

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:** February 19, 2019

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

### **Summary**

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

A strong low- to mid-level ridge of high pressure extending from the western Atlantic to Florida should persist in roughly the same position through this weekend. This feature is blocking the southward progress of a weak cold front over the northern portion of the District this morning and should cause the boundary to retreat as a warm front by this afternoon and move to the north of the District by this evening. Plentiful low-level moisture and weakly convergent low-level winds along the boundary should help to trigger some shower activity north of Lake Okeechobee and especially over the upper Kissimmee Valley this morning and afternoon, with any rains generally shifting northward along with the front. However, drier air aloft and weak atmospheric instability should continue to be limiting factors that would keep rains from becoming widespread and rainfall maxima under a half to possibly two-thirds of an inch. Dry conditions are expected elsewhere across the District through this evening, but light shower activity could develop or reach portions of the east coast of Florida overnight in association with a surge of low-level moisture. The dominant low- to mid-level ridge east of Florida should steer the next storm system over the southern Plains into the Great Lakes Wednesday and Thursday, with its associated cold front stalling over the southern United States late this week. This weather pattern should favor a continuation of warm temperatures and below or even much below normal total District rainfall through the weekend, with Wednesday, Friday and Sunday possibly seeing a hundredth or less of area-wide accumulation each day. Thursday and Saturday could be a little more active, due to a more southerly low-level flow and enhanced moisture across the area, but total District rainfall is not expected to reach the daily climatological value of 0.07 inches on either day. Another weak cold front is forecast to press southward to just north of the District or over the far northern portion of the District on Monday next week which could result in some increase of rains. The most likely scenario however would be for the front to stall to the north of the area and for the relatively dry pattern from this week to extend into the early part of next week. For the week ending next Tuesday morning, the deterministic total District quantitative precipitation forecast (QPF) is about 0.15 inches or a little less than 30 percent of normal, while the probabilistic model output favors a slightly wetter week with a likely value of just under 0.25 inches and an even chance that the total would approach 0.33 inches. The wetter distribution of possible outcomes could be a result of somewhat greater rains than currently forecast on Saturday and could also be connected to the uncertainty regarding next Monday's forecast. Regardless, the theme for the week is for below or much below normal rainfall and a continuation of a long streak of days since mid-month with little rain.

## **Kissimmee**

Tuesday morning stages were 57.0 feet NGVD (1.0 feet below schedule) in East Lake Toho, 53.9 feet NGVD (1.1 feet below schedule) in Toho, and 50.7 feet NGVD (0.9 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.2 feet NGVD at S-65A and 25.9 feet NGVD at S-65D. Tuesday morning discharges were 2,812 cfs at S-65, 2,741 cfs at S-65A, 3,422 cfs at S-65D and 3,055 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 4.7 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 1.37 feet. No new recommendations this week.

## **Lake Okeechobee**

Lake Okeechobee stage is 12.84 feet NGVD, increasing 0.14 feet from the previous week, after decreasing by 0.03 feet the week before. The Lake is 0.52 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 above average rainfall associated with a weak El Niño 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 574 cfs over the past week with 0 cfs coming from Lake Okeechobee. Over the past week, salinity decreased 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 averaged 2,269 cfs over the past week with 483 cfs coming from the Lake. Over the past week, surface salinity decreased slightly in the upper estuary (Ft. Myers and up) due to increased releases at S-79 but increased slightly in the lower estuary probably due to wind events and tide. The 30-day moving average surface salinity is 1.1 at Val I-75 and 4.5 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass. Salinity conditions are in the good range for adult eastern oysters at Cape Coral and Shell Point. 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.

## **Stormwater Treatment Areas**

Over the past week, the STAs received approximately 8,000 acre-feet of Lake releases. The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 1,436,000 acre-feet, which includes approximately 373,000 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. This week, if Lake releases are sent to the WCAs and conditions allow, releases will be sent to STA-1E, STA-2 and STA-3/4.

## **Everglades**

The WCAs received on average 1.14 inches of rainfall last week. Stage changes across the Everglades were relatively uniform this week with WCA-2A being the exception as it was the only basin to experience a decline in stage. WCA-2A remains above schedule but is receding quickly. Canal stage at Gauge S11B\_HW rose quickly to equalize with the marsh and is now receding quickly, with the marsh stage at Gauge 2-17 following at a slower rate but in excess of the recommended recession rate of up to 0.09 feet per week. Flows into northern WCA-3A and Holey Land and Rotenberger Wildlife Management Areas continue to be ecologically beneficial. As these areas reach depths typical for this time of year, water released south from WCA-3A has increased ecological benefit downstream. Taylor Slough stages remain above average for this time of year which is ecologically beneficial. Salinity in Florida Bay increased 1 psu on average this week. Flows from the five creeks were negative due to wind and tide last week and remain just above the 25th percentile.

## Supporting Information

### KISSIMMEE BASIN

#### Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.97 inches of rainfall in the past week and the Lower Basin received 1.23 inches (SFWMD Daily Rainfall Report 2/18/2018).

#### 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: 2/19/2019**

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)						
							2/17/19	2/10/19	2/3/19	1/27/19	1/20/19	1/13/19	1/6/19
Lakes Hart and Mary Jane	S-62	177	LKMJ	61.0	R	61.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
Lakes Myrtle, Preston, and Joel	S-57	39	S-57	61.2	R	61.1	0.1	0.1	0.0	-0.2	0.0	0.1	0.0
Alligator Chain	S-60	0	ALLI	63.8	R	64.0	-0.2	-0.4	-0.5	-0.7	-0.8	-0.7	-0.7
Lake Gentry	S-63	39	LKGT	61.5	R	61.5	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0
East Lake Toho	S-59	700	TOHOE	57.0	R	58.0	-1.0	-0.8	-0.8	-0.5	-0.5	-0.4	0.0
Lake Toho	S-61	1,635	TOHOW, S-61	54.0	R	55.0	-1.0	-0.9	-0.8	-0.7	-0.5	-0.4	-0.5
Lakes Kissimmee, Cypress, and Hatchineha	S-65	3,220	KUB011, LKIS5B	50.7	R	51.7	-1.0	-1.0	-1.1	-1.5	-1.7	-1.8	-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: 2/19/2019

		1-Day Average		Average for the Preceding 7-Days <sup>1</sup>								
Metric	Location	2/17/2019	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	12/16/18
Discharge (cfs)	S-65	2,892	3,220	2,653	1,615	950	392	343	273	277	253	301
Discharge (cfs)	S-65A <sup>2</sup>	2,844	3,154	2,472	1,517	764	306	261	194	201	182	180
Discharge (cfs)	S-65D <sup>2</sup>	3,324	2,668	1,564	1,221	621	341	261	241	242	238	253
Headwater Stage (feet NGVD)	S-65D <sup>2</sup>	25.70	25.81	25.82	25.90	26.00	25.94	25.91	25.86	25.88	25.73	25.80
Discharge (cfs)	S-65E <sup>2</sup>	3,277	2,533	1,442	1,151	606	309	261	215	218	266	242
Discharge (cfs)	S-67	0	0	0	0	0	0	0	0	0	0	0
DO (mg/L) <sup>3</sup>	Phase I river channel	5.4	4.7	5.0	6.5	6.6	6.8	6.4	6.1	6.6	6.7	6.4
Mean depth (feet) <sup>4</sup>	Phase I floodplain	1.37	1.25	0.71	0.46	0.12	0.07	0.08	0.09	0.11	0.12	0.10

<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)

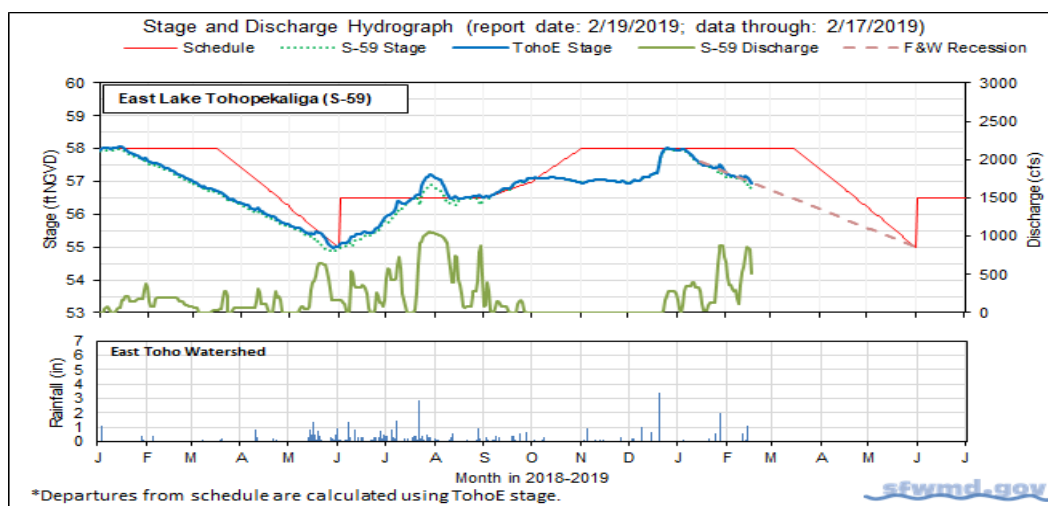


Figure 1.

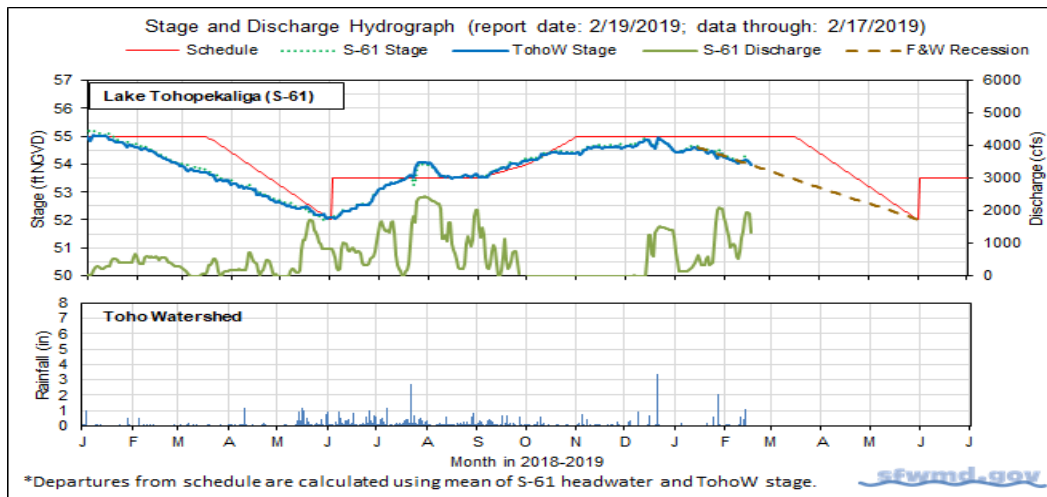


Figure 2.

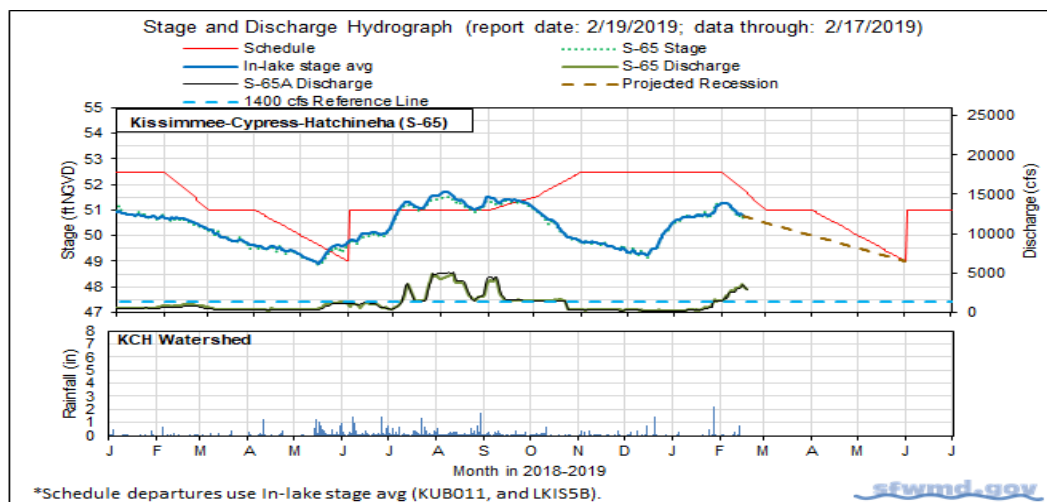


Figure 3.

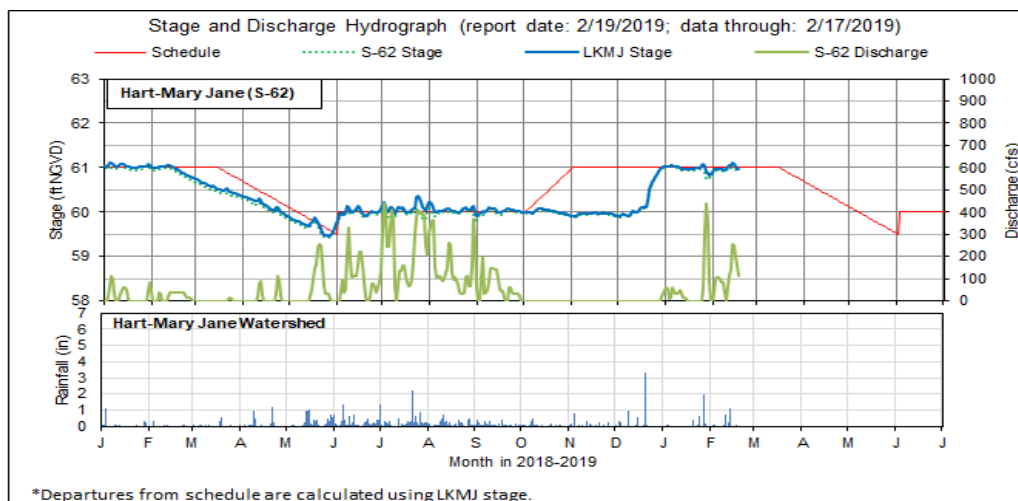


Figure 4.

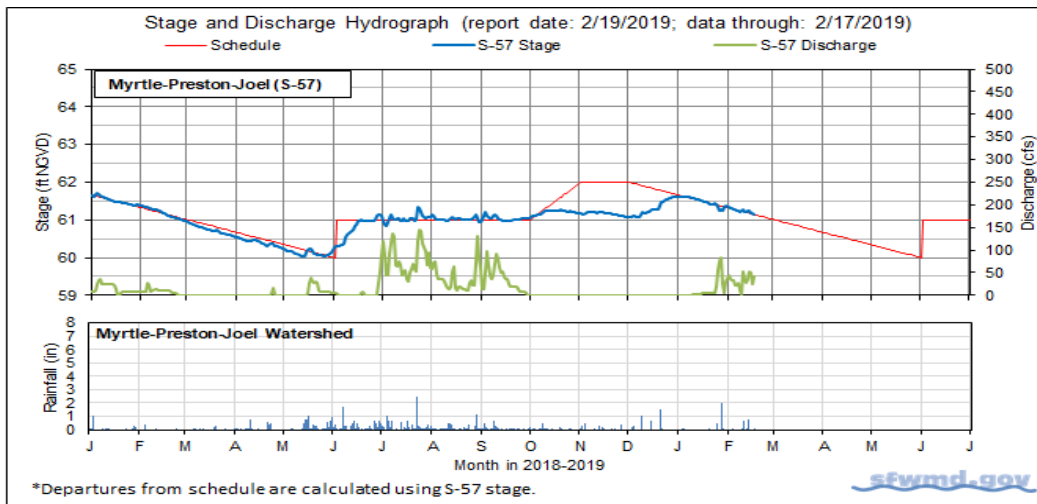


Figure 5.

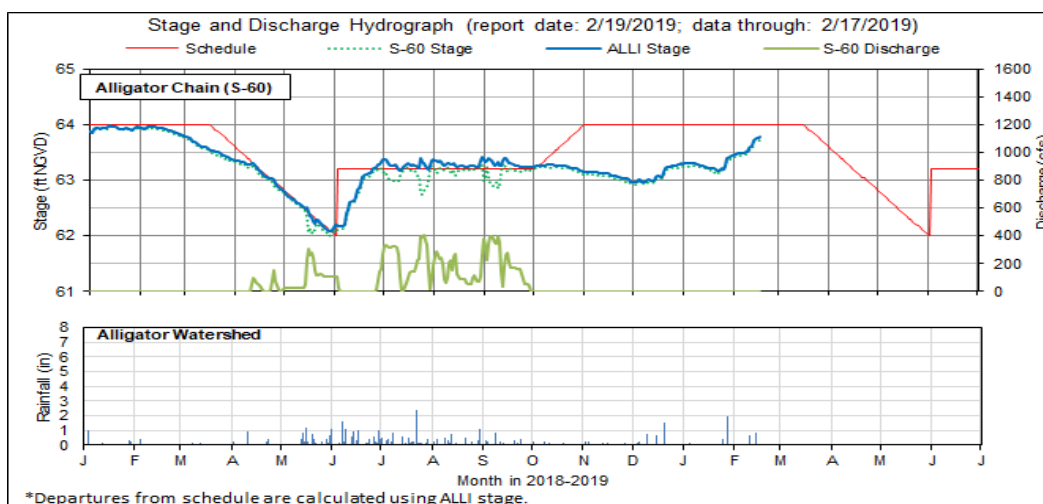


Figure 6.

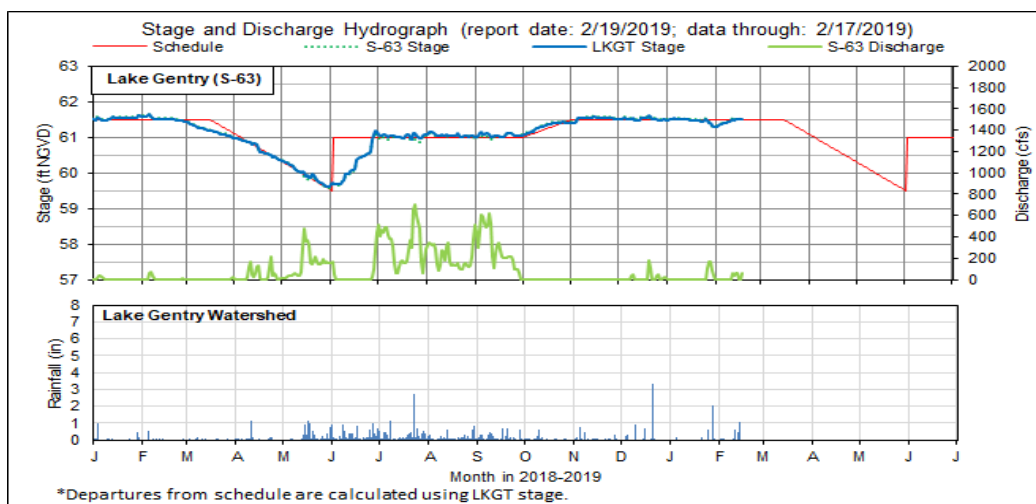
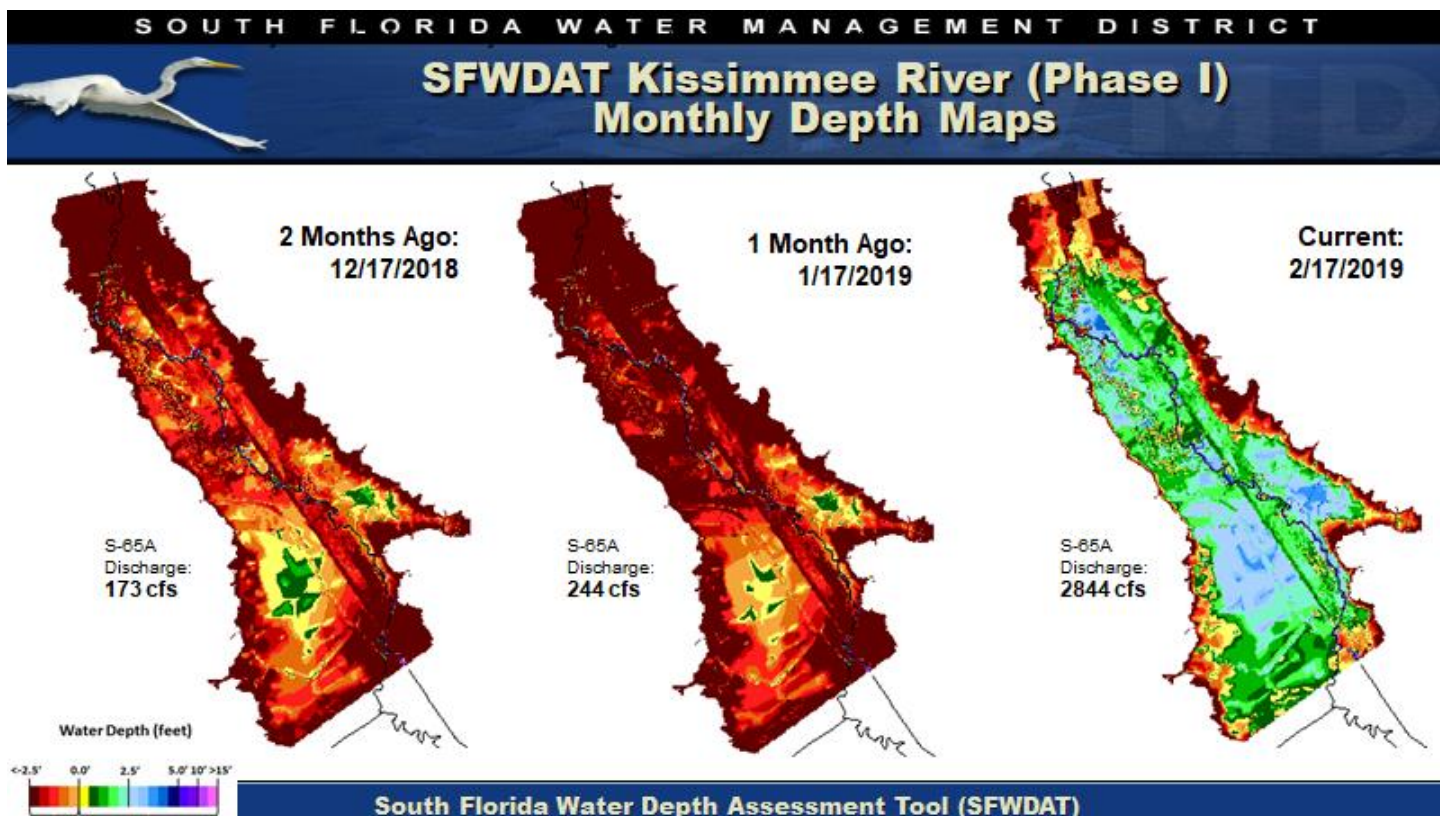
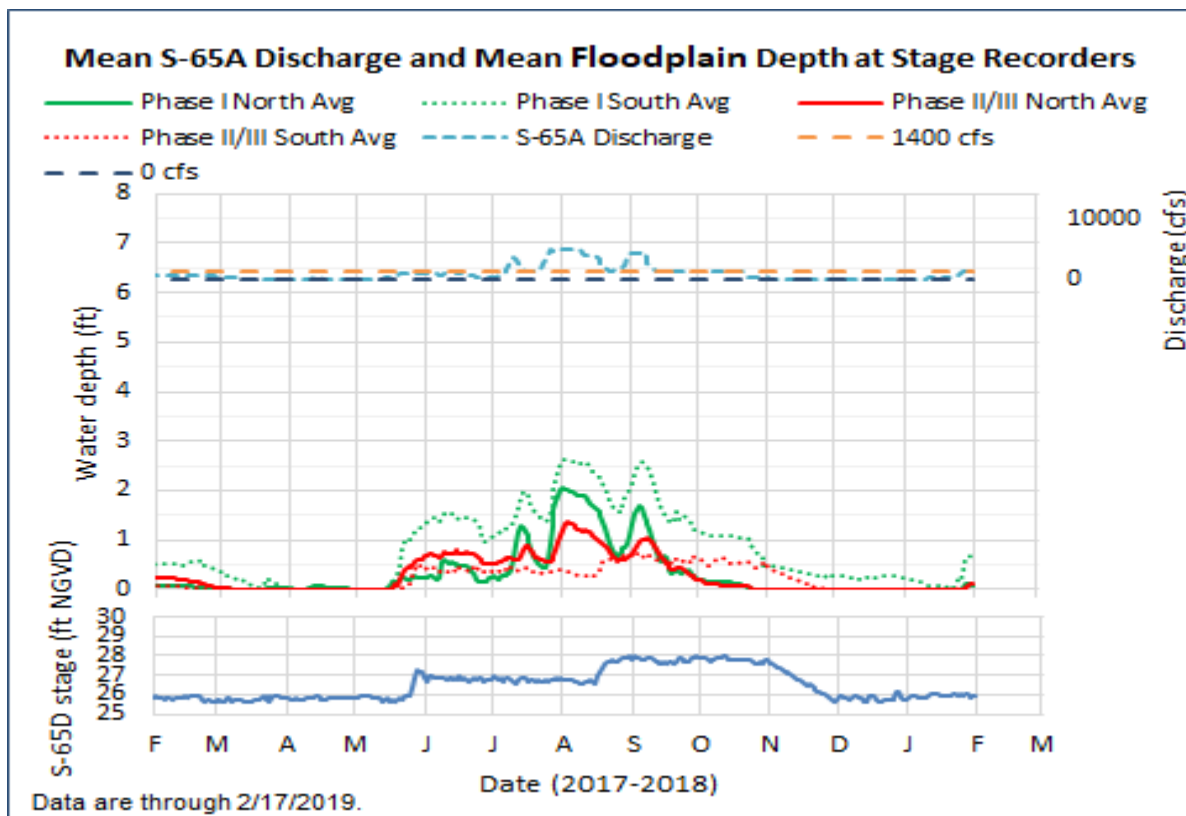


Figure 7.

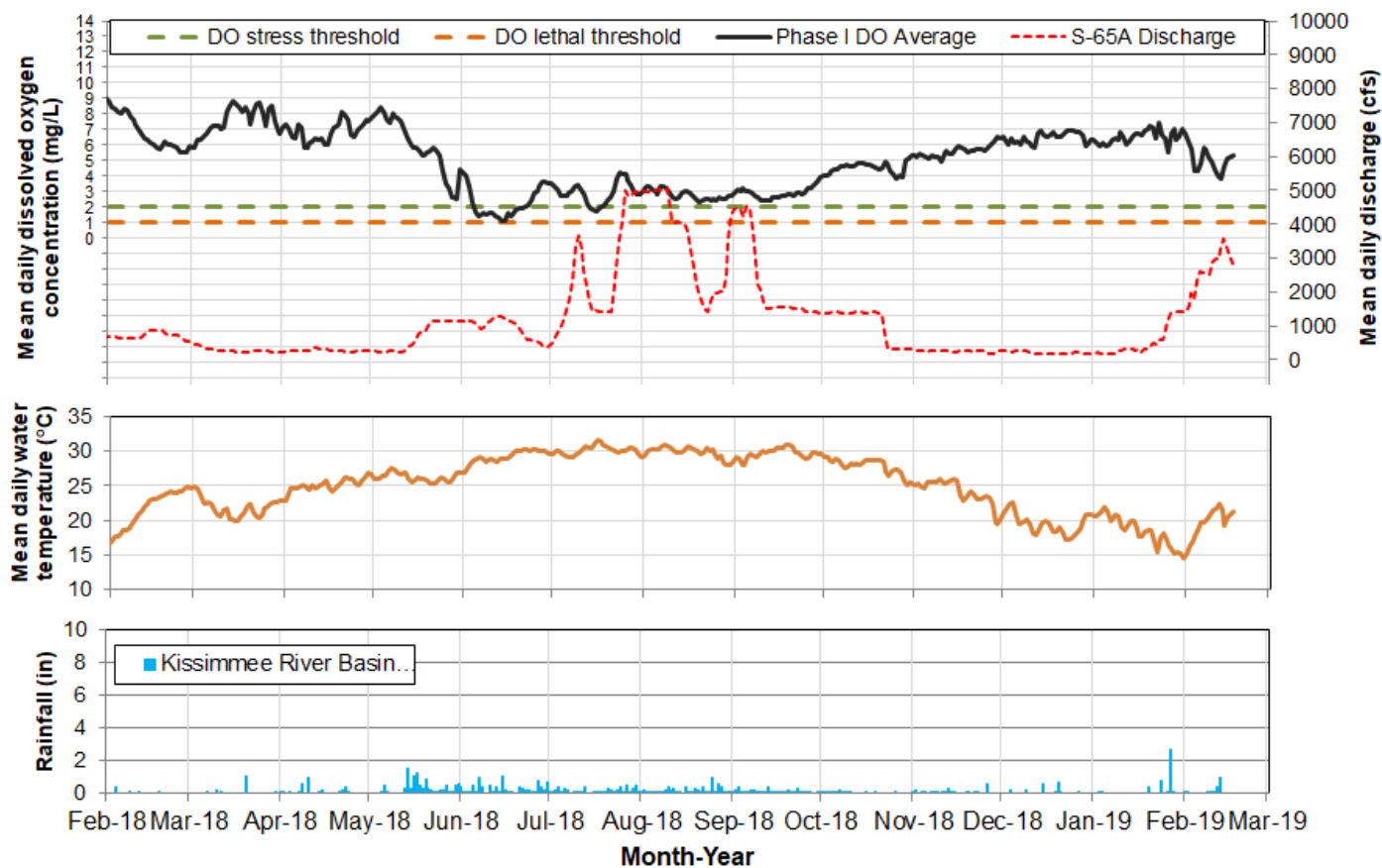


**Figure 8.** Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.



**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: 2/19/2019; data are through: 2/17/2019.

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

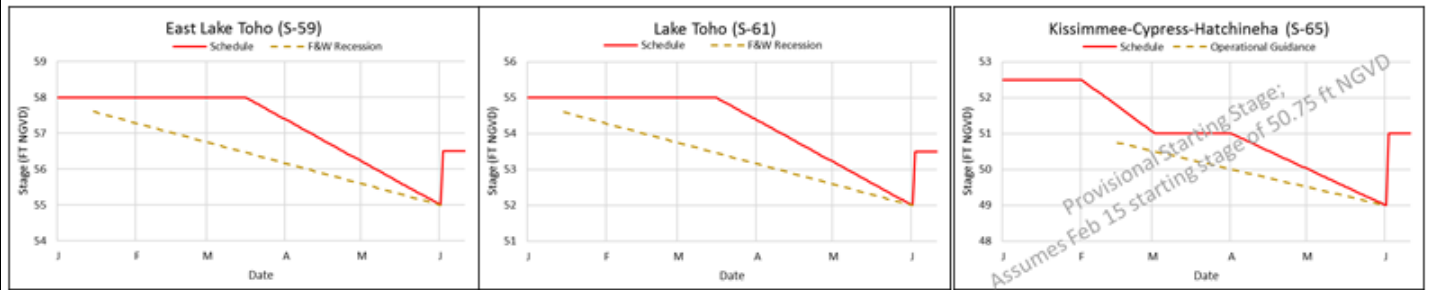


# Water Management Recommendations

## Kissimmee Basin Adaptive Recommendations and Operational Actions

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
2/19/2019	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 KRR 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
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

### 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

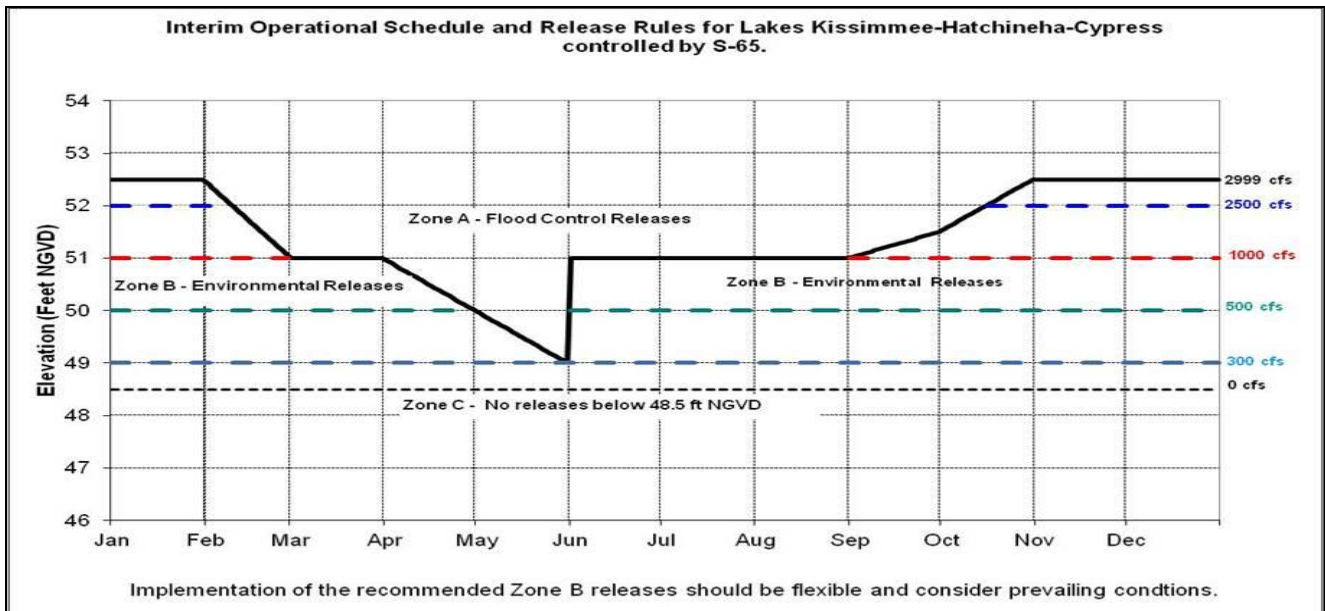
#### East Lake (ELT) and Toho (WLT)

- **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

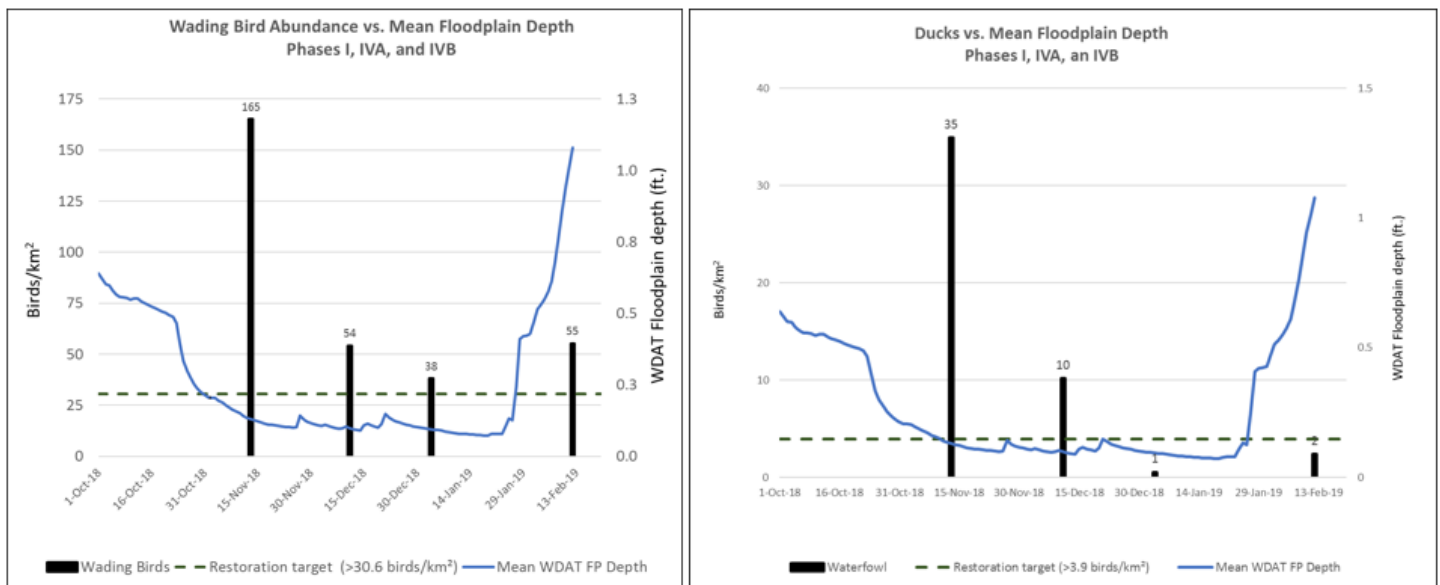
#### Kissimmee-Cypress-Hatchineha (KCH)

- **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.

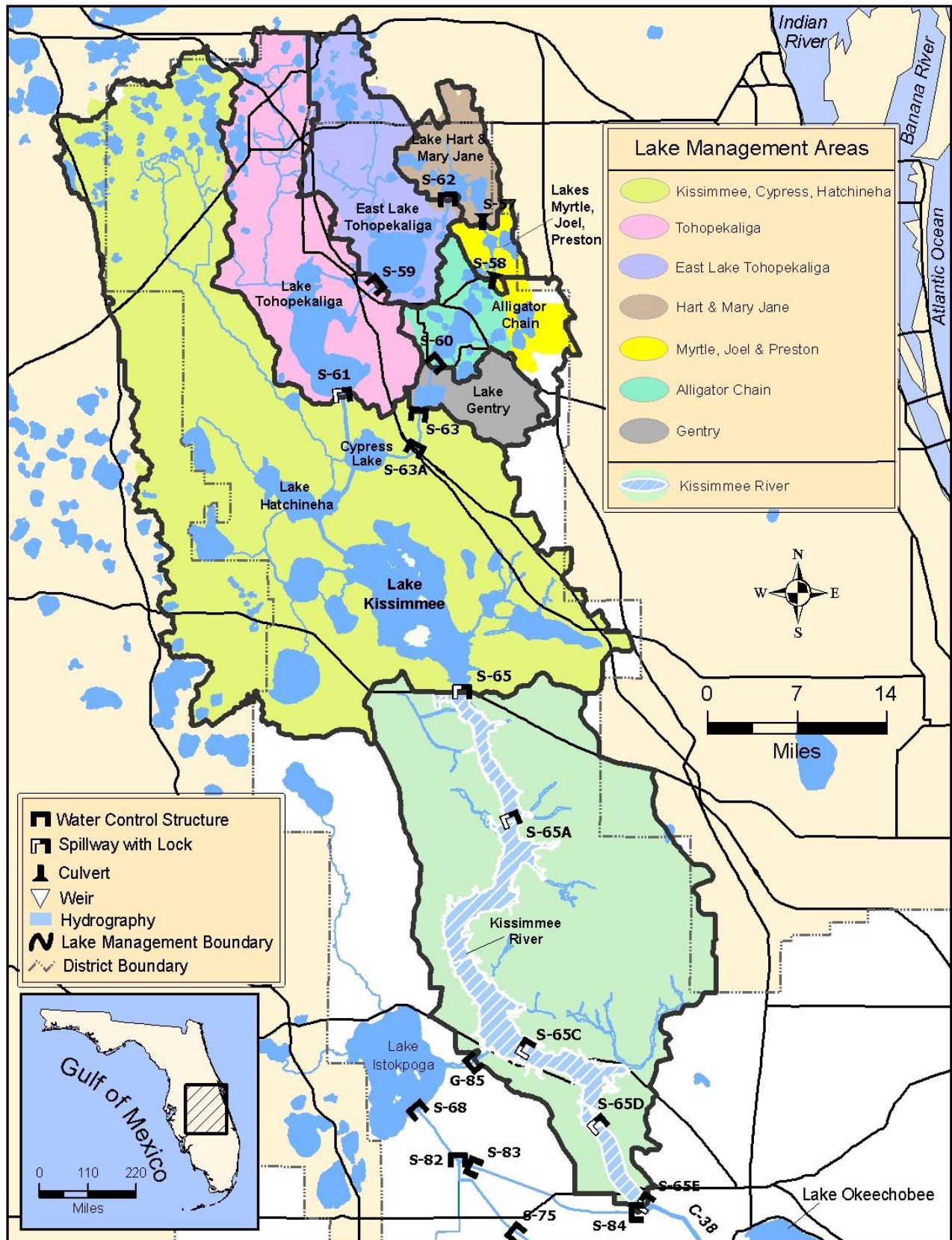


Figure 14. The Kissimmee Basin.



## **LAKE OKEECHOBEE**

According to the USACE web site, Lake Okeechobee stage is at 12.84 feet NGVD for the period ending at midnight on February 18, 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 0.52 feet higher than it was a month ago and 2.24 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 18 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 RAINДАР, 1.06 inches of rain fell directly over the Lake during the week of February 12 - 18, 2019. There was no rain over the Lake during the preceding week (February 5 - 11), but 3.69 inches fell in mid to late January (Figure 4). The upper Kissimmee Valley and the remainder of the watershed also received between 1 and 2 inches of rain.

Average daily inflows (minus rainfall) to the Lake were higher than last week at 3,475 cfs, compared to 2,011 cfs. The inflows from the Kissimmee River also increased, rising from 1,509 cfs to 2,723 cfs, whereas inflows from the remaining structures exhibited a more modest increase from the previous week (Table 1).

Total outflows (minus evapotranspiration) decreased from the previous week, going from 2,558 average daily cfs to 1,241 cfs this past week (Table 1). Outflows west via S-77 decreased from 765 cfs to 525 cfs and south outflows through the S-350 structures also decreased, going from 1,596 average daily cfs the previous week to 644 cfs this past week. The inflows through S-308 last week dropped from 134 cfs to 63 cfs. Outflows from the L-8 Canal (Culvert 10A) decreased from a daily average of 62 cfs to 9 cfs. The corrected average daily evapotranspiration value for the week based on the L006 weather platform solar radiation was 0.04 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 15, 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).

## **Water Management Recommendations**

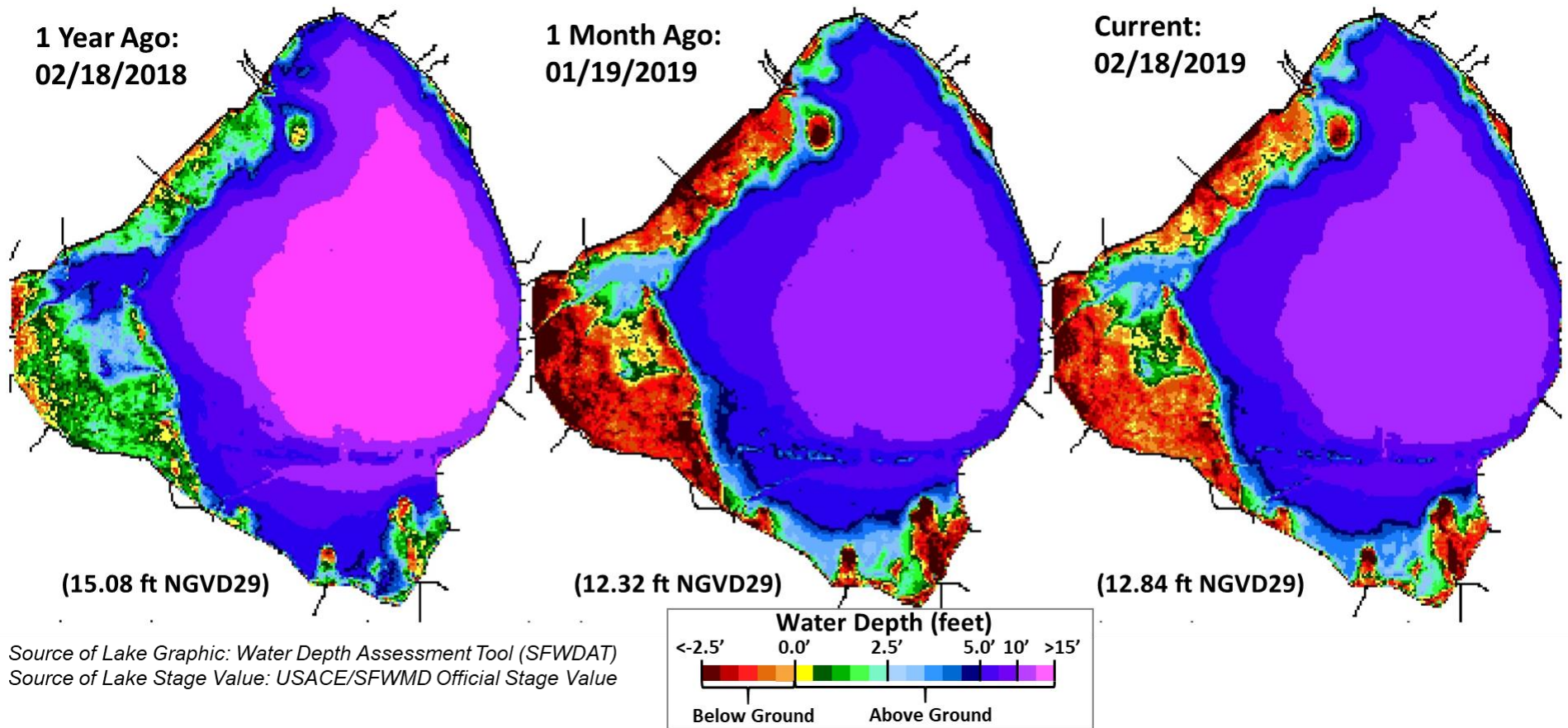
Lake Okeechobee stage is 12.84 feet NGVD, increasing 0.14 feet from the previous week, after decreasing by 0.03 feet the week before. The Lake is 0.52 feet higher than 30 days ago and remains in the Base Flow sub-band. However, the Lake is still more than 1 foot below the bottom of the ecological envelope, 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.

**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	1509	2723	1.2
S71 & 72	22	33	0.0
S84 & 84X	440	621	0.3
Fisheating Creek	37	45	0.0
S154	0	1	0.0
S191	1	0	0.0
S133 P	0	9	0.0
S127 P	0	4	0.0
S129 P	1	13	0.0
S131 P	2	12	0.0
S135 P	0	15	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	2405	1.1
<b>Total</b>	<b>2011</b>	<b>5880</b>	<b>2.6</b>

OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S77	765	525	0.2
S308	134	63	0.0
S351	631	240	0.1
S352	383	124	0.1
S354	582	280	0.1
L8 Outflow	62	9	0.0
ET	742	668	0.3
<b>Total</b>	<b>3299</b>	<b>1909</b>	<b>0.8</b>

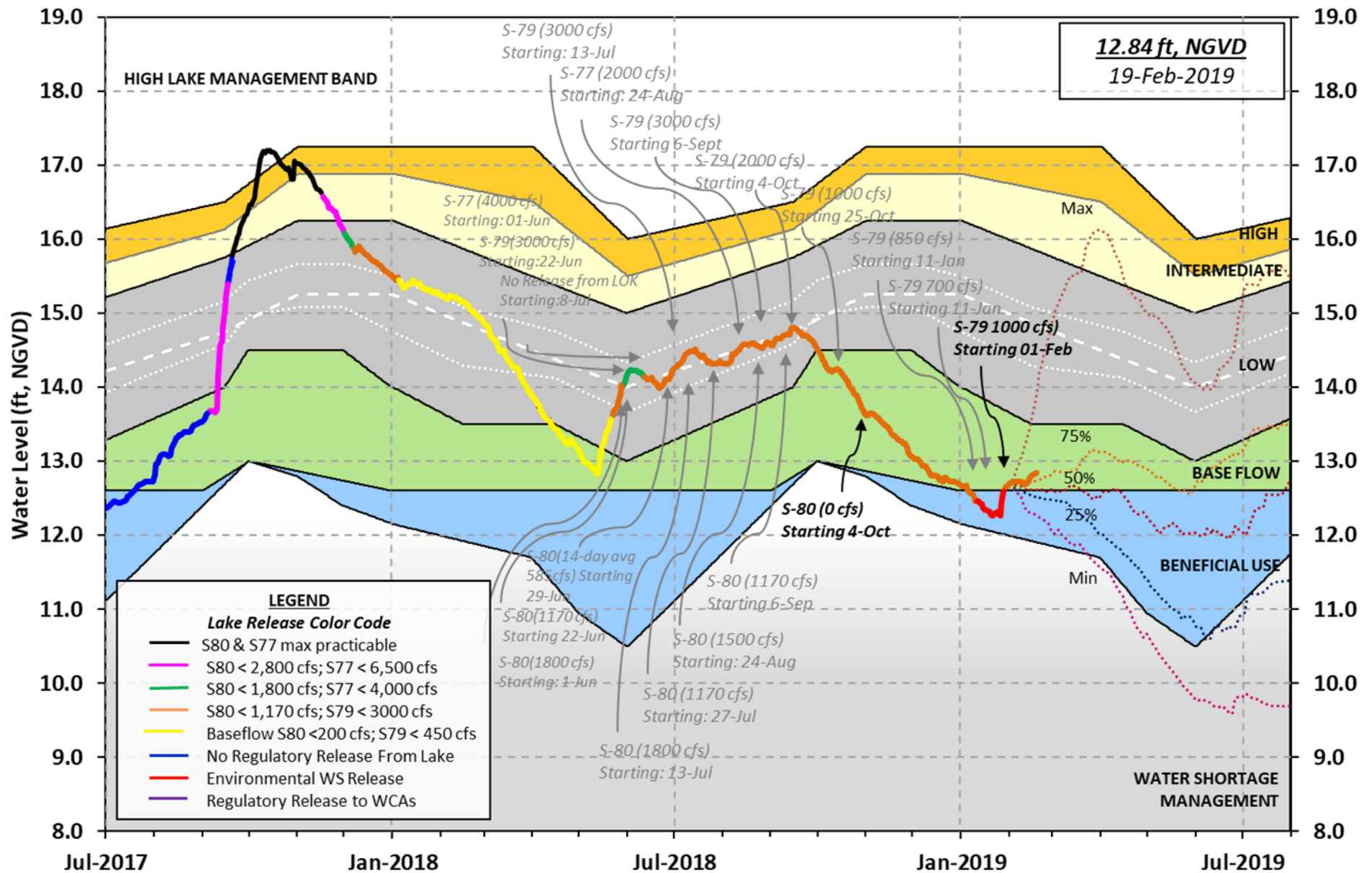
Provisional Data



**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



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

# Lake Okeechobee Water Level Comparison

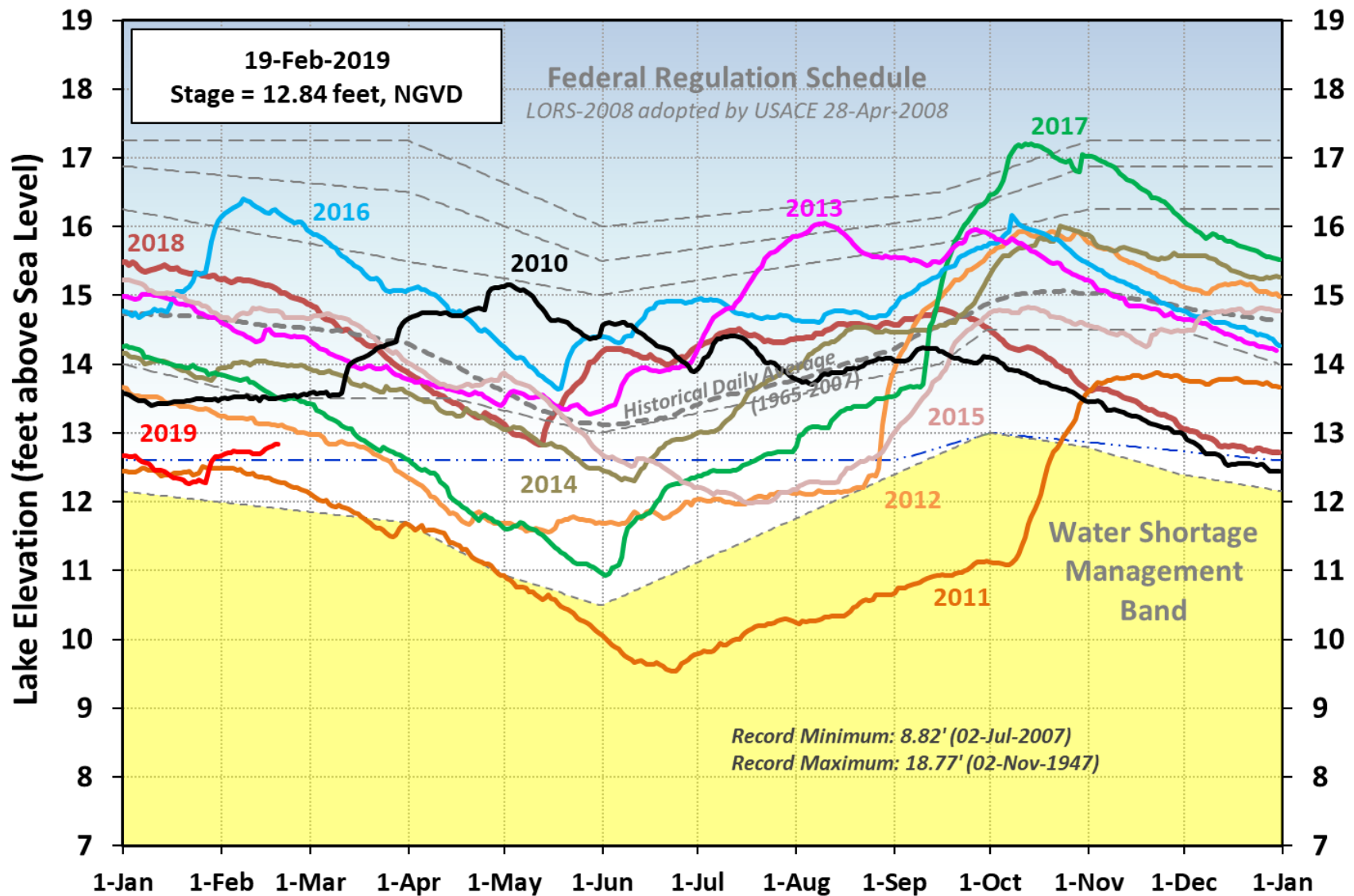
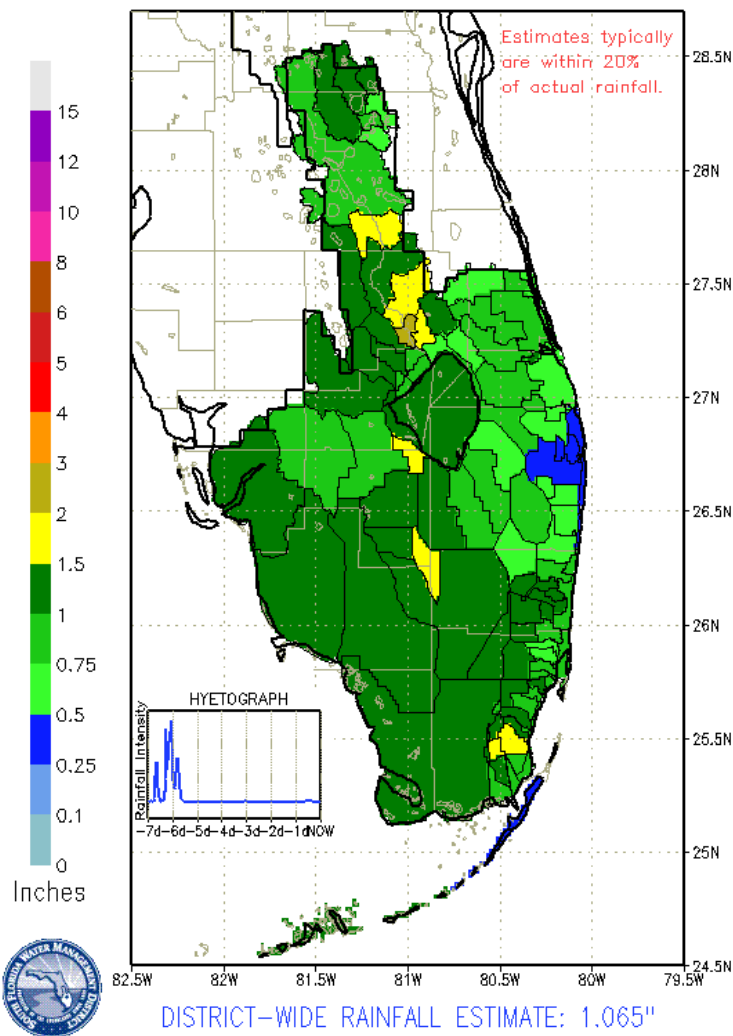


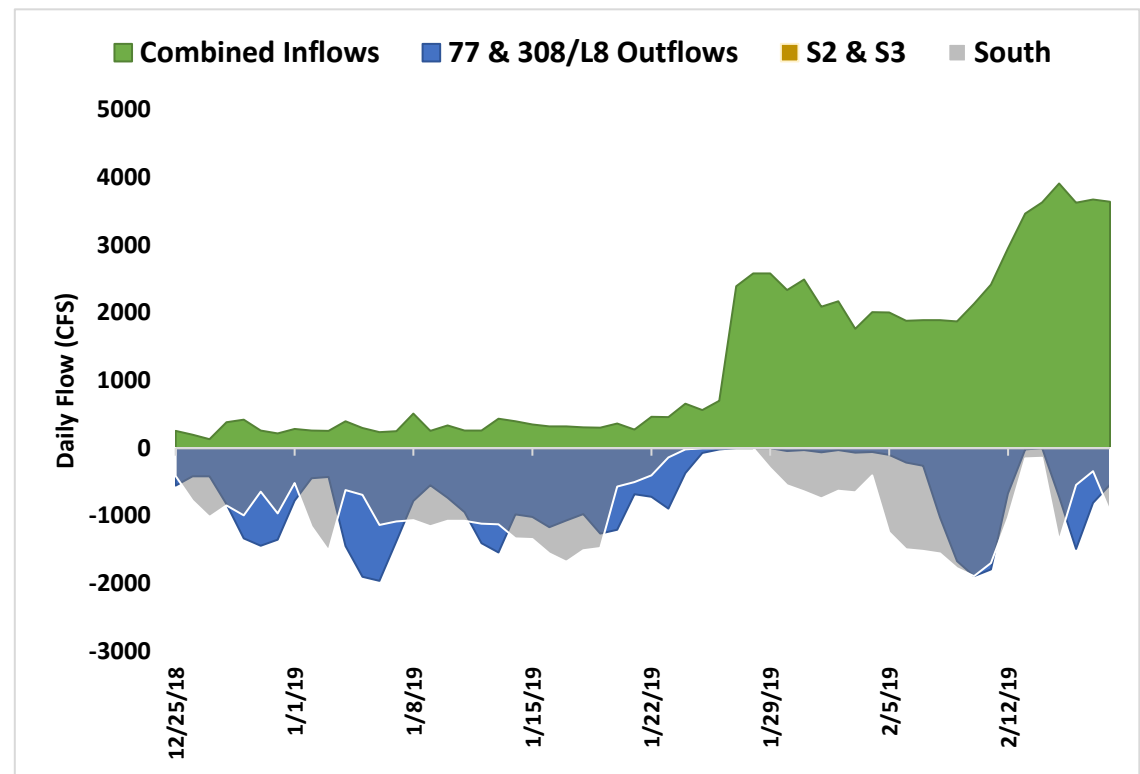
Figure 3. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

# SFWMD PROVISIONAL RAINFALL 7-DAY BASIN RAINFALL ESTIMATES

FROM: 0915 EST, 02/12/2019 THROUGH: 0915 EST, 02/19/2019

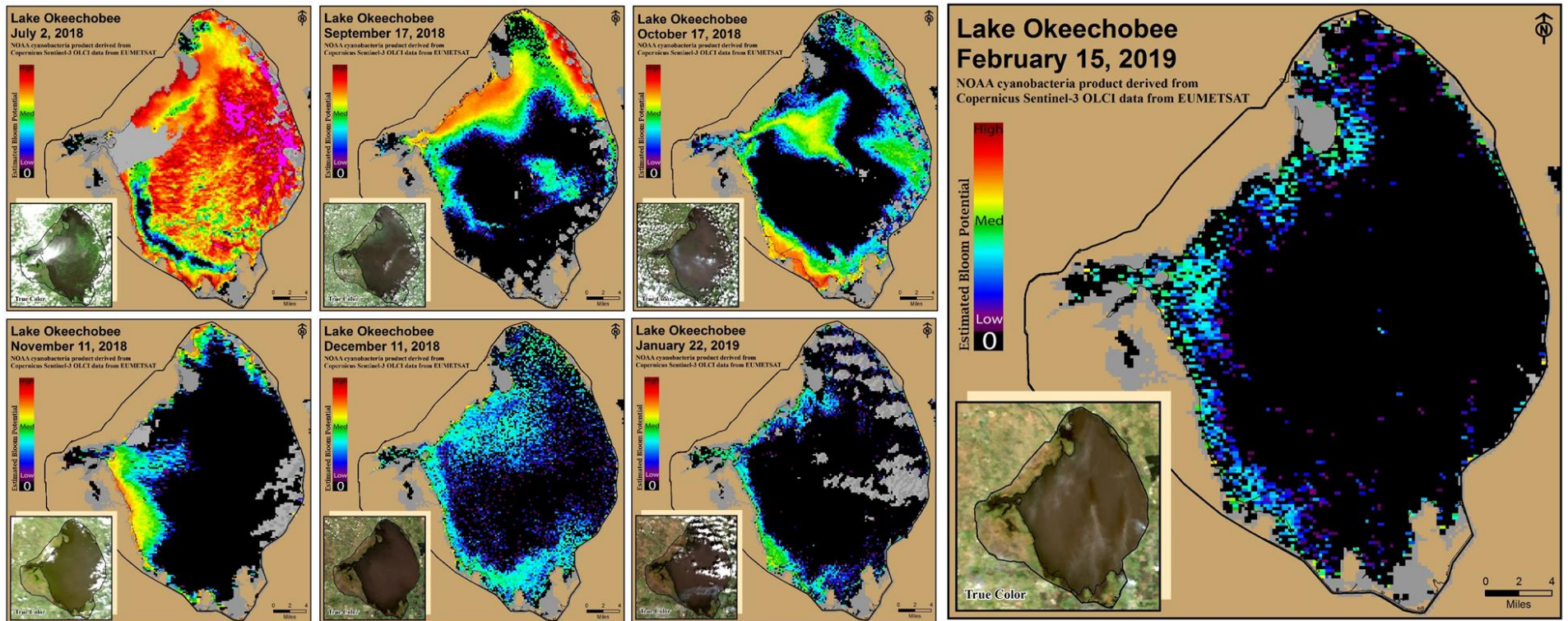


**Figure 4.** Rainfall estimates by basin.



**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 574 cfs (Figures 1 and 2) and last month inflow averaged about 652 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	268
S-80	0
S-308	63
S-49 on C-24	67
S-97 on C-23	92
Gordy Rd. structure on Ten Mile Creek	147

Over the past week, salinity decreased 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 17.8. 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.

<b>Sampling Site</b>	<b>Surface</b>	<b>Bottom</b>	<b>Envelope</b>
HR1 (North Fork)	<b>14.3</b> (15.2)	<b>17.2</b> (18.2)	NA <sup>1</sup>
US1 Bridge	<b>18.5</b> (19.0)	<b>17.0</b> (19.0)	10.0-26.0
A1A Bridge	<b>25.9</b> (EM <sup>2</sup> )	<b>27.8</b> (28.6)	NA <sup>1</sup>

<sup>1</sup>Envelope not applicable and <sup>2</sup>Equipment Malfunction.

### **Caloosahatchee Estuary:**

Last week total inflow to the Caloosahatchee Estuary averaged approximately 2,269 cfs (Figures 5 and 6) and last month inflow averaged about 2,411 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	496
S-78	888
S-79	1898
Tidal Basin Inflow	371

Over the past week in the estuary, salinity remained about the same at S-79, decreased to Ft. Myers Yacht Basin, and increased downstream (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 1.1 at Val I-75 and 4.5 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> (0.2)	<b>0.3</b> (0.2)	NA <sup>1</sup>
Val I75	<b>0.3</b> (0.4)	<b>0.3</b> (0.5)	0.0-5.0 <sup>2</sup>
Ft. Myers Yacht Basin	<b>2.9</b> (3.8)	<b>3.6</b> (4.8)	NA
Cape Coral	<b>10.7</b> (8.4)	<b>13.0</b> (11.0)	10.0-30.0
Shell Point	<b>22.4</b> (20.2)	<b>21.5</b> (19.4)	10.0-30.0
Sanibel	<b>NR</b> <sup>3</sup> (26.6)	<b>NR</b> (27.7)	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 1.5 to 4.5 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 650 cfs and Tidal Basin inflows of 265 cfs.

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

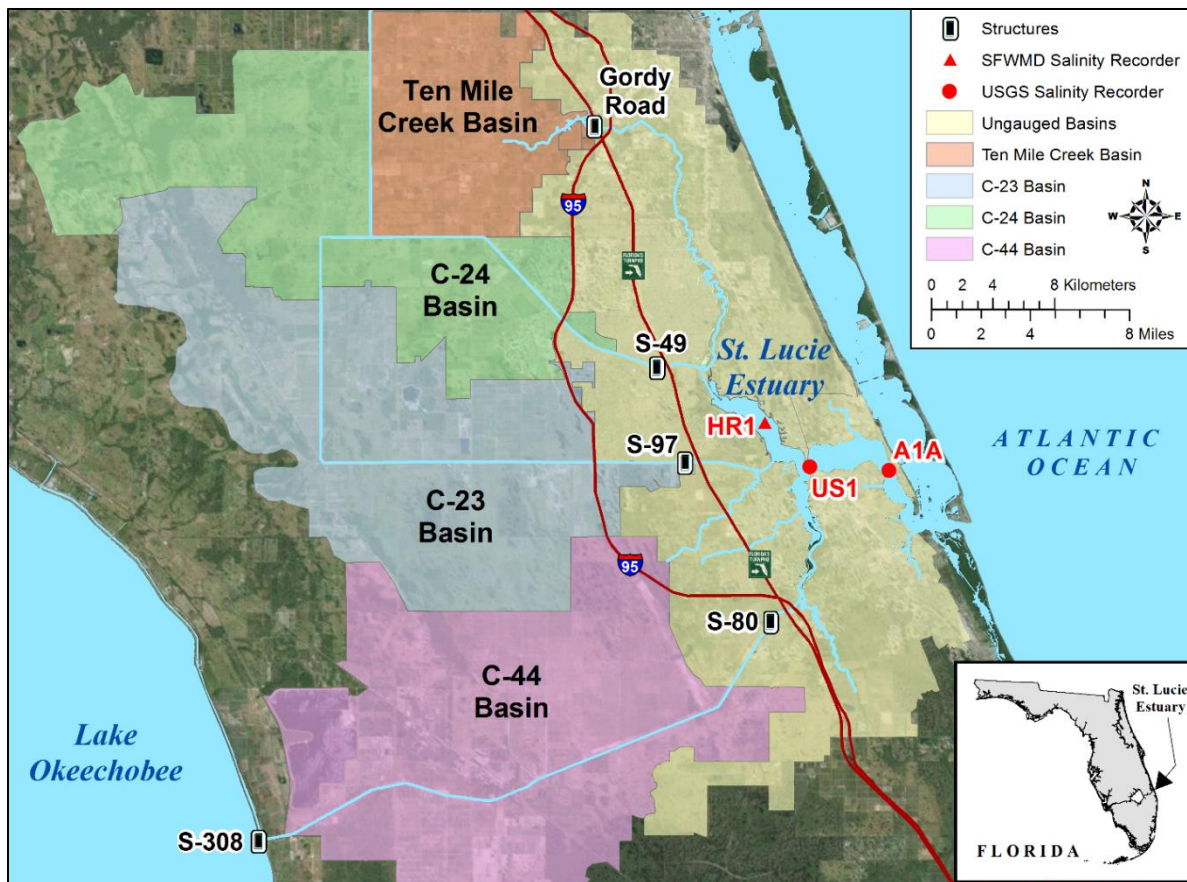
Scenario	Q79 (cfs)	TB runoff (cfs)	Daily salinity	30 day mean
A	0	265	4.5	1.3
B	300	265	2.7	0.8
C	375	265	2.1	0.6
D	450	265	1.9	0.6
E	650	265	1.5	0.5

#### Red tide:

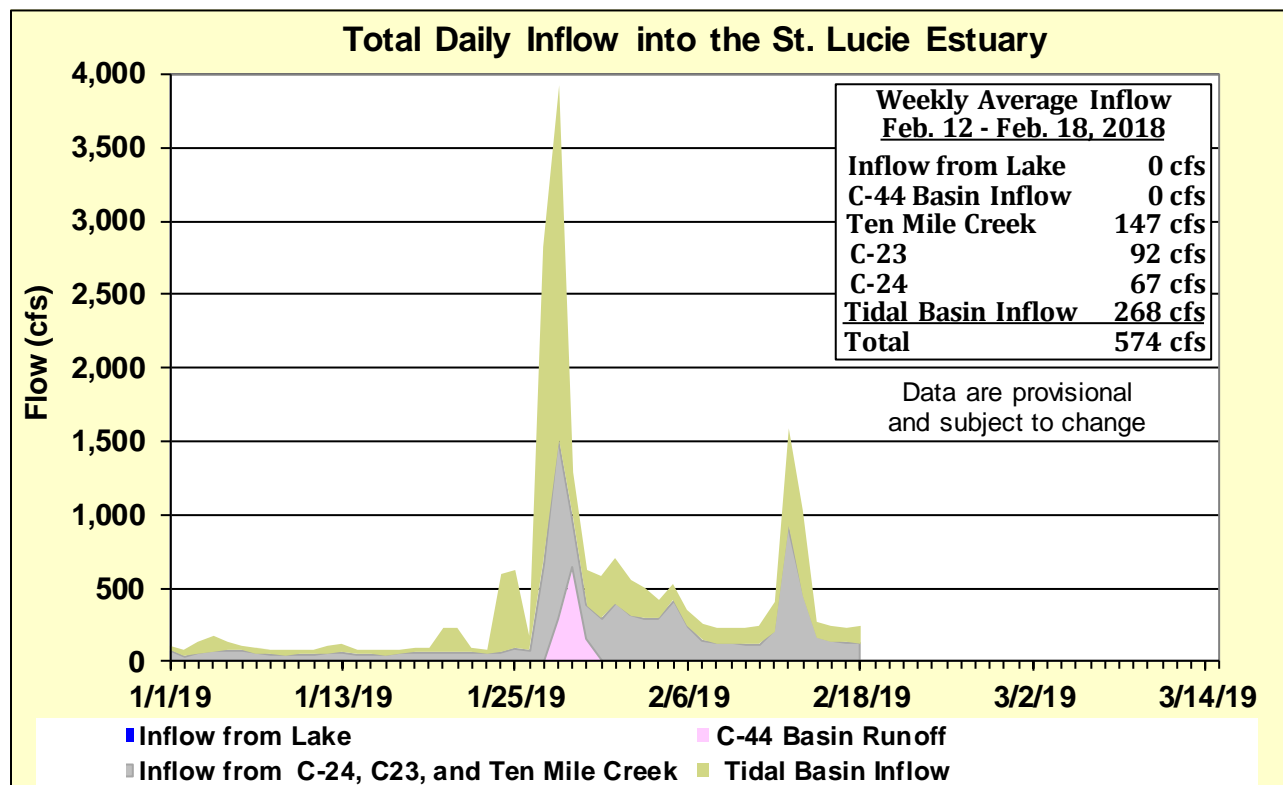
The Florida Fish and Wildlife Research Institute reported on February 15, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from or offshore of Lee County. *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from Palm Beach, Broward, or Miami-Dade counties. No samples were collected from St. Lucie or Martin counties 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 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.



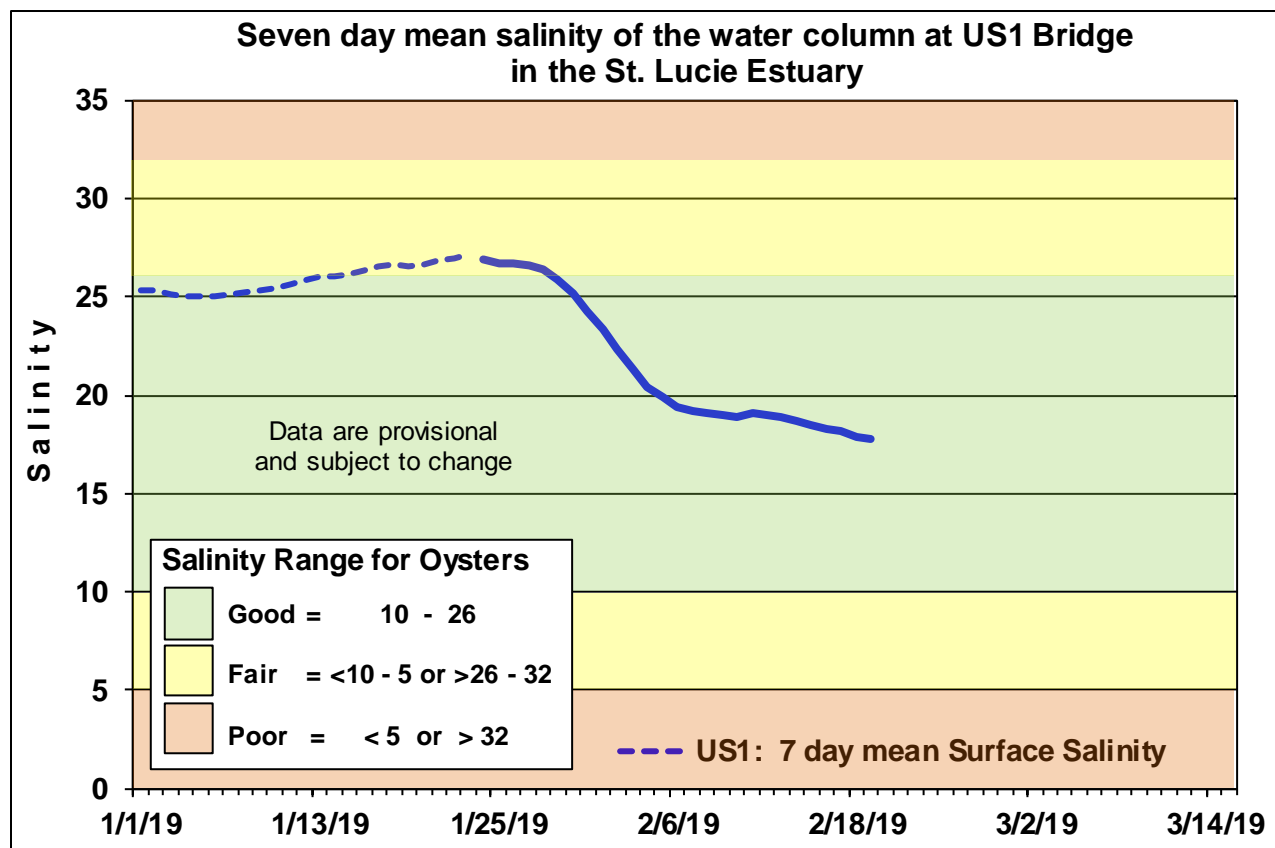


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

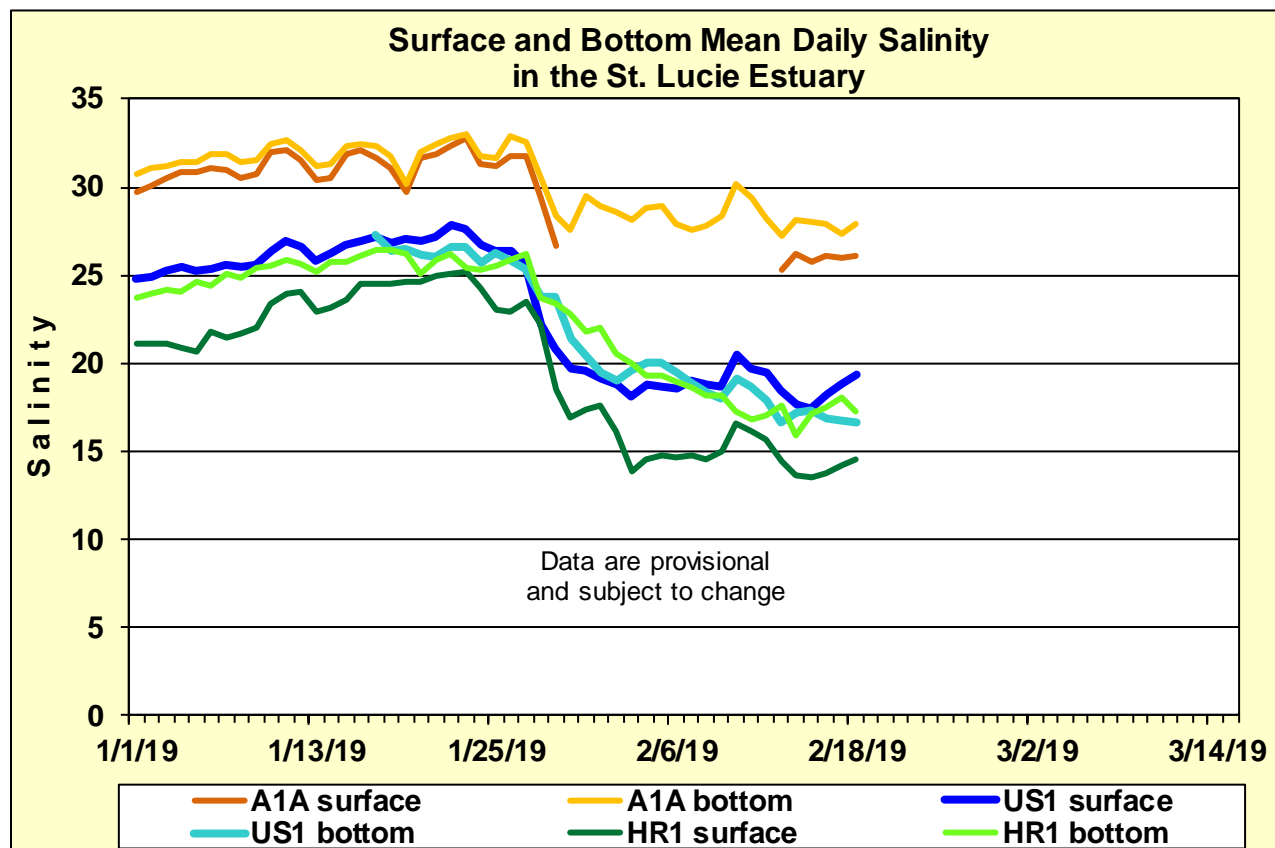
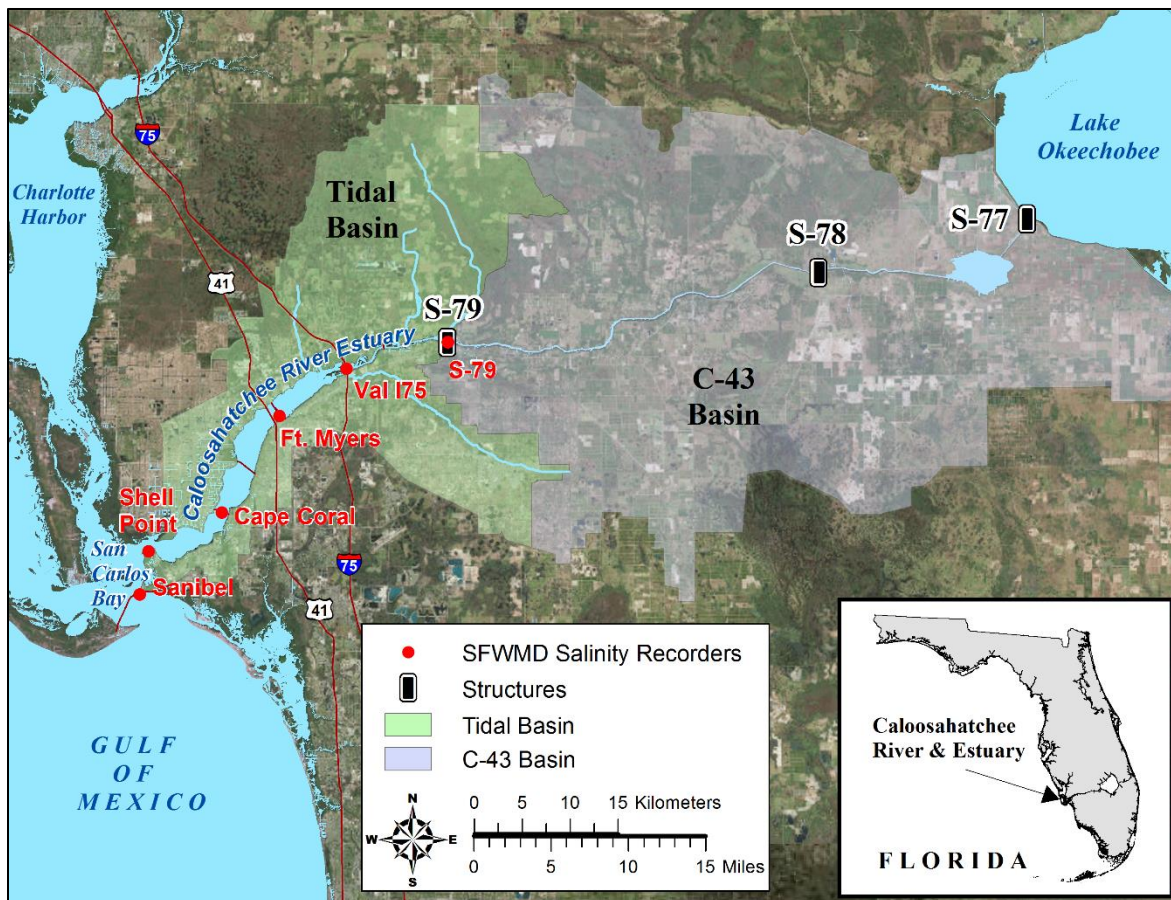
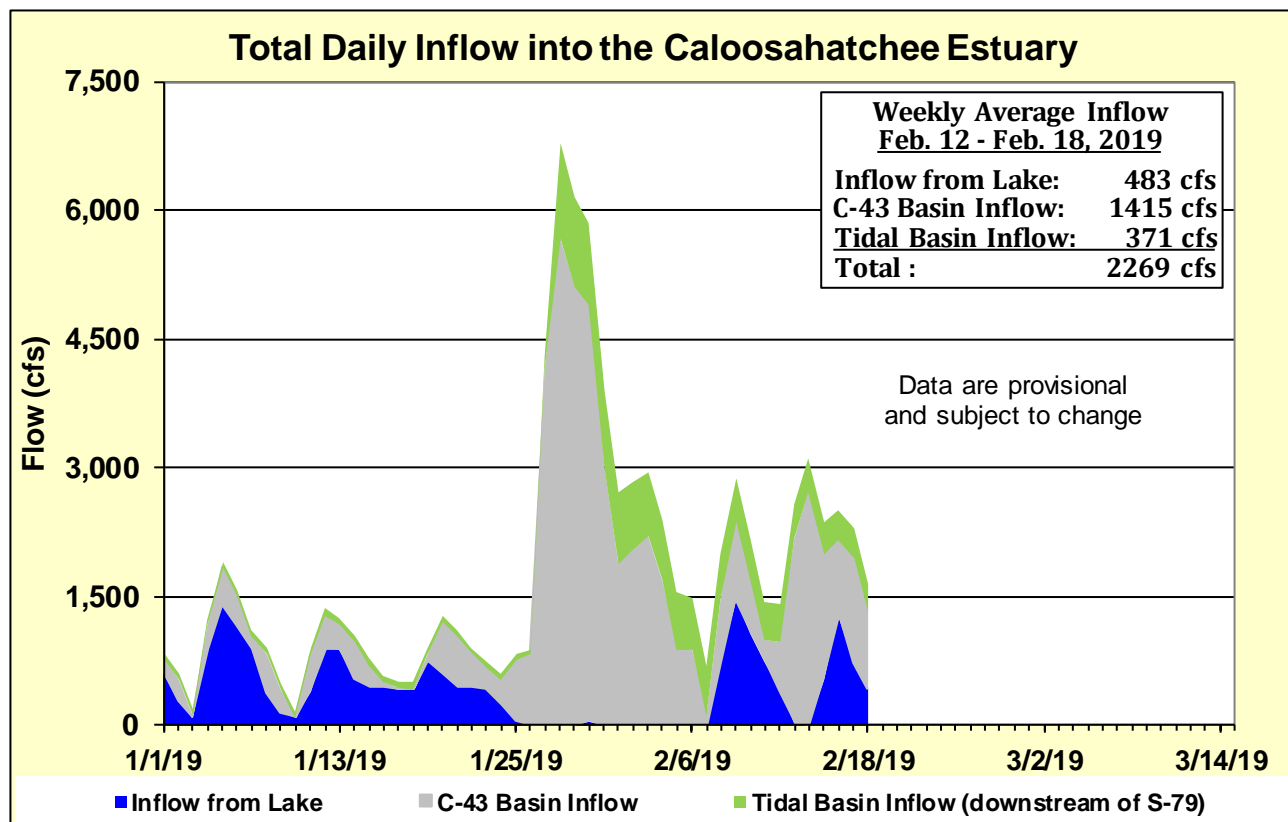


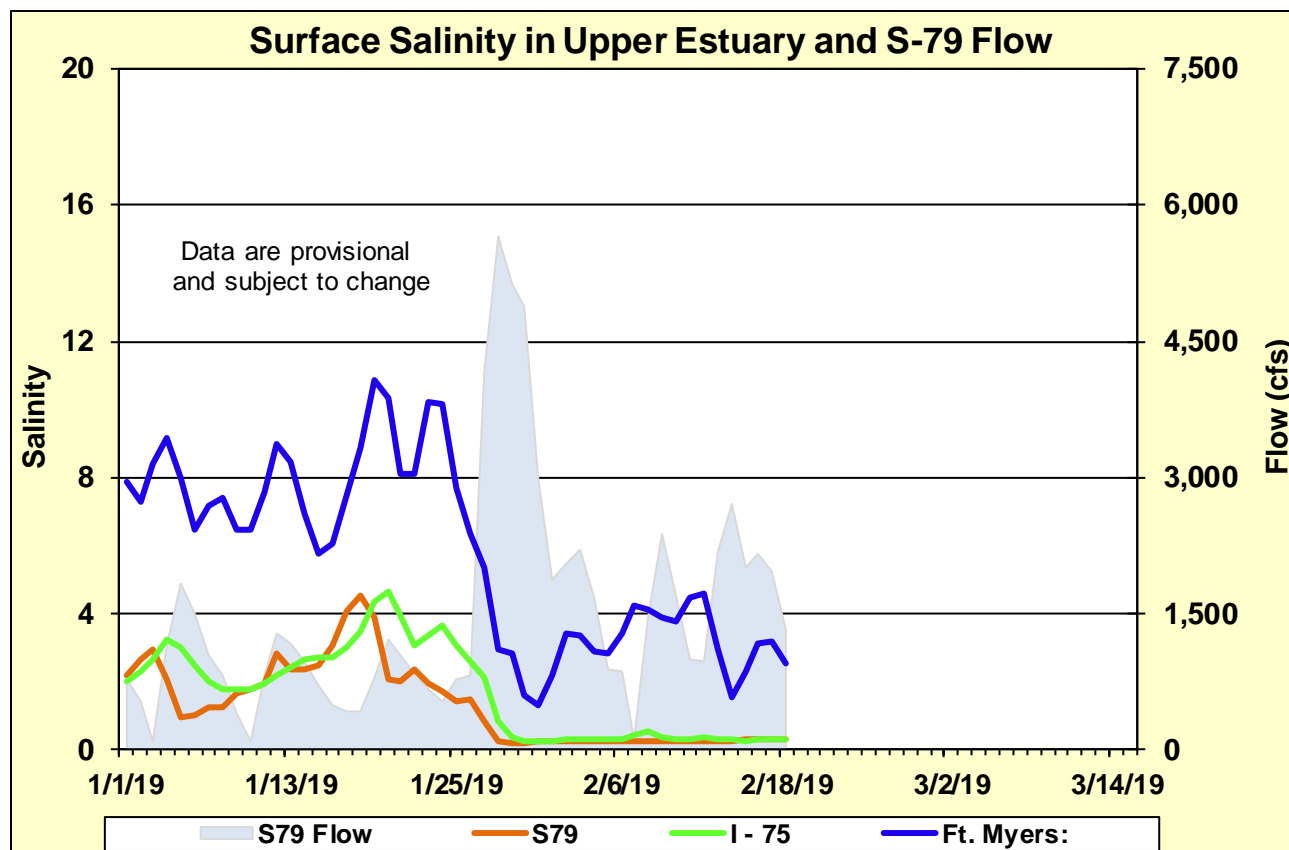
Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.



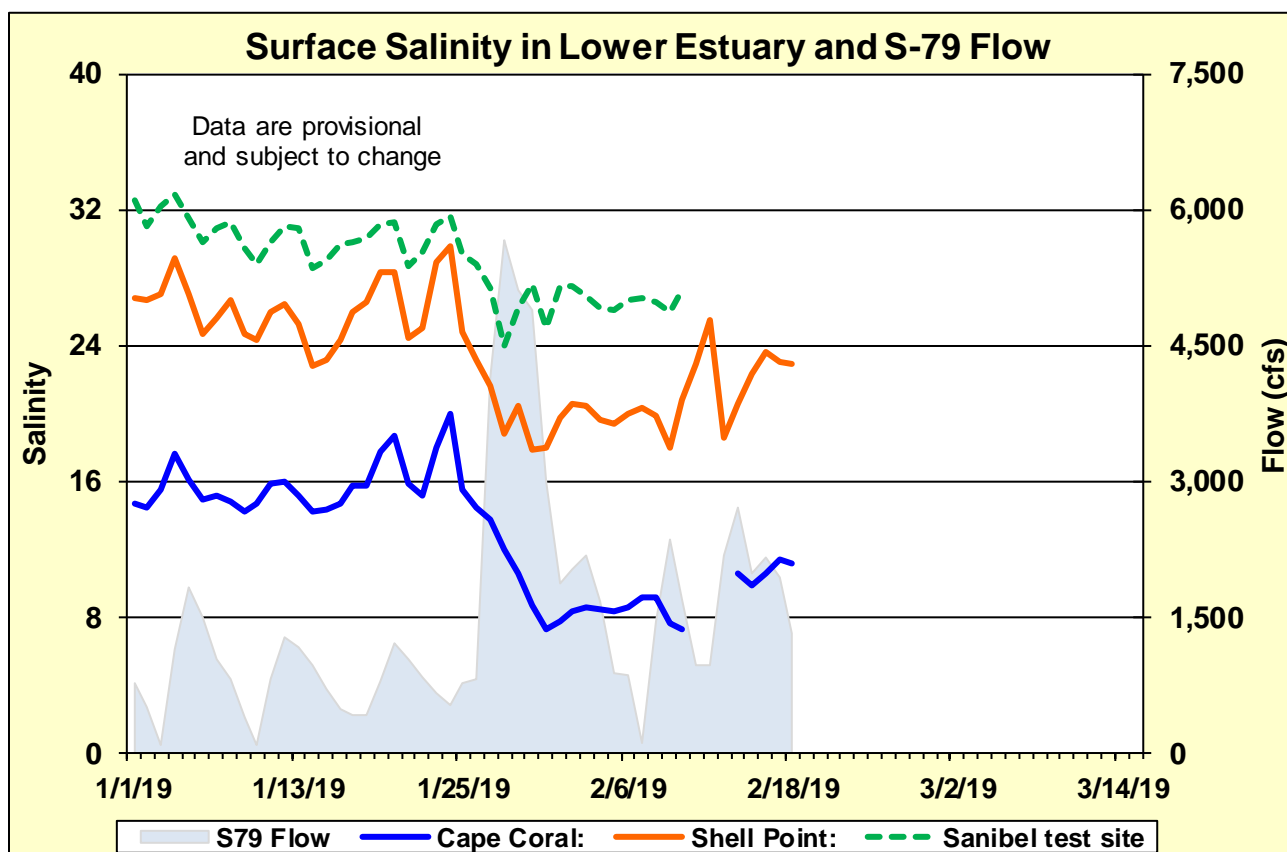
**Figure 5.** Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.



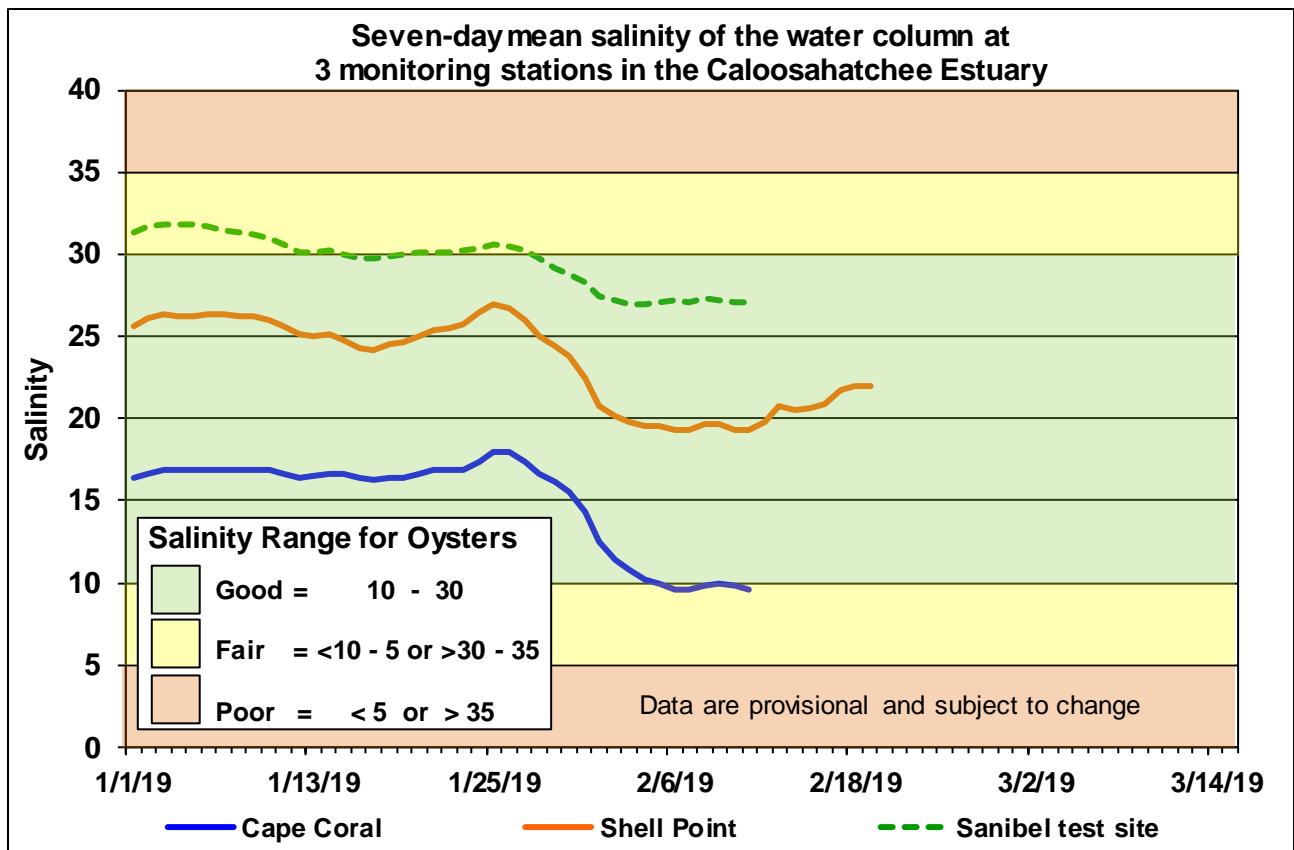
**Figure 6.** Total daily inflows from Lake Okeechobee, runoff from the C-43 Basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.



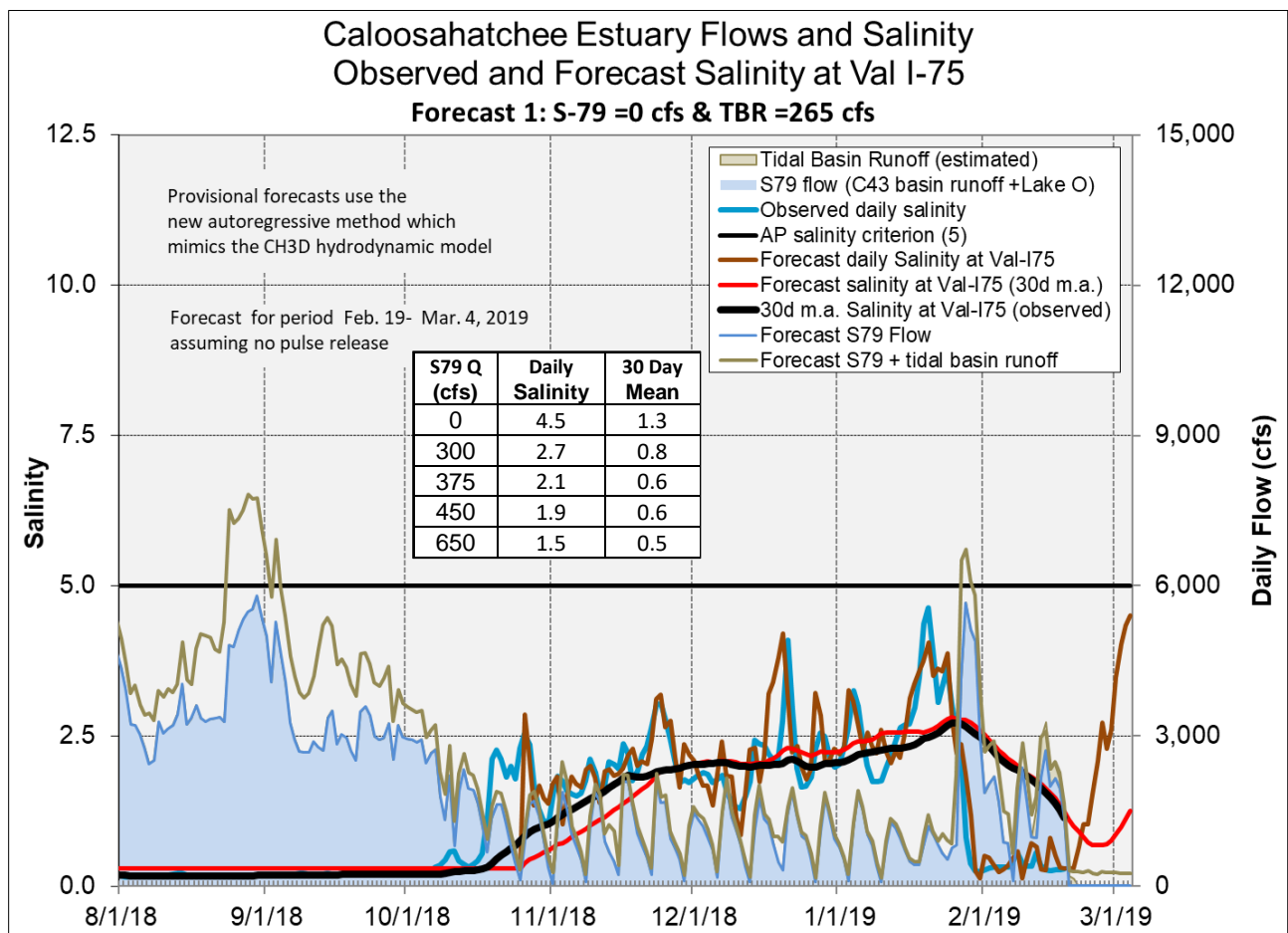
**Figure 7.** Daily mean flows at S-79 and salinity at upper estuary monitoring stations.



**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.

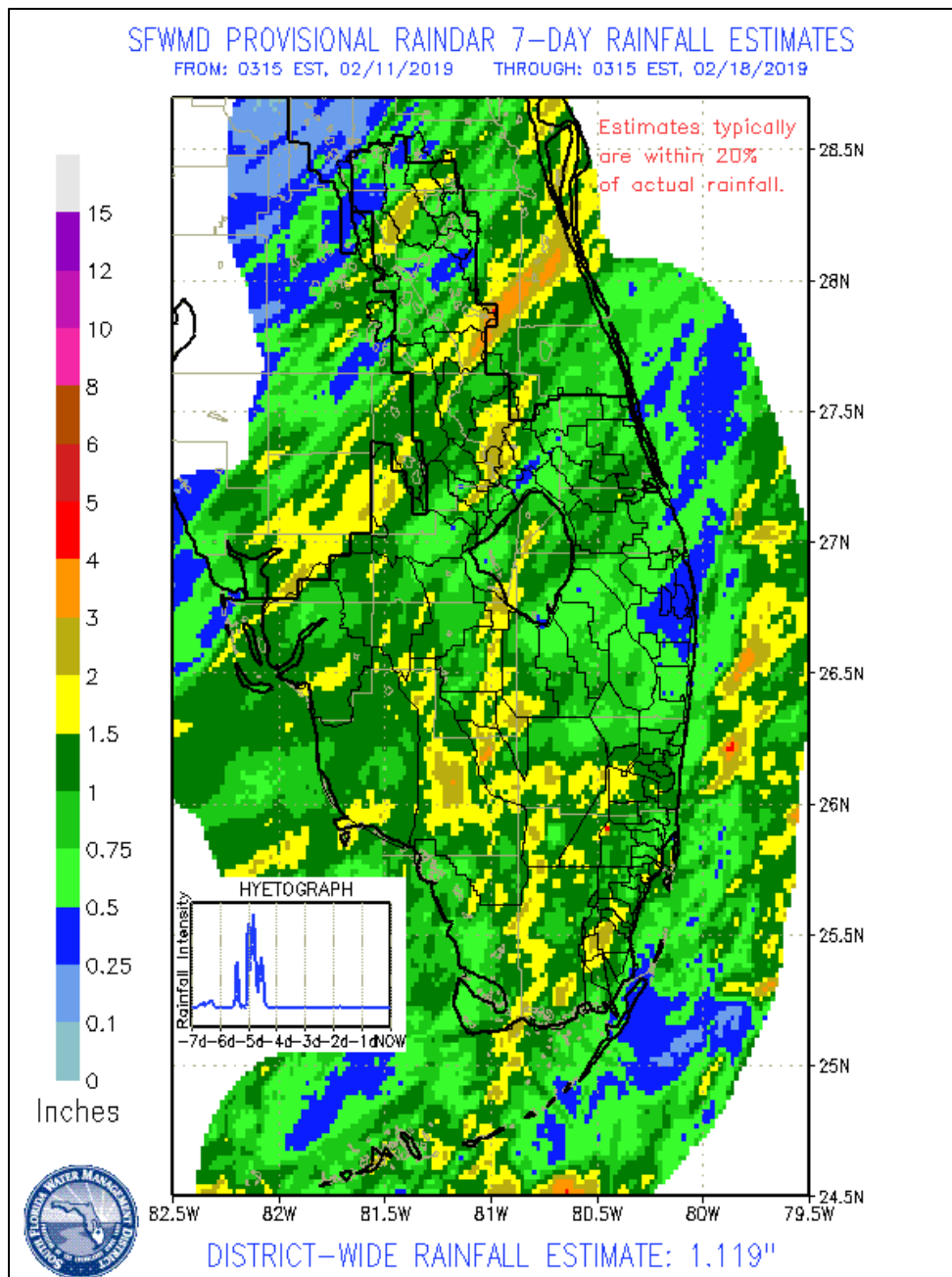


**Figure 10.** Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

## **EVERGLADES**

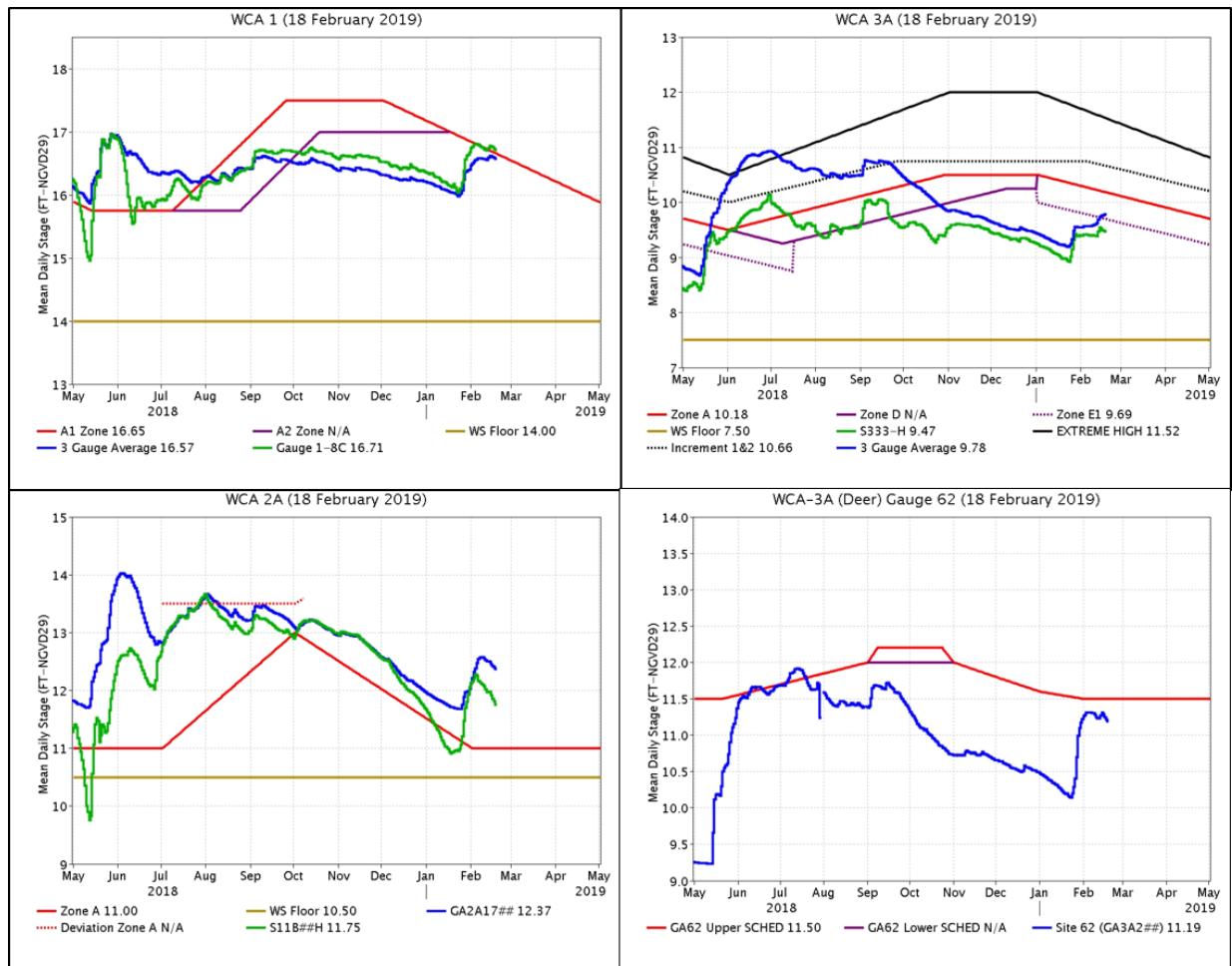
At the gauge locations monitored for this report, stages changed more consistently this week across the WCAs compared to last week. The most extreme individual gauge changes within the WCAs ranged from -0.16 feet (WCA-2A) to +0.32 feet (WCA-3A northeast). Pan evaporation was estimated at 1.15 inches this week (+0.14 from last week).

<b>Everglades Region</b>	<b>Rainfall (Inches)</b>	<b>Stage Change (feet)</b>
WCA-1	0.78	+0.01
WCA-2A	0.83	-0.16
WCA-2B	1.21	+0.14
WCA-3A	1.38	+0.13
WCA-3B	1.45	+0.04
ENP	1.18	+0.09



Regulation Schedules: WCA1: Stage at Gauge 1-8C is 0.06 feet above the Zone A1 regulation line. The three-gauge average stage is 0.17 feet below the canal stage. WCA-2A: S11B headwater stage is 0.75 feet above Zone A and is receding quickly. Gauge 2A17 is 0.62 feet above the canal stage. WCA-3A: The three-gauge average stage is now 0.09 feet above the Zone E1 regulation line. WCA-3A stage at Gauge 62 (northwest corner) has stabilized this week and is 0.31 feet below the lower schedule.



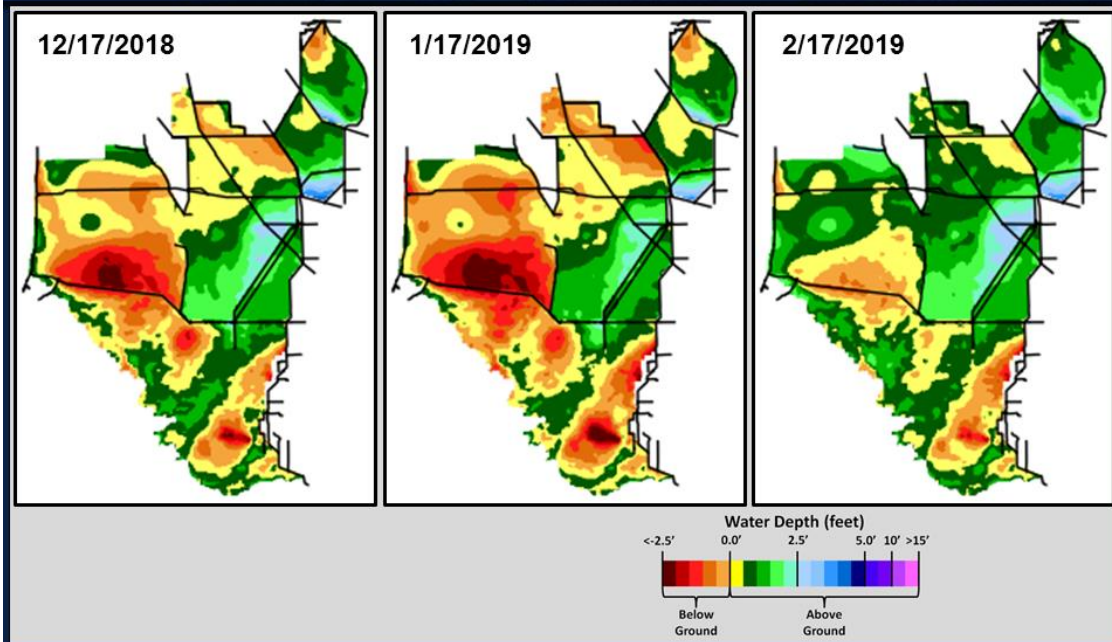


Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicates the recent rains and water management have had a continued impact on stages with an increase in depths in northern WCA-3A and northern WCA-1. In northeast WCA-3A, the model is no longer indicating depths greater than 0.5 feet below ground. The S-150 structure in northeast WCA-3A discharged on average 190 cfs last week. WDAT difference output indicates that water depths increased across the Everglades over the month. Most changes were moderate but areas that are significantly deeper than a month ago reflect water management and the recent rainfall. In the “1 Year” inset, the difference between the current depths and depths 1 year ago can be seen, as well as the lessening impact of Hurricane Irma on water depths a year ago. The currently higher depths in northern WCA-3A and lower depths in WCA-1 and southern WCA-3A are ecologically beneficial particularly in northern WCA-3A to protect peat soils and in southern WCA-3A to moderate the flooding of tree islands.





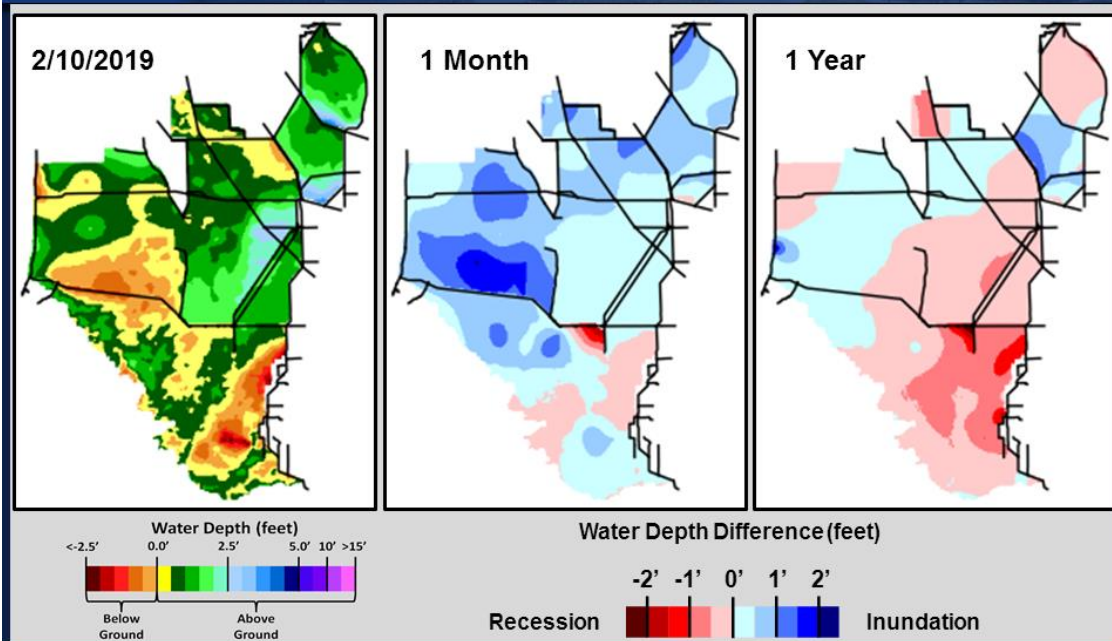
## SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)



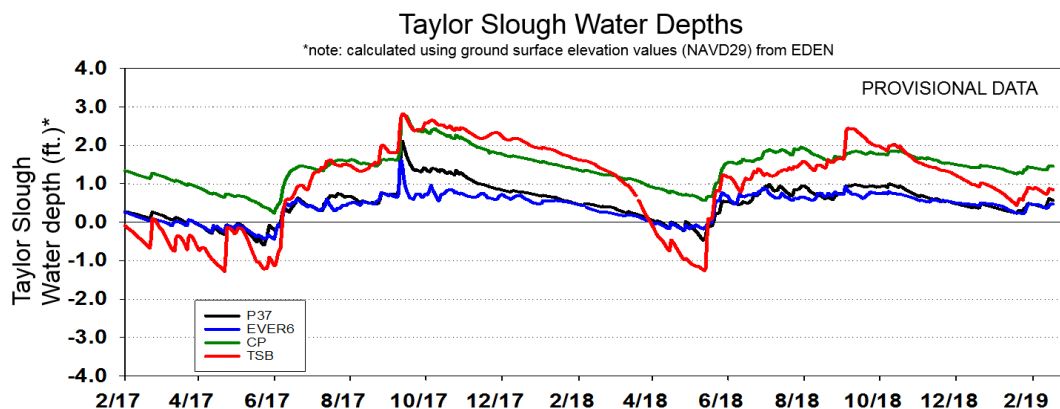
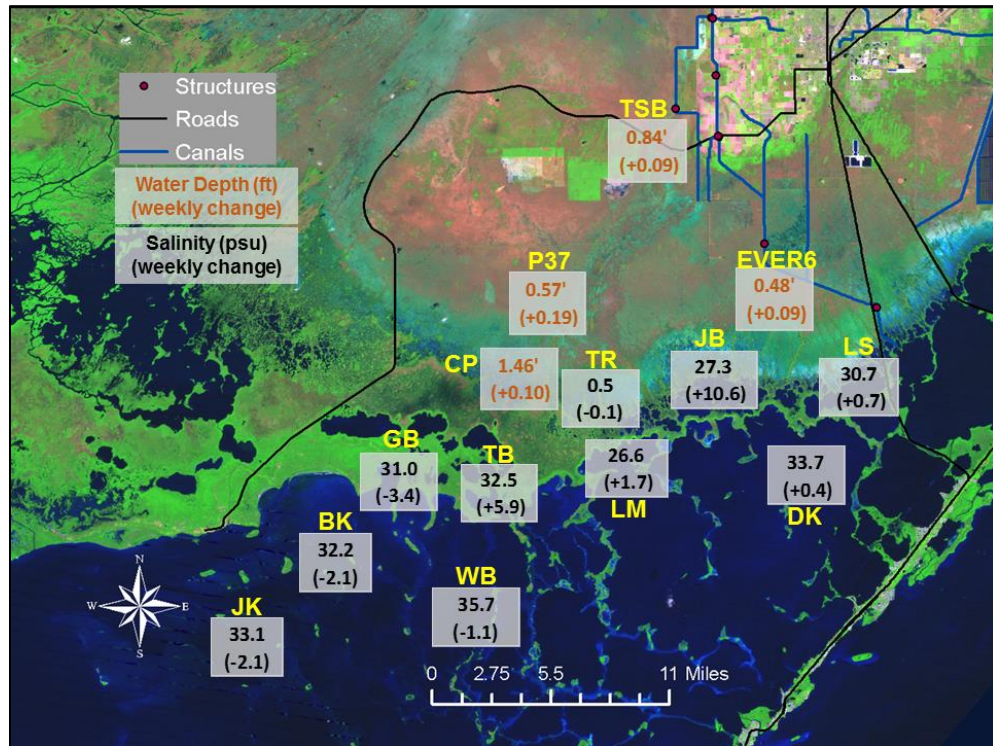
## SFWDAT Everglades Difference Maps (Present - Past)

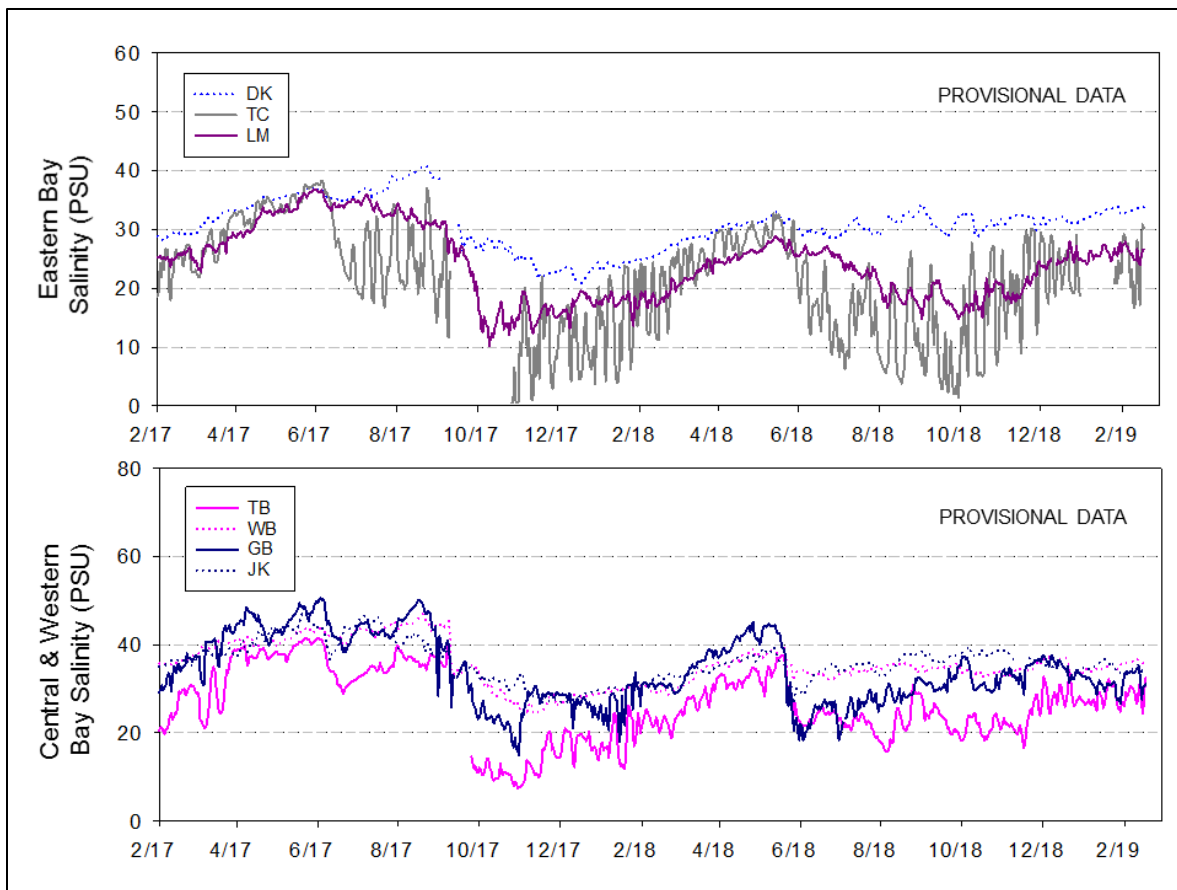


South Florida Water Depth Assessment Tool (SFWDAT)

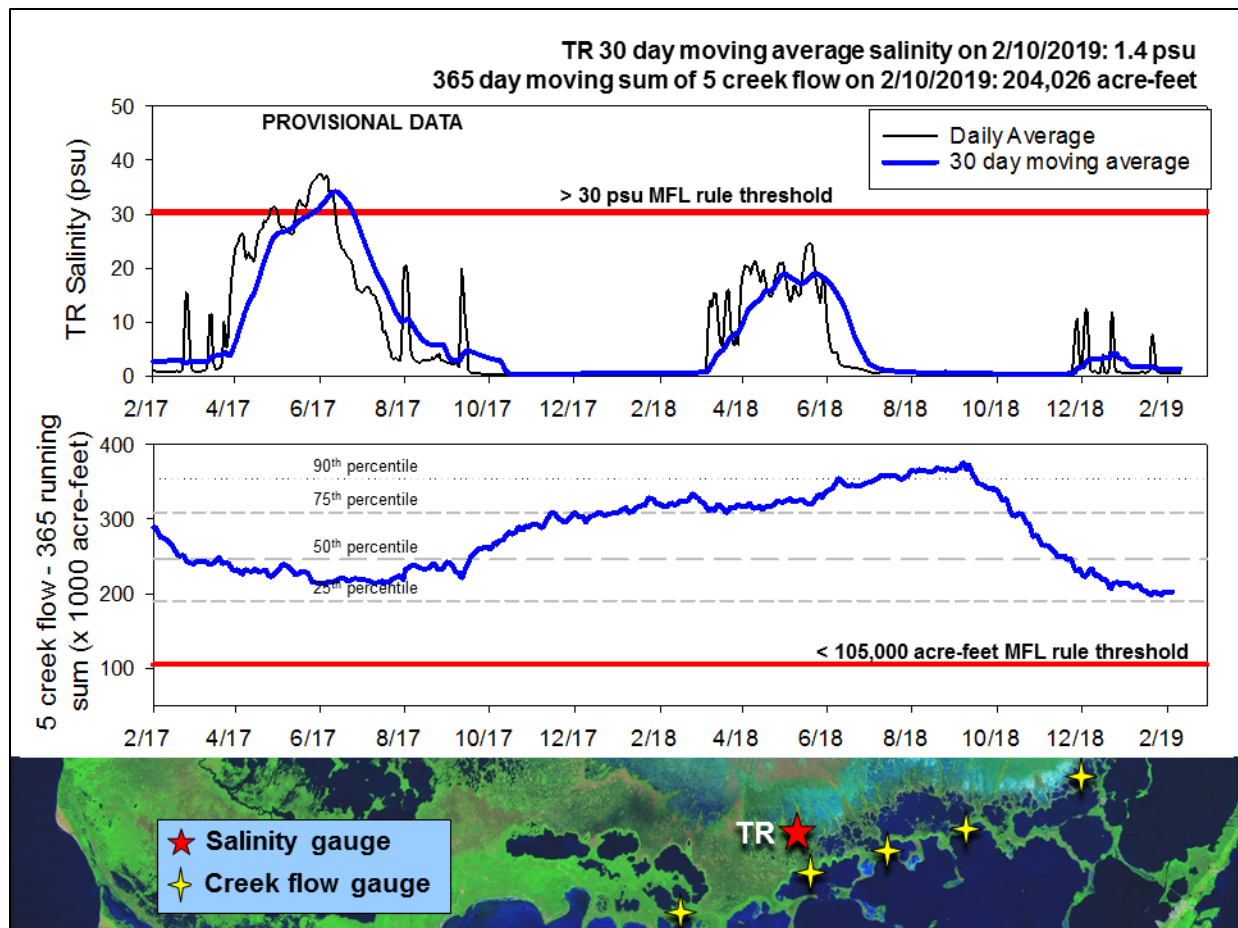
Taylor Slough Water Levels: An average of 1.2 inches of rain fell on Taylor Slough and Florida Bay this past week, which raised water levels an average of 0.09 feet. Water depths averaged 0.77 feet across Taylor Slough by Sunday. Water depths are 6 inches above average for this time of year.

Florida Bay Salinities: Average salinity in Florida Bay increased by 1 psu this last week with individual station changes ranging from a decrease of 3 psu to an increase of 11 psu (caused by wind driven upstream flows). Daily average salinities ranged from 27 psu in the northeast to 36 psu in the central bay and are still about 4 psu above average for this time of year.





Florida Bay MFL: Salinity in the mangrove zone decreased slightly to 0.5 psu. The 30-day moving average also decreased slightly to 1.3 psu over the last week. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about -1,700 acre-feet for the last week representing wind effects on the Florida Bay shoreline area. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) has decreased slightly to 203,667 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**

Discharges into northern WCA-3A, Holey Land and Rotenberger remain ecologically beneficial and an ecological priority. As these areas reach depths typical for this time of year, water released south from WCA-3A has increased ecological benefit downstream. Wading bird foraging was noted in WCA-2A three weeks ago, but current foraging patterns within the Everglades are unknown as the most recent wading bird flights have been postponed (there is one scheduled for 2/20/19). Due to the drier than average conditions and a recession at Gauge 2-17 that exceeded the rate which has been determined to be optimal for wading bird foraging last week, 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. WCA-2A has the potential to support nesting colonies in WCA-1 and WCA-3A. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.



### SFWMD Everglades Ecological Recommendations, February 19th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage increased by 0.01'	Maintain depths at regulation schedule.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage decreased by 0.16'	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 0.14'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage increased by 0.32'	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 0.06'	Maintain depths at regulation schedule.	
Central WCA-3A S	Stage increased by 0.13'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
Southern WCA-3A S	Stage increased by 0.11'		
WCA-3B	Stage increased by 0.04'	Maintain depths at temporary regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
ENP-SRS	Stage decreased by 0.04'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from +0.09' to +0.19'	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 -3.4 to +10.6 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.