

Disclaimer: Information contained in the report addresses environmental conditions only and is not the official South Florida Water Management District operations recommendation or decision.

## **M E M O R A N D U M**

**TO:** John Mitnik, Chief, Operations, Engineering and Construction Bureau  
Paul Linton, Chief, Operations Section

**FROM:** SFWMD Staff Environmental Advisory Team

**DATE:** September 4, 2018

**SUBJECT:** Weekly Environmental Conditions for Systems Operations

### **Summary**

#### **Weather Conditions and Forecast**

A couple of below-average rainfall days are forecast. Tropical Storm Gordon continues to move away from the District and the heavy rains associated with the storm are well off shore the west coast. Daytime heating should help develop scattered showers and thunderstorms over the District in peripheral bands loosely associated with Gordon. The focus of activity should be along the east coast this morning and then over western areas this afternoon. A decrease in moisture should then yield below average daily thunderstorm coverage Wednesday with afternoon thunderstorms focused over the interior and west. An upper level low is expected to bring coastal showers east late Wednesday night and Thursday morning and then help generate scattered afternoon thunderstorms focused over the interior and west Thursday. Rebounding moisture and southerly steering flow associated with a tropical wave are forecast to increase thunderstorm coverage on Friday, Saturday, and Sunday as the upper level low moves slowly west-southwest across the District and into the Gulf of Mexico. Building high pressure will bring southeasterly winds back to the District which should focus scattered afternoon thunderstorms over the interior and west Monday.

#### **Kissimmee**

Tuesday morning stages were 56.5 feet NGVD (at schedule) in East Lake Toho, 53.6 feet NGVD (0.1 feet above schedule) in Toho, and 51.5 feet NGVD (0.5 feet above schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.43 feet NGVD at S-65A and 27.9 feet NGVD at S-65D. Tuesday morning discharges were: 4,120 cfs at S-65, 4,482 cfs at S-65A, and 4,480 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged N/A mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 1.61 feet. No new recommendations were made this week.

#### **Lake Okeechobee**

Lake Okeechobee stage is 14.61 feet NGVD, rising 0.07 feet from last week and 0.22 feet over the last 30 days. The seasonal low for 2018 (12.83 feet NGVD) was the third highest since 2011, and the third time in six years that lake stage did not reach the bottom of the preferred stage envelope (12.5 – 15.5 feet NGVD). Due to record rainfall in May, the submerged aquatic vegetation (SAV) coverage on the Lake will likely remain at minimal levels beyond next summer, prolonging impacts from high water levels associated with El Niño in 2016 and Hurricane Irma in 2017. Cyanobacteria bloom potential has remained lower since late-August, with NOAA's analysis of satellite data (see supporting information below). The latest image (September 1) had substantial cloud cover but shows very few areas with potential for blooms. However, conditions will likely remain favorable for some level of recurring blooms throughout the month, particularly during stretches of low wind and high temperature on the Lake.

## **Estuaries**

Total inflow to the St. Lucie Estuary averaged 2,829 cfs over the past week with 1,287 cfs coming from Lake Okeechobee. Surface salinity stayed the same in the North Fork and decreased in the middle and lower parts of the estuary. The seven-day average salinity at the US1 Bridge is in the poor range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 7,233 cfs over the past week with 2,235 cfs coming from the Lake. Salinity remained near 0 down to Ft. Myers Yacht Basin and decreased downstream. The 30-day moving average surface salinity is 0.2 at Val I-75 and 0.2 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass. Salinity conditions are in the poor range for adult eastern oysters at Cape Coral and in the good range at Shell Point. Given the current estuarine conditions, there are no ecological benefits associated with freshwater releases from Lake Okeechobee.

## **Stormwater Treatment Areas**

Over the past week, the STAs received approximately 50,800 acre-feet of inflows (which includes approximately 14,900 acre-feet of Lake releases). The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 838,000 acre-feet, which includes approximately 147,000 acre-feet of Lake releases. Most STA cells are at or above target depths. Operational restrictions are in place for a Restoration Strategies Science Plan study in STA-3/4 and for construction related activities in STA-1W. STA-5/6 Flow-ways 2 and 3 are offline for initiation of a Restoration Strategies project to grade non-effective treatment areas. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to the STA-1E, A-1 FEB/STA-3/4 and STA-2.

## **Everglades**

Conditions within the Everglades remains stable as the WCAs remain close to the current regulation/deviation schedules. Water depths on average rose slightly across the Water Conservation Areas. The average water depth at the gauges located in WCA-3A North is 1.64 feet and in WCA-3A South the average depth is 2.34 feet. Gauge 65 is below the threshold that indicates flooding stress to tree islands. In Taylor Slough water depths remain about 1 foot deep and slightly above the historical average. Salinities in the nearshore of Florida Bay recovered over the last week, returning to near normal. Stage and rainfall data for this report is updated Sunday (9/2) at midnight, regulation schedules updated 9/3.

## Supporting Information

### KISSIMMEE BASIN

#### **Kissimmee Basin Rainfall**

The Upper Kissimmee Basin received 2.38 inches of rainfall in the past week and the Lower Basin received 2.06 inches (SFWMD Daily Rainfall Report 9/1/2018).

#### **Upper Kissimmee Basin**

Stages and departures in the Kissimmee Chain of Lakes (KCOL) are shown in **Table 1**. KCOL stage hydrographs with respective regulation schedules and rainfall are shown in Figures 1-7.

**Table 1.** Average discharge (cfs) for the preceding seven days, one-day stage (feet NGVD), and departures from KCOL flood regulation (R) or temporary schedules (T, A, or S). Provisional, real-time data are from SFWMD.

**Report Date: 9/4/2018**

Water Body	Structure	7-day Average Discharge (cfs) <sup>1</sup>	Stage Monitoring Site <sup>2</sup>	Lake Stage (feet)	Schedule Type <sup>3</sup>	Schedule Stage (feet)	Daily Departure (feet)						
							9/2/18	8/26/18	8/19/18	8/12/18	8/5/18	7/29/18	7/22/18
Lakes Hart and Mary Jane	S-62	130	LKMJ	60.0	R	60.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Lakes Myrtle, Preston, and Joel	S-57	56	S-57	61.1	R	61.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
Alligator Chain	S-60	205	ALLI	63.4	R	63.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
Lake Gentry	S-63	300	LKGT	61.0	R	61.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
East Lake Toho	S-59	434	TOHOE	56.5	R	56.5	0.0	0.0	0.0	0.0	0.5	0.7	0.1
Lake Toho	S-61	1,499	TOHOW, S-61	53.6	R	53.5	0.1	0.1	0.0	0.1	0.3	0.6	-0.1
Lakes Kissimmee, Cypress, and Hatchineha	S-65	3,088	KUB011, LKIS5B	51.5	R	51.0	0.5	0.1	0.1	0.4	0.7	0.6	0.2

<sup>1</sup> Seven-day average of weighted daily means through midnight.

<sup>2</sup> Names of in-lake monitoring sites and structures used to determine lake stage; if more than one site is listed, an average is reported.

<sup>3</sup> T = temporary schedule, R = USACE flood control schedule, S = temporary snail kite schedule, A = projected ascension line, N/A = not applicable or data not available.  
DATA ARE PROVISIONAL

#### **Lower Kissimmee Basin**

Discharges at Lower Basin structures are shown in Table 2. SFWDAT depth maps for the Phase I restoration area are shown in Figure 8. Kissimmee River floodplain stages at selected stations are shown in Figure 9.

**Table 2.** One-day and seven-day averages of discharge at S-65x structures, of dissolved oxygen concentration in the Phase I area river channel, and water depth in the Phase I area floodplain. Data are provisional real-time data from SFWMD.

Report Date: 9/4/2018

Metric	Location	1-Day Average		Average for the Preceding 7-Days <sup>1</sup>								7/1/18
		9/2/2018	9/2/18	8/26/18	8/19/18	8/12/18	8/5/18	7/29/18	7/22/18	7/15/18	7/8/18	
Discharge (cfs)	S-65	4,132	3,088	1,806	3,282	4,337	4,407	4,179	1,567	2,561	1,287	514
Discharge (cfs)	S-65A <sup>2</sup>	4,481	3,315	1,765	3,443	4,674	4,980	4,267	1,479	2,615	1,294	466
Discharge (cfs)	S-65D <sup>2</sup>	3,171	2,699	3,077	4,254	4,617	4,458	2,264	2,641	2,226	1,774	1,608
Headwater Stage (feet NGVD)	S-65D <sup>2</sup>	27.96	27.88	27.70	27.00	26.63	26.78	26.75	26.68	26.77	26.80	26.79
Discharge (cfs)	S-65E <sup>2</sup>	3,367	2,902	3,219	1,955	4,848	4,566	2,400	2,764	2,399	2,000	1,834
Discharge (cfs)	S-67	181	190	187	169	160	157	209	183	217	292	298
DO (mg/L) <sup>3</sup>	Phase I river channel	N/A	N/A	2.4	2.9	3.1	3.3	3.8	2.3	2.7	2.9	3.4
Mean depth (feet) <sup>4</sup>	Phase I floodplain	1.61	1.24	1.16	1.76	2.02	2.08	1.25	1.08	1.20	0.60	0.46

<sup>1</sup>Seven-day average of weighted daily means through Sunday midnight.

<sup>2</sup>S-65A discharge combines S-65A with auxiliary structures; S-65D discharge combines discharge at S-65D, S-65DX1, and S-65DX2; S-65D stage averages stage at S-65D and S-65DX1; S-65E discharge combines S-65E and S-65EX1.

<sup>3</sup>DO is the average for sondes at PC62 and PC33.

<sup>4</sup>1-day spatial average from South Florida Water Depth Assessment Tool (SFWDAT).

DATA ARE PROVISIONAL; N/A indicates that data were not available.

## KCOL Hydrographs (through Sunday midnight)

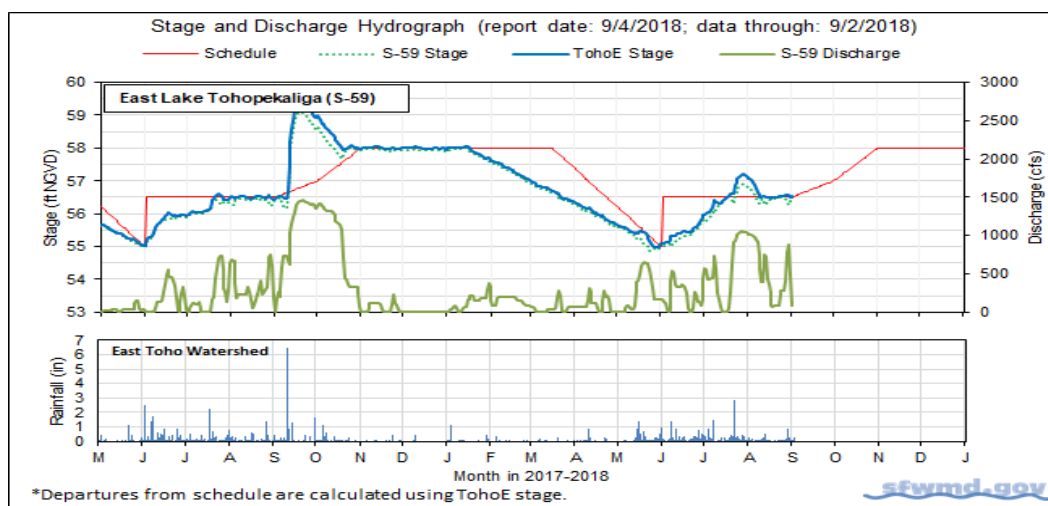


Figure 1.

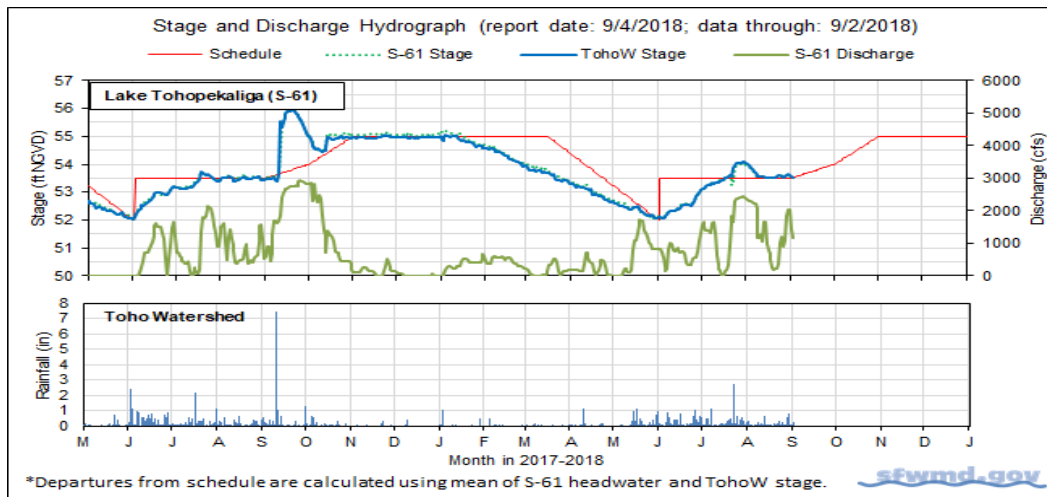


Figure 2.

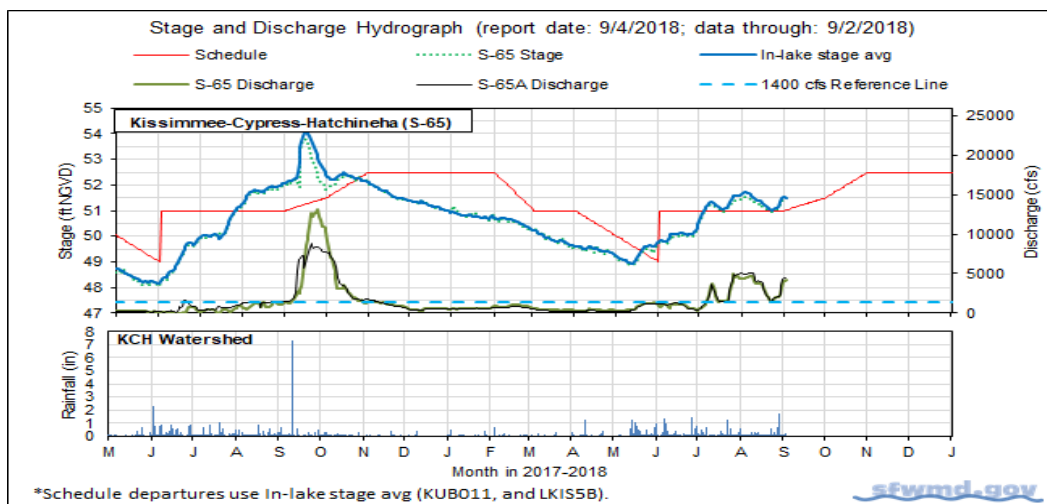


Figure 3.

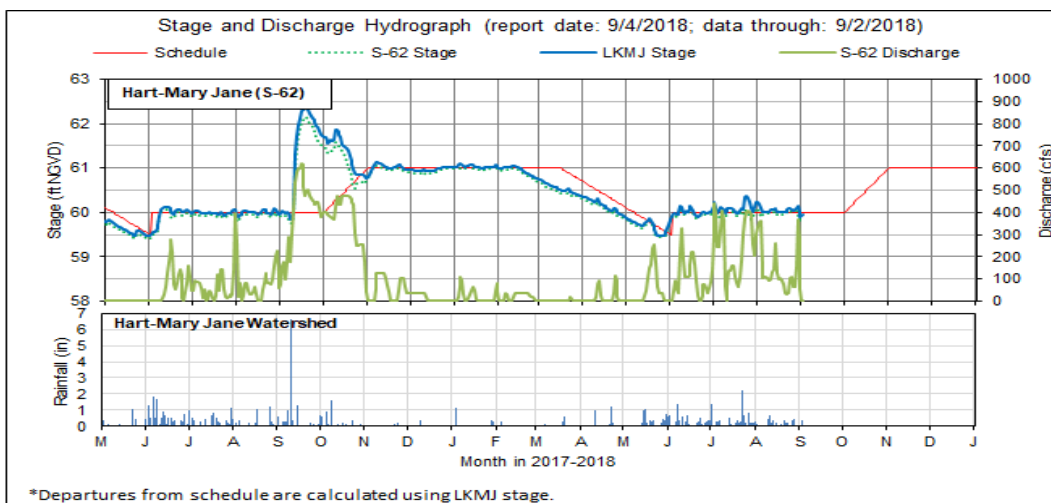


Figure 4.

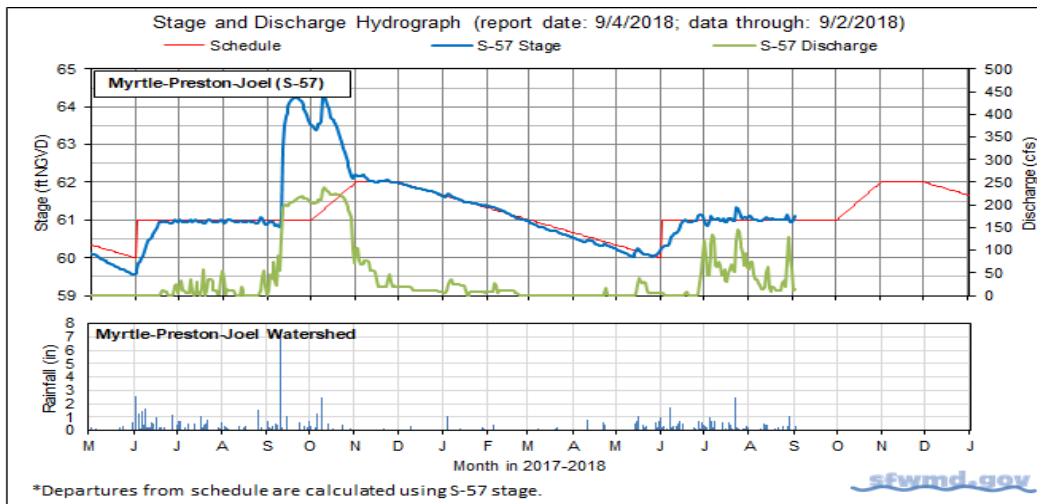


Figure 5.

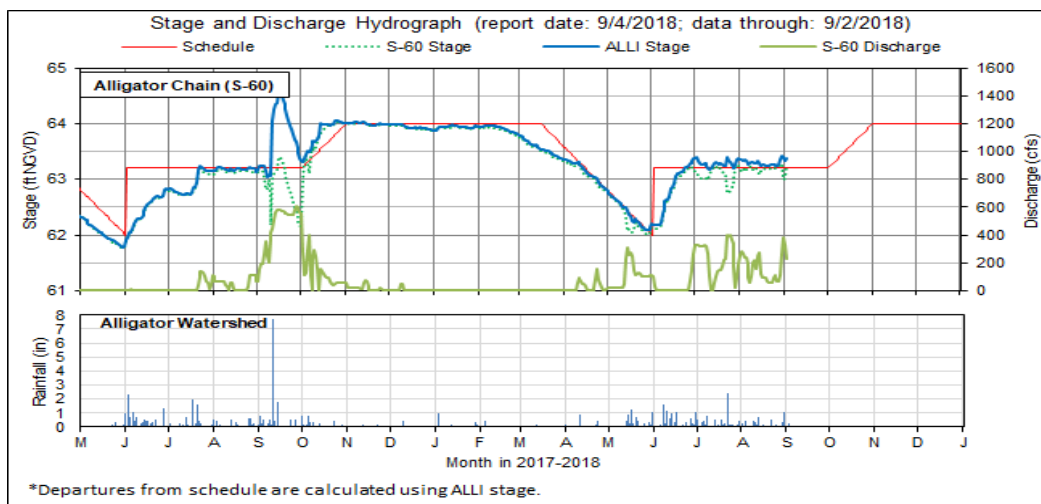


Figure 6.

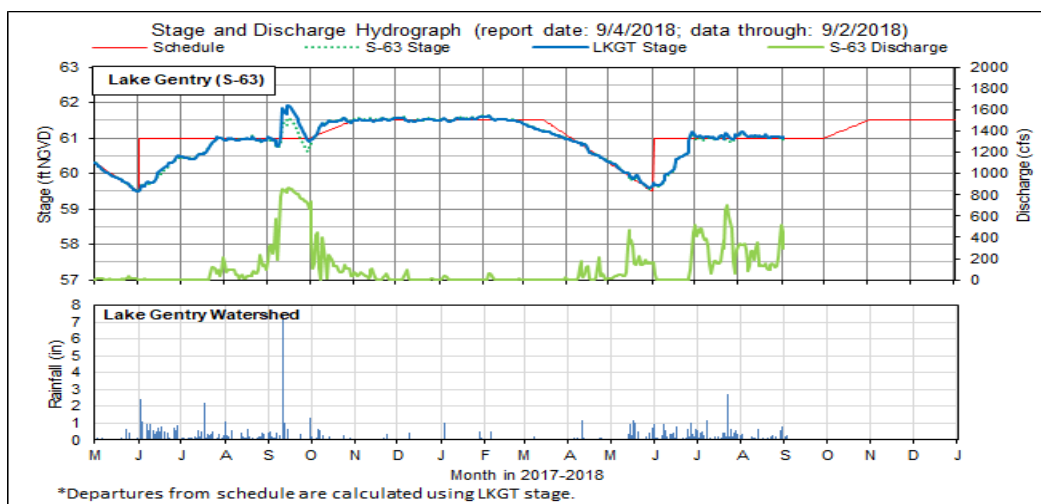
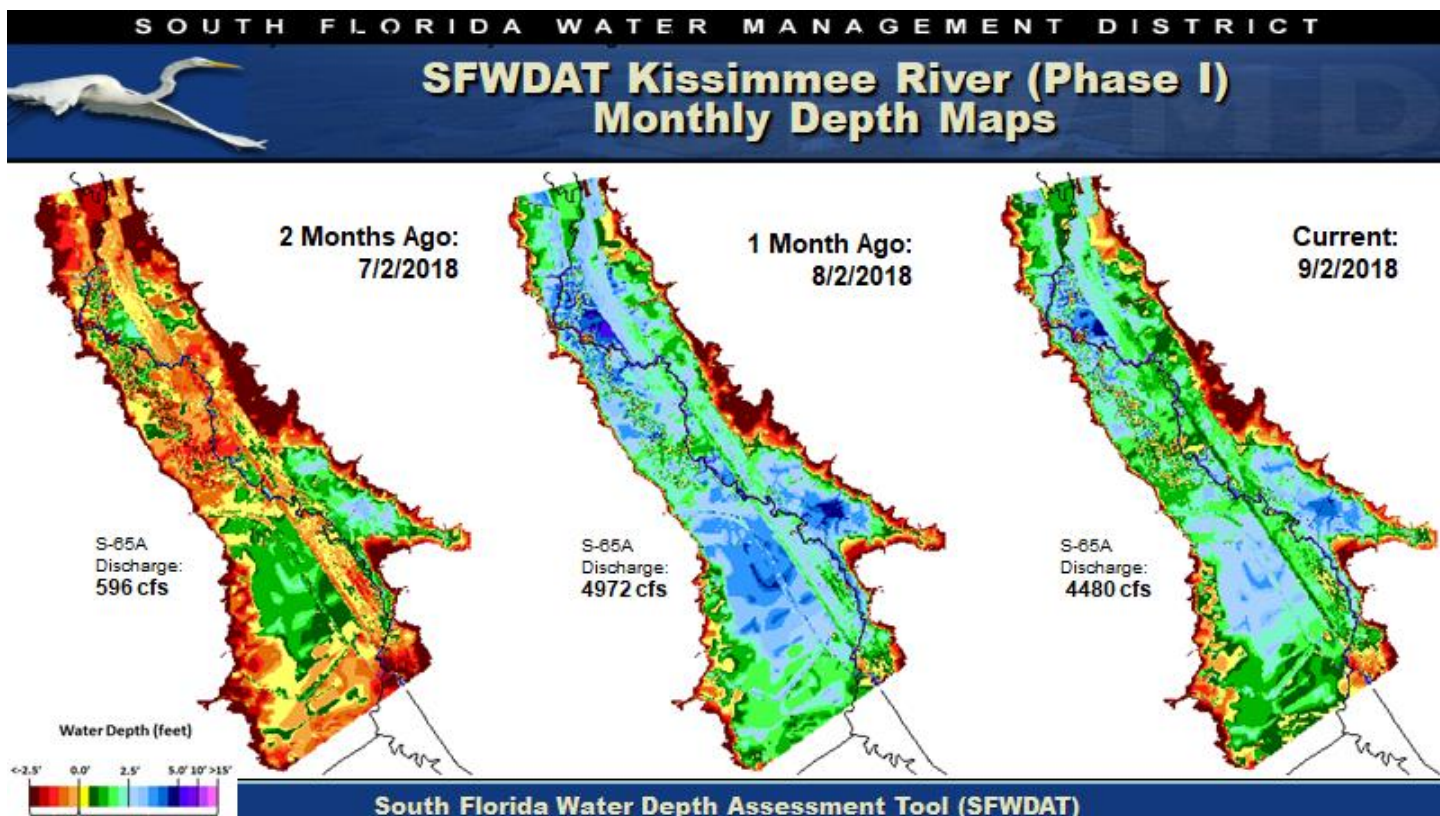
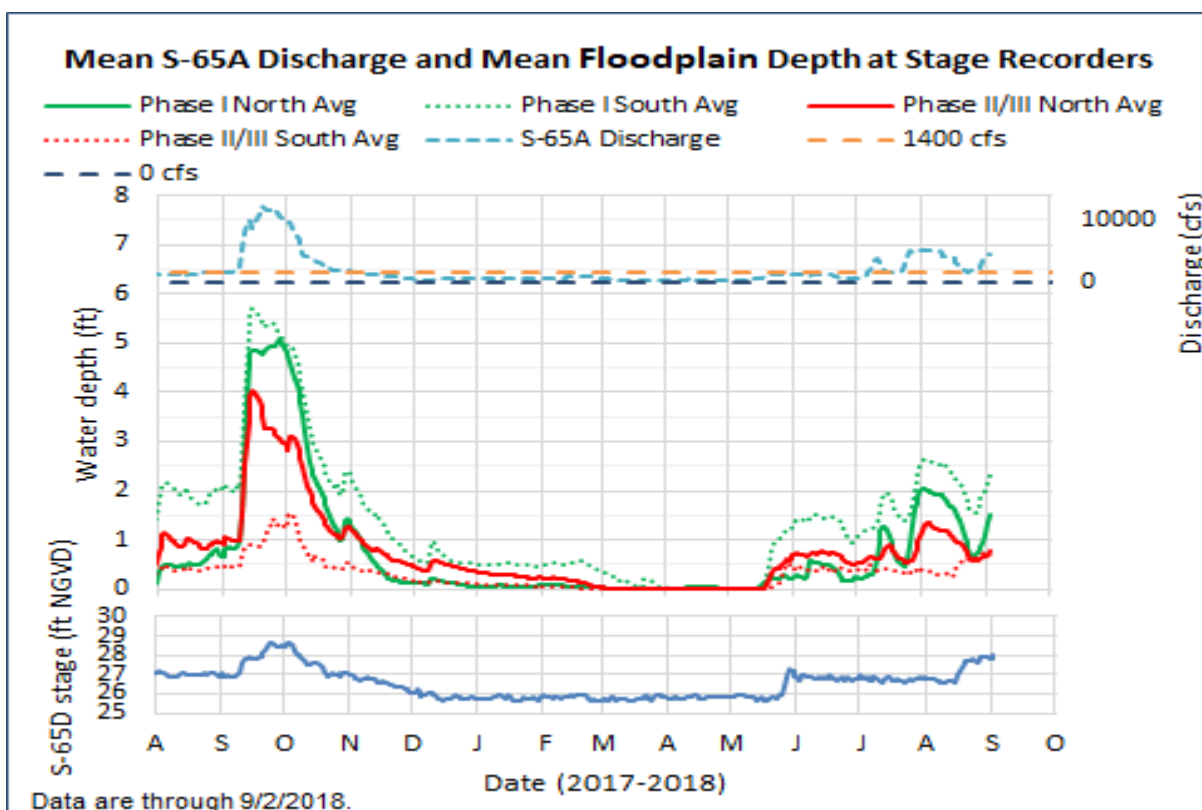


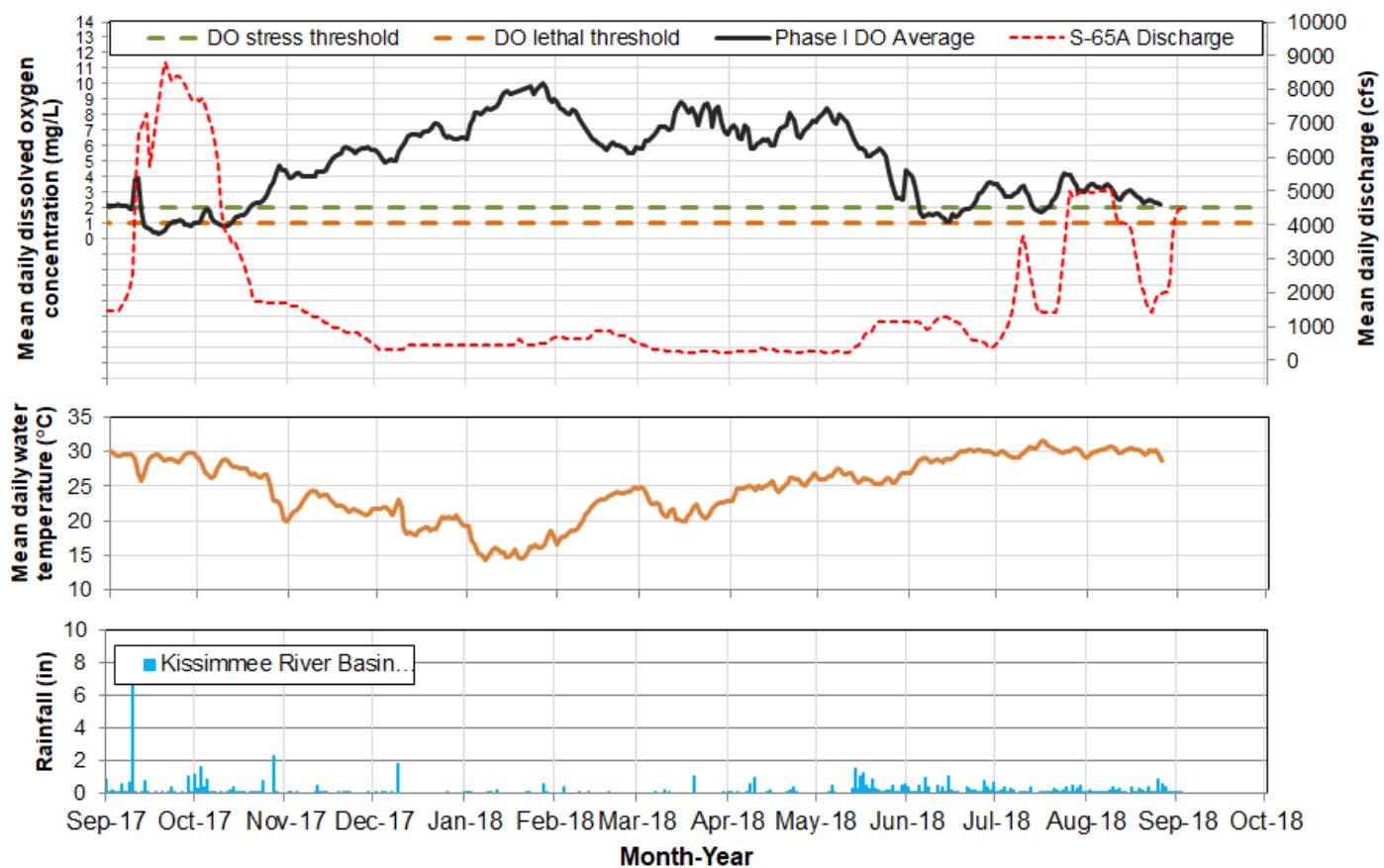
Figure 7.



**Figure 8.** Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.



**Figure 9.** Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.



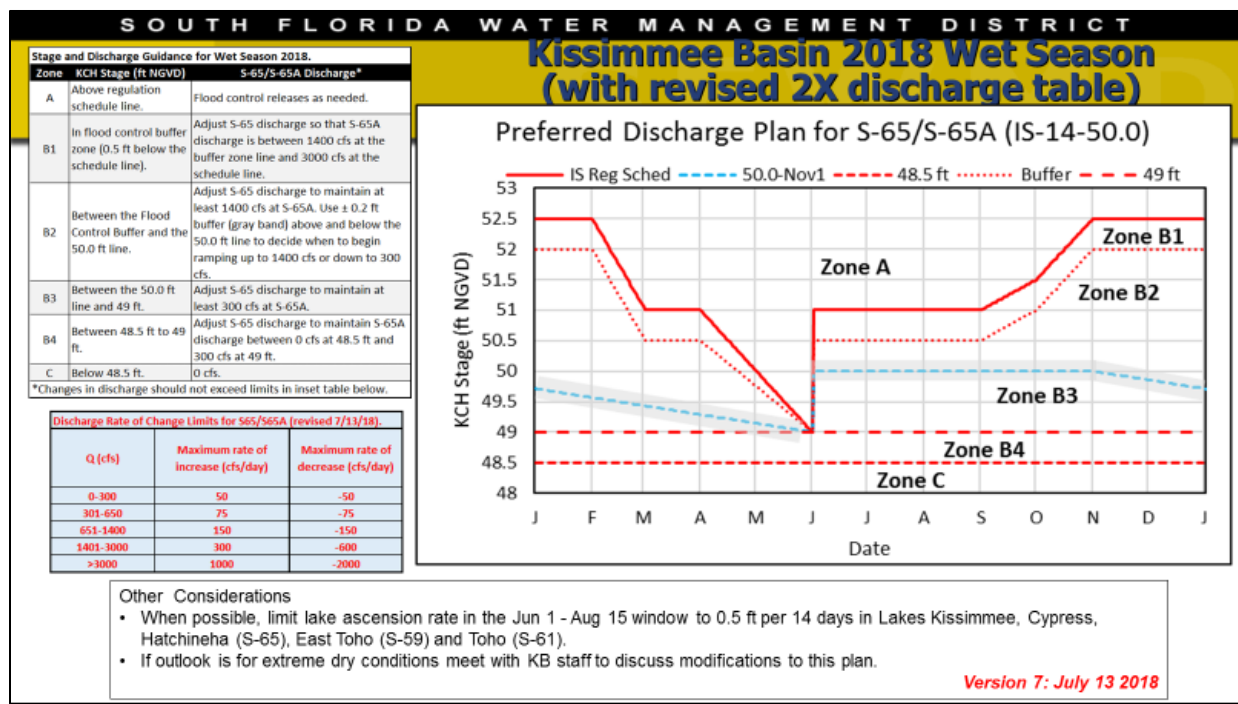
Report Date: 9/4/2018; data are through: 9/2/2018.

**Figure 10.** Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phase I river channel.

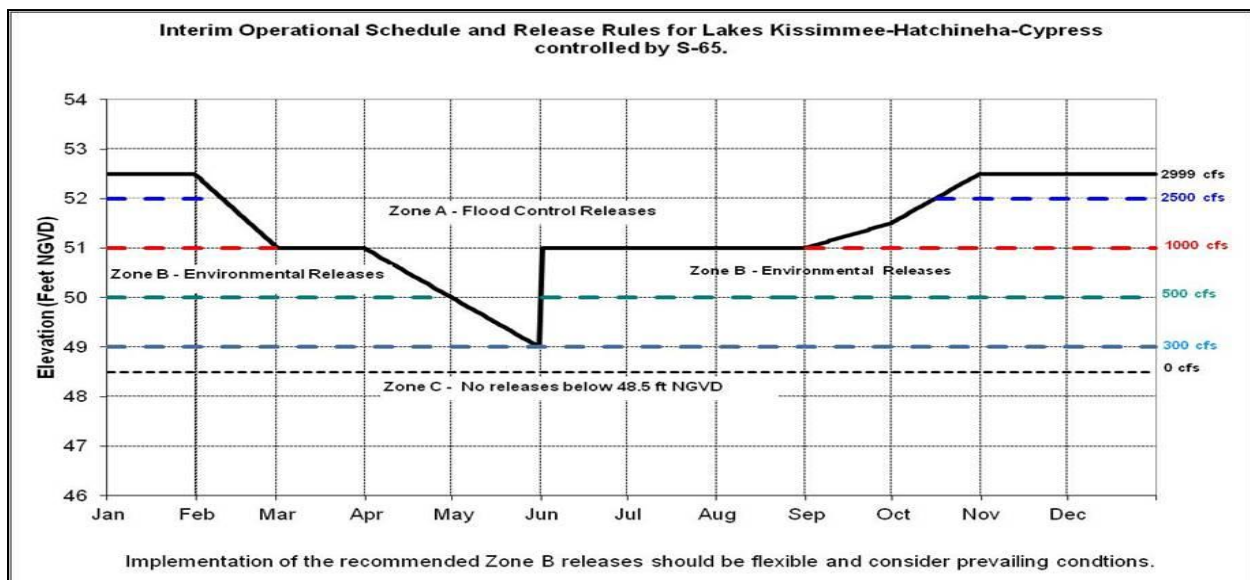
# Water Management Recommendations

## Kissimmee Basin Adaptive Recommendations and Operational Actions

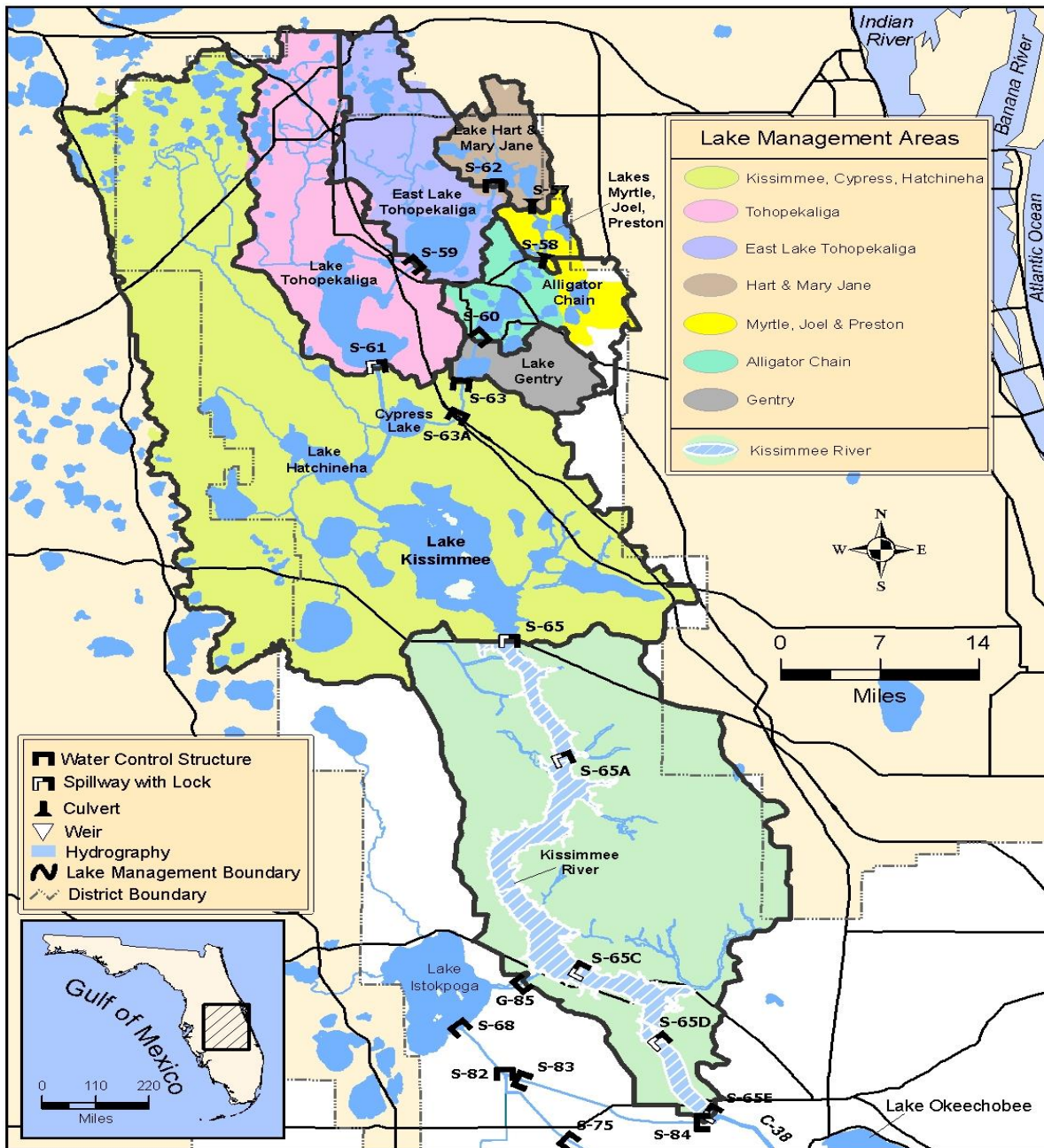
Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
9/4/2018	No new recommendations.		N/A		8/7/2018
8/28/2018	No new recommendations.		N/A		8/7/2018
8/21/2018	No new recommendations.		N/A		8/7/2018
8/14/2018	No new recommendations.		N/A		8/7/2018
8/7/2018	No new recommendations.		N/A		8/7/2018
7/23/2018-7/24/2018	Increase discharge from 1400 cfs to 3000 cfs, then 3200 cfs and 3500 cfs.	For flood control in Lake Kissimmee.	Implemented	SFWMD Water Mgt/KB Ops	7/31/2018
7/19/2018	Follow Revised (X2) 2018 Wet Season Discharge Plan to the extent possible, including 50 foot stage threshold and 0.5 foot flood control buffer.	To the extent possible, maintain sufficient discharge to keep areas under snail kites nests in Pool D hydrated until nests fledge, while avoiding large increases in discharge that might flood the nests.	N/A	KB Ops	7/24/2018
7/13/2018	Maintain at least 1400 cfs at S-65A while Lake Kissimmee stage is above 50 feet. (See revised 2018 discharge plan).	To the extent possible, maintain sufficient discharge to keep areas under snail nest kites in Pool D hydrated until nests fledge.	N/A	KB Ops	7/17/2018
7/13/2018	Reduce S-65/S-65A discharge by 600 cfs/day until 1400 cfs is reached. (See revised 2018 discharge plan, below).	Reach 1400 cfs faster to help stabilize Lake Kissimmee stage.	Implemented	SFWMD Water Mgt/KB Ops	7/17/2018
7/9/2018	Increase S-65/S-65A discharge by 300 cfs if needed.	Stabilize Lake Kissimmee stage.	N/A	SFWMD Water Mgt/KB Ops	7/10/2018
7/8/2018	Increase S-65/S-65A discharge by 900 cfs today in 3 increments of 300 cfs each.	Stabilize Lake Kissimmee stage.	Implemented	KB Ops	7/10/2018
7/5/2018	Increase S-65/S-65A discharge by 300 cfs/day (double the prescribed rate of increase) Thursday through Sunday .	Stabilize Lake Kissimmee stage.	Implemented	SFWMD Water Mgt	7/10/2018
7/2/2018	Increase S-65/S-65A discharge by 150 cfs/day (double the prescribed rate of increase).	Stabilize Lake Kissimmee stage.	Implemented	SFWMD Water Mgt/KB Ops	7/10/2018
6/30/2018	Increase S-65/S-65A discharge as slowly as feasible	Slow stage ascension in Kissimmee-Cypress-Hatchineha	Implemented	KB Ops/SFWMD Water Mgt	7/3/2018
6/28/2018	Continue to reduce discharge at S-65/S-65A as slowly as feasible.	Prevent stage decline in Kissimmee-Cypress-Hatchineha.	Implemented	KB Ops/SFWMD Water Mgt	7/3/2018
6/21/2018	Reduce discharge at S-65/S-65A as slowly as feasible.	Prevent stage decline in Kissimmee-Cypress-Hatchineha.	Implemented	KB Ops/SFWMD Water Mgt	6/26/2018
6/15/2018	Reduce S-65A discharge by 150-300 cfs over the weekend.	Slow or stop DO decline in Kissimmee River.	Implemented	KB Ops	6/19/2018
6/12/2018	No new recommendations.		N/A		6/12/2018
6/5/2018	No new recommendations.		N/A		6/5/2018
5/29/2018	Begin implementation of the 2018 Wet Season Discharge Plan for S-65/S-65A on June 1 (see figure).	Provide variable flow from S-65/S-65A to balance Kissimmee River and Headwaters Lakes objectives including Kissimmee River floodplain inundation, moderated rates of change in discharge, and constrained rate of stage rise in the lakes.	Planned	KB Ops/SFWMD Water Mgt/FWC/FWS	5/29/2018
5/22/2018	Hold Kissimmee-Cypress-Hatchineha at current stage of approximately 49.5 ft until June 1.	(a) Reduce impacts of rising water on DO in the Kissimmee River; and (b) limit stage reversal in KCH to <1 foot to protect snail kite nests.	Implemented	KB Ops/SFWMD Water Mgt	5/29/2018
5/18/2018-5/20/2018	Increase discharge gradually in response to rainfall in consultation with KB staff.	(a) Reduce impacts of rising water on DO in the Kissimmee River; and (b) limit stage reversal in KCH to <1 foot to protect snail kite nests.	Implemented	KB Ops	5/22/2018
5/15/2018	Adjust S-65/S-65A discharge over the next few days to avoid additional stage rise in Kissimmee-Cypress-Hatchineha. Make any needed discharge changes gradually in consultation with Kissimmee Basin staff to reduce potential effects on Kissimmee River dissolved oxygen.	Protect Lake Kissimmee snail kite nests from rising water if there is additional rainfall.	N/A	KB Ops	5/22/2018
5/8/2018	No new recommendations.		N/A		5/8/2018
5/1/2018	No new recommendations.		N/A		5/1/2018
4/24/2018	No new recommendations.		N/A		4/24/2018
4/17/2018	No new recommendations.		N/A		4/17/2018
4/10/2018	No new recommendations.		N/A		4/10/2018
4/3/2018	No new recommendations.		N/A		4/3/2018



**Figure 11.** The 2018 Wet Season Discharge Plan for S-65/S-65A.



**Figure 12.** Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.



**Figure 13.** The Kissimmee Basin.

## **LAKE OKEECHOBEE**

According to the USACE web site, Lake Okeechobee stage is at 14.61 feet NGVD for the period ending at midnight on September 3, 2018. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and four perimeter stations (S-308, S-352, S-4 and S-133). The Lake is now 0.22 feet higher than it was a month ago and 0.96 feet higher than a year ago (Figure 1). The Lake remains in the Low sub-band (Figure 2). The September 3rd lake stage was the third highest since 2008, with only 2013 and 2016 having higher stages; at 0.94 feet and 0.38 feet higher, respectively. According to RAINДАР, 1.61 inches of rain fell over the Lake during the week August 28, 2018 – September 3, 2018. Most of the watershed received less rainfall, between 0.75 and 1.5 inches of rain, while the upper Kissimmee basin received more (between 2.0 – 3.0 inches) (Figure 3).

Average daily inflows to the Lake increased slightly from the previous week, going from 4,357 cfs to 4,693 cfs. Most of the increase in inflows was from Lake Istokpaga via the S-84 structures, going from 785 cfs the previous week to 992 cfs this past week (Table 1). There have been no back-pumping operations from the S-2 or S-3 pumps during the wet season thus far.

Total outflows were very similar to the previous week at 4,551 average daily cfs. However, there were increases in discharges east and west via the S-308 and S-77 structures, respectively, while there were decreases in discharges south through the S-350 structures. Discharges via the S-308 increased slightly from 1,045 cfs to 1,287 cfs this past week, while S-77 discharges increased from 1,551 cfs to 2,235 cfs this past week. Outflows through the S-350 structures decreased from 1,990 cfs the previous week to 1,030 cfs this past week. The corrected average daily evapotranspiration value for the week based on the L006 weather platform solar radiation also decreased slightly from 0.12 inches the previous week to 0.11 inches this past week.

Total lake inflows and outflows for the past week are detailed in Table 1, as well as the approximate change in lake stage from each major structure's total flows over the period. Figure 4 shows the combined average daily cfs for inflows and outflows for the Lake over the past eight weeks. These data are provisional and are subject to change.

Water quality samples from 17 nearshore and pelagic stations on August 14 – August 15 showed relatively stable turbidity (ntu), which is a measure of water clarity, and average total phosphorus (TP) values after falling from January peaks from Hurricane Irma sediment disruptions (Figure 5). However, despite consistent declining trends, average TP for the pelagic (143 µg/L) and nearshore regions (122 µg/L) remained higher than any other August value since 2005, which was also a year following hurricane impacts on the Lake.

The most recent satellite imagery (September 1) using the cyanobacteria monitoring product derived from NOAA's analysis of EUMETSAT's OLCI satellite sensor showed low potential for a cyanobacterial bloom throughout the Lake, likely due to windy conditions. As the summer progresses, periods of calm, drier weather may worsen bloom conditions periodically (Figure 6).

Snail kite nesting continues on the Lake, with 34 new nests found in August alone, bringing the year's total to 188; the most of any other waterbody in the state. Fifty-four of the nests are currently active and are heavily concentrated in the Moonshine Bay areas that were managed by the Florida Fish and Wildlife Conservation Commission and the District in 2015 to reduce cattail coverage and restore a less dense, open water marsh in the area (Figure 7). This is the second summer that snail kites have established 100-plus nests (the other year was 2016) in and around the managed portion of the Bay, making it extremely successful in terms of restoring wading bird and snail kite use of the marsh.

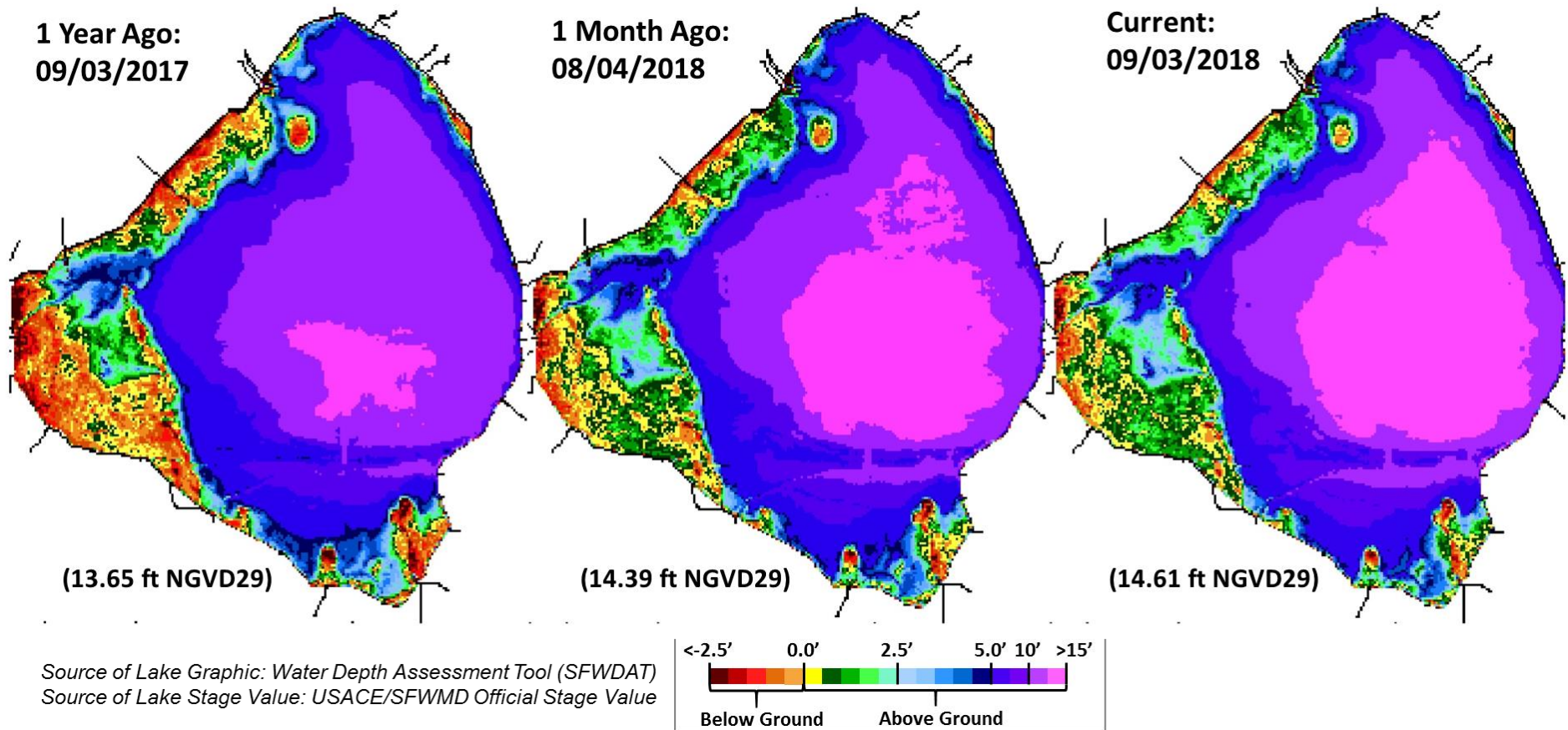
## Water Management Recommendations

Lake Okeechobee stage is 14.61 feet NGVD, 0.07 feet higher than last week and 0.22 feet higher than 30 days ago. The seasonal low for 2018 (12.83 feet NGVD) was the third highest since 2011, and the third time in six years that lake stage did not reach the bottom of the preferred stage envelope (12.5 – 15.5 feet NGVD). Due to record rainfall in May, the submerged aquatic vegetation (SAV) coverage on the Lake will likely remain at minimal levels beyond the summer of next year, prolonging impacts from high water levels associated with El Niño in 2016 and Hurricane Irma in 2017. Recovery of SAV in the nearshore zone will require low lake stages in the summer of 2019, so efforts to prepare for such an event will help speed the rebound of this important community.

**Table 1.** Average daily inflows and outflows and the approximate depth equivalents on Lake Okeechobee for various structures.

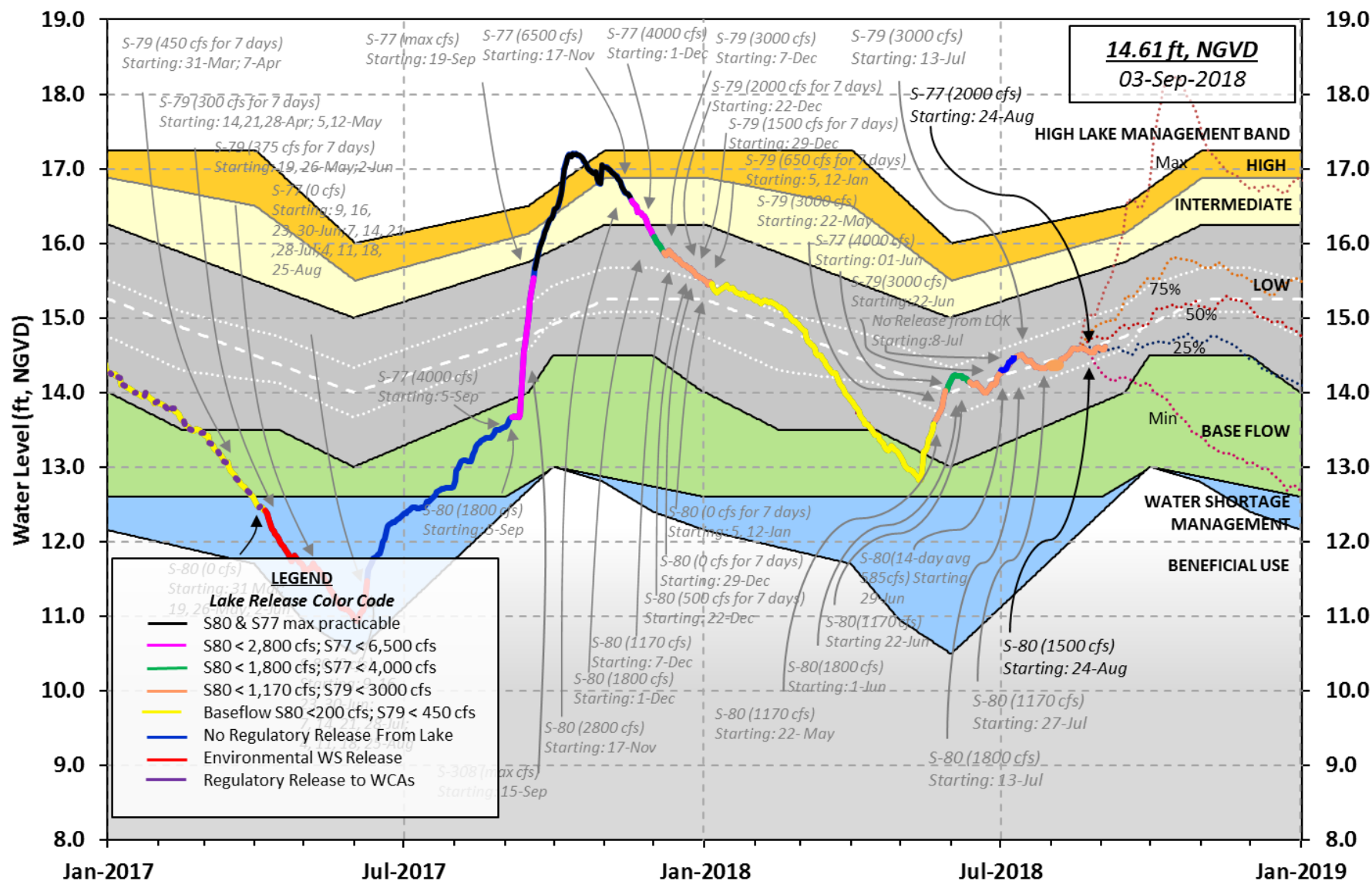
INFLOWS	Previous Week Avg Daily cfs	Avg Daily Inflow cfs	Equivalent Depth Week Total (in)	OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S65E & S65EX1	3037	3075	1.2	S77	1551	2235	0.9
S71 & 72	235	168	0.1	S308	1045	1287	0.5
S84 & 84X	785	992	0.4	S351	876	637	0.3
Fisheating Creek	133	168	0.1	S352	341	317	0.1
S154	0	12	0.0	S354	773	76	0.0
S191	116	146	0.1	L8 Outflow	1	0	0.0
S133 P	23	41	0.0	ET	2370	2205	0.9
S127 P	4	12	0.0	<b>Total</b>	<b>6958</b>	<b>6755</b>	<b>2.7</b>
S129 P	2	3	0.0				
S131 P	0	0	0.0				
S135 P	21	70	0.0				
S2 P	0	0	0.0				
S3 P	0	0	0.0				
S4 P	0	0	0.0				
L8 Backflow	0	8	0.0				
Rainfall	3968	4437	1.6				
<b>Total</b>	<b>8326</b>	<b>9130</b>	<b>3.5</b>				

PROVISIONAL DATA



**Figure 1.** Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

## Lake Okeechobee Water Level History and Projected Stages



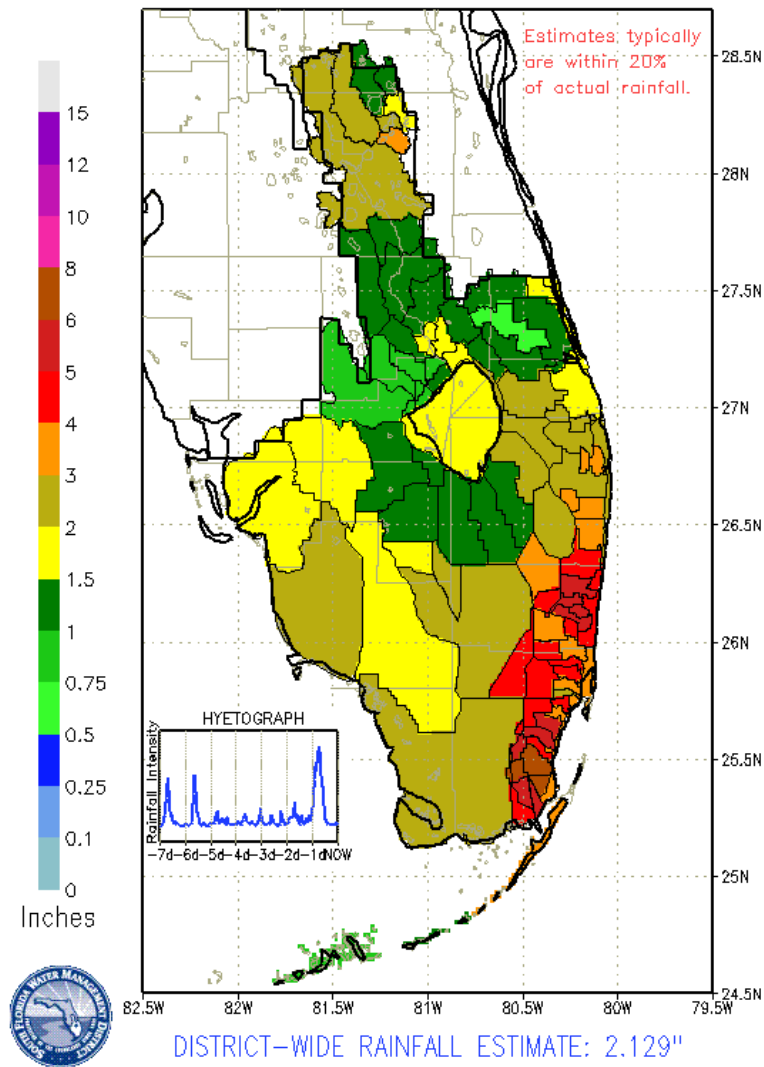
LORS-2008  
Adopted by USACE 28-April-2008

Projected Stage Percentiles From  
SFWMD-HESM Position Analysis

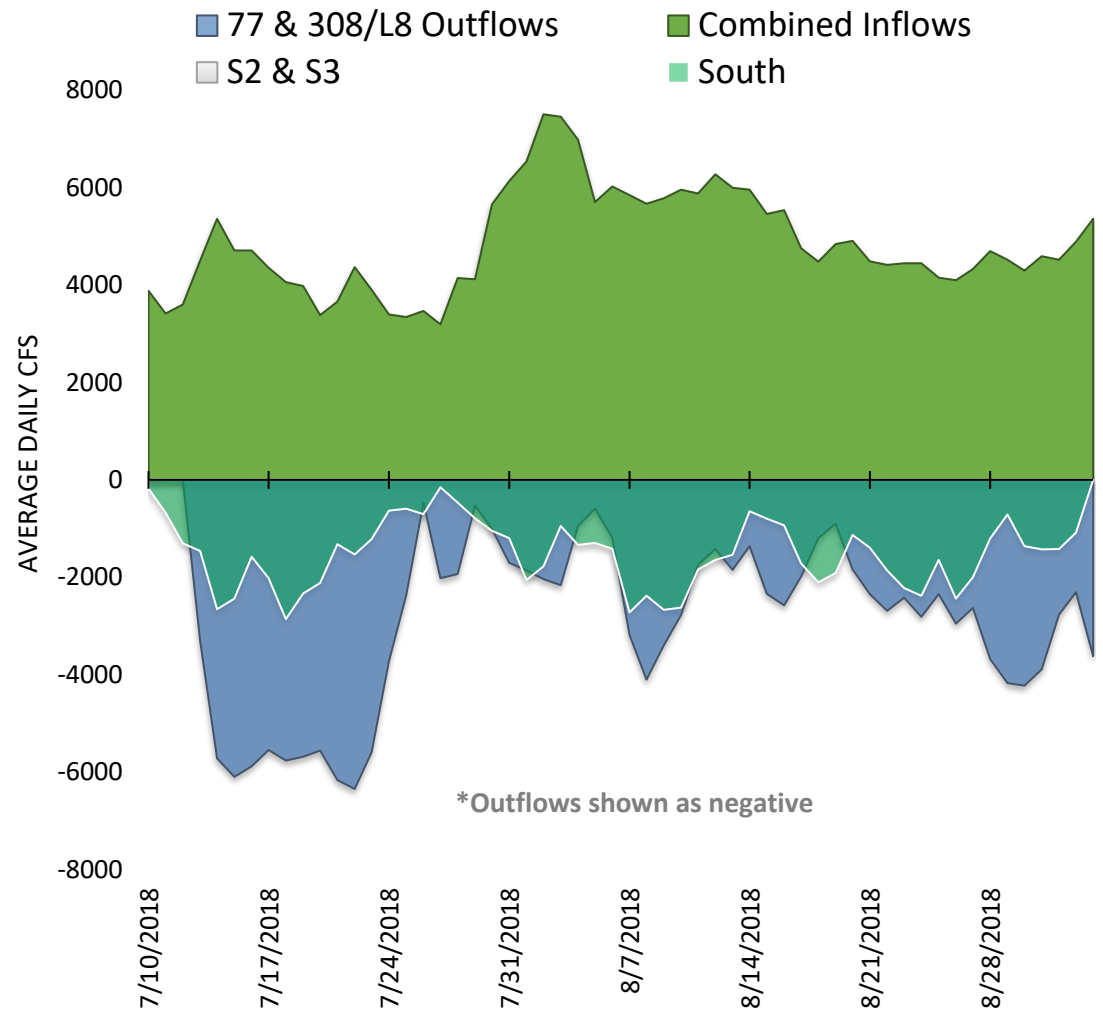
**Figure 2.** Recent Lake Okeechobee stage and releases, with projected stages based on a dynamic position analysis.

# SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES

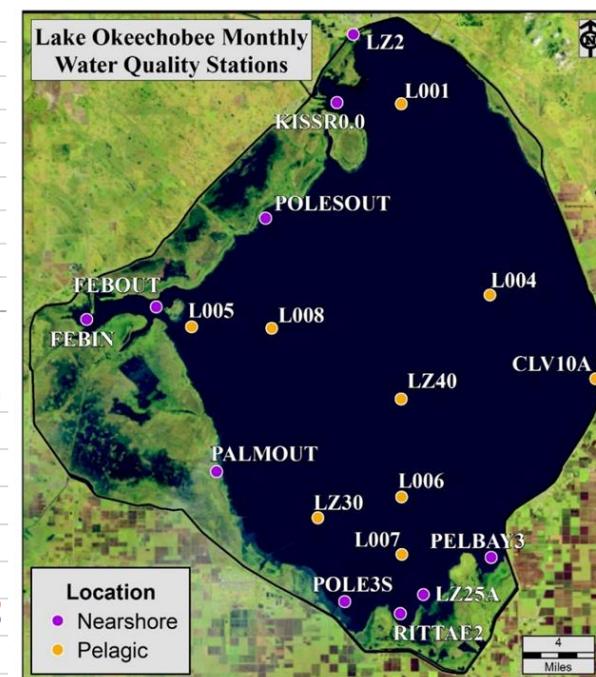
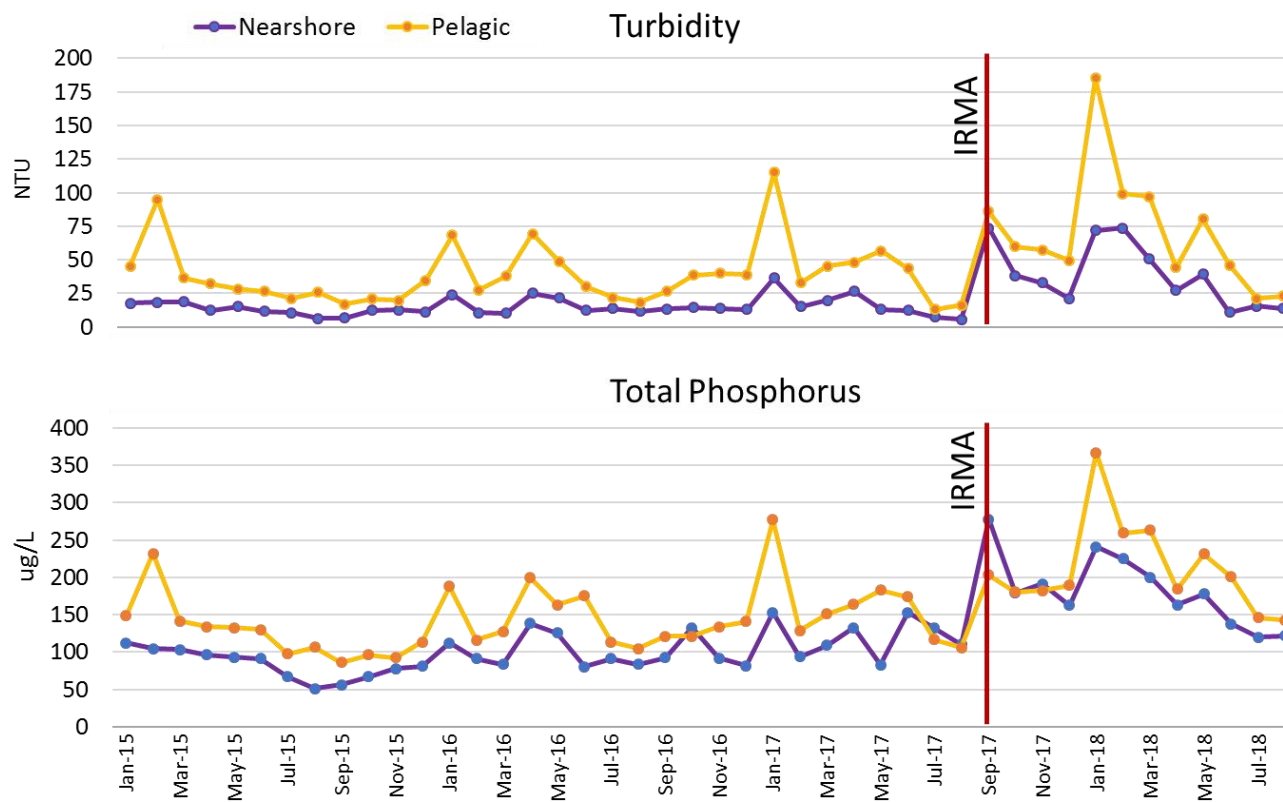
FROM: 0530 EST, 08/28/2018 THROUGH: 0530 EST, 09/04/2018



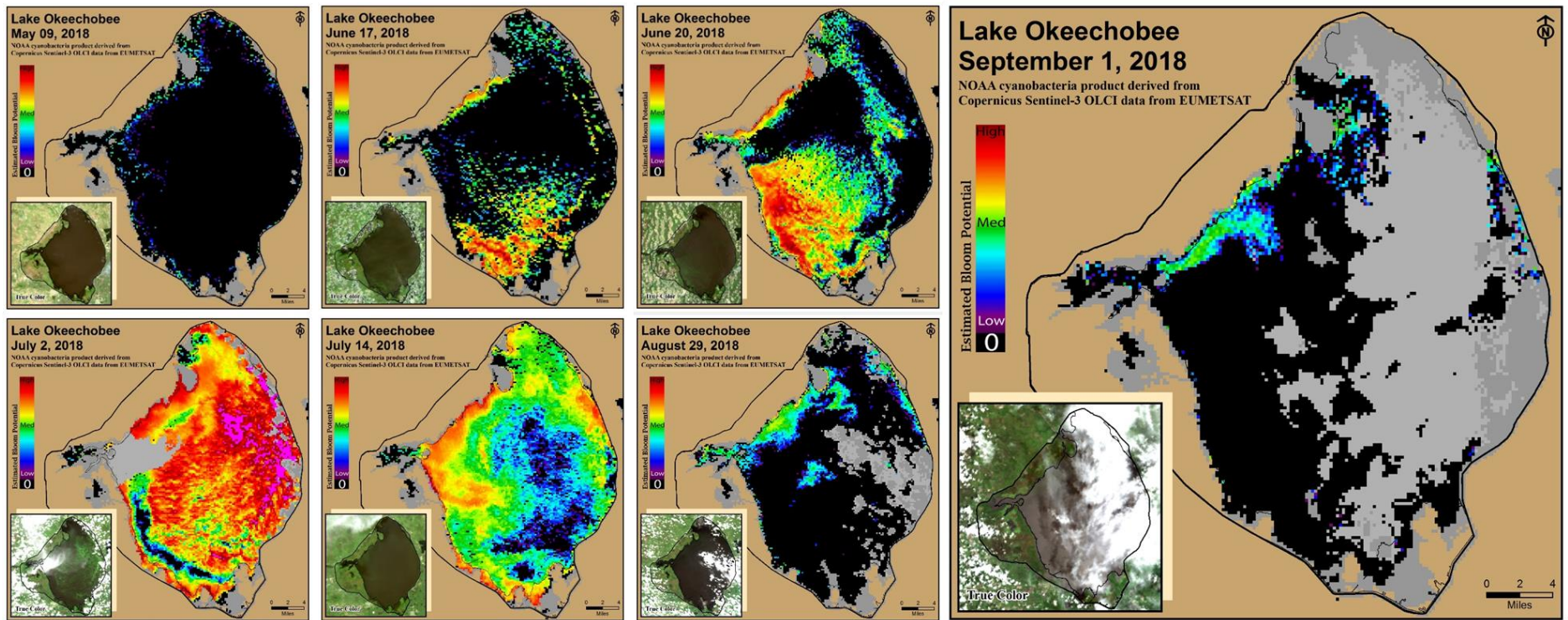
**Figure 3.** Rainfall estimates by basin.



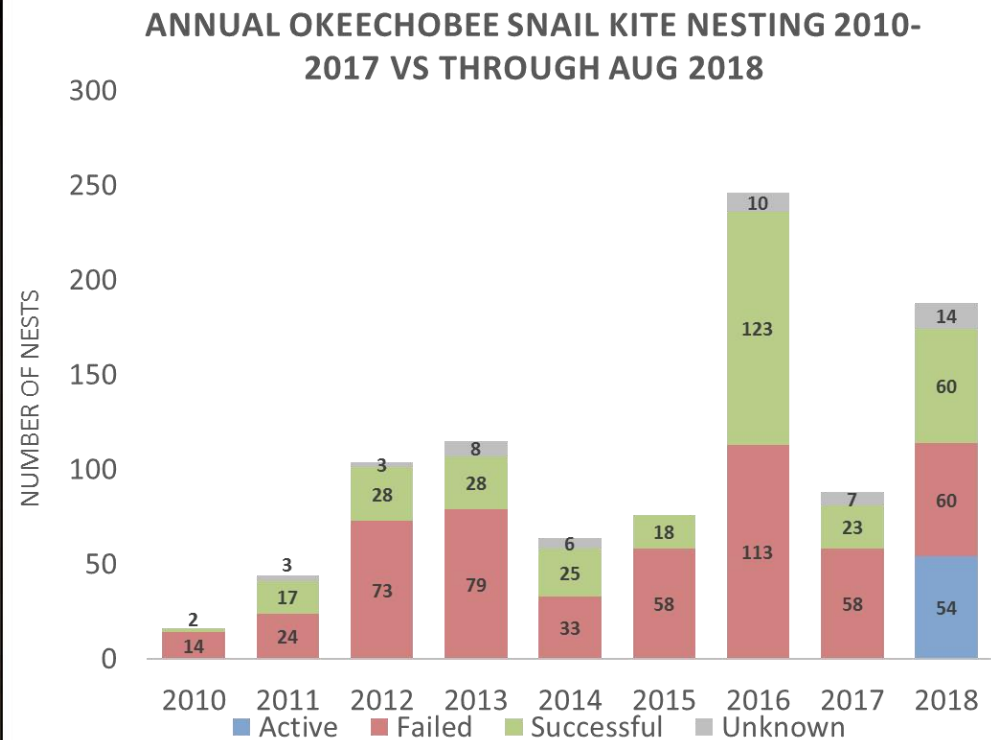
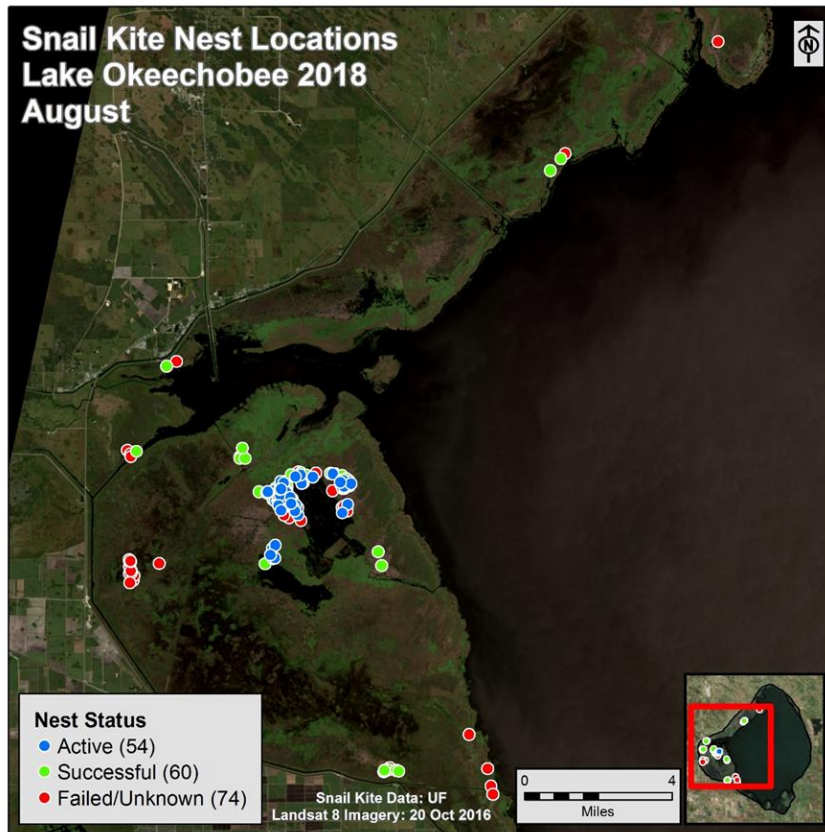
**Figure 4.** Major inflows and outflows of Lake Okeechobee, including the S-350 structures designated as South. The L-8 canal flows through culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. Inflows and outflows are shown as positive and negative, respectively, for visual purposes.



**Figure 5.** Water quality sampling locations on Lake Okeechobee in the nearshore and pelagic regions (top image), followed by average total phosphorus monthly values for each region from January 2015 – July 2018. Note: The FEBIN and FEBOUT stations were not included due to intermittent sampling.



**Figure 6.** Potential for cyanobacterial blooms on Lake Okeechobee based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover. All data are experimental and unvalidated at this point in product development.



**Figure 7.** Snail kite nest status and locations on Lake Okeechobee for the 2018 nesting season, and in comparison to previous years from 2010 to present. Note that 2018 numbers are incomplete as nesting continues, whereas all other years are the final numbers for each nesting season.

## **ESTUARIES**

### **St. Lucie Estuary:**

Last week total inflow to the St. Lucie Estuary averaged about 2,829 cfs (Figures 1 and 2) and last month inflow averaged about 2,495 cfs. Last week's provisional averaged inflows from the tidal basin and the structures are shown in Table 1.

**Table 1.** Weekly average inflows (data are provisional).

<b>Location</b>	<b>Flow (cfs)</b>
Tidal Basin Inflow	739
S-80	1,599
S-308	1,287
S-49 on C-24	142
S-97 on C-23(estimate)	177
Gordy Rd. structure on Ten Mile Creek	173

Over the past week in the estuary, surface salinity stayed more or less the same in the North Fork (HR1) and decreased in the middle and lower parts of the estuary (Table 2, Figures 3 and 4). The seven-day moving average salinity of the water column (an average of the surface and bottom salinity) at the US1 Bridge is 2.9. Salinity conditions in the middle estuary are within the poor range for adult eastern oysters (Figure 3).

**Table 2.** Seven-day average salinity at three monitoring sites in the St. Lucie Estuary. Current average is in bold face type, previous average in parentheses. The envelope reflects the preferred salinity range for adult eastern oysters (*Crassostrea virginica*) in the middle estuary.

<b>Sampling Site</b>	<b>Surface</b>	<b>Bottom</b>
HR1 (North Fork)	<b>1.1</b> (1.3)	<b>1.4</b> (2.3)
US1 Bridge	<b>2.1</b> (4.3)	<b>2.5</b> (6.1)
A1A Bridge	<b>9.4</b> (11.0)	<b>17.0</b> (20.9)

<sup>1</sup>Envelope not applicable and <sup>2</sup>Not Reporting.

### **Caloosahatchee Estuary:**

Last week total inflow to the Caloosahatchee Estuary averaged about 5,744 cfs (Figures 5 and 6) and last month inflow averaged about 4,352 cfs. Last week's provisional averaged inflows from the structures are shown in Table 3.

**Table 3.** Weekly average inflows (data is provisional).

<b>Location</b>	<b>Flow (cfs)</b>
S-77	2,235
S-78	2,999
S-79	5,212
Tidal Basin Inflow	2,021

Over the past week, salinity was near 0 down to Ft. Myers Yacht Basin and decreased downstream (Table 4, Figures 7 & 8). The seven-day average salinity values are estimated to be in the poor range for adult eastern oysters at Cape Coral, in the good range at Shell Point, and were not available at Sanibel (Figure 9). The 30-day moving average surface salinity is 0.2 at Val I-75 and 0.2 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass.

**Table 4.** Seven-day average salinity at six monitoring stations in the Caloosahatchee Estuary. Current average is in bold face type, previous average in parentheses. The envelope reflects the preferred salinity range for tape grass (*Vallisneria americana*) at Val I-75 and for adult eastern oysters (*Crassostrea virginica*) elsewhere.

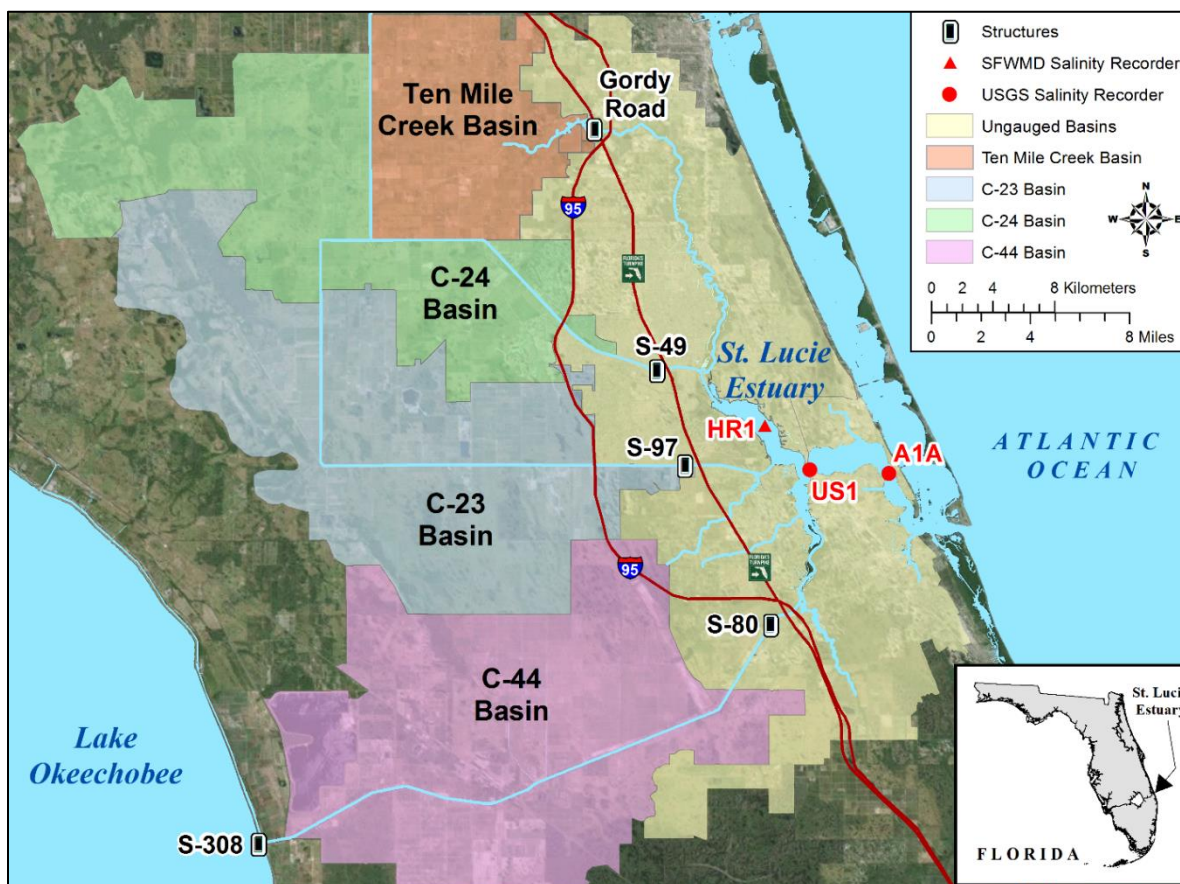
Sampling Site	Surface	Bottom
S-79 (Franklin Lock)	<b>0.2</b> (0.2)	<b>0.2</b> (0.2)
Val I75	<b>0.2</b> (0.2)	<b>0.2</b> (0.2)
Ft. Myers Yacht Basin	<b>0.2</b> (0.2)	<b>0.2</b> (0.2)
Cape Coral	<b>0.8</b> (2.2)	<b>1.1</b> (3.5)
Shell Point	<b>10.7</b> (13.1)	<b>10.8</b> (13.3)
Sanibel	<b>NR</b> <sup>3</sup> (NR)	<b>NR</b> (NR)

<sup>1</sup>Envelope not applicable, <sup>2</sup>Envelope is based on a 30-day average, and <sup>3</sup>Not Reporting.

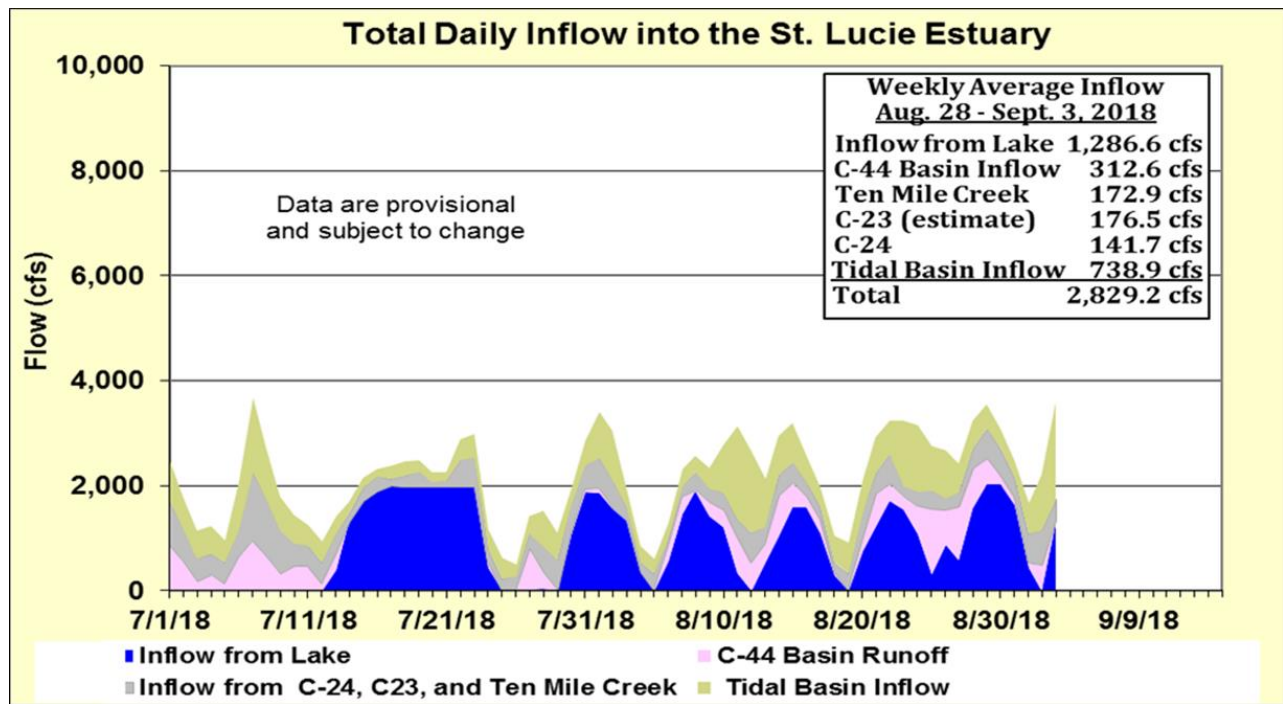
The Florida Fish and Wildlife Research Institute reported on August 31, 2018, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background to high concentrations in 29 samples collected from or offshore of Lee County. Fish kills and respiratory irritation were reported in Lee County over the past week.

### Water Management Recommendations

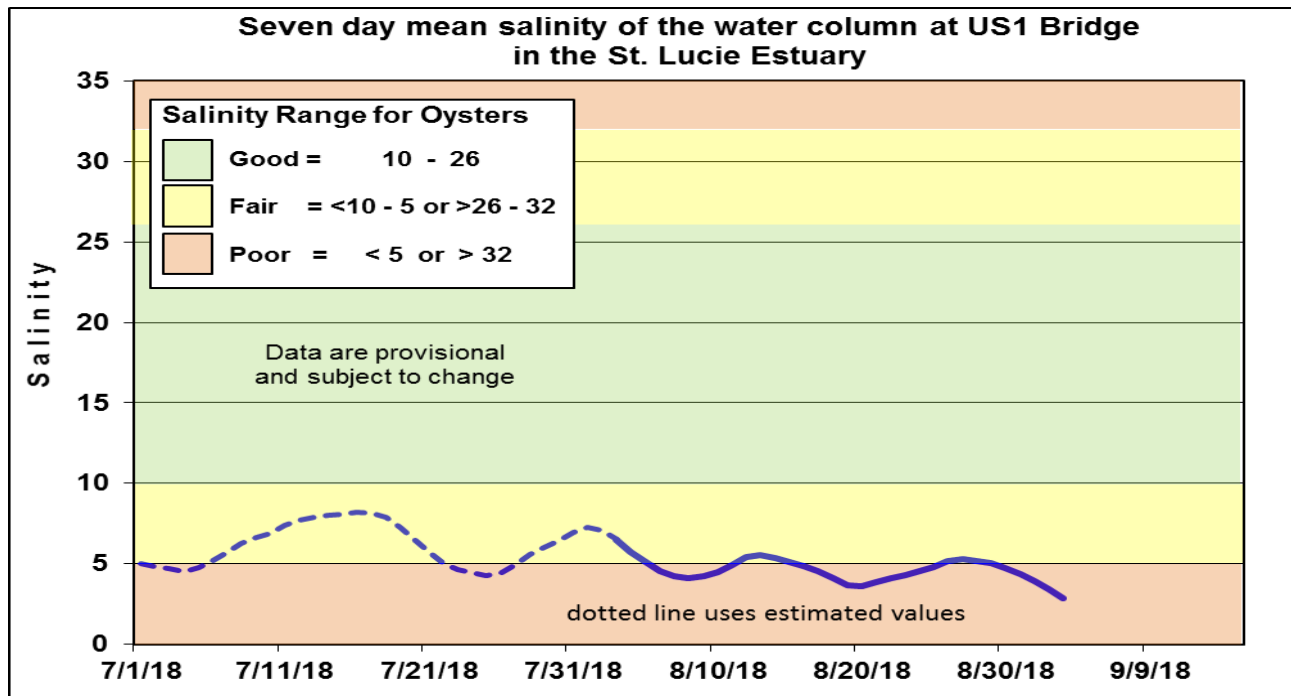
Lake stage is in the Low sub-band of 2008 LORS. Tributary hydrological conditions are wet. The 2008 LORS recommends up to 3,000 cfs at S-79 and up to 1,170 cfs at S-80. Given the current estuarine conditions, there are no ecological benefits associated with freshwater releases from Lake Okeechobee.



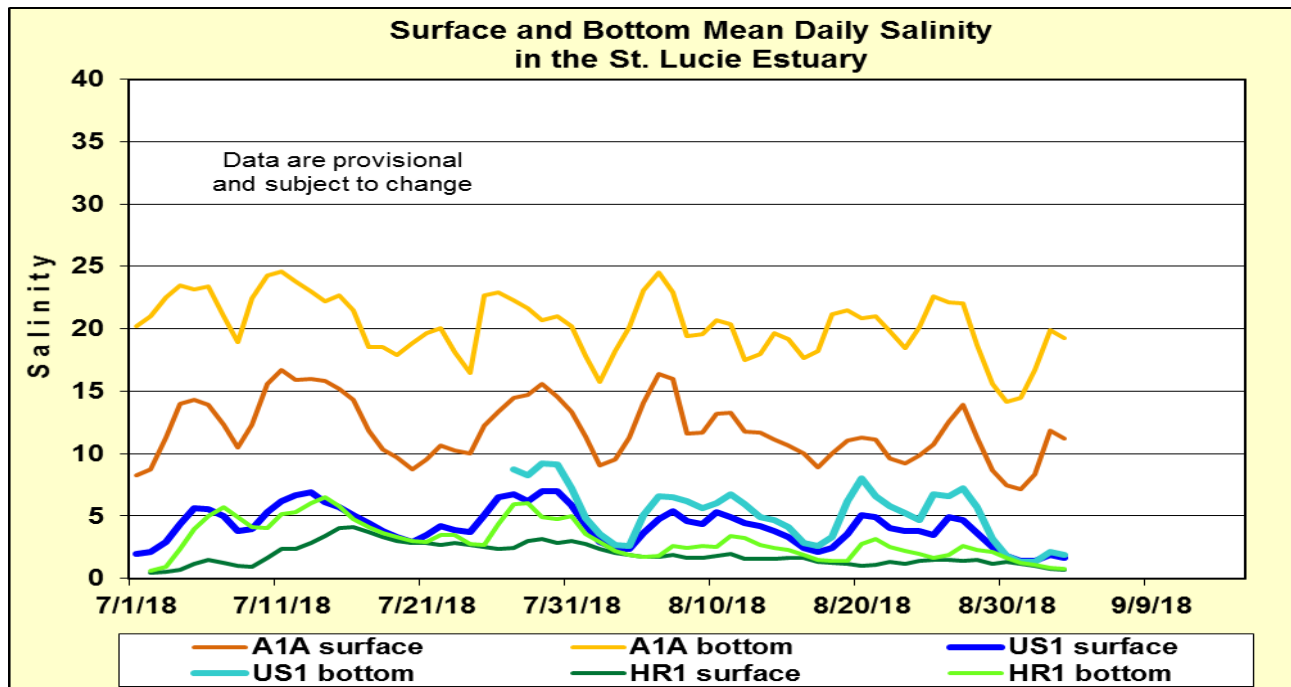
**Figure 1.** Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.



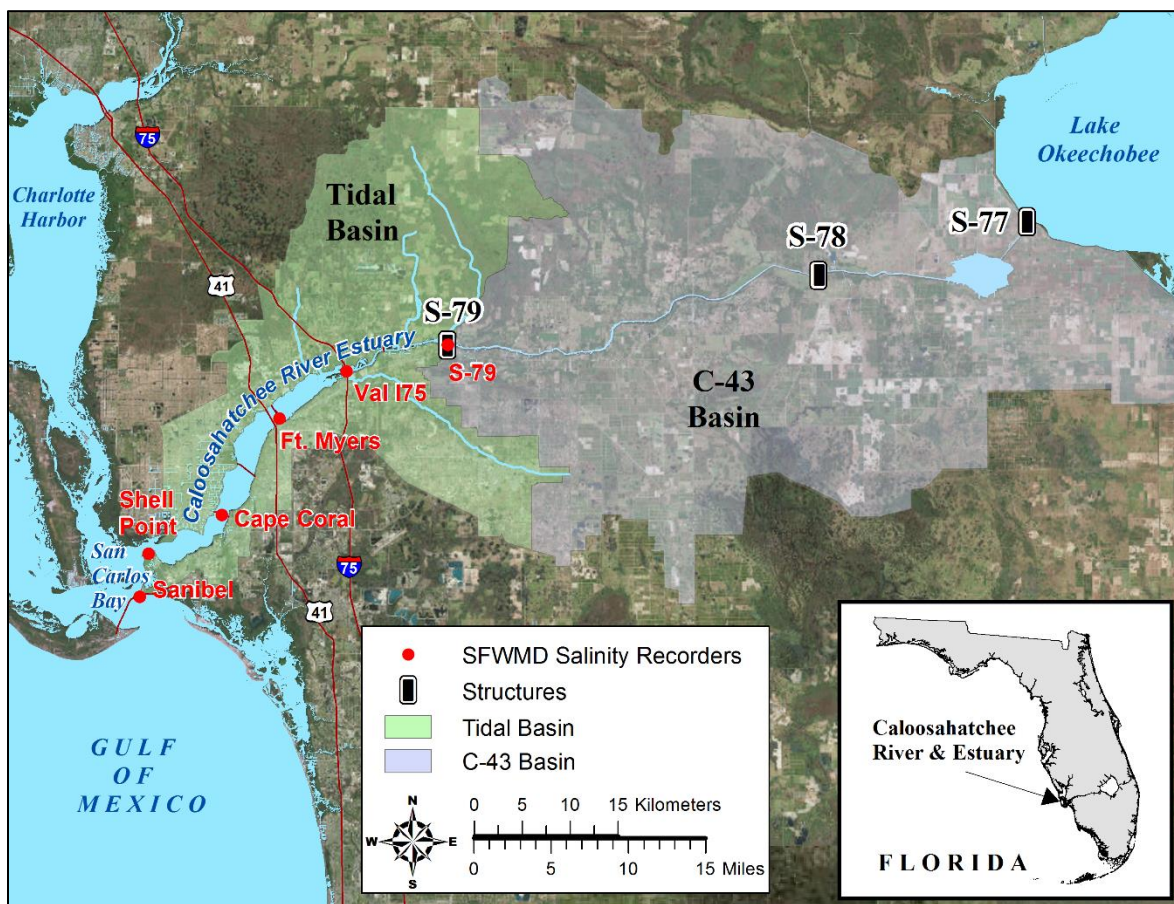
**Figure 2.** Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.



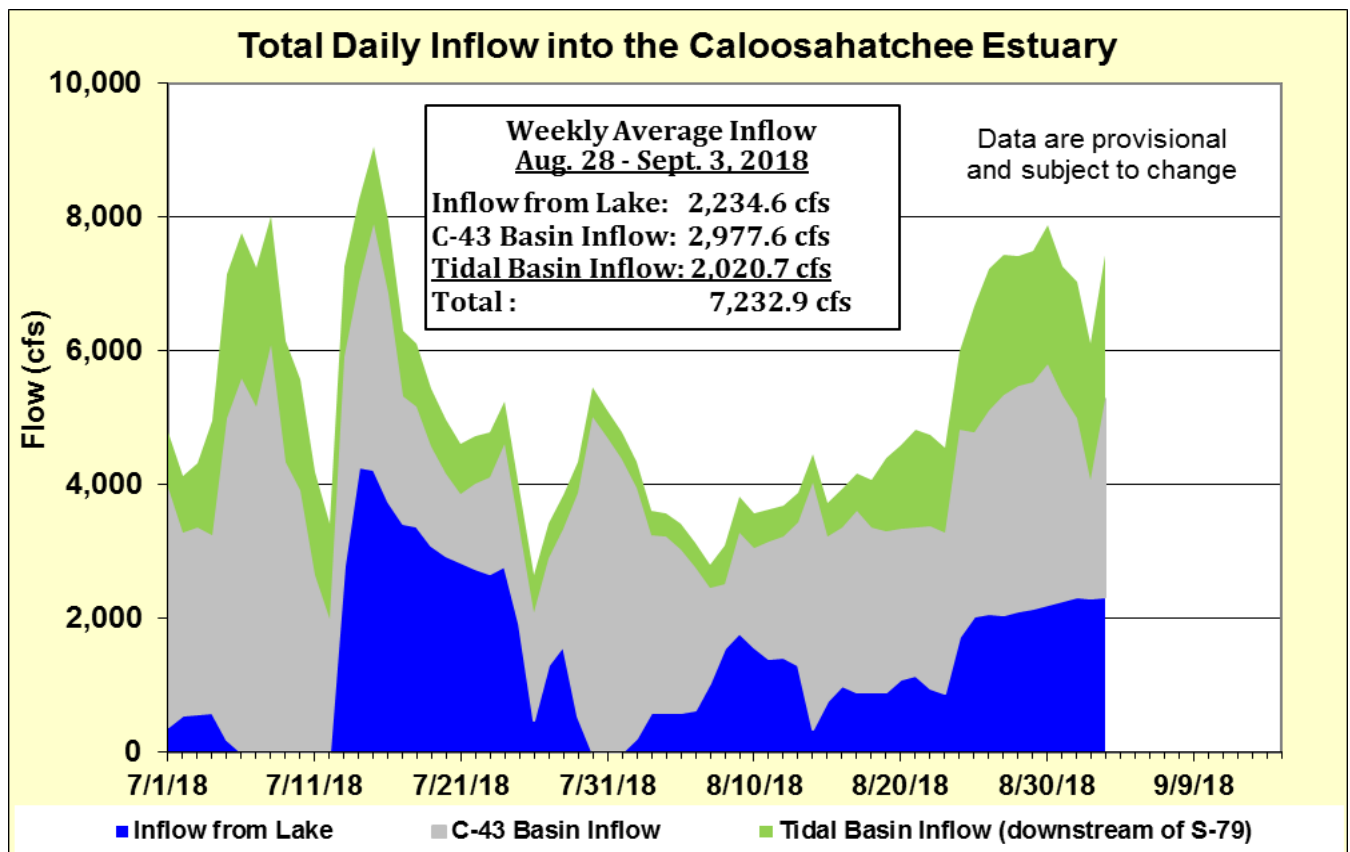
**Figure 3.** Seven-day mean salinity of the water column at the US1 Bridge.



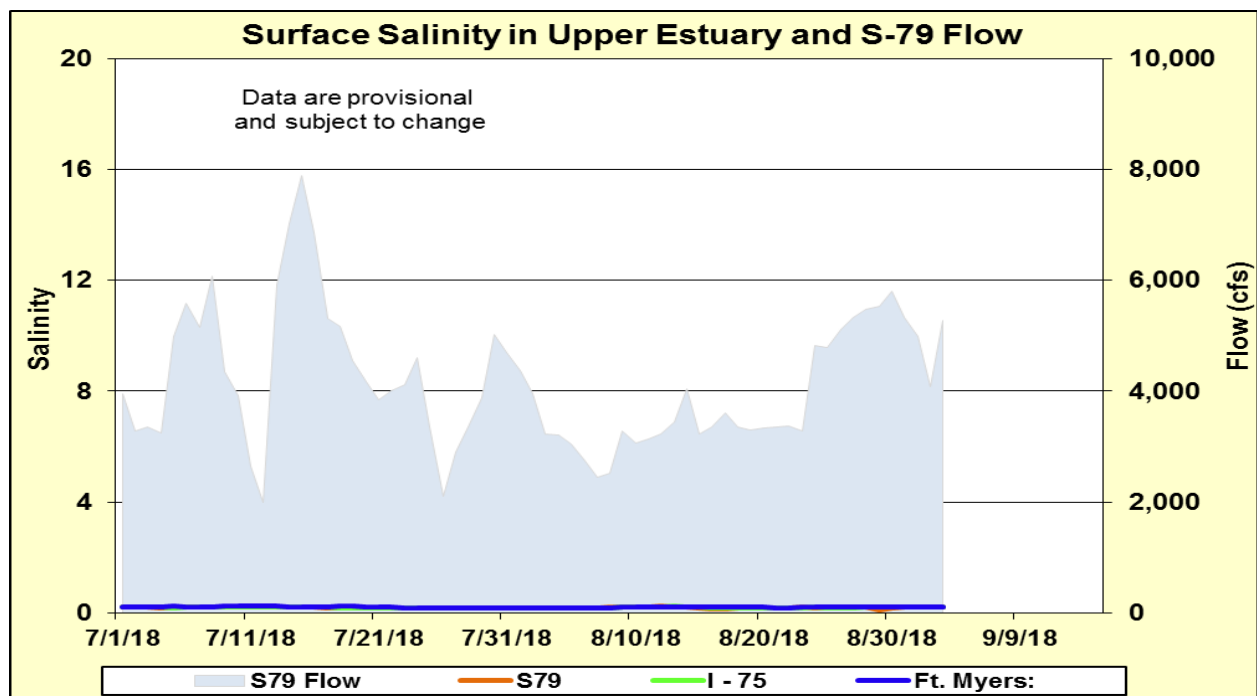
**Figure 4.** Daily mean salinity at the A1A, US1 and estimated HR1 stations.



**Figure 5.** Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.



**Figure 6.** Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.



**Figure 7.** Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

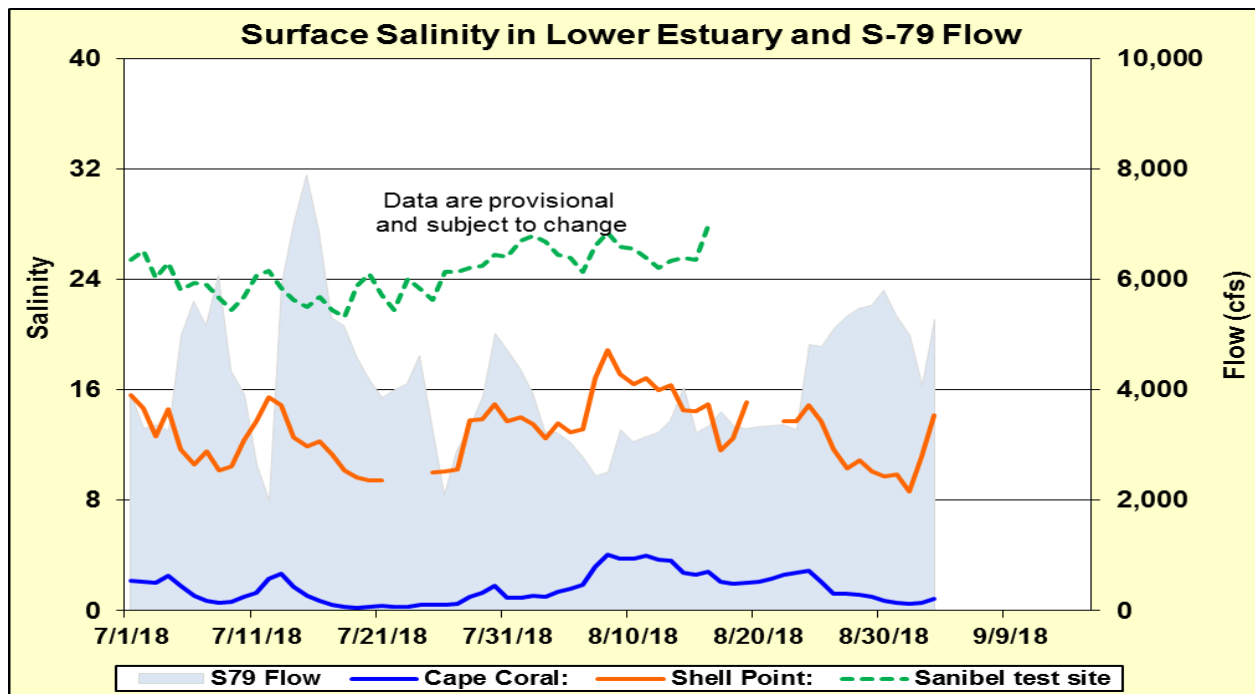


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

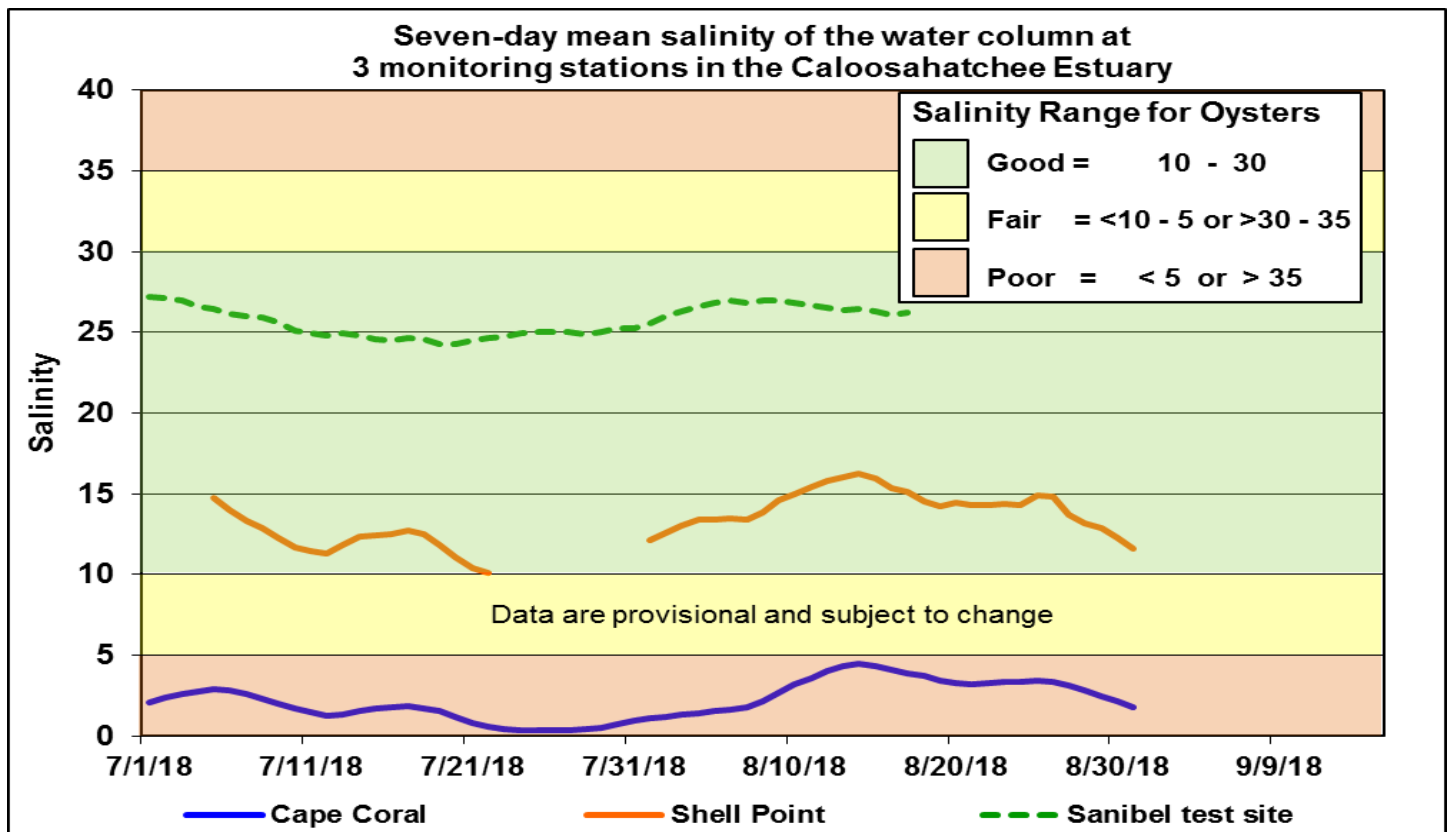
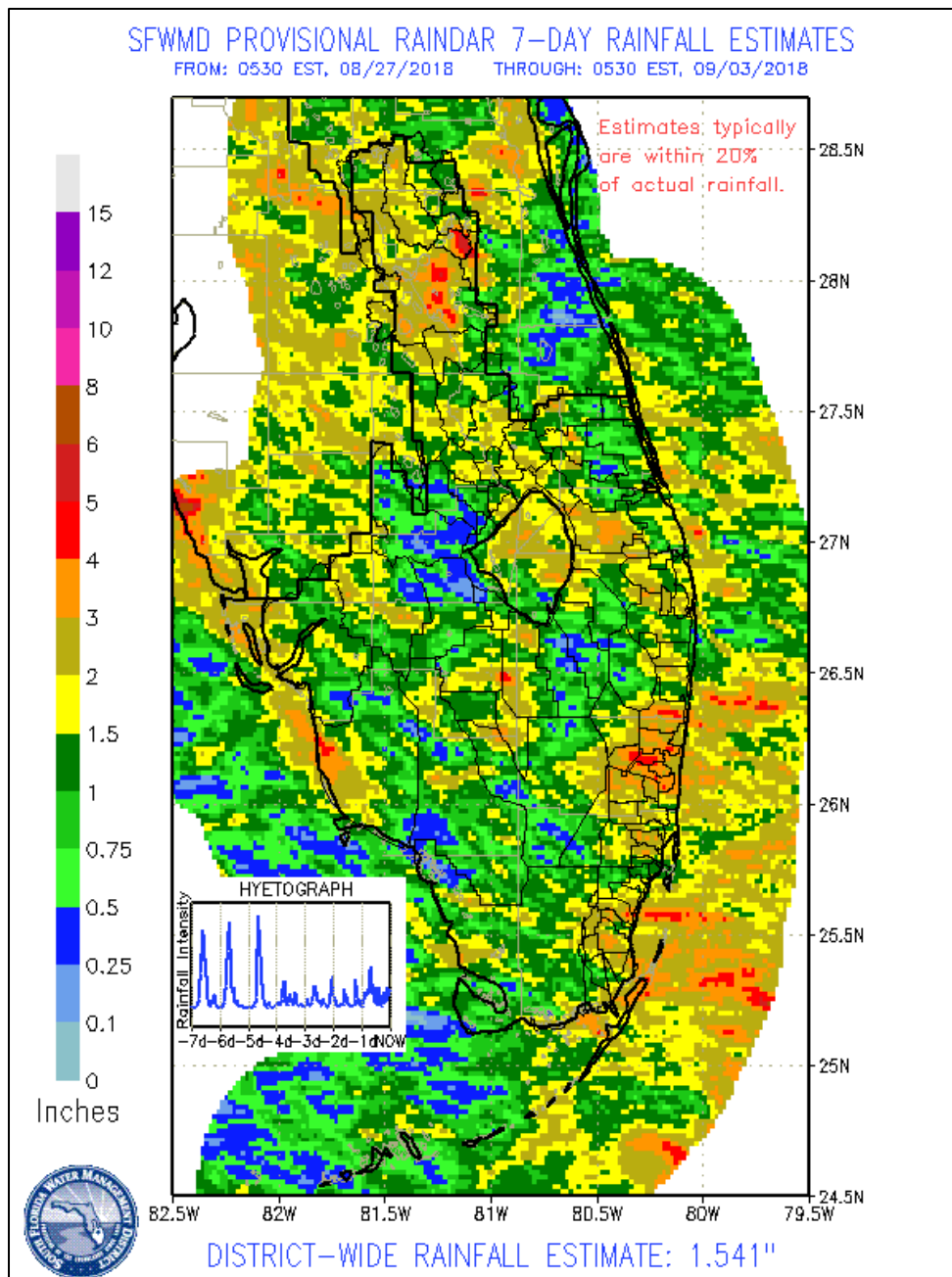


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

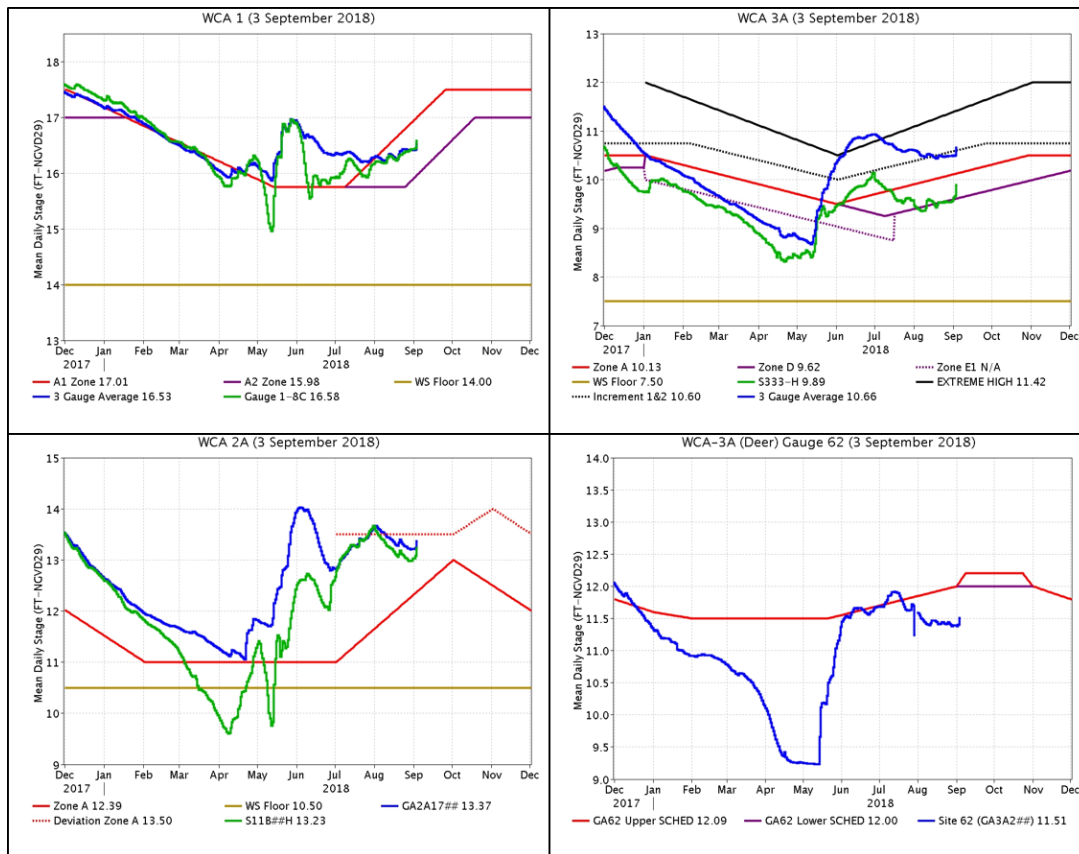
## **EVERGLADES**

At the gauge locations monitored for this report stages within the Everglades rose 0.03 feet on average over the last week. The most extreme individual gauge changes within the WCAs ranged from -0.06 feet (WCA-1) to +0.11 feet (WCA-2B). Pan evaporation was estimated at 1.73 inches.

<b>Everglades Region</b>	<b>Rainfall (Inches)</b>	<b>Stage Change (feet)</b>
WCA-1	1.04	+0.03
WCA-2A	1.58	+0.03
WCA-2B	2.92	+0.11
WCA-3A	1.14	+0.02
WCA-3B	1.17	+0.01
ENP	1.15	-0.01



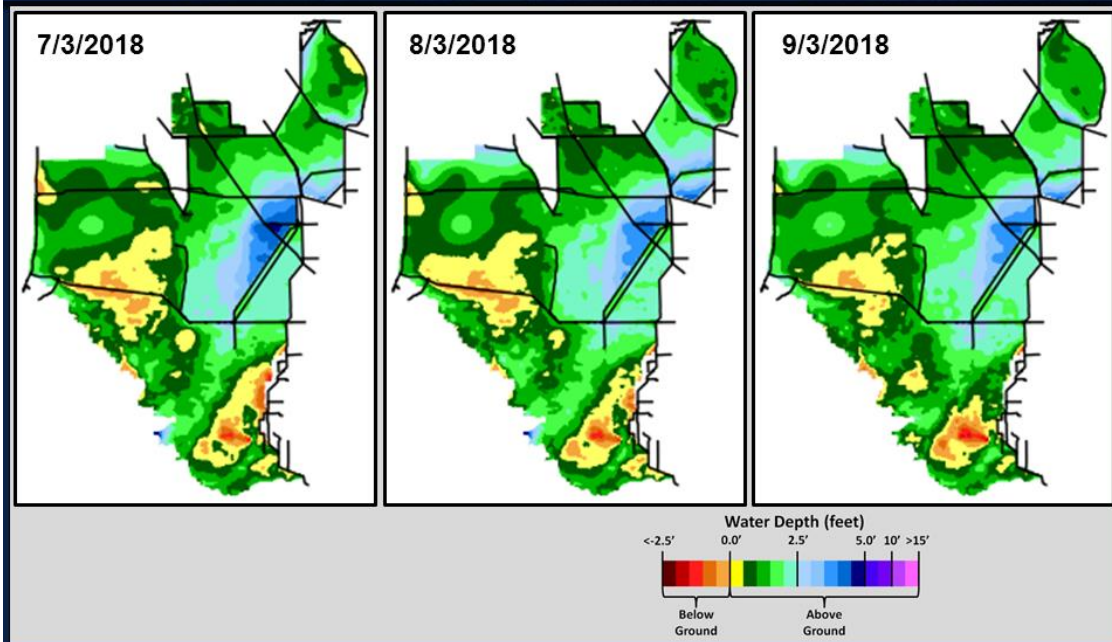
Regulation Schedules: WCA-1 three-gauge average stage is 0.48 feet below Zone A1, gauge 1-8C stage is 0.43 feet below. Both remain between Zone A1 and A2. WCA-2A marsh stage is 0.13 feet below Dev. Zone A, S-11B Headwater stage is 0.27 feet below. WCA-3A three-gauge average stage is 0.06 feet above Increment 1&2, 0.53 feet above Zone A. WCA-3A stage at gauge 62 (northwest corner) remains 0.58 feet below the rising arm of the upper schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate that depths have remained stable in the WCAs over the last month. WDAT difference output indicates that water levels across WCA-3A, 3B and WCA-1 are relatively unchanged compared to one month ago; WCA-2A depths are unchanged or slightly lower. The southernmost portions of all the WCAs (areas that are historically ponded) are currently significantly drier than they were a year ago.



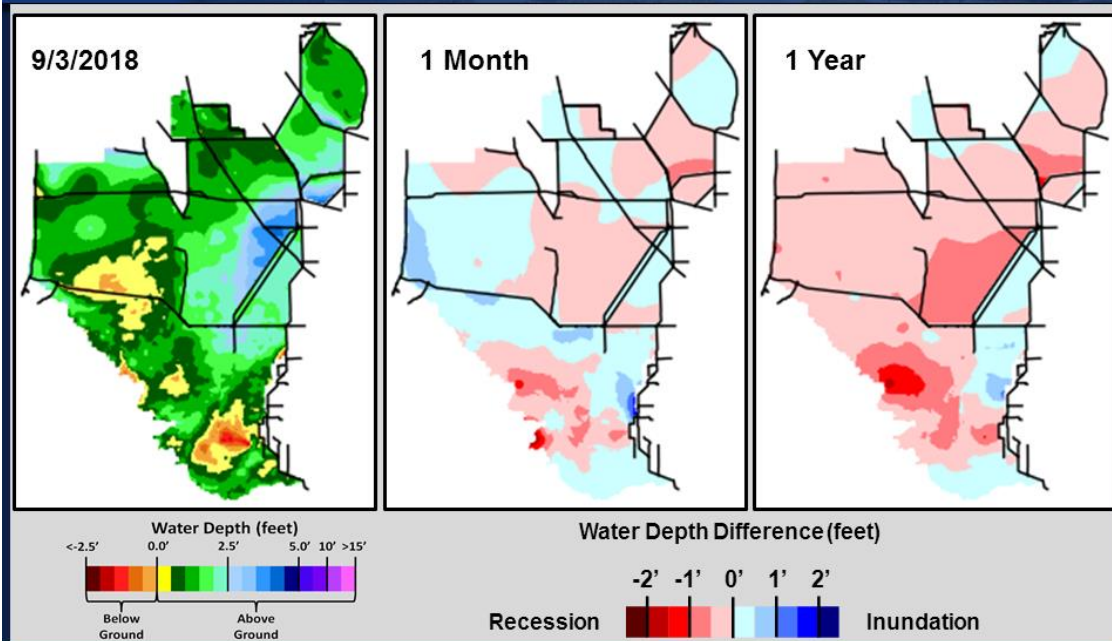
## SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)



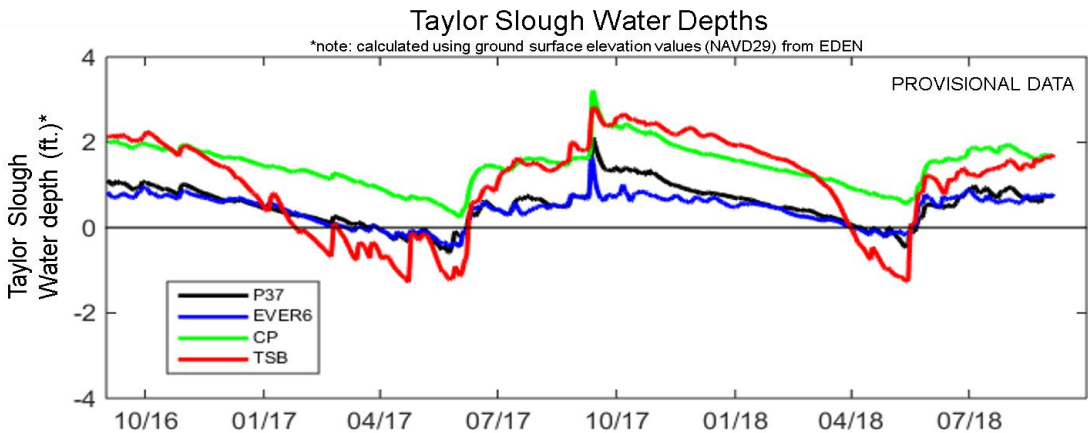
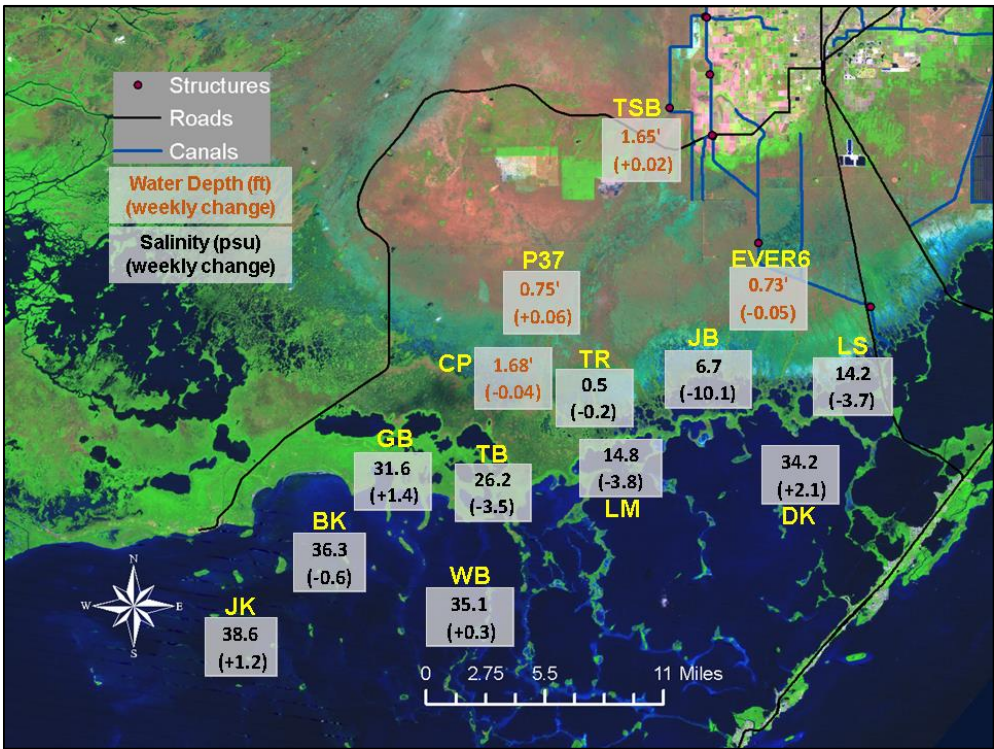
## SFWDAT Everglades Difference Maps (Present - Past)

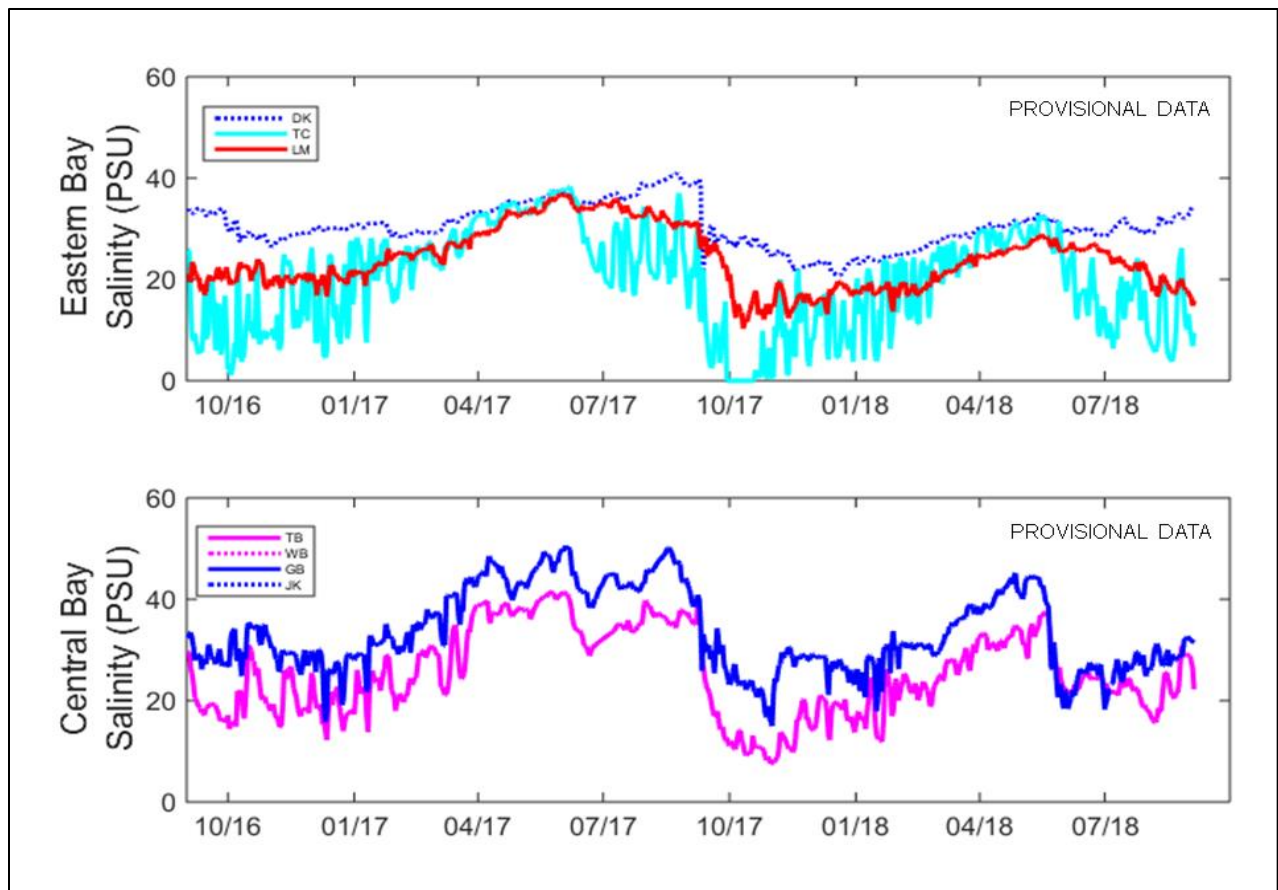


South Florida Water Depth Assessment Tool (SFWDAT)

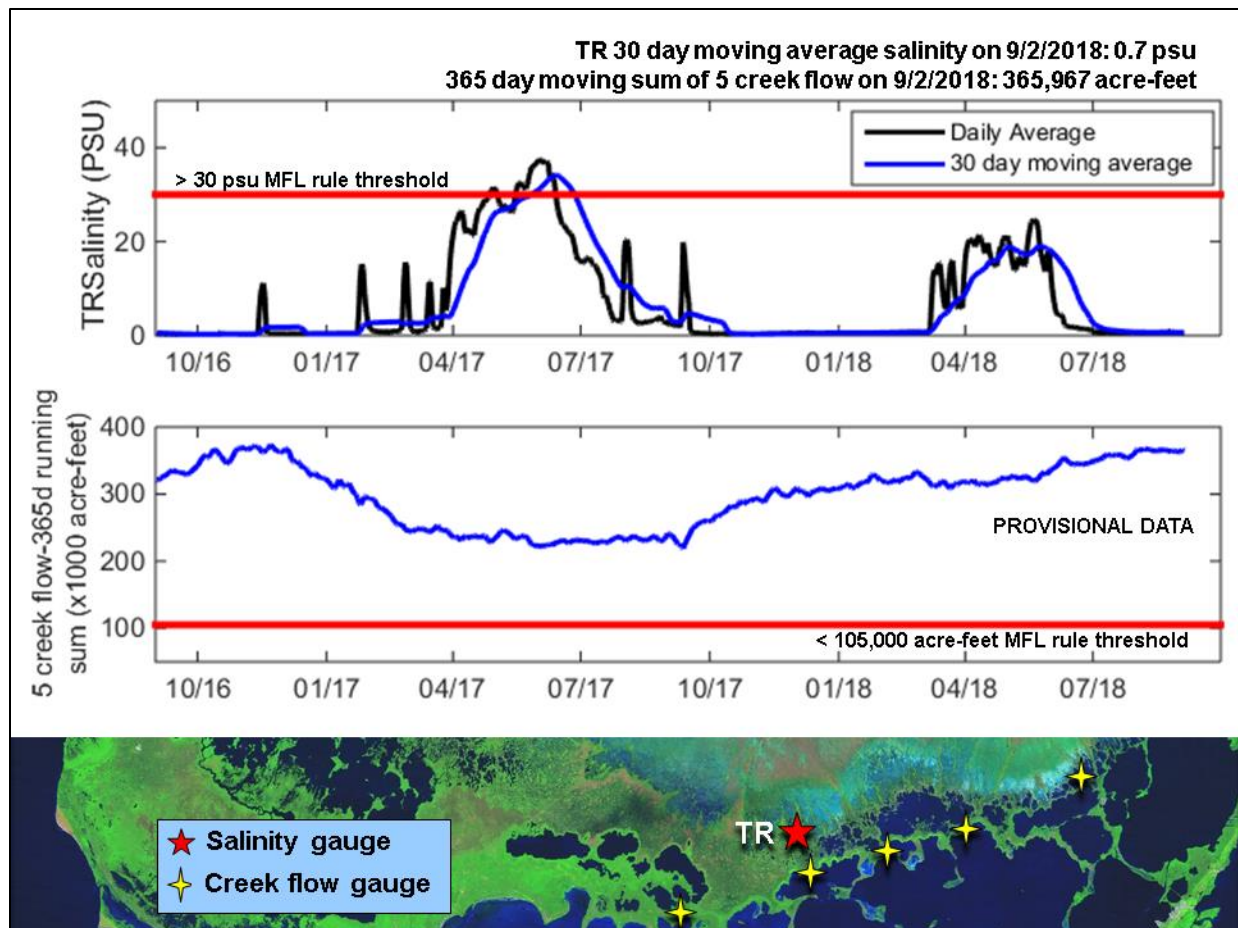
Taylor Slough Water Levels: An average of 1.8 inches of rain fell on Taylor Slough and Florida Bay this past week (does not include Monday), and stages averaged a decrease of -0.01 feet. Water depths still average about 1.1 feet across Taylor Slough which is about 1.3 inches higher than the historic averages.

Florida Bay Salinities: Salinities in Florida Bay recovered from the previous week's wind event and returned to near normal salinities in the nearshore area. Salinities range from 7 psu in the northeast to 39 psu in the west which is 0.6 psu lower than the historic averages for this time of year. Data for the impact of Tropical Storm Gordon was not yet available for this report.





Florida Bay MFL: Mangrove zone daily average salinity decreased from 0.7 psu to 0.5 psu. The 30-day moving average is still 0.7 psu. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about 9,500 acre-feet for the last week which is average for this time of year. The 365-day moving sum of flow from the five creeks ended the last week at 365,967 acre-feet (still greater than the long-term average of 257,628 acre-feet and above the 90th percentile). This value has not been changing much the past month. Creek flow is provisional data from the USGS and is highly variable.



### **Water Management Recommendations**

Inflows to northernmost WCA-3A create lower ecological stress when compared to flows to more southern WCA-3A. Currently the water depth at gauge 3-62 (located in northwest WCA-3A) is 1.32 feet, and water depth at gauge 3-63 (located in northeast WCA-3A) is 1.65 feet. WDAT output indicates that most of WCA-3A North's water depths are around 1.0 feet. These conditions contrast with conditions in WCA-3A South. After last year's above average wet season depth conditions in WCA-3A South, maintaining lower stages within that basin has ecological benefit to tree islands that have been stressed by flooding. WCA-2A has also experienced relatively deep-water conditions over the past two wet seasons. Water management that minimizes high water stress during the wet season but protects peat soils (especially in WCA-3A North) as the dry season approaches has increased ecological benefit this water year by allowing ecological processes time to recover from flooding. Management measures could include temporary pumping that could serve both flood protection and ecological means. Incremental change in the rate of structure flows (i.e., when changing flow rates from 0 cfs to 1,000 cfs, make 500 cfs adjustment per week) to the WCAs is more ecologically sensitive than abrupt rate changes. Ascension rates are now critical for apple snail reproduction in the Everglades. The current recommended stage ascension rate is less than 0.25 feet per week (or 0.5 feet per 2 weeks). Due to elevated levels of phosphorus in the S-332D detention area and the Frog Pond detention area, a recommendation is being made to limit the increase in depths within the L-31W to no more than 3 inches per day over the course of 3 to 4 weeks when S-332D, S-328, and/or G-737 are opened. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

**SFWMD Everglades Ecological Recommendations, September 4th, 2018 (red is new)**

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage increased by 0.03'	Maintain depths at regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage increased by 0.03'	Maintain depths at temporary regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife.
WCA-2B	Stage increased by 0.11'	Maintain depths at temporary regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage increased by 0.04'	Maintain depths at regulation schedule.	Protect habitat including <u>peat soil</u> development, tree islands and wildlife.
WCA-3A NW	Stage increased by 0.01'	Maintain depths at regulation schedule.	
Central WCA-3A S	Stage decreased by 0.02'	Maintain depths at regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect habitat including peat soil development, <u>tree islands</u> and wildlife.
Southern WCA-3A S	Stage increased by 0.03'		
WCA-3B	Stage changes ranged from -0.05' to +0.07'	Maintain depths at temporary regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife.
ENP-SRS	Stage decreased by 0.01'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from -0.05' to +0.06'	Move water southward as possible. Limit increases in the L-31W to less than 3 inches per day for 3-4 weeks to allow for reductions in phosphorus concentrations.	When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP.
FB- Salinity	Salinity changes ranged -10.1 to +2.1 psu.	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.