

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

## MEMORANDUM

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

**FROM:** SFWMD Staff Environmental Advisory Team

**DATE:** February 26, 2019

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

### Summary

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

Rains today and Wednesday. An upper level impulse moving eastward through north Florida is generating an area of rain and thunderstorms which will move across the northern portion of the District this afternoon and evening. The impulse is also expected to help flare up showers and thunderstorms along a stalled frontal boundary currently across the southern end of the District this afternoon and tonight. While there remains some uncertainty about localized shifts in the frontal boundary's location, it is expected to remain over areas south of Lake Okeechobee today and tonight and provide the focusing mechanism for heaviest rains. Therefore, locally heavy rainfall cannot be ruled out for any portion of the District south of Lake Okeechobee this afternoon and evening. With the boundary remaining across the District, moderate to heavy showers and thunderstorms are expected to redevelop over portions of the District Wednesday with heaviest rainfall forecast to occur over eastern areas. The boundary should then push south of the District and daytime heating is forecast to develop scattered daily light shower activity Thursday through Sunday. The next front is forecast to push into the north-central Florida and stall Monday. This boundary would be expected to generate some scattered shower activity over northern portions of the District Monday and Tuesday.

#### **Kissimmee**

Tuesday morning stages were 56.7 feet NGVD (1.3 feet below schedule) in East Lake Toho, 53.8 feet NGVD (1.2 feet below schedule) in Toho, and 50.4 feet NGVD (0.9 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.3 feet NGVD at S-65A and 25.7 feet NGVD at S-65D. Tuesday morning discharges were 1746 cfs at S-65, 1482 cfs at S-65A, 2547 cfs at S-65D and 2444 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 3.4 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 1.05 feet. No new recommendations for the week.

#### **Lake Okeechobee**

Lake Okeechobee stage is 12.75 feet NGVD, decreasing 0.09 feet from the previous week, after increasing by 0.14 feet the week before. The Lake is 0.48 feet higher than 30 days ago and remains in the Base Flow sub-band. However, the Lake is still more than 1 foot below the bottom of the ecological envelope, which varies seasonally from 12.5 – 15.5 ft NGVD. Given the potential for heavy rainfall associated with El Niño conditions this winter/spring and the poor condition of SAV and EAV in the nearshore zone, lower lake stages are ideal for vegetation recovery but will reduce habitat for fish and wildlife in the near-term and encourage spread of invasive vegetation in the upper marsh.

## **Estuaries**

Total inflow to the St. Lucie Estuary averaged 510 cfs over the past week with 276 cfs coming from Lake Okeechobee. Over the past week, salinity increased slightly in the estuary. The seven-day average salinity at the US1 Bridge is within the good range for adult eastern oysters. Total inflow to the Caloosahatchee Estuary average 1,868 cfs over the past week with 818 cfs coming from the Lake. Over the past week, surface salinity changed very little in the estuary. The 30-day moving average surface salinity is 0.4 at Val 1-75 and 3.1 at Ft. Myers. Salinity conditions between Val 1-75 and Ft. Myers are good for tape grass. Salinity conditions are in the good range for adult eastern oysters at Cape Coral Shell Point.

## **Stormwater Treatment Areas**

Over the past week, the STAs received approximately 9,700 acre-feet of Lake releases. The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 1,449,000 acre-feet, which includes approximately 383,000 acre-feet of Lake releases. Most STA cells are at or above target depths. STA-1W Northern Flow-way is offline for STA-1W Expansion project construction activities, STA-1E Central Flow-way is offline for vegetation management activities, STA-1E Western Flow-way is offline for levee repairs in the West Distribution Cell, and STA-5/6 Flow-ways 2 and 3 are offline for the Restoration Strategies project to grade non-effective treatment areas. Operational restrictions are in place in STA-3/4 Western Flow-way for a Restoration Strategies Science Plan study. This week, if Lake releases are sent to the WCAs and conditions allow, releases will be sent to STA-2 and STA-3/4.

## **Everglades**

The WCAs received very little rainfall last week and stage changes across the Everglades were relatively uniform this week with WCA-2A (higher recession rate) and ENP (stage increase) being the exception. Keeping rainfall runoff within the Everglades system, distributing it equally across the WCAs and moving it south through the system when possible remains ecologically beneficial given the expectation for closer to average dry season rainfall amounts from now until June. An increase in flows through the WCAs would be expected and wouldn't be ecologically detrimental if inflows and outflows rates were similar. WCA-2A remains above schedule but is receding quickly. Canal stage at s11B\_HW falls quickly towards the regulation line, the marsh stage at 2-17 is following at a slower rate but at more than double the recommended recession rate of up to -0.09 feet per week. Very little rainfall on TS and FB this week. Taylor Slough stages remain above ground this week when historically would have gone below ground, the current depth of 0.7 feet likely representing water management from the north and recent rainfall. Average salinity in Florida Bay and the mangrove zone increased slightly this week. Flows from the 5 creeks were sloshy.

## Supporting Information

### KISSIMMEE BASIN

#### **Kissimmee Basin Rainfall**

The Upper Kissimmee Basin received 0.05 inches of rainfall in the past week and the Lower Basin received 0.06 inches (SFWMD Daily Rainfall Report 2/25/2018).

#### **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: 2/26/2019**

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)						
							2/24/19	2/17/19	2/10/19	2/3/19	1/27/19	1/20/19	1/13/19
Lakes Hart and Mary Jane	S-62	130	LKMJ	60.8	R	61.0	-0.2	0.0	0.0	0.0	-0.1	0.0	0.0
Lakes Myrtle, Preston, and Joel	S-57	30	S-57	61.0	R	61.1	-0.1	0.1	0.1	0.0	-0.2	0.0	0.1
Alligator Chain	S-60	0	ALLI	63.8	R	64.0	-0.2	-0.2	-0.4	-0.5	-0.7	-0.8	-0.7
Lake Gentry	S-63	21	LKGT	61.5	R	61.5	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0
East Lake Toho	S-59	419	TOHOE	56.8	R	58.0	-1.2	-1.0	-0.8	-0.8	-0.5	-0.5	-0.4
Lake Toho	S-61	980	TOHOW, S-61	53.8	R	55.0	-1.2	-1.0	-0.9	-0.8	-0.7	-0.5	-0.4
Lakes Kissimmee, Cypress, and Hatchineha	S-65	2,385	KUB011, LKISSB	50.5	R	51.3	-0.8	-1.0	-1.0	-1.1	-1.5	-1.7	-1.8

<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: 2/26/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days <sup>1</sup>								
		2/24/2019	2/24/19	2/17/19	2/10/19	2/3/19	1/27/19	1/20/19	1/13/19	1/6/19	12/30/18	12/23/18
Discharge (cfs)	S-65	1,846	<b>2,385</b>	3,220	2,653	1,615	950	392	343	273	277	253
Discharge (cfs)	S-65A <sup>2</sup>	1,726	<b>2,280</b>	3,154	2,472	1,517	764	306	261	194	201	182
Discharge (cfs)	S-65D <sup>2</sup>	2,802	<b>3,097</b>	2,668	1,564	1,221	621	341	261	241	242	238
Headwater Stage (feet NGVD)	S-65D <sup>2</sup>	25.74	<b>25.77</b>	25.81	25.82	25.90	26.00	25.94	25.91	25.86	25.88	25.73
Discharge (cfs)	S-65E <sup>2</sup>	2,629	<b>2,945</b>	2,533	1,442	1,151	606	309	261	215	218	266
Discharge (cfs)	S-67	49	<b>53</b>	0	0	0	0	0	0	0	0	0
DO (mg/L) <sup>3</sup>	Phase I river channel	3.0	<b>3.4</b>	4.0	5.3	6.5	6.6	6.8	6.4	6.1	6.6	6.7
Mean depth (feet) <sup>4</sup>	Phase I floodplain	1.05	<b>1.20</b>	1.25	0.71	0.46	0.12	0.07	0.08	0.09	0.11	0.12

<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)

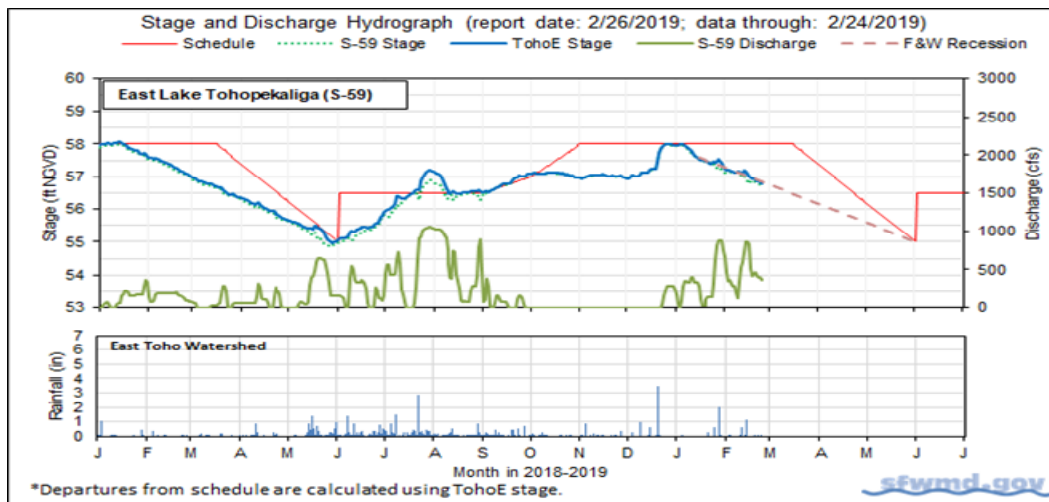


Figure 1.

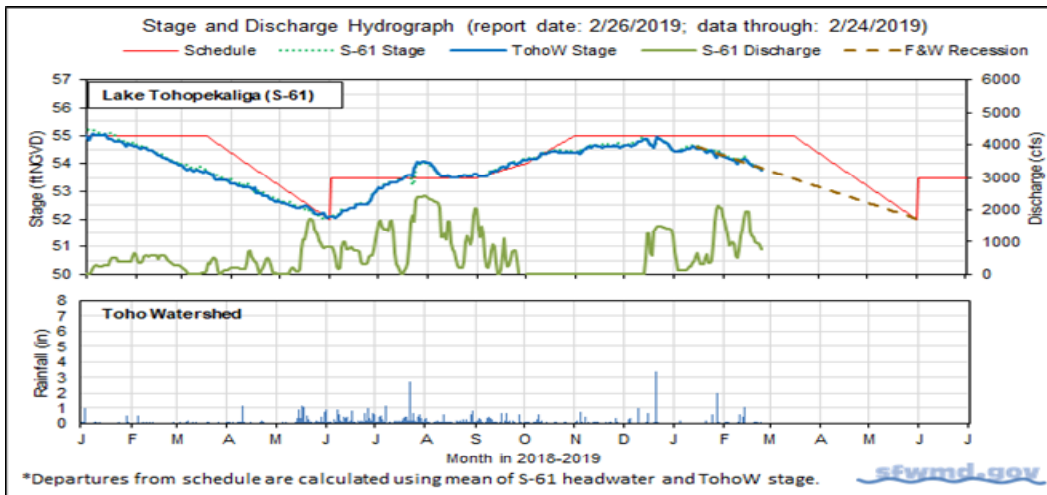


Figure 2.

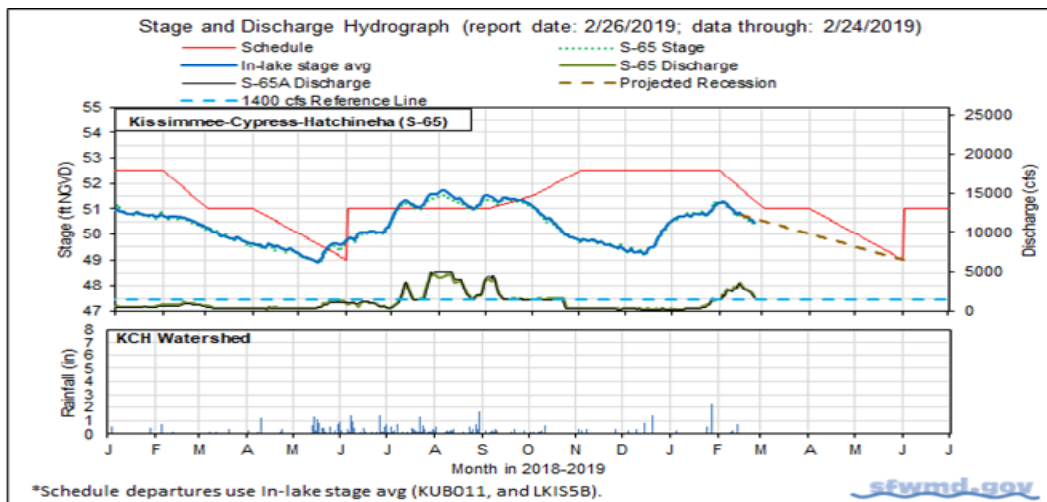


Figure 3.

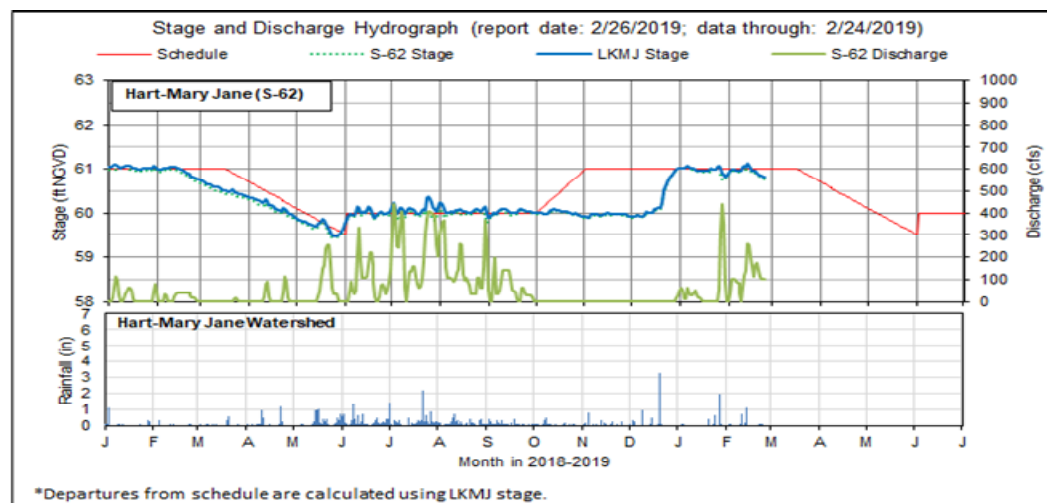


Figure 4.

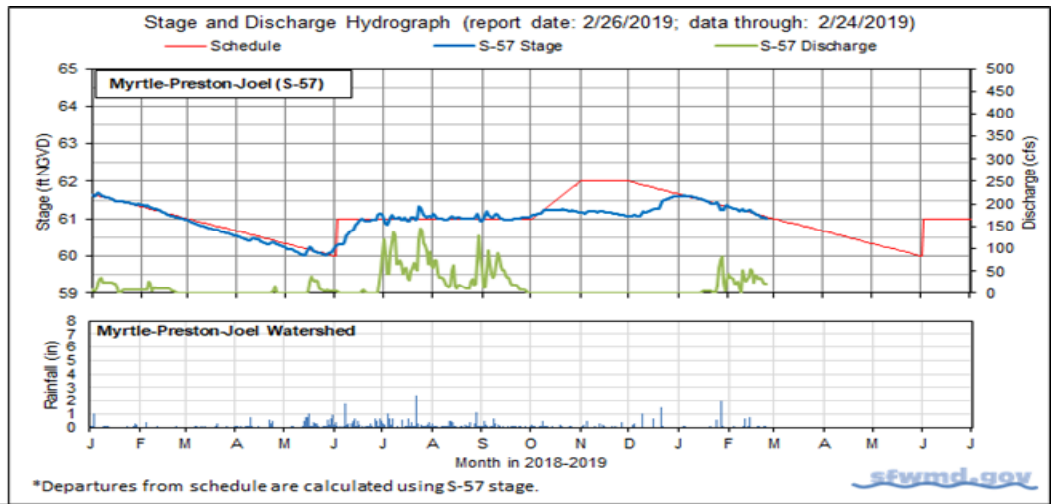


Figure 5.

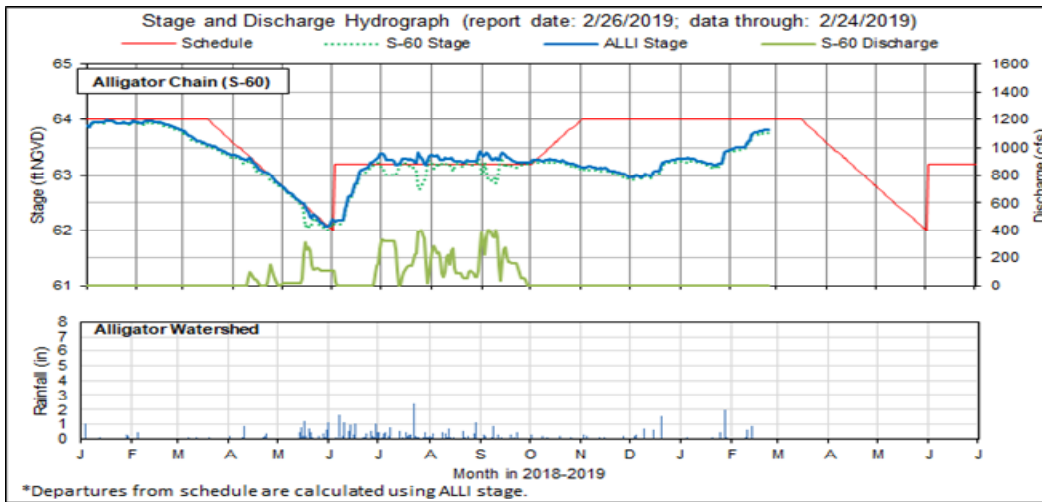


Figure 6.

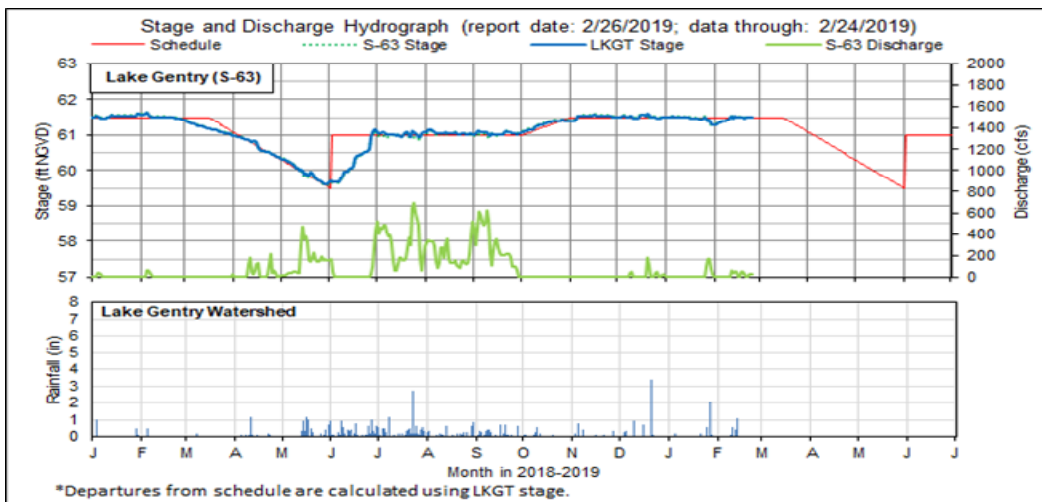
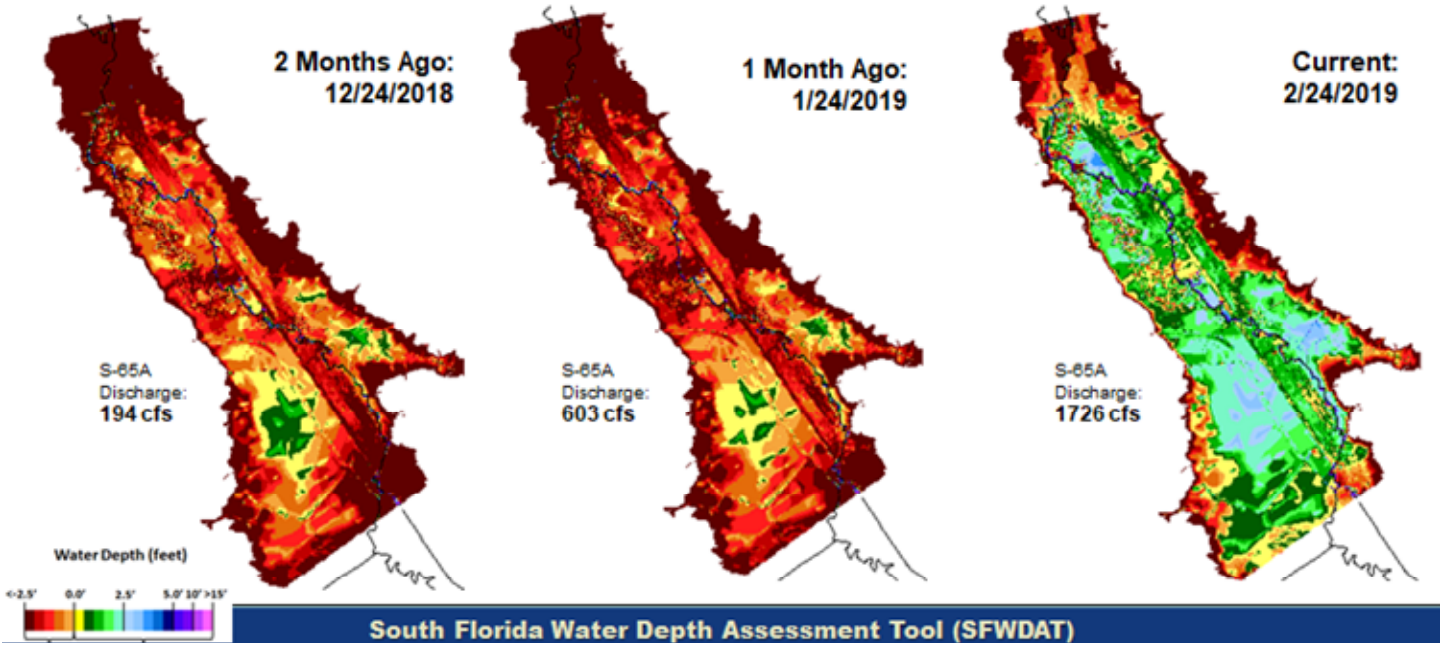


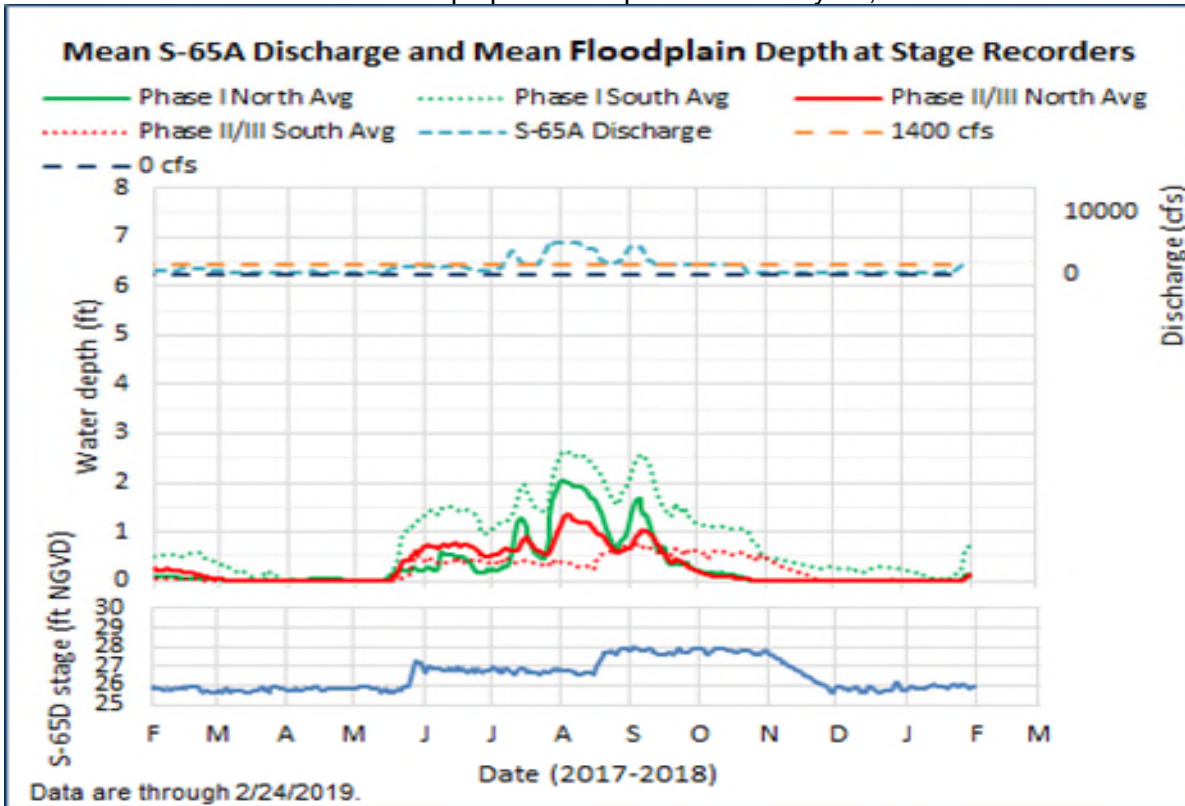
Figure 7.



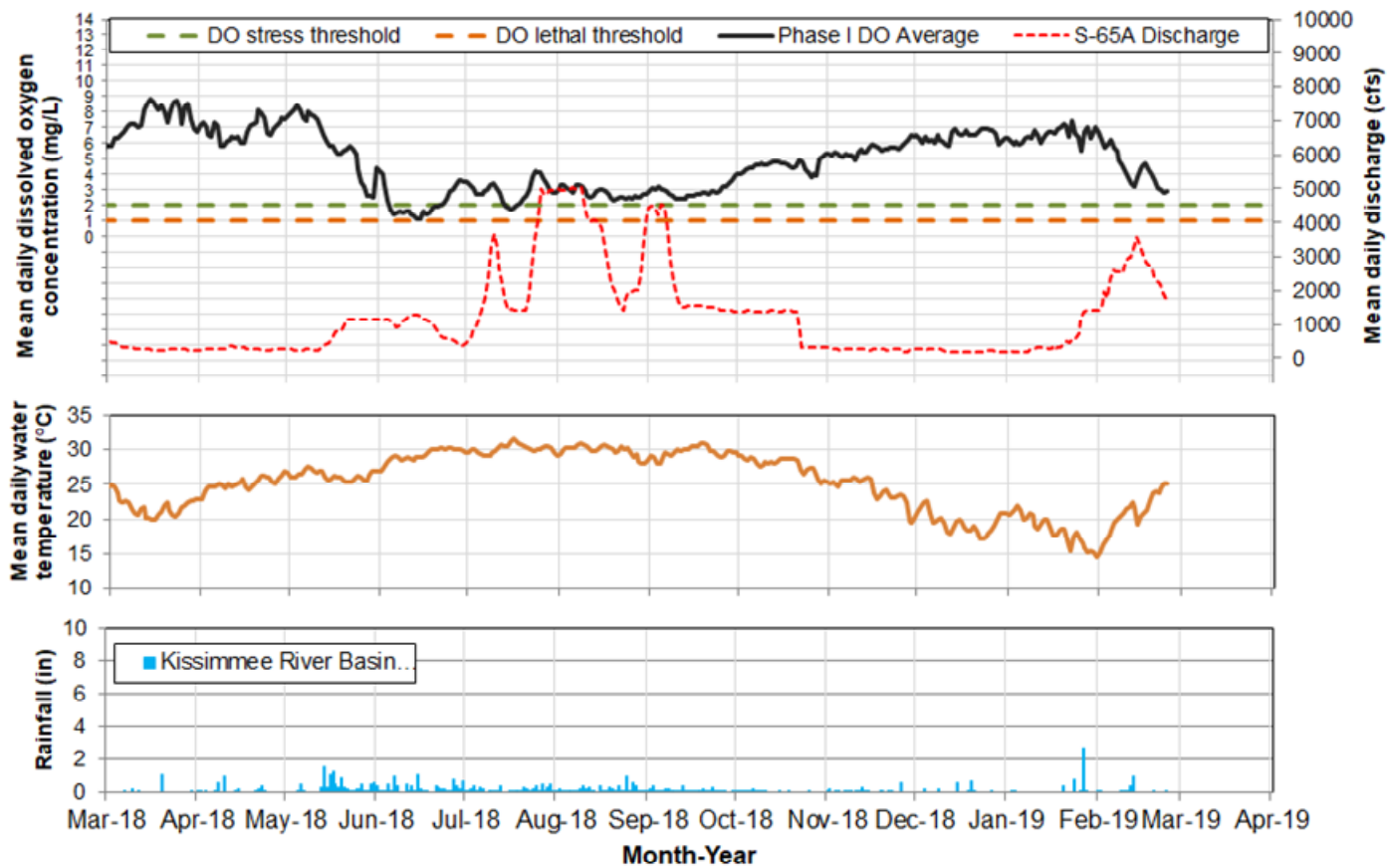
# SFWDAT Kissimmee River (Phase I) Monthly Depth Maps



**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.



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

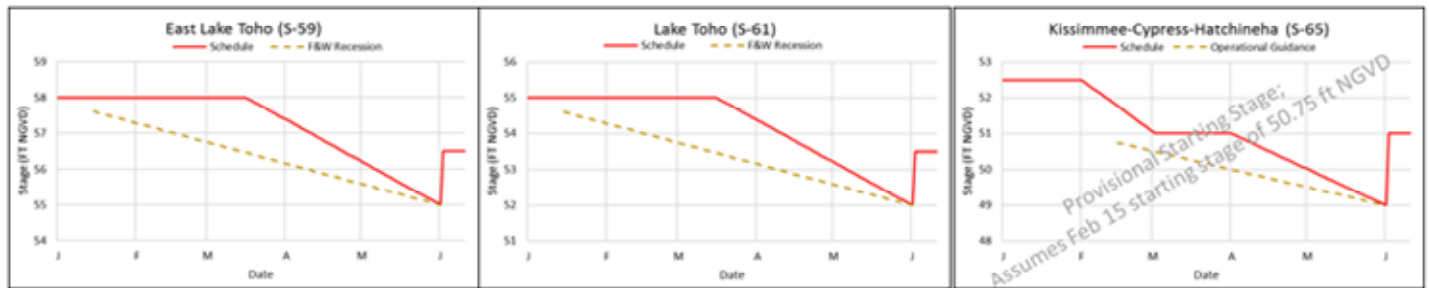


# Water Management Recommendations

## Kissimmee Basin Adaptive Recommendations and Operational Actions

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
2/26/2019	No new recommendations.		N/A		2/26/2019
2/19/2019	No new recommendations.		N/A		2/19/2019
2/10/2019	Increase discharge at S-65 by 600 cfs.	To compensate for increased inflow and rain forecast for Tuesday.	Implemented	KB Ops/SFWMD Water Mgt	2/12/2019
2/4/2019	Increase discharge at S-65/S-65A to begin reducing KCH stage to reach 50.75 ft on 2/15/2019.	Reduce to the stage at which the seasonal recession will begin.	Implemented	KB Ops/SFWMD Water Mgt	2/5/2019
1/26/2019	Increase S65A discharge by a total of 350 cfs today, which will put S65A at 1,400 cfs. Continue to increase discharge as needed.	Moderate or stop the rise in Lake KCH preemptively before forecast rainfall and provide capacity at S65A for S65A basin runoff.	Implemented	SFWMD Water Mgt/KB Ops	1/29/2019
1/22/2019	No new recommendations.		N/A		1/22/2019
	Begin recessions on Lake Toho and East Lake Toho on Jan 15, with a continuous recession to the regulation dry season low (52.0 ft on Toho; 55.0 ft on East Lake) on May 31. The lines are represented graphically in the Dry Season Operations slides.				
1/15/2019	Tentatively plan on a recession in Kissimmee-Cypress-Hatchineha starting on February 15 with a continuous recession to the dry season low (49 ft) on May 31. A provisional diagram is included in the Dry Season Operations slides; however, starting stage may change depending on conditions.	Slow recession rates in East Toho, Toho, and KCH to benefit fish and wildlife; as possible limit flow volume at S-65D to facilitate RRR construction.	N/A	KB Ops	1/15/2019
	Discharge and reversal guidelines are provided in the Dry Season Operations slides.				
1/4/2019	Discontinue 54 foot stage reduction target in Lake Toho.	Lake Kissimmee has already risen by ~1.5 ft.	Implemented	SFWMD Water Mgt/KB Ops	1/8/2019
12/14/2018	Manage S-61 discharge to reduce stage in Lake Toho to 54 ft over the next 7-9 days.	Move water to KCH to reduce the rate of stage decline in KCH; reduce the head difference between S-61 headwater and tailwater.	N/A	SFWMD Water Mgt/KB Ops	12/18/2018
12/10/2018	Reduce S-65A discharge to 180 cfs.	Reduce rate of stage decline in lakes Kissimmee-Cypress-Hatchineha	N/A	SFWMD Water Mgt/KB Ops	12/11/2018
12/3/2018	No new recommendations.		N/A		12/4/2018
11/26/2018	No new recommendations.		N/A		11/27/2018
11/19/2018	No new recommendations.		N/A		11/20/2018
11/12/2018	No new recommendations.		N/A		11/13/2018
11/2/2018	Reduce S-65/S-65A discharge to approximately 250 cfs.	To conserve stage in Lake Kissimmee.	Implemented	SFWMD Water Mgt/KB Ops	11/6/2018
10/30/2018	No new recommendations.		N/A		10/30/2018
10/22/2018	Reduce S-65/S-65A discharge to approximately 300 cfs (minimum discharge) in one step of approximately 1100 cfs today.	Reduce rate of stage decline in lakes Kissimmee-Cypress-Hatchineha	Implemented	SFWMD Water Mgt/KB Ops	10/23/2018
10/16/2018	No new recommendations.		N/A		10/16/2018
10/9/2018	No new recommendations.		N/A		10/9/2018
10/2/2018	No new recommendations.		N/A		10/2/2018
9/25/2018	No new recommendations.		N/A		9/25/2018
9/18/2018	No new recommendations.		N/A		9/18/2018
9/11/2018	No new recommendations.		N/A		9/11/2018
9/4/2018	No new recommendations.		N/A		9/4/2018
8/28/2018	No new recommendations.		N/A		8/28/2018
8/21/2018	No new recommendations.		N/A		8/21/2018
8/14/2018	No new recommendations.		N/A		8/14/2018
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

Dry Season Operations Slide 1 - 2018-2019  
(NOTE revised discharge table)



Other Considerations

- KCH starting stage may vary; the maximum is 50.75 ft NGVD on Feb 15.
- Maintain S65/S65A discharge of at least 300 cfs.
- If outlook is for extreme dry conditions meet with KB staff to discuss modifications to this plan.

Version 1: January 14 2019

Discharge Rate of Change Limits for S65/S65A (revised 1/14/19).

Q (cfs)	Maximum rate of INCREASE (cfs/day)	Maximum rate of DECREASE (cfs/day)
0-300	100	-50
301-650	150	-75
651-1400	300	-150
1401-3000	600	-300
>3000	1000	-1000

Figure 11A. Slide 1 of the 2018-2019 Dry Season Operations Plan for S-59, S-61, and S-65/S-65A.

Dry Season Operations Slide 2 - 2018-2019

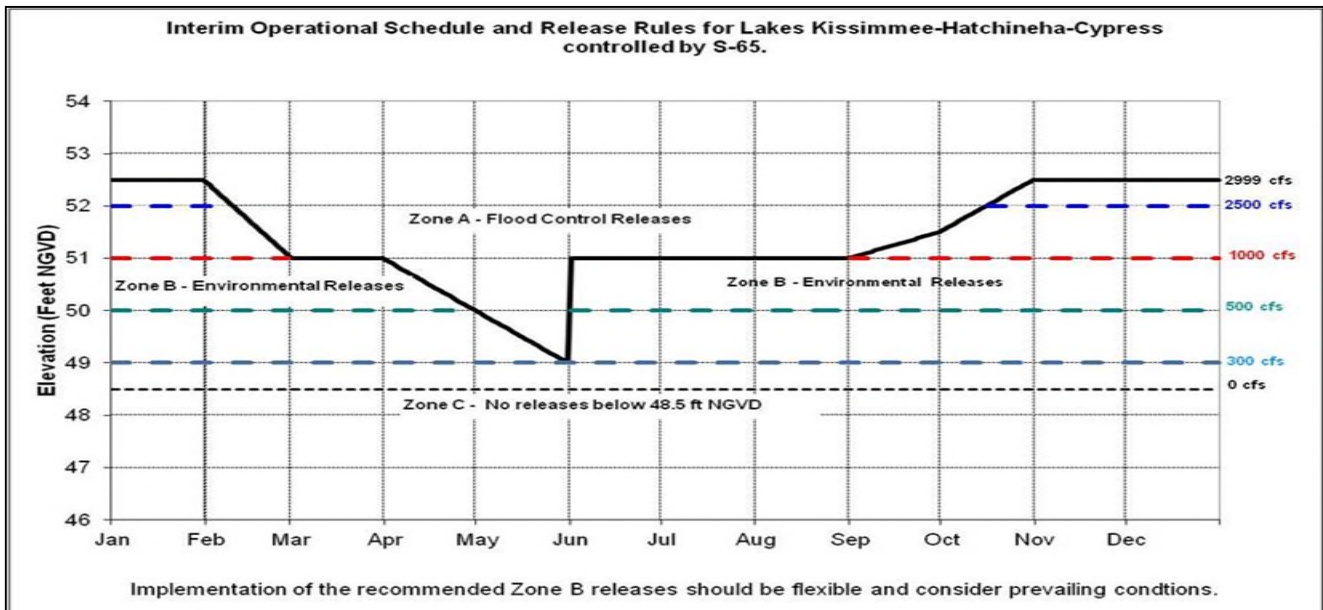
East Lake (ELT) and Toho (WLT)

- **East Toho and Toho Recessions:**
  - Make releases to begin recessions on Jan 15 with lake stage approximately 0.4 ft below winter pool and continue to follow straight line recessions through May 31<sup>st</sup> to the extent practical
- **East Toho and Toho Stage Reversals :**
  - Adjust discharge to bring stage back to the recession line within about a week
  - Pre-storm releases may be used to lower stage below the recession line and create storage of about half of the forecast rain volume
  - If stage cannot be brought back to the recession line within about a week, the recession line may need to be reset following discussion with partner agencies
  - In general, the water released from ELT and WLT basins will be released to KHC (to the extent that hydraulic capacity is available) without consideration for Lake KHC stage. However, the priority of KCH is subject to change if more nesting occurs in KCH than Toho or East

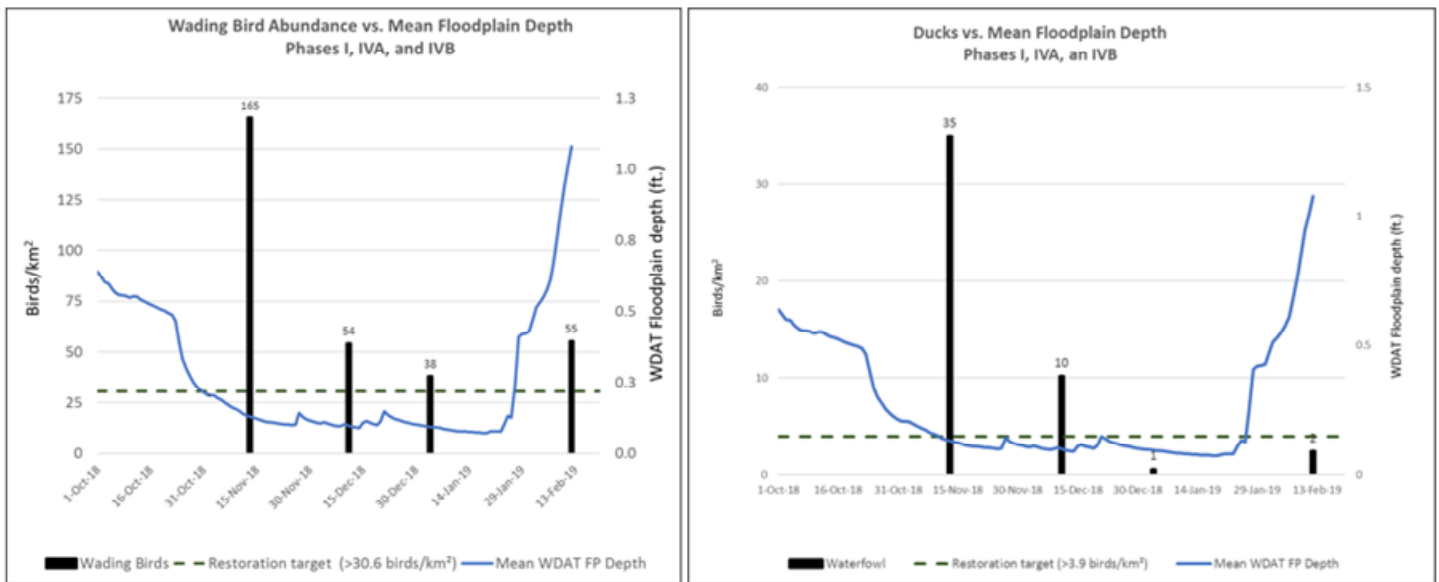
Kissimmee-Cypress-Hatchineha (KCH)

- **KCH Recession:**
  - Begin recession on February 15 (subject to change) starting no higher than 50.75 feet
  - To the extent feasible considering discharge constraints, make releases to follow a straight-line recession through May 31
  - In general, use the available storage in Lake KCH to keep flow at S-65D below 1,000 cfs; when possible keep flow below 600 cfs
- **KCH Stage Reversals :**
  - To address reversals, in general increase flow by 100 cfs for every 0.1 foot of rise above the recession line (e.g. from 300 cfs at the line to 800 cfs at 0.5 feet above the line)

Figure 11B. Slide 2 of the 2018-2019 Dry Season Operations Plan for S-59, S-61, and 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.** Kissimmee River Wading Bird and Waterfowl Surveys from November 2018 to February 2019.

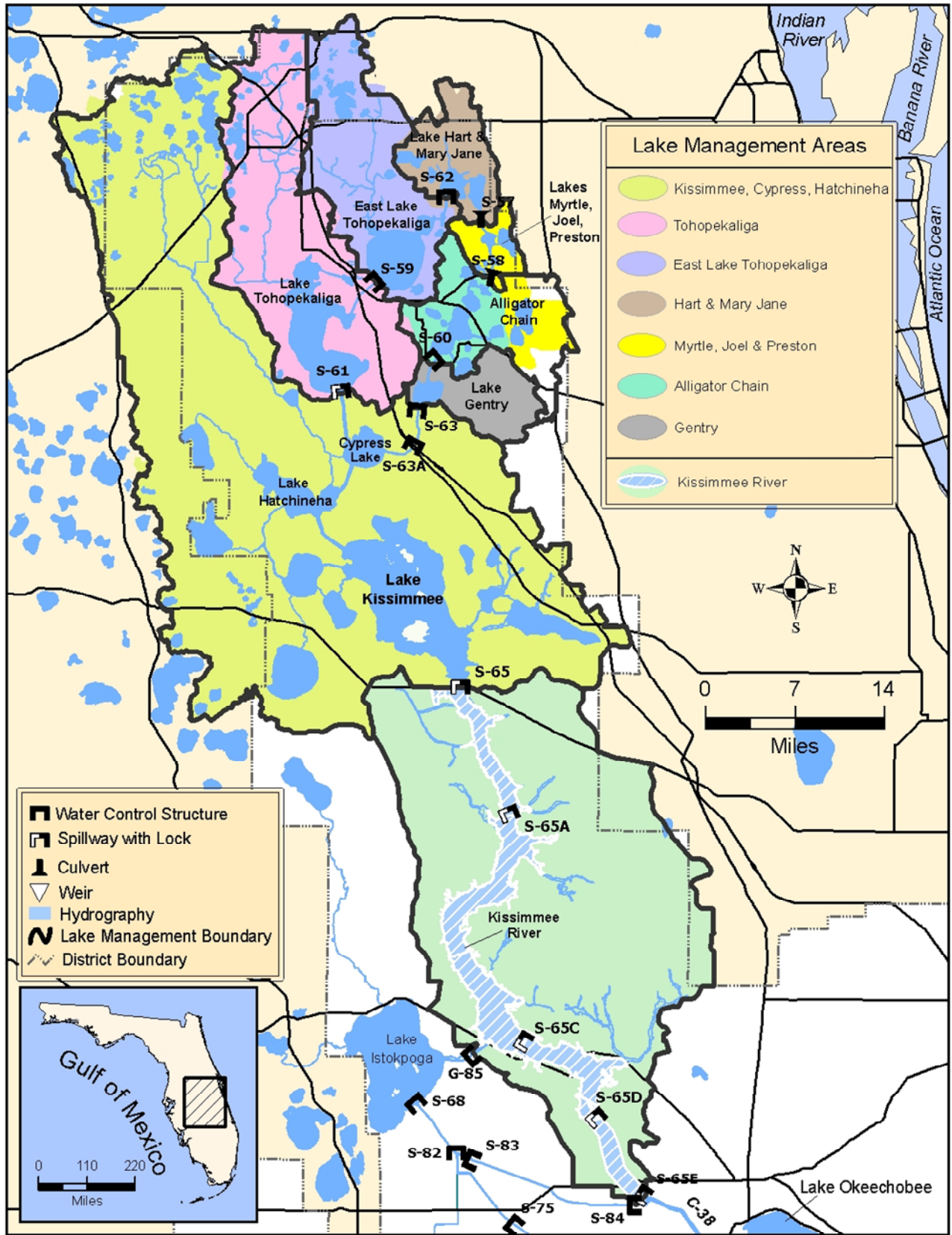


Figure 14. The Kissimmee Basin.

## **LAKE OKEECHOBEE**

According to the USACE web site, Lake Okeechobee stage is at 12.75 feet NGVD for the period ending at midnight on February 25, 2019. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and three perimeter stations (S-308, S-4 and S-133). The Lake is now 0.48 feet higher than it was a month ago and 2.18 feet lower than a year ago when runoff from Hurricane Irma caused extreme high lake stages (Figure 1). The Lake is in the Base Flow sub-band (Figure 2). The February 25 lake stage was the lowest for this time of year since 2011, which followed a very dry rainy season in 2010 (Figure 3). According to RAINDAR, 0.04 inches of rain fell directly over the Lake and the entire watershed received less than 0.25 inches during the week of February 19 - 25, 2019 (Figure 4).

Average daily inflows (minus rainfall) to the Lake were lower than last week at 3,125 cfs, compared to 3,475 cfs. The inflows from the Kissimmee River increased, rising from 2,723 cfs to 2,860 cfs, whereas inflows from the remaining structures were similar or decreased from the previous week (Table 1).

Total outflows (minus evapotranspiration) increased from the previous week, going from 1,241 average daily cfs to 2,931 cfs this past week (Table 1). Outflows increased at all structures except S352. Outflows west via S-77 increased from 525 cfs to 1108 cfs, outflows east via S308 increased from 63 cfs to 360 cfs and south outflows through the S-350 structures increased, going from 687 average daily cfs the previous week to 930 cfs this past week. Outflows from the L-8 Canal (Culvert 10A) increased from a daily average of 7 cfs to 532 cfs. The corrected average daily evapotranspiration value for the week based on the L006 weather platform solar radiation was 0.05 inches this 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 5 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.

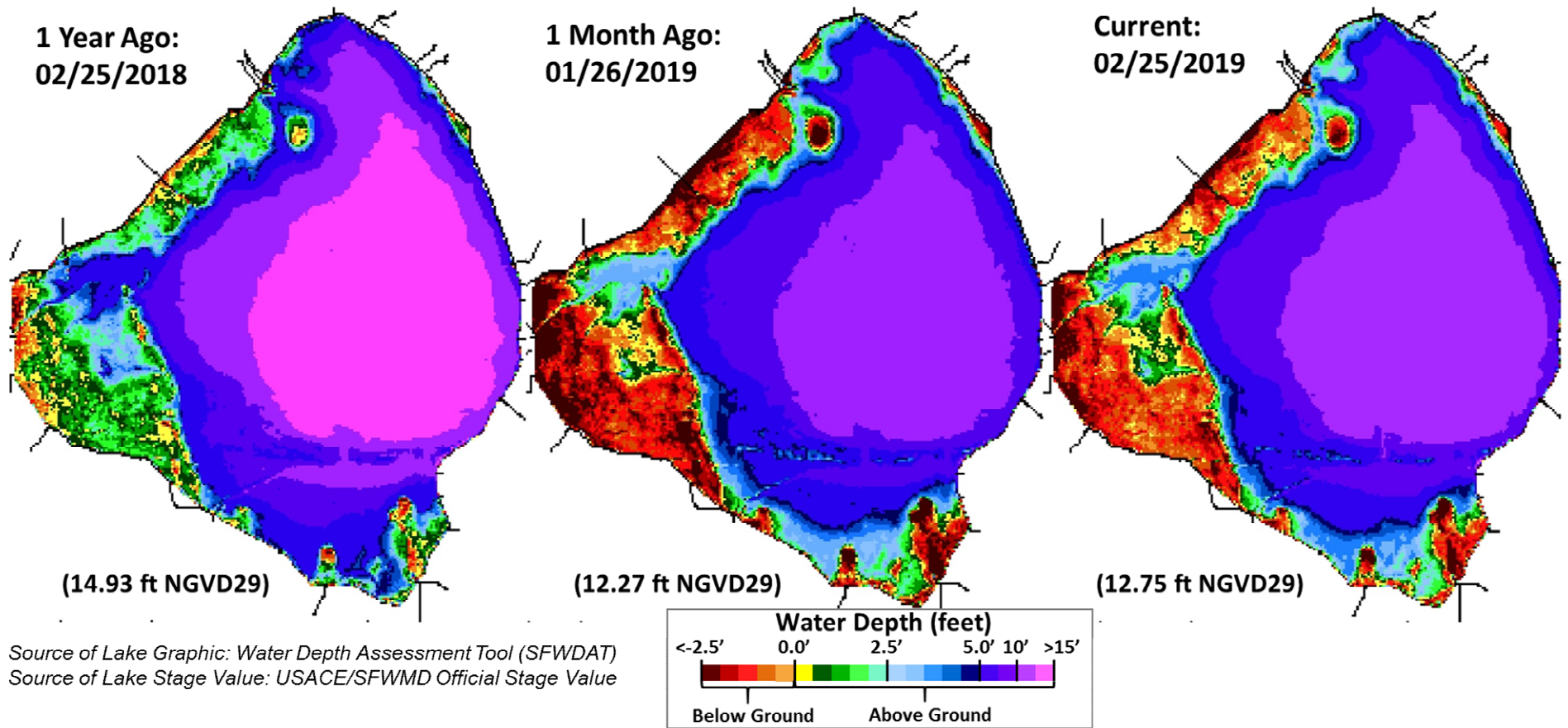
The most recent satellite imagery (February 23, 2019) using the cyanobacteria monitoring product derived from NOAA's analysis of EUMETSAT's OLCI satellite sensor showed bloom potential is low for most of the Lake, continuing the trend of gradually reducing potential over the past several weeks (Figure 6).

**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)
S65E & S65EX1	2723	2860	1.3
S71 & 72	32	0	0.0
S84 & 84X	621	220	0.1
Fisheating Creek	45	44	0.0
S154	1	0	0.0
S191	0	1	0.0
S133 P	9	0	0.0
S127 P	4	0	0.0
S129 P	13	0	0.0
S131 P	12	0	0.0
S135 P	15	0	0.0
S2 P	0	0	0.0
S3 P	0	0	0.0
S4 P	0	0	0.0
L8 Backflow			
Rainfall	0.0	2392	1.1
<b>Total</b>	<b>3475</b>	<b>5518</b>	<b>2.4</b>

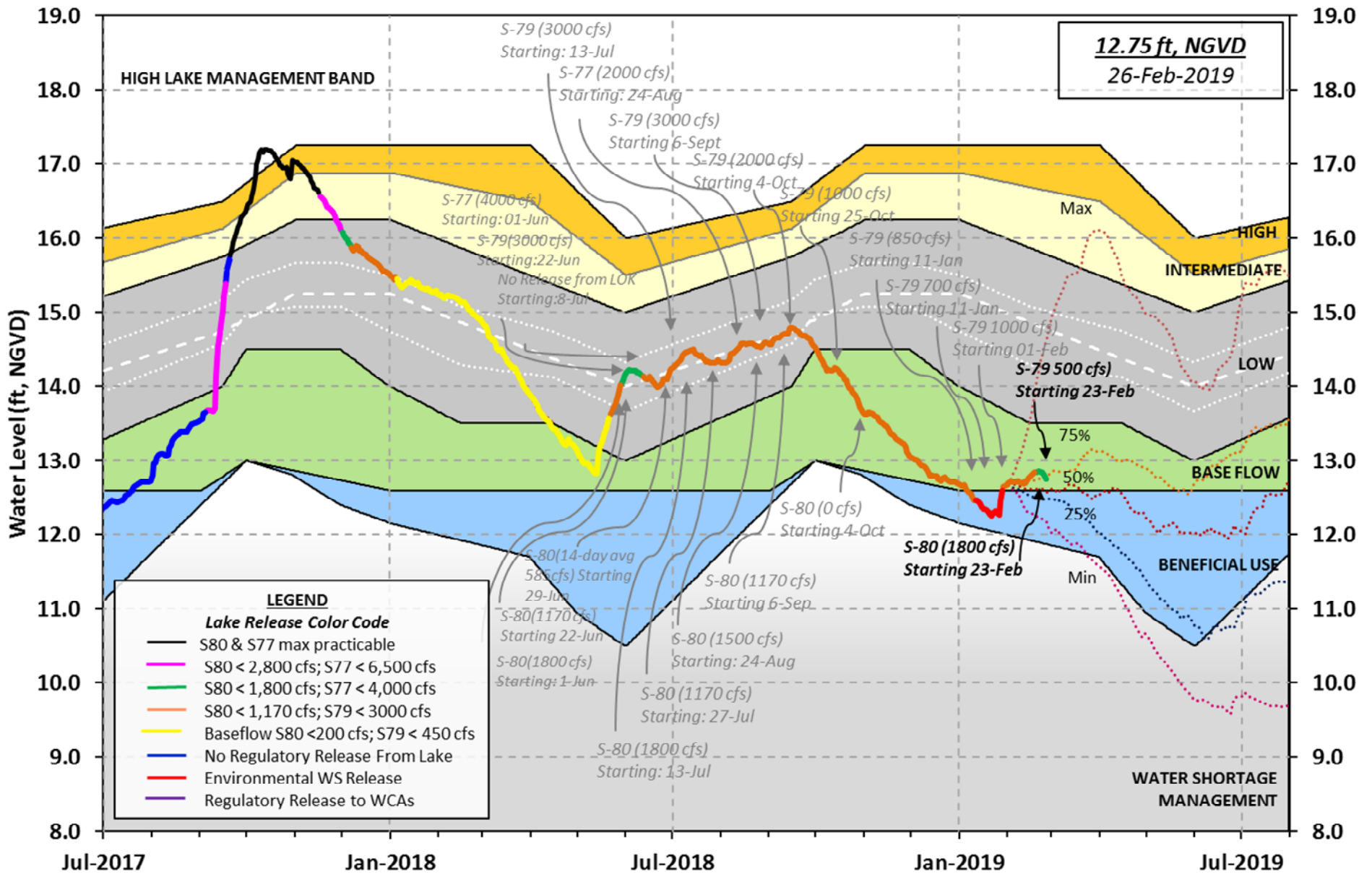
OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S77	525	1108	0.5
S308	63	360	0.2
S351	224	240	0.1
S352	183	124	0.1
S354	280	566	0.3
L8 Outflow	7	532	0.2
ET	668	778	0.3
<b>Total</b>	<b>1950</b>	<b>3709</b>	<b>1.6</b>

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.



# Lake Okeechobee Water Level Comparison

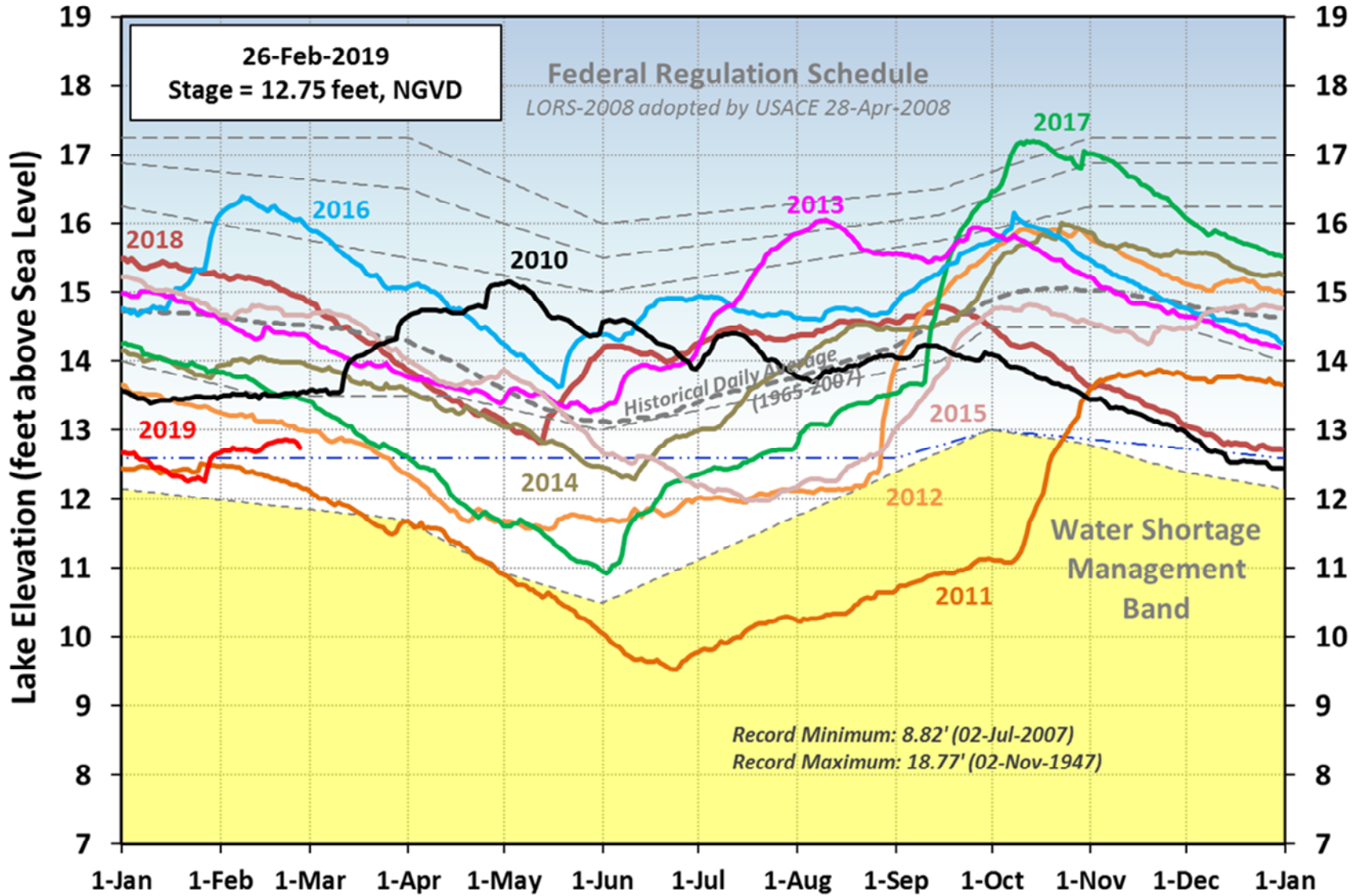


Figure 3. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES  
 FROM: 0615 EST, 02/19/2019 THROUGH: 0615 EST, 02/26/2019

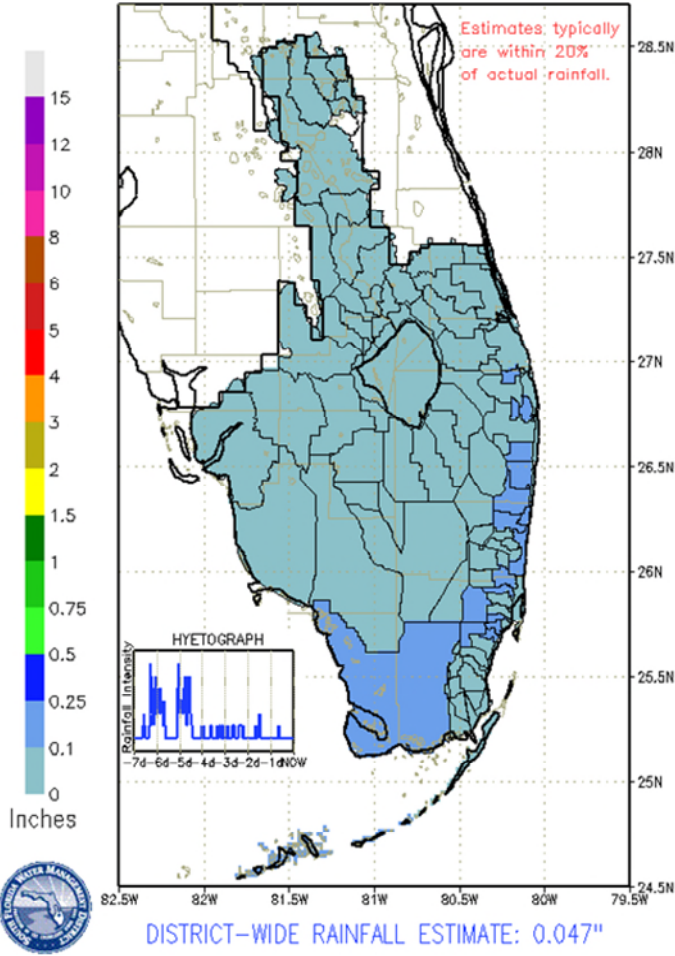


Figure 4. Rainfall estimates by basin.

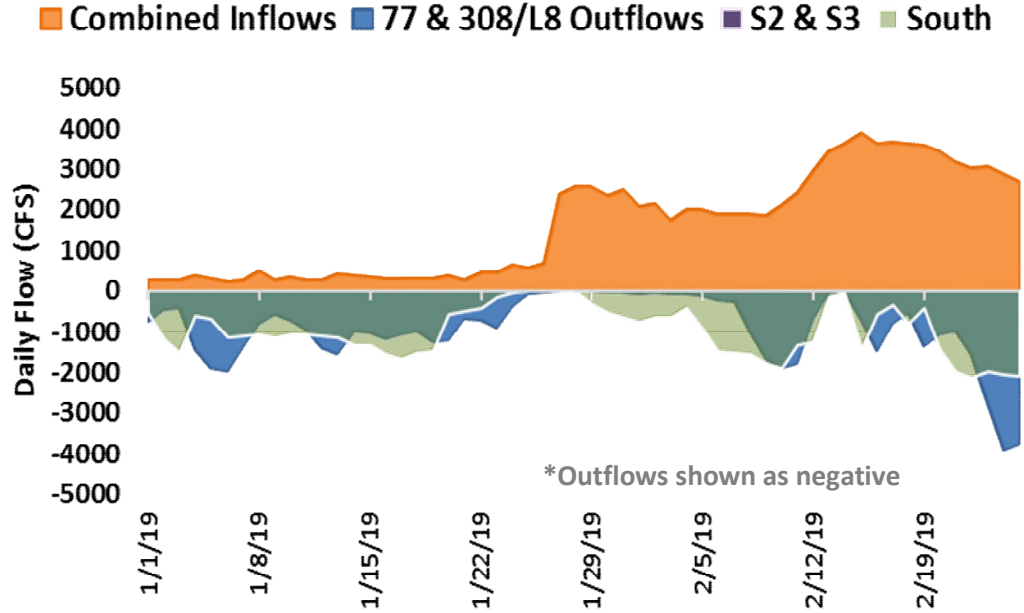
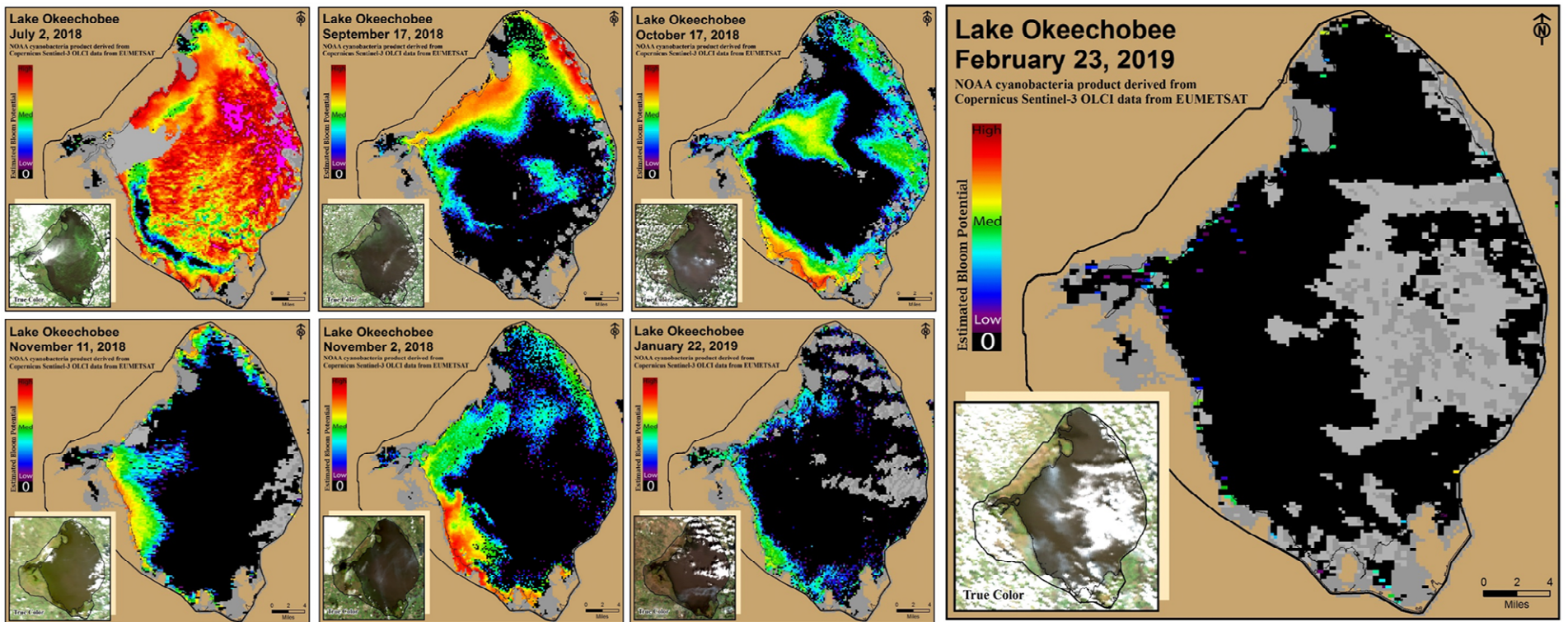


Figure 5. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive and negative, respectively, for visual purposes.



Gray = Cloud Cover

NOAA cyanobacteria product derived from Copernicus Sentinel-3 OLCI data from EUMETSAT

Unvalidated and Experimental Data

**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.

## ESTUARIES

### St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 510 cfs (Figures 1 and 2) and last month inflow averaged about 703 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).

Location	Flow (cfs)
Tidal Basin Inflow	119
S-80	279
S-308	360
S-49 on C-24	0
S-97 on C-23	0
Gordy Rd. structure on Ten Mile Creek	112

Over the past week, salinity increased throughout 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 estimated to be less than 26. Salinity conditions in the middle estuary are within the good 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.

Sampling Site	Surface	Bottom	Envelope
HR1 (North Fork)	<b>15.2</b> (14.3)	<b>18.1</b> (17.2)	NA <sup>1</sup>
US1 Bridge	<b>19.9</b> (18.5)	<b>16.7</b> <sup>2</sup> (17.0)	10.0-26.0
A1A Bridge	<b>27.6</b> (25.9)	<b>29.2</b> (27.8)	NA <sup>1</sup>

<sup>1</sup>Envelope not applicable and <sup>2</sup>Questionable.

### Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 1,868 cfs (Figures 5 and 6) and last month inflow averaged about 2,635 cfs. Last week's provisional averaged inflows from the structures are shown in Table 3.

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

Location	Flow (cfs)
S-77	1108
S-78	955
S-79	1599
Tidal Basin Inflow	269

Over the past week, salinity remained about the same throughout the estuary (Table 4, Figures 7 & 8). The seven-day average salinity values are estimated to be within the good range for adult eastern oysters at Cape Coral and at Shell Point (Figure 9). Salinity values were not available at Sanibel. The 30-day moving average surface salinity is 0.4 at Val I-75 and 3.1 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	Envelope
S-79 (Franklin Lock)	<b>0.3</b> (0.3)	<b>0.3</b> (0.3)	NA <sup>1</sup>
Val I75	<b>0.3</b> (0.3)	<b>0.3</b> (0.3)	0.0-5.0 <sup>2</sup>
Ft. Myers Yacht Basin	<b>3.0</b> (2.9)	<b>3.6</b> (3.6)	NA
Cape Coral	<b>10.9</b> (10.7)	<b>13.6</b> (13.0)	10.0-30.0
Shell Point	<b>23.4</b> (22.4)	<b>22.1</b> (21.5)	10.0-30.0
Sanibel	<b>NR</b> <sup>3</sup> (NR)	<b>NR</b> (NR)	10.0-30.0

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

Forecast of surface salinity (Table 5 and Figure 10) at Val I-75 for the next two weeks using the autoregression model (Qiu and Wan, 2013) coupled with a linear reservoir model for the tidal basin predicts daily salinity ranging from 0.3 to 3.2 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 1800 cfs and Tidal Basin inflows of 245 cfs.

**Table 5.** Predicted salinity at Val I-75 at the end of forecast period

Scenario	Q79 (cfs)	TB runoff (cfs)	Daily salinity	30 day mean
A	0	245	3.2	1.2
B	300	245	2.7	1.1
C	375	245	2.3	1.0
D	450	245	2.1	1.0
E	650	245	1.4	0.9
F	1800	245	0.3	0.5

### Red tide

The Florida Fish and Wildlife Research Institute reported on February 22, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from or offshore of St. Lucie, Martin, Palm Beach, Miami-Dade, or Lee counties. No samples were collected from Broward County this week.

### Water Management Recommendations

Lake stage is in the Base Flow sub-band of 2008 LORS. Tributary hydrological conditions are wet. The 2008 LORS recommends up to 450 cfs release at S-79 and up to 200 cfs release at S-80. Given the current estuarine conditions, there are no ecological benefits to the upper estuary associated with freshwater releases from Lake Okeechobee, but some benefits may accrue to areas further downstream.



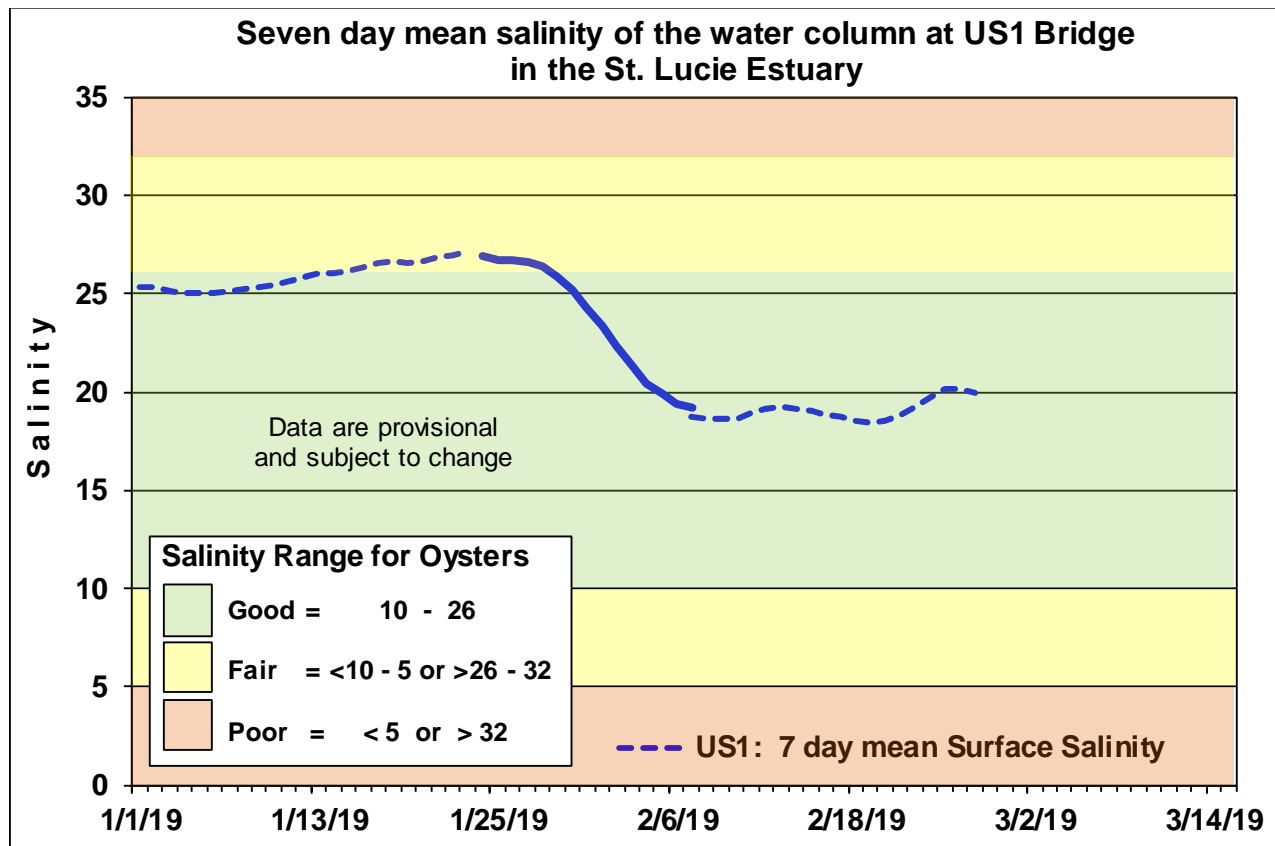


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

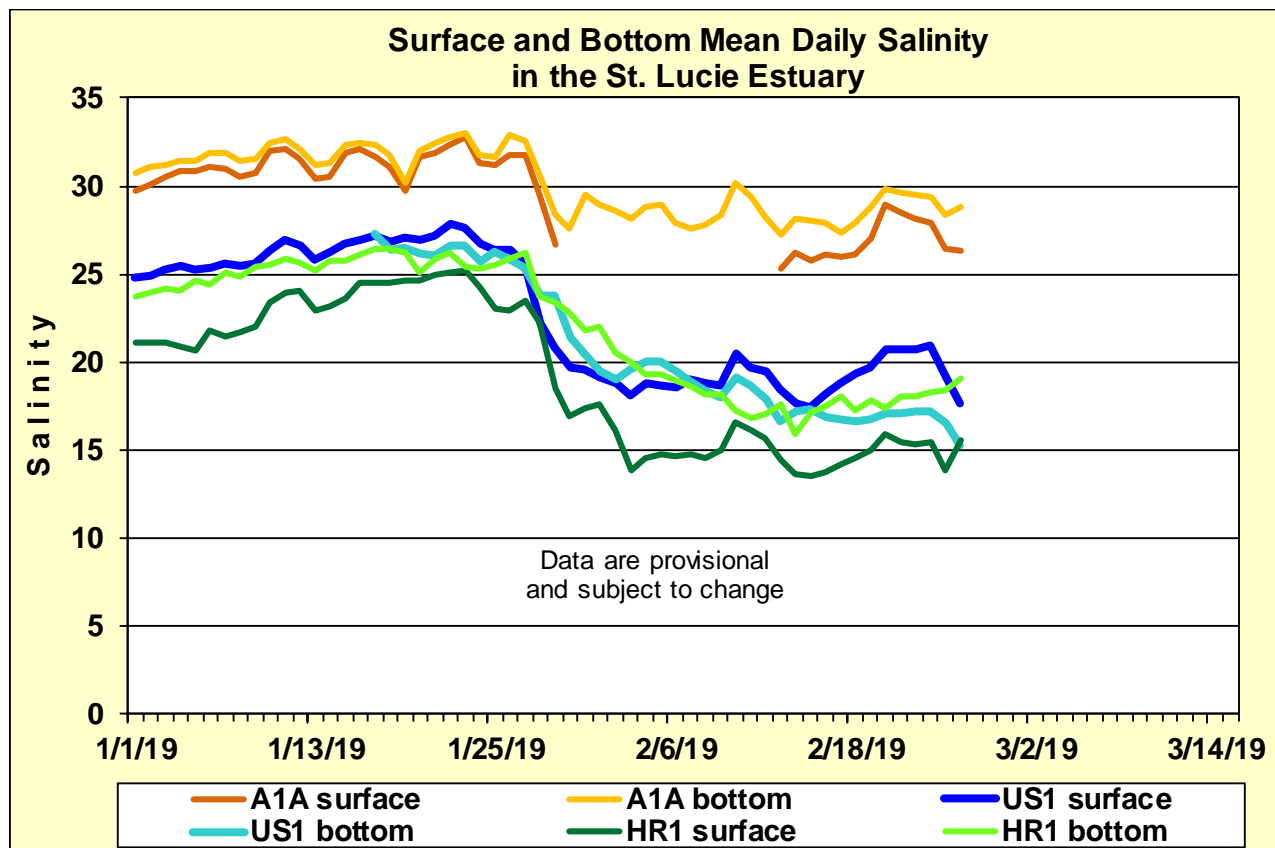


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

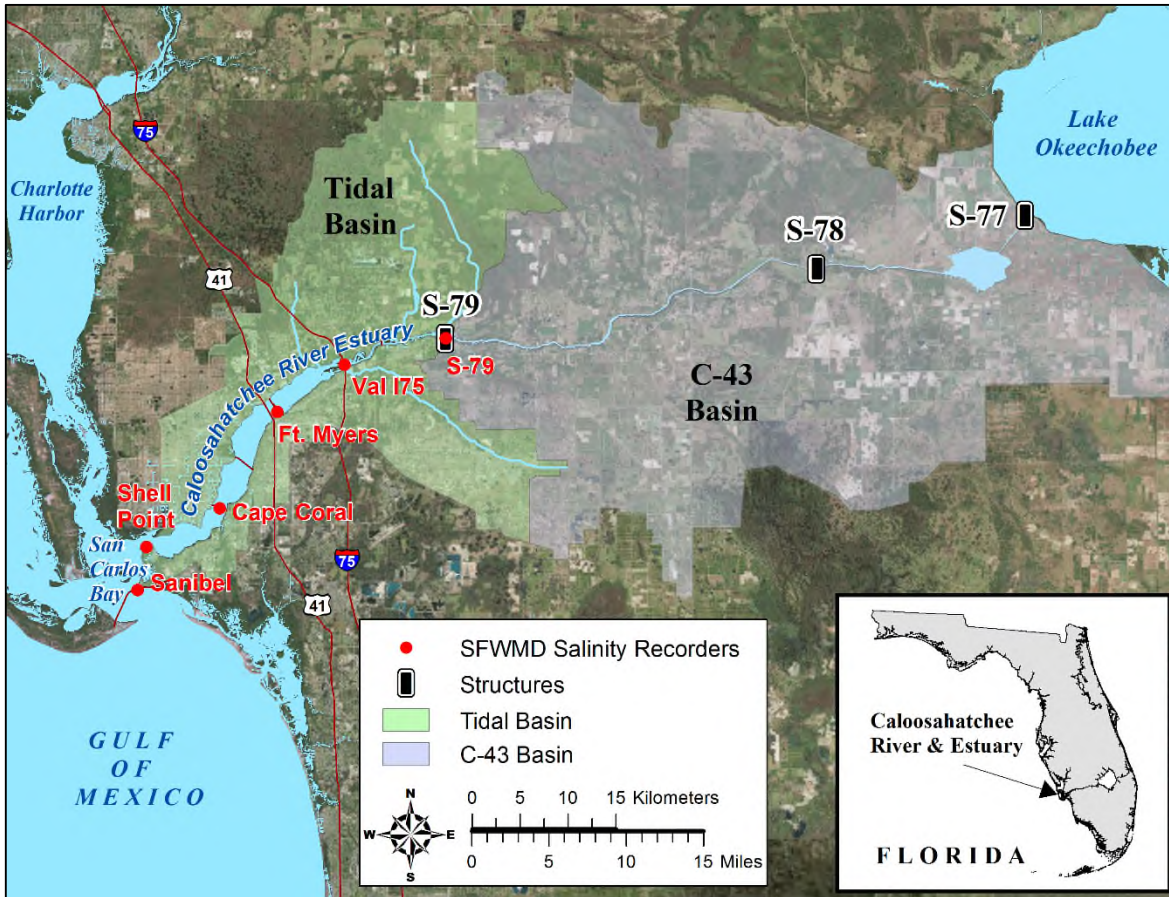


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

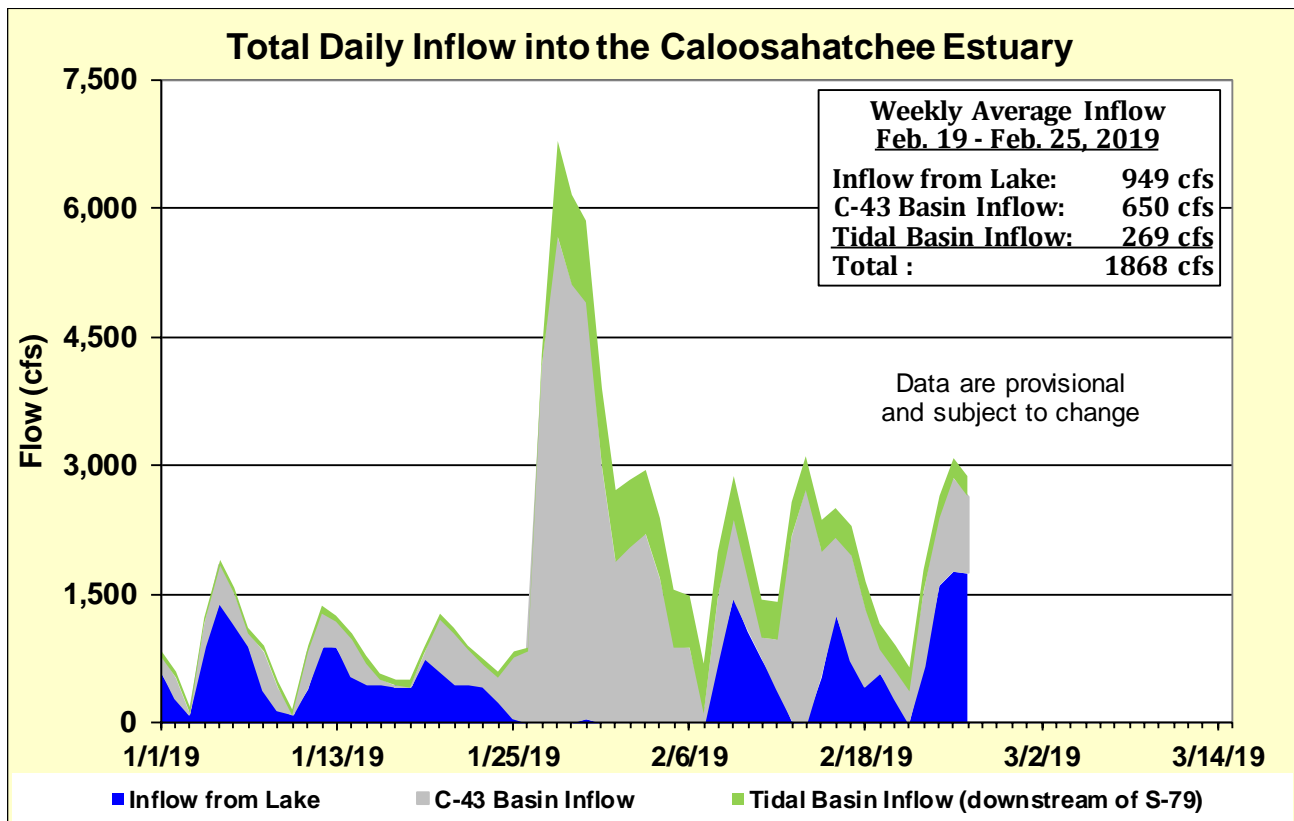


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.



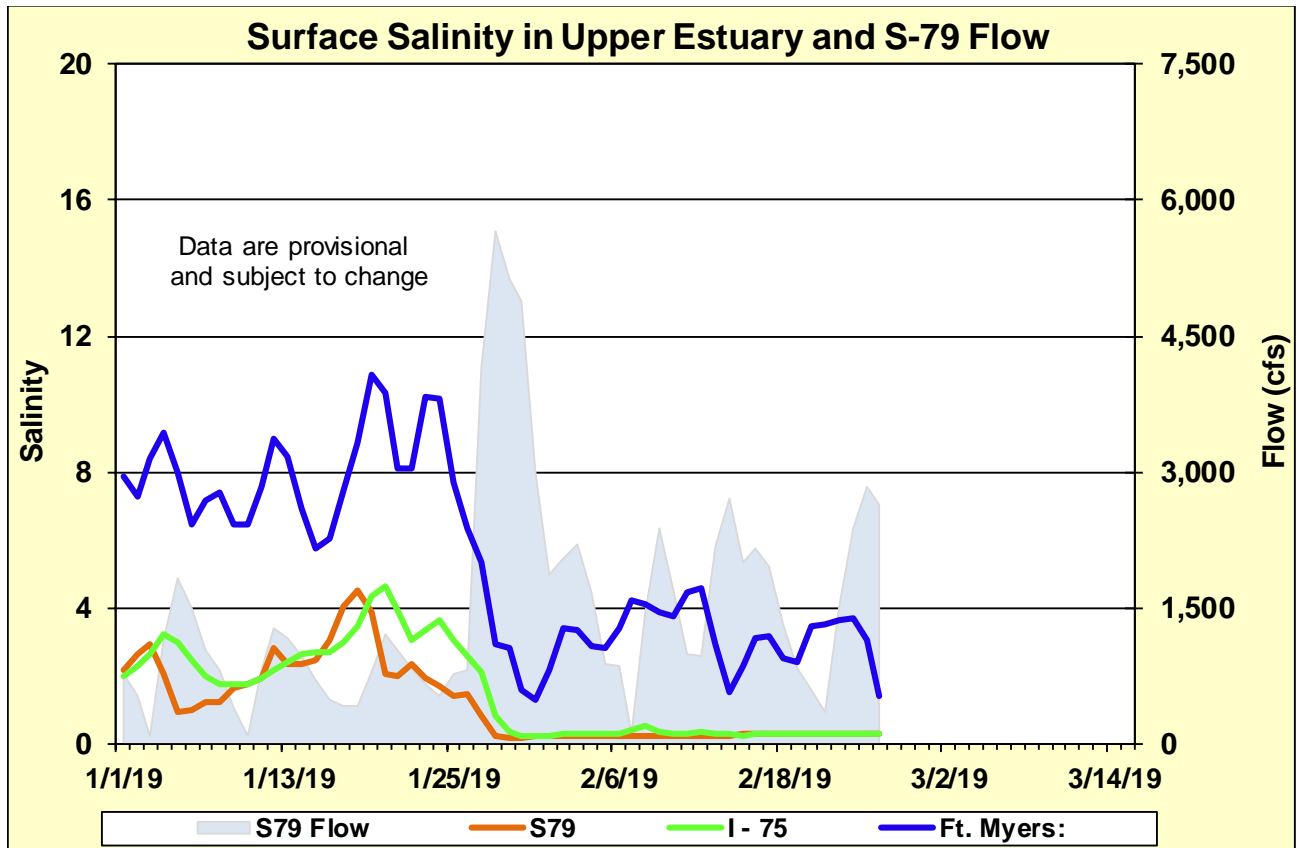


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

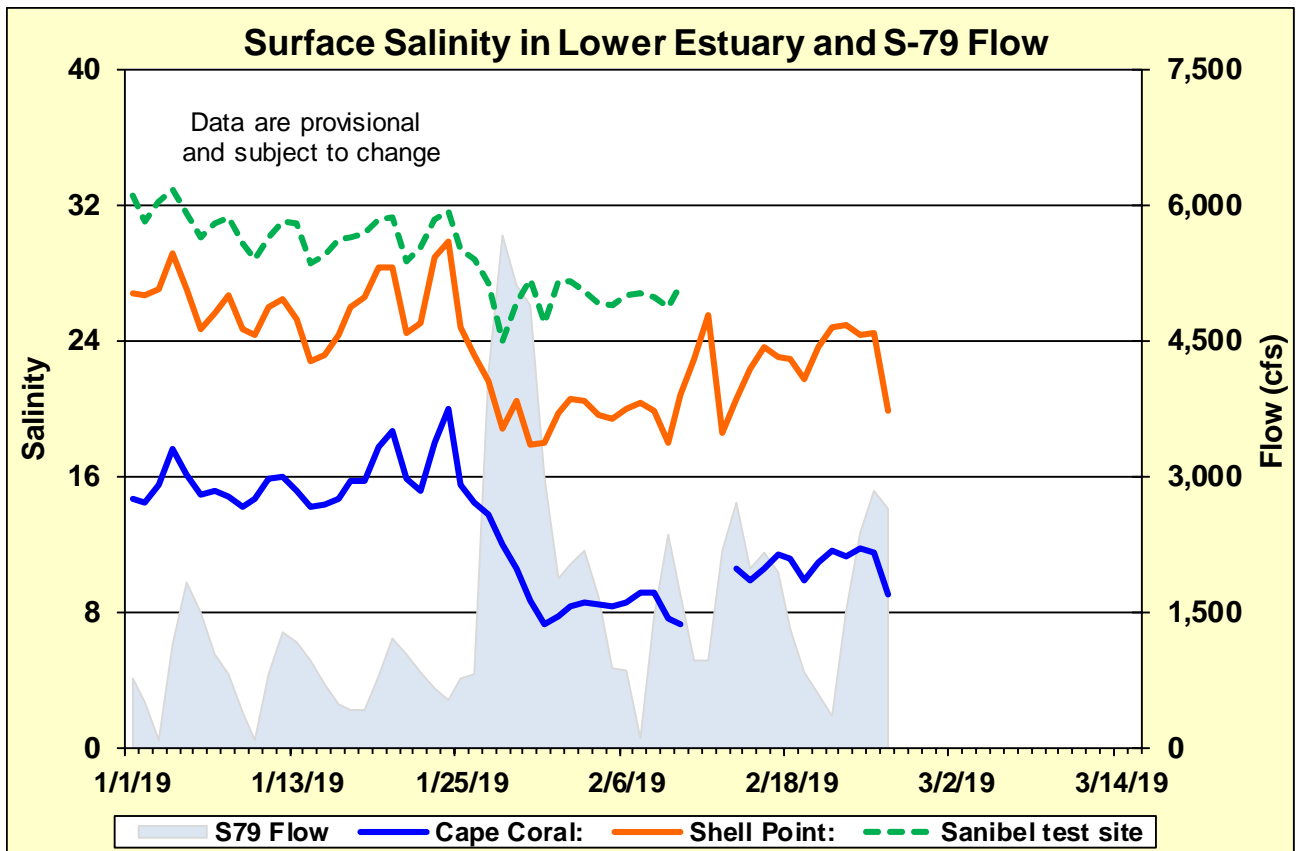
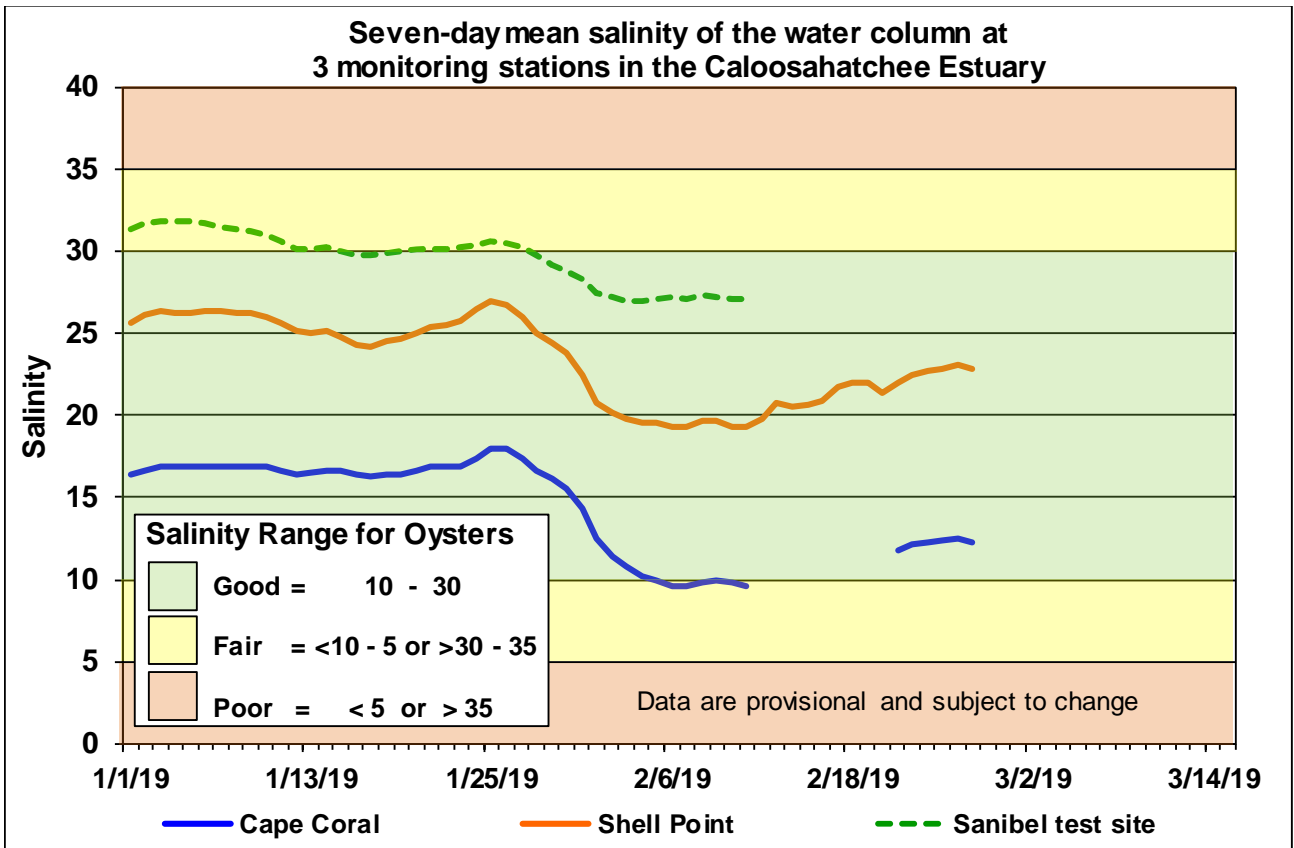
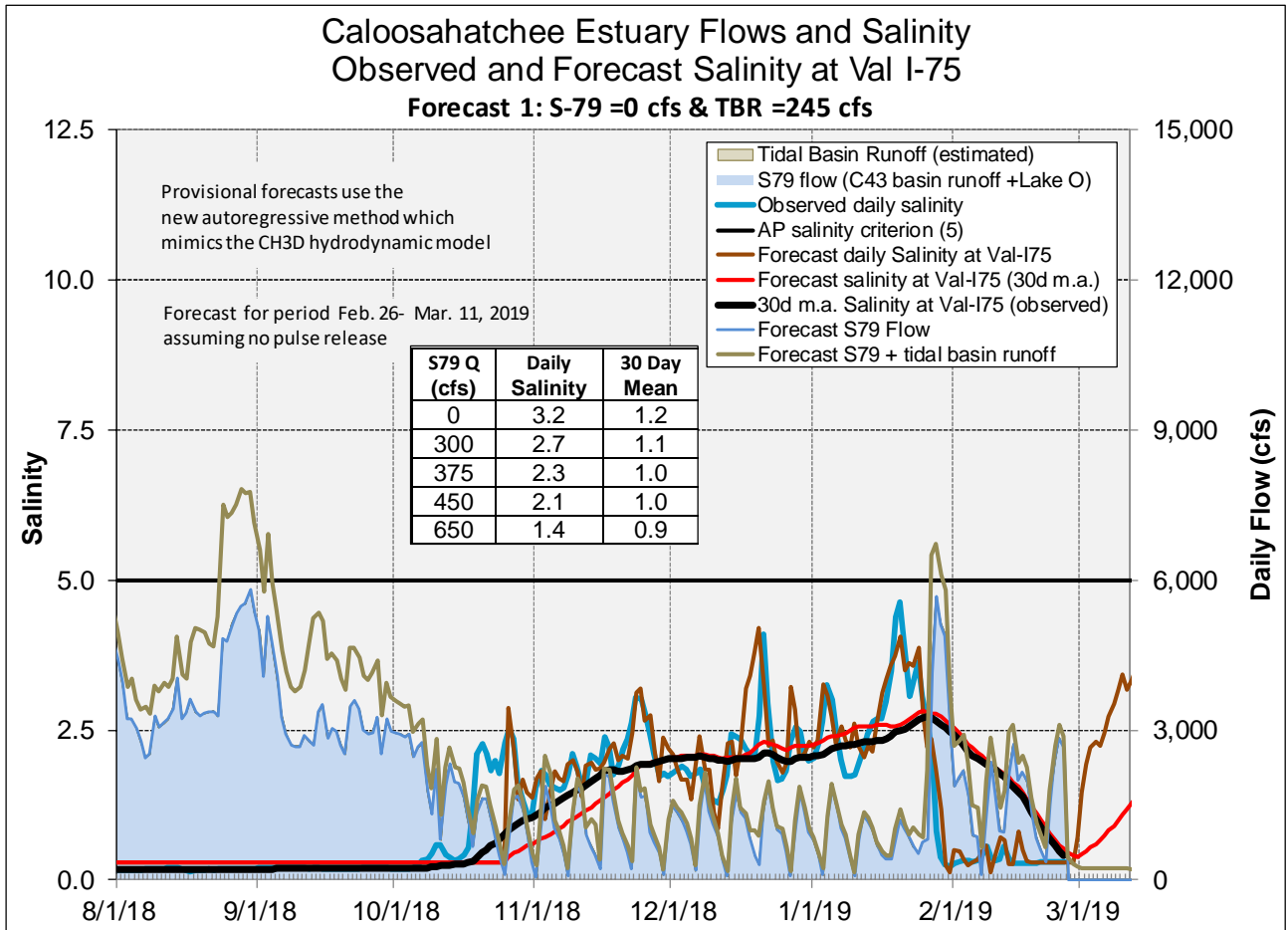


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.



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

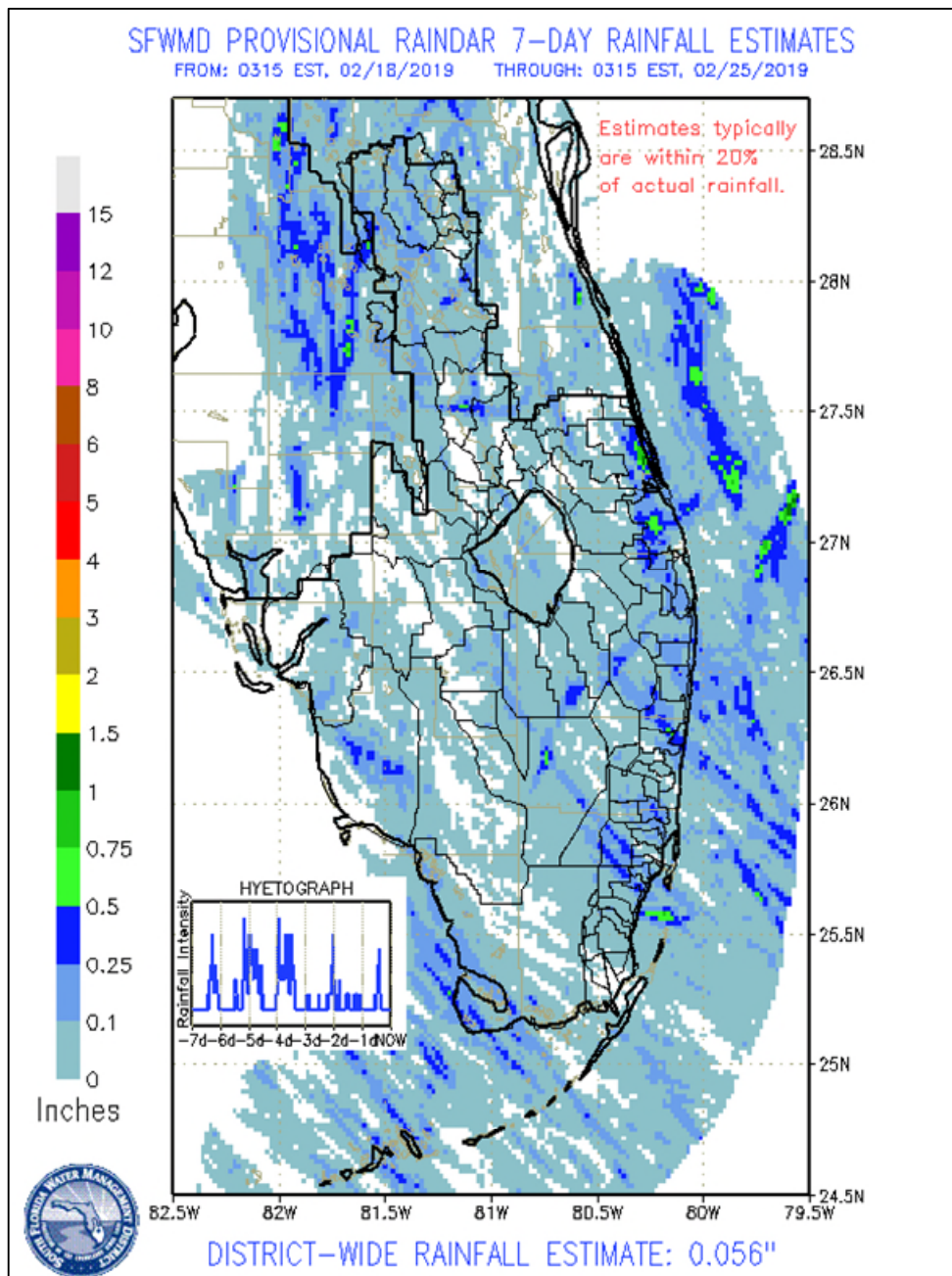


**Figure 10.** Forecasted Val I-75 surface salinity assuming no pulse release at S79.

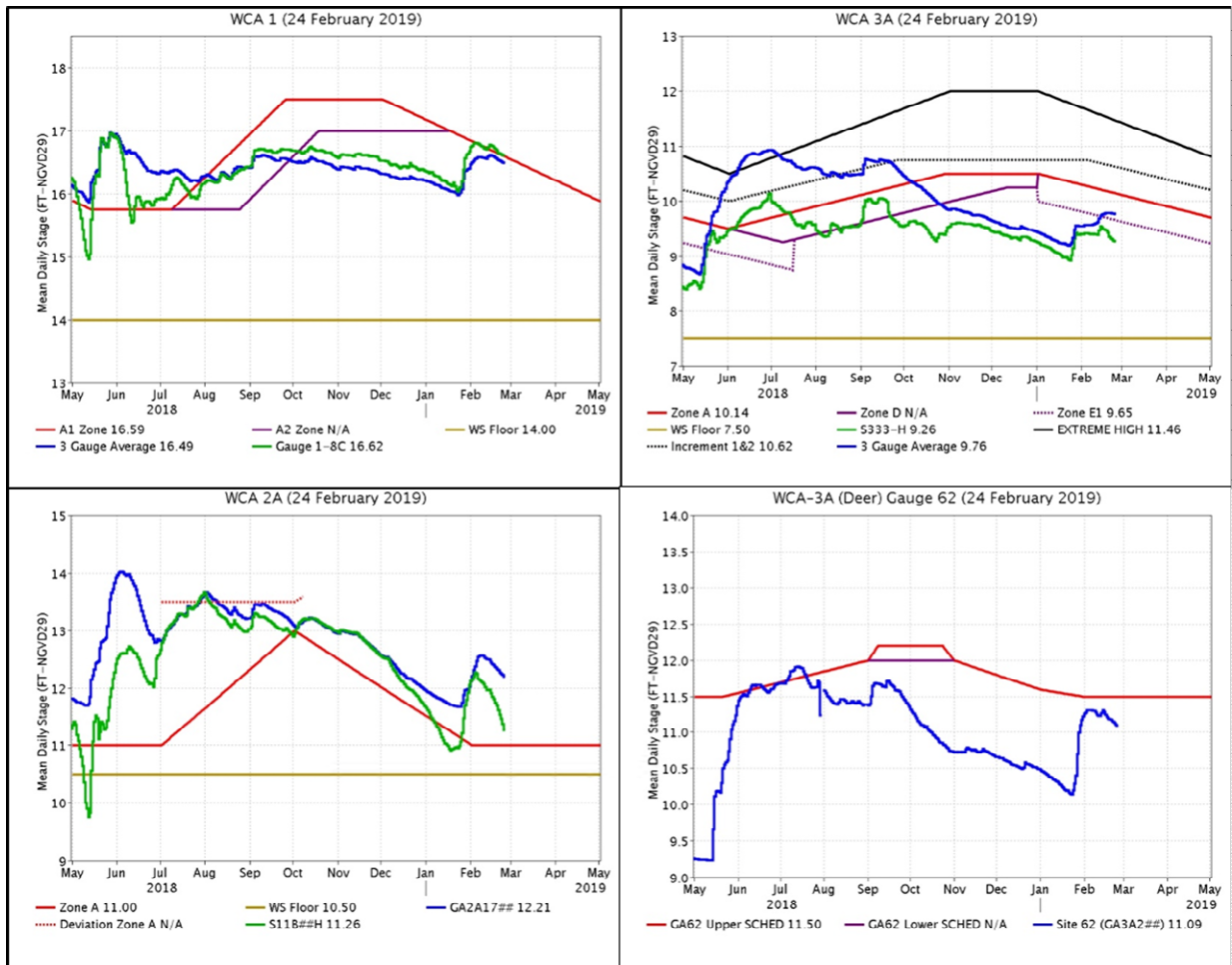
## **EVERGLADES**

At the gauge locations monitored for this report stages dropped across WCAs and rose at the ENP station in NE SRS. The most extreme individual gauge changes within the WCAs ranged from -0.19 feet (WCA-2A) to +0.15 feet (ENP SRS). Pan evaporation was estimated at 1.29 inches this week (+0.14 from last week).

<b>Everglades Region</b>	<b>Rainfall (Inches)</b>	<b>Stage Change (feet)</b>
WCA-1	0.12	-0.09
WCA-2A	0.03	-0.19
WCA-2B	0.04	-0.03
WCA-3A	0.05	-0.04
WCA-3B	0.07	-0.06
ENP	0.05	+0.15



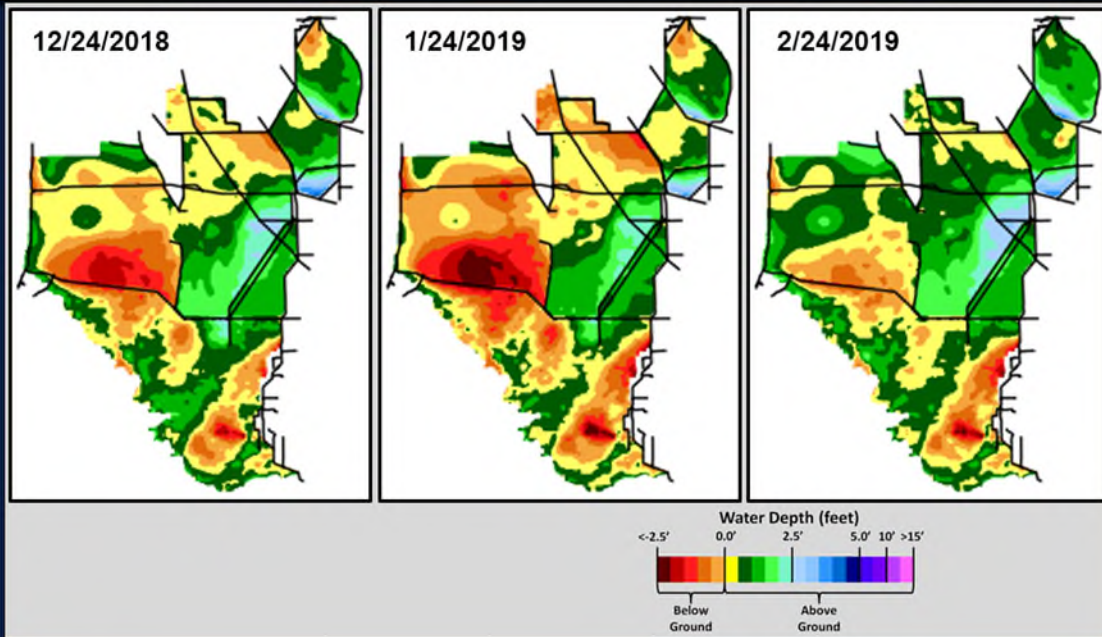
Regulation Schedules: WCA1: Gauge 1-8C is 0.03 feet above the Zone A1 regulation line. The three-gauge average is 0.13 below the canal stage. WCA2A: S11B Headwater stage is 0.26 feet above Zone A and is receding quickly towards the regulation line. Gauge 2A17 trends less sharply and is 0.95 feet above the canal stage. WCA-3A: The Three Gauge Average stage is 0.11 feet above Zone E1 regulation line and is following the line. WCA-3A at gauge 62 (Northwest corner) returns to a recession and is 0.41 feet below the Upper Schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate the recent rains and water management have had an impact on stages with an increase in depths across the WCAs and ENP. In the northeast of WCA-3A North we no longer see the model indicating depths greater than 0.5 feet below ground. A ground-truthing exercise conducted on 2/25 confirmed the model results of depths of up to 6 inches in northeastern WCA-3A. WDAT difference output indicates that water levels got deeper across all the Everglades over the month, most changes were moderate and areas that are significantly deeper than a month ago reflect water management and the recent rainfall. In the "1 Year" inset we see continue to see the difference between current depth conditions and post Hurricane Irma's lessening impact on water depths a year ago. Compared to last year on this date, stages are higher in WCA-3A North and lower in WCA-3A South, these differences are ecologically favorable as we look to protect peat soils in the north of WCA-3A and moderate the flooding of tree islands in the south.



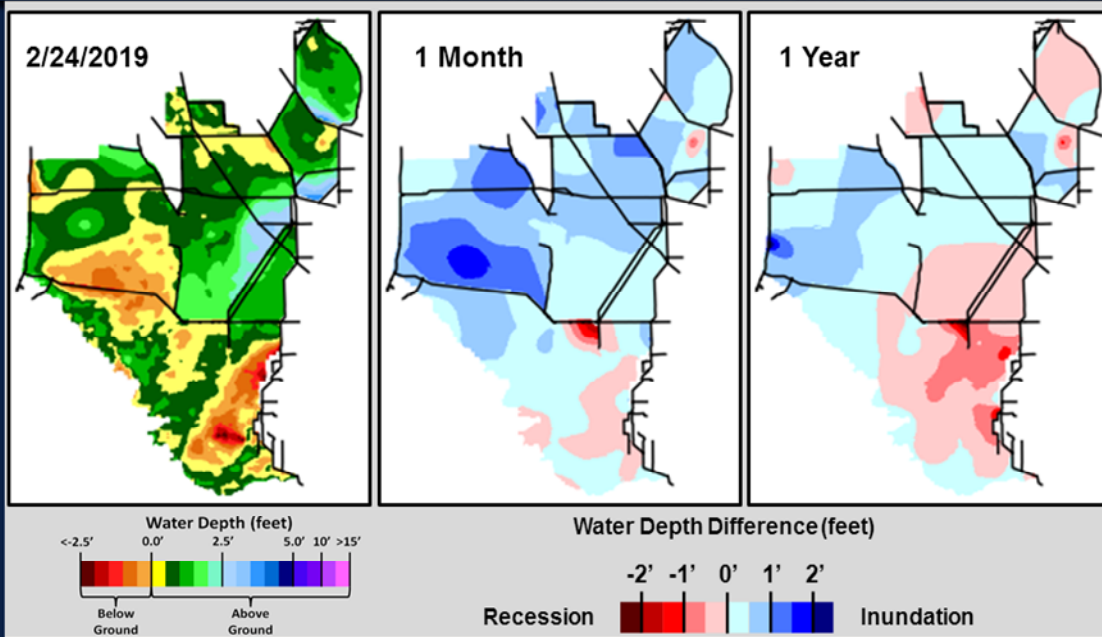
### SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)

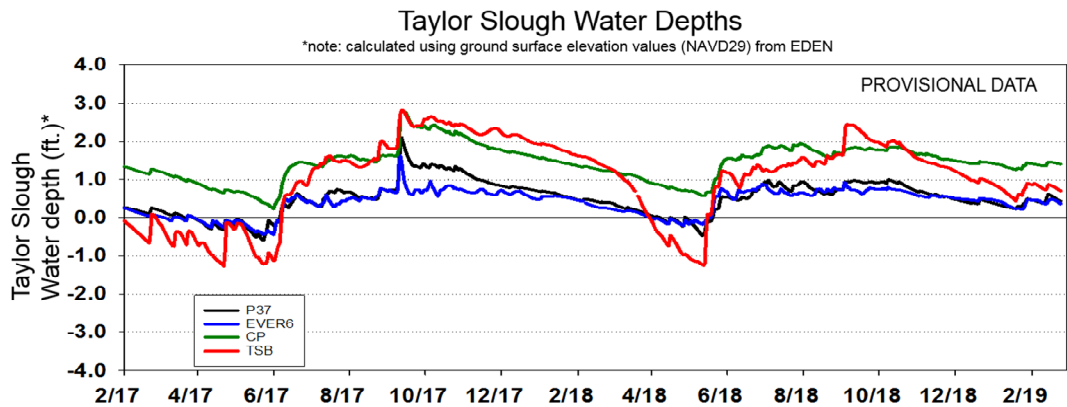
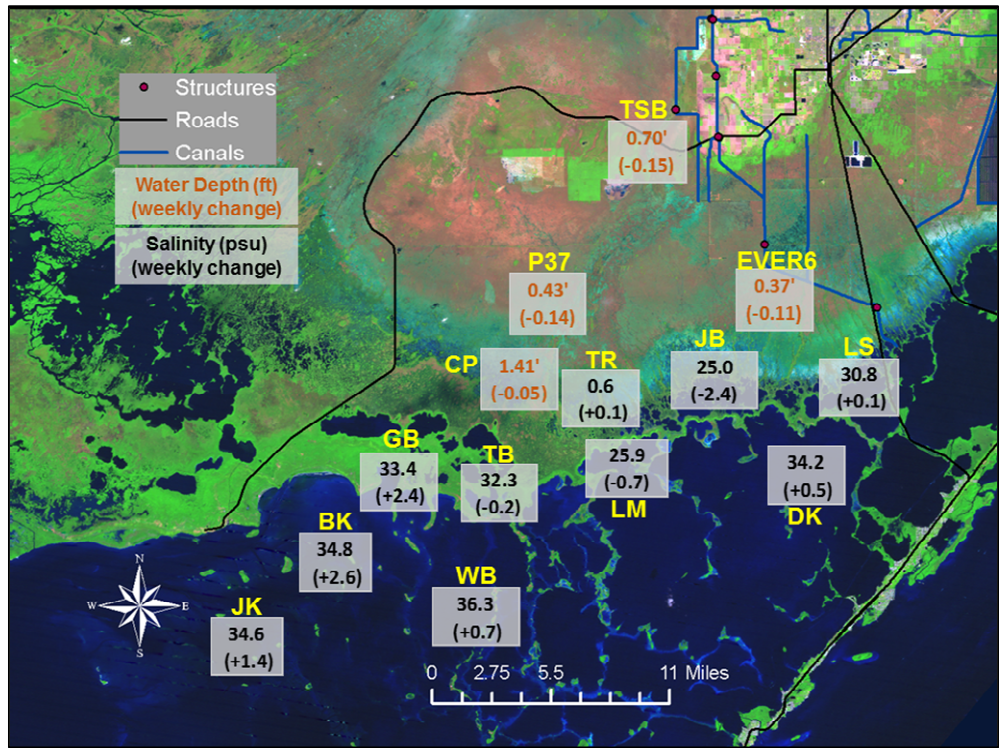


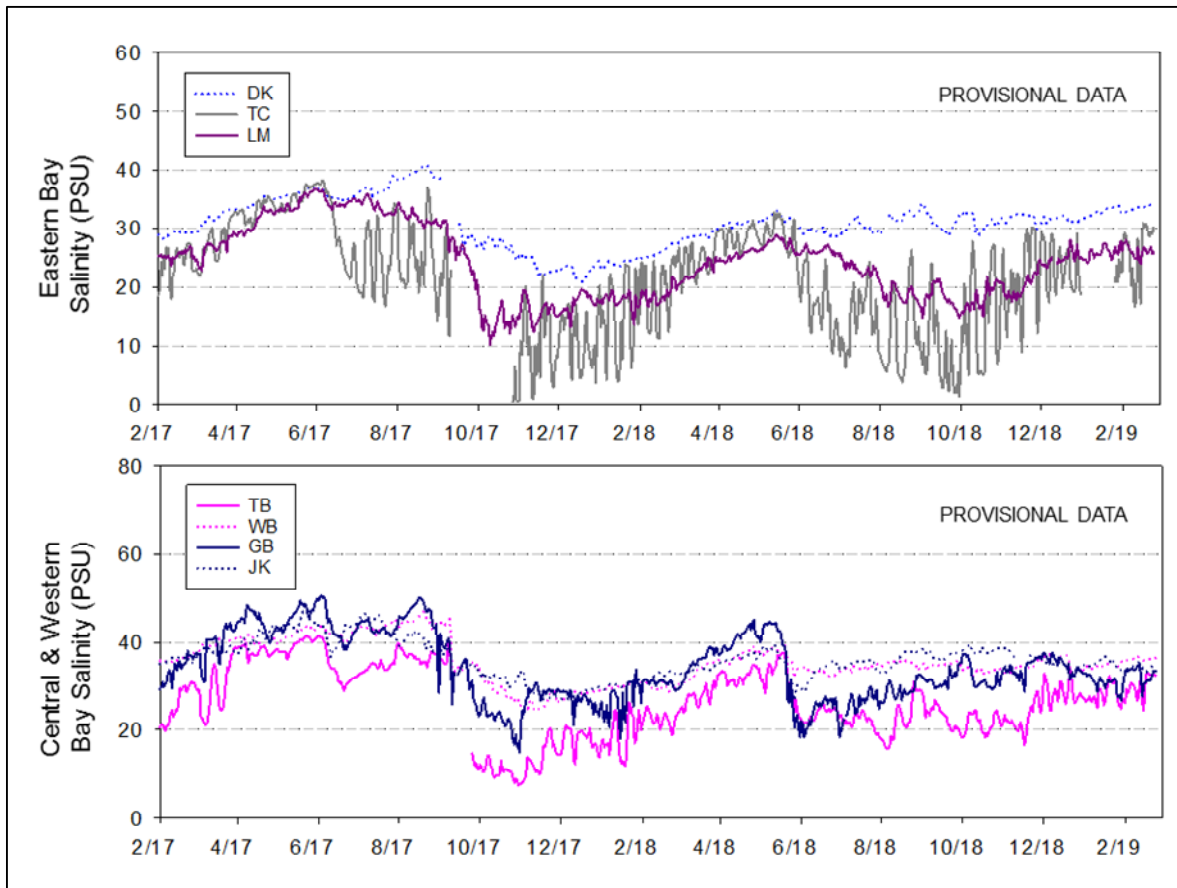
### SFWDAT Everglades Difference Maps (Present - Past)



South Florida Water Depth Assessment Tool (SFWDAT)

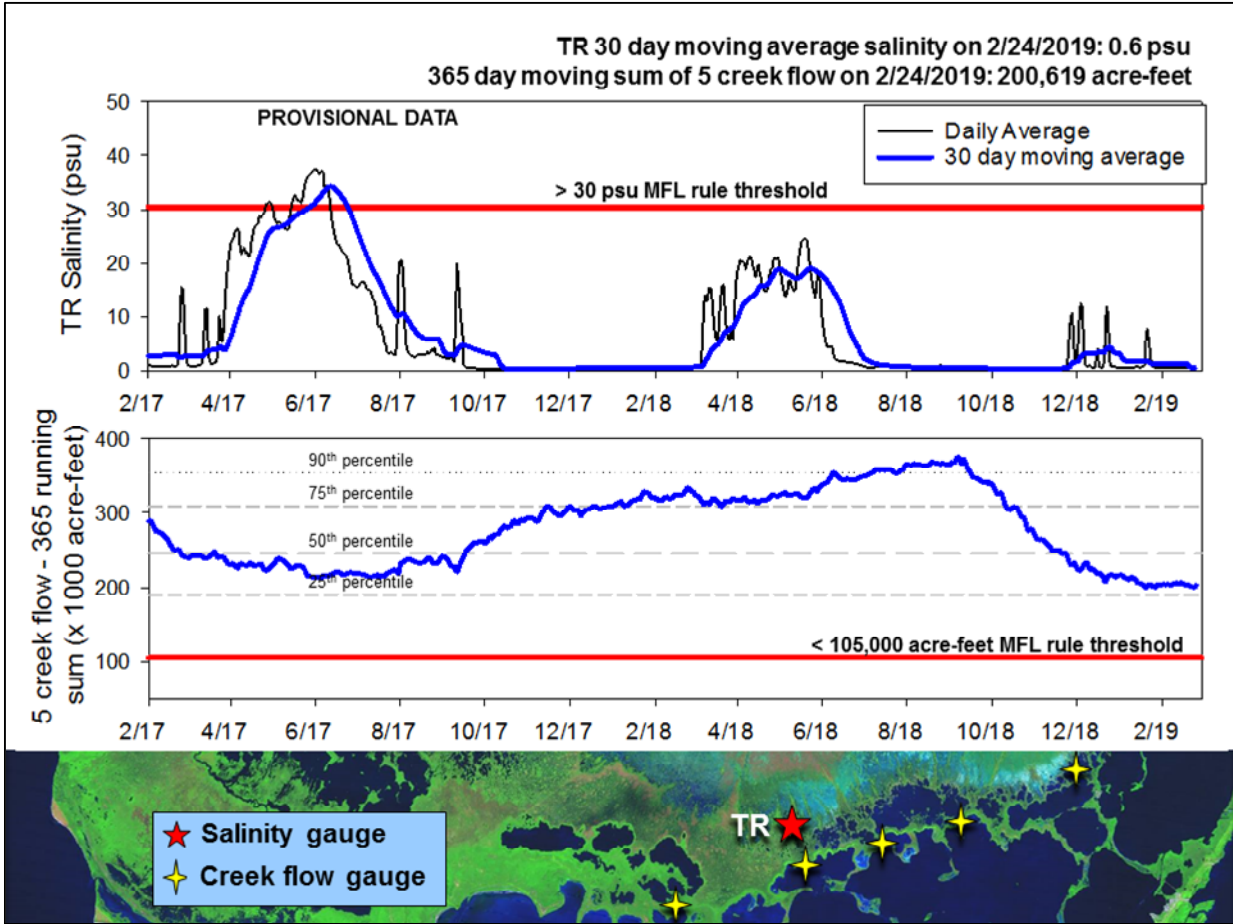
Taylor Slough Water Levels: Less than 0.1 inches of rain fell on Taylor Slough and Florida Bay this past week allowing water depths to decrease an average of 0.09 feet. Water depths averaged 0.77 feet across Taylor Slough by Sunday. Conditions are 5 inches above average for this time of year with northern Taylor Slough staying the furthest from average. Florida Bay Salinities: Average salinity in Florida Bay increased by 0.5 psu this last week with individual station changes ranging from a decrease of 2 psu to an increase of 3 psu. Daily average salinities ranged from 25 psu in the northeast to 36 psu in the central bay and remain about 4 psu above average for this time of year.





Florida Bay MFL: Salinity in the mangrove zone increased slightly to 0.6 psu. The 30-day moving average decreased from 1.3 psu to 0.6 psu over the last week. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about -500 acre-feet with several changes in flow direction suggesting that this past week experienced mostly slosh. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) has decreased slightly to 200,619 acre-feet (less than the long-term average of 257,628 acre-feet and approaching the 25th percentile). Creek flow is provisional data from the USGS and is highly variable.





**Water Management Recommendations**

Keeping rainfall/freshwater in the Everglades system while protecting a dry season recession is a priority. Discharges into northern WCA-3A, Holey Land and Rotenberger remain ecologically beneficial and an ecological priority. As northeastern WCA-3A North has reached depths typical for this time of year, discharges into northwestern WCA-3A North and south from WCA-3A have downstream ecological benefit. While very low numbers of wading birds have been noted foraging in the WCAs and expectations are for lower than average nesting success. WCA-2A has the potential to support nesting colonies in WCA-1 and WCA-3A. Due to the unusual climatic conditions and a recession at Gauge 2-17 that exceeded the rate which has been determined to be optimal for wading bird foraging for the last two weeks, a careful recession is recommended in WCA-2A with the goal to reach suitable wading bird foraging depths within the next month and not too fast as to over drain the area. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

## SFWMD Everglades Ecological Recommendations, February 26th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage decreased by 0.09'	Maintain depths at regulation schedule.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage decreased by 0.19'	Moderate recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week.	Protect conditions that provide wading bird foraging habitat later into the nesting season.
WCA-2B	Stage decreased by 0.03'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage increased by 0.06'	Maintain depths at regulation schedule.	Protect habitat including <u>peat soil</u> development, tree islands and wildlife. Hydration provided to this area continues to have high ecological value.
WCA-3A NW	Stage decreased by 0.10'	Maintain depths at regulation schedule.	
Central WCA-3A S	Stage remained unchanged	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
Southern WCA-3A S	Stage decreased by 0.12'		
WCA-3B	Stage decreased by 0.06'	Maintain depths at temporary regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
ENP-SRS	Stage increased by 0.15'	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 -0.15'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP.
FB- Salinity	Salinity changes ranged -2.4 to +2.6 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.