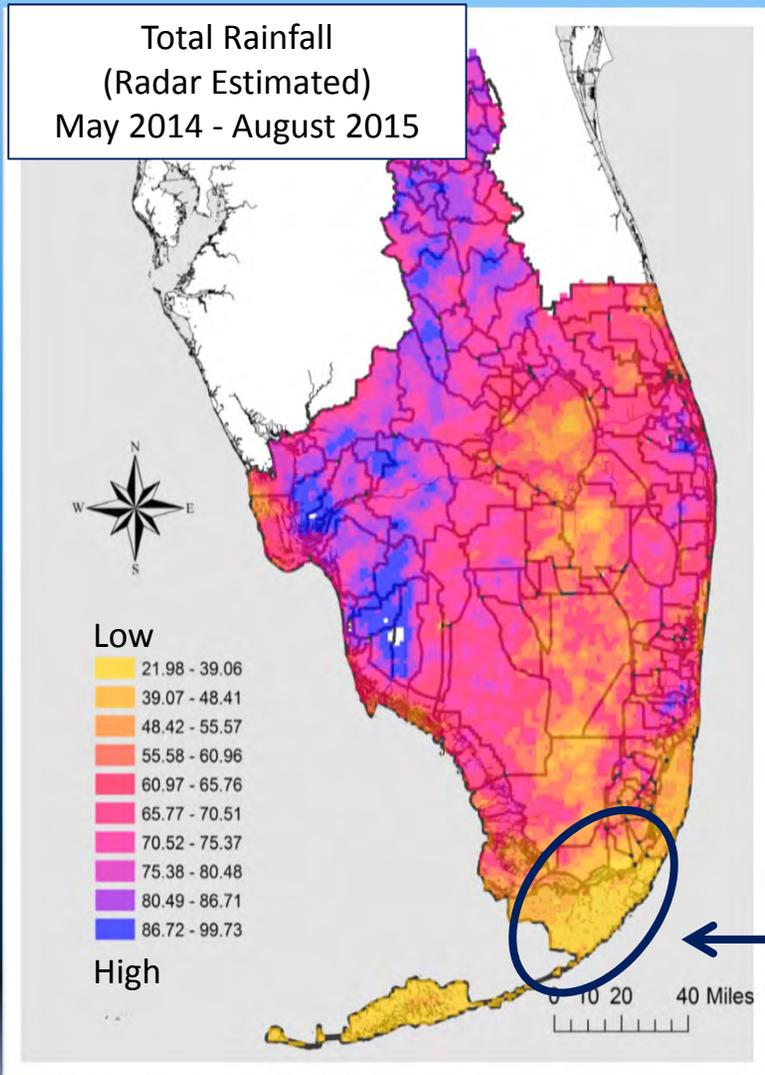
- **Sources:** precipitation, freshwater flow from coast (stream, sheet, ground)
- **Sinks:** evaporation
- **Mixing:** tide and wind driven across complex boundaries



Month  
From: Nuttle 2000



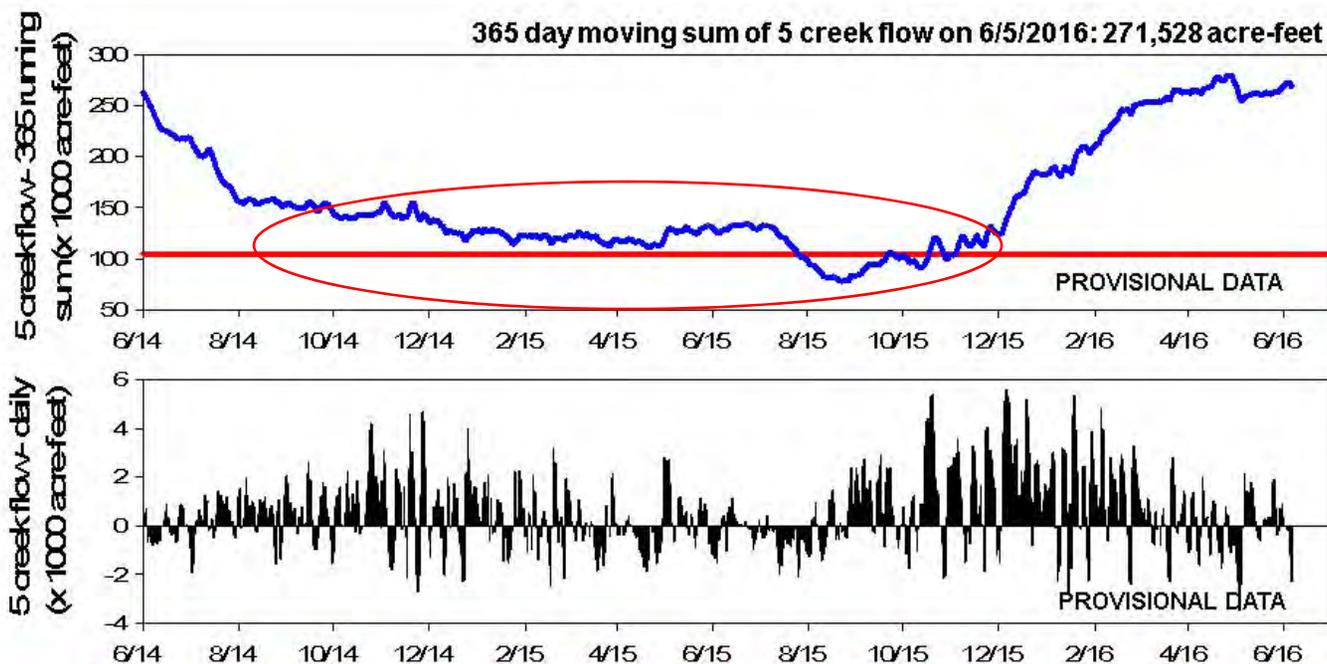
# District Rainfall Distribution WY15 & Early WY16



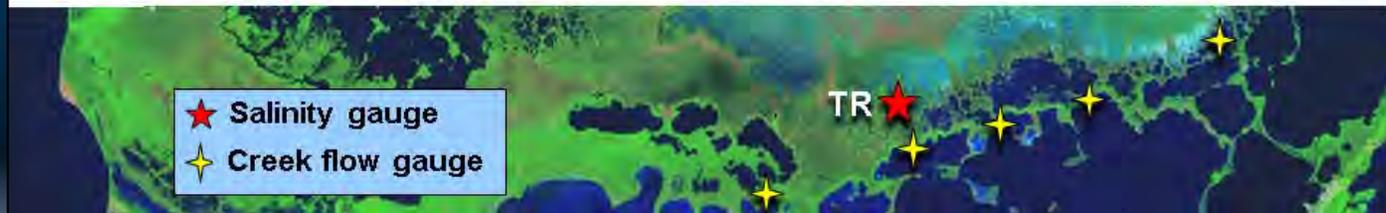
- Taylor Slough & Florida Bay received the lowest amounts of rainfall
- 25-35 inches compared to 50-60 inches (wet year)

# Current Florida Bay Inflow

5 Creek Cumulative Flow and Florida Bay MFL Flow Criteria Tracking

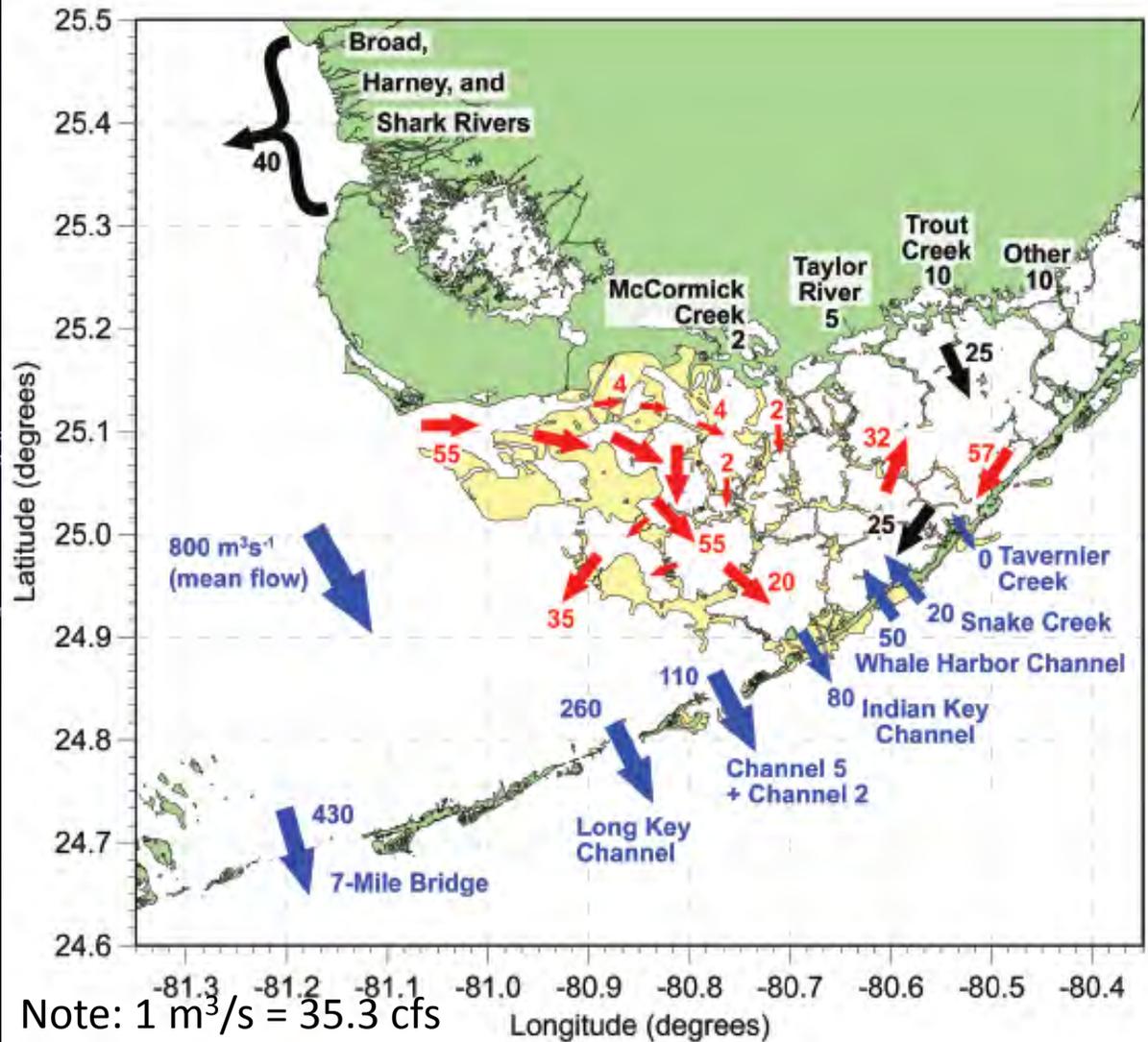
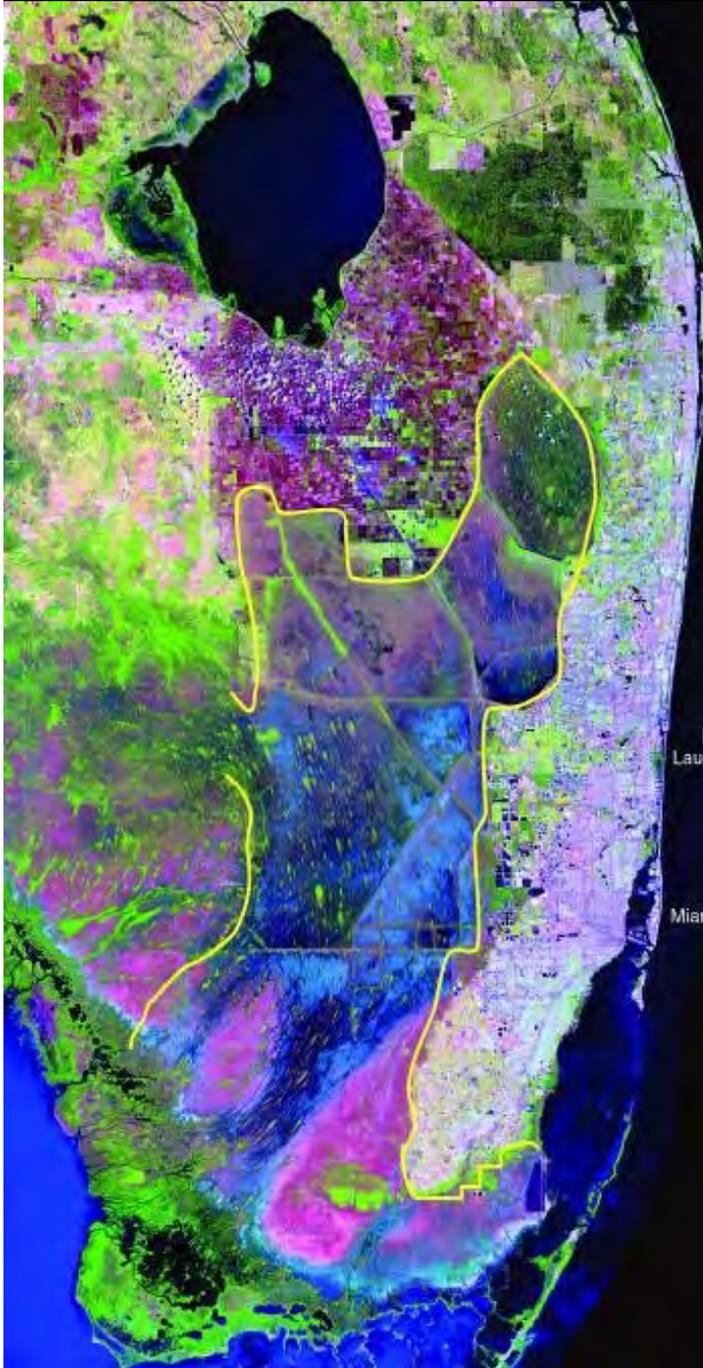


The 365 day running sum of the cumulative flow from the 5 creeks feeding Florida Bay increased very slightly to 271,528 acre-feet last week (6/5/16), which is above the average 365 day running sum for the 5 creek flow of 257,628 acre-feet. The weekly cumulative flow from the 5 creeks decreased to 524 acre-feet. Creek flow is provisional data from the USGS and is highly variable.



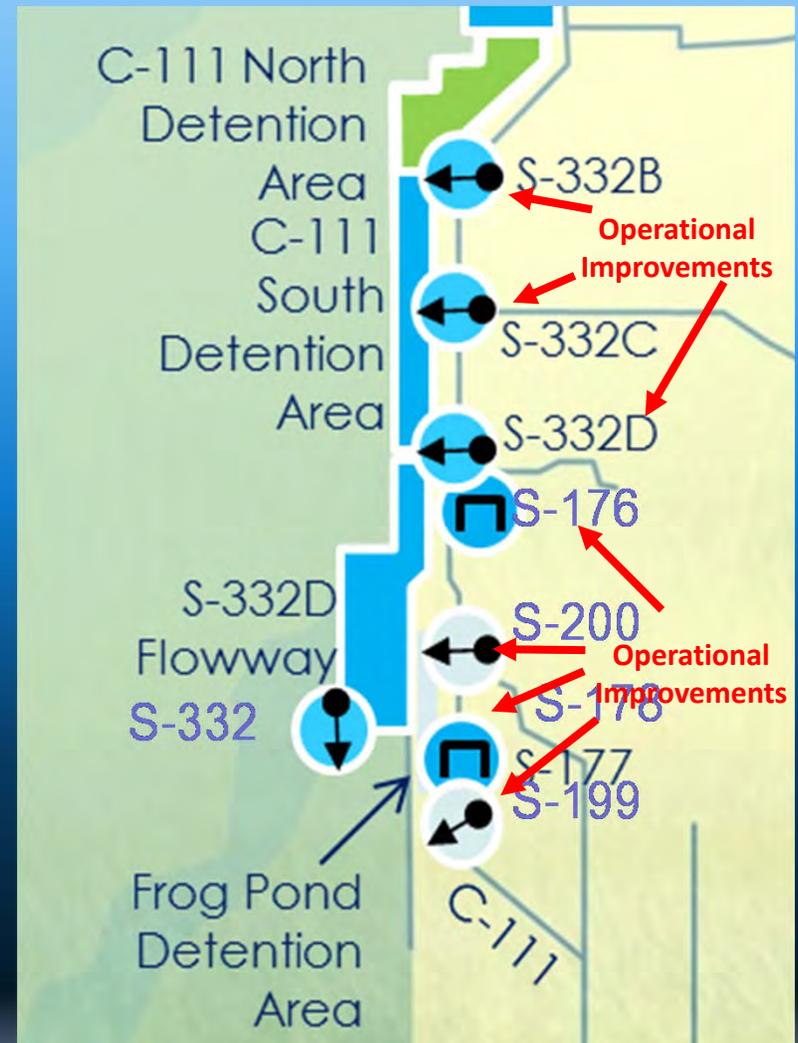
# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Lee et al. 2016: Annual Mean Volume ( $\text{m}^3 / \text{sec}$ )



# Operational and Structural Recommendations to Deliver More Water to Taylor Slough

- ✓ Implemented operating guidance within existing water control plan authority
  - Operate the S-332B, S-332C, S-332D, S-199 and S-200 pumps at the lower end of their current operating range
  - Operate the water control structures S-176 and S-177 based on rainfall event criteria
- ✓ Seasonal and lower operating ranges at S-199 and S-200 pump stations
- ✓ Seasonal and lower operating ranges at S-332 pump stations, S-176 and S-177 structures
- ✓ Modify high head cell at S-332D



# Operational and Structural Recommendations to Deliver More Water to Taylor Slough

- ✓ Increase S-199 and S-200 pump capacity
- Modify infrastructure in vicinity of Taylor Slough Headwaters
  - ✓ Rebuild weir north of S-332 on east side of canal
  - ✓ Staff has initiated a more detailed assessment of the hydraulic conveyance in the vicinity of Taylor Slough headwaters

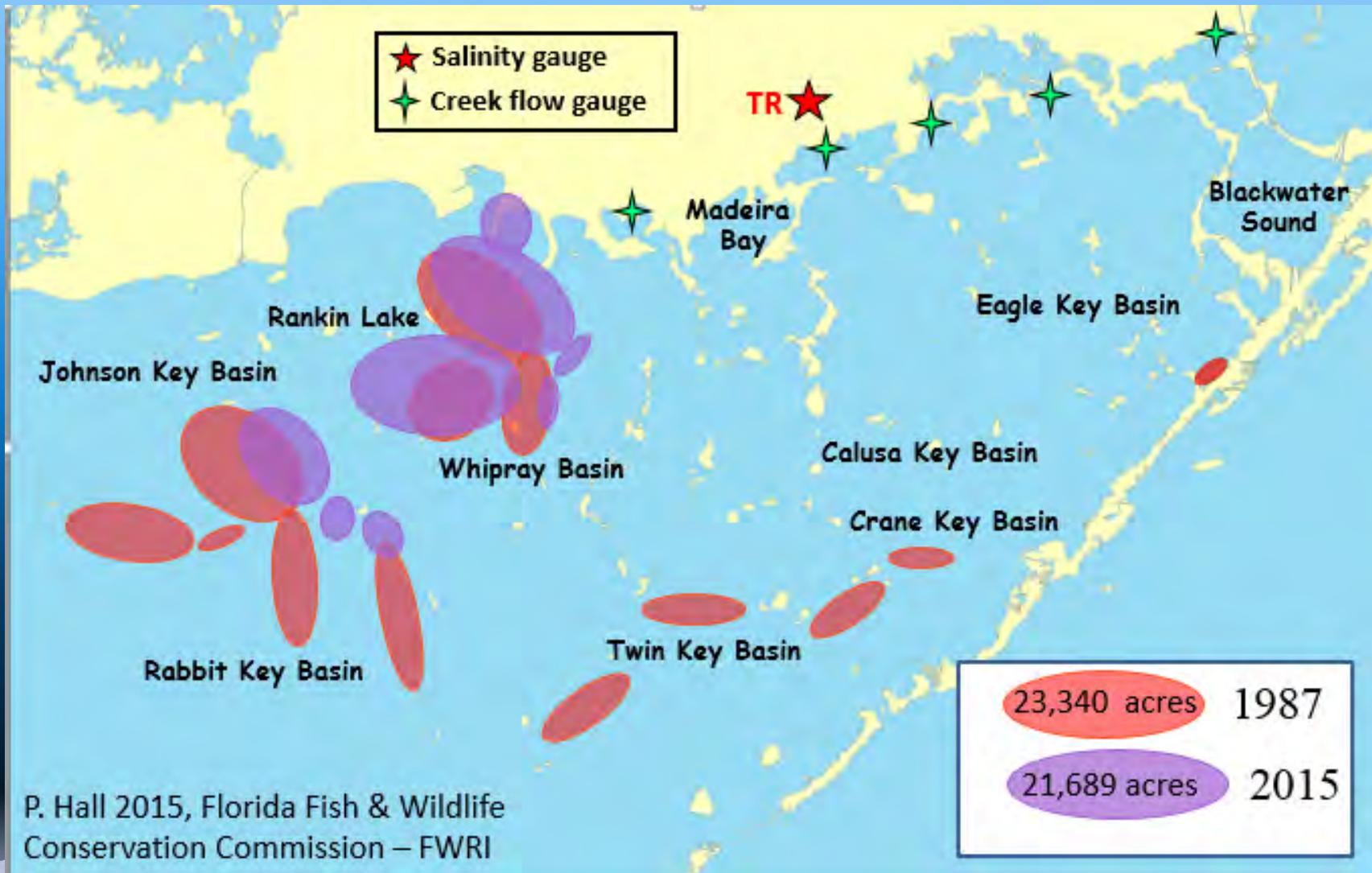


# Construction of C-111 South Dade Project

- Contract 8 construction by U.S. Army Corps of Engineers contractor is underway
- Contract 8A is expected to be awarded by U.S. Army Corps of Engineers in September 2016; Contract 9 to follow
- Once complete, the newly constructed flowways within the detention areas will move water more effectively



# Turtle Grass Die-Off Locations 1987-1990 vs 2016 Event



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

