

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 12, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Showers are forecast for this afternoon, tonight, and Wednesday. A cold front is forecast to push through the northern half of the District tonight and then through the southern half of the District Wednesday before stalling in the Florida Straits Wednesday night. Daytime heating and a pre-frontal trough are expected to generate scattered showers and thunderstorms with some locally heavy rain this afternoon mainly inland of the east and west coasts. A second round of moderate to heavy showers and thunderstorms will then accompany the front as it pushes in from the northwest tonight to near Lake Okeechobee by Wednesday morning. Some moderate to heavy showers and thunderstorms are forecast to move through the south and east during the day Wednesday as the frontal boundary moves into the Florida Straits and stalls. Widely scattered showers should persist southeast Thursday and Friday as the frontal boundary lingers near the southern end of the District then lifts back north. The front is now forecast to return southward into north Florida over the weekend but remain north of the District so widely scattered mainly afternoon showers are forecast each day Friday, Saturday, and Sunday. In the extended outlook, high pressure should then continue below-average rainfall days until a wetter pattern sets up across the District during the latter part of February.

Kissimmee

Tuesday morning stages were 57.1 feet NGVD (0.9 feet below schedule) in East Lake Toho, 54.1 feet NGVD (0.9 feet below schedule) in Toho, and 50.8 feet NGVD (1.2 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.5 feet NGVD at S-65A and 25.9 feet NGVD at S-65D. Tuesday morning discharges were 3,130 cfs at S-65, 2,967 cfs at S-65A, 2,026 cfs at S-65D and 1,790 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 5.0 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 0.94 feet. The recommendation as of 2/10/2019 is to increase discharge at S-65 by 600 cfs to compensate for increased inflow and rain forecast for Tuesday.

Lake Okeechobee

Lake Okeechobee stage is 12.69 feet NGVD, decreasing 0.03 feet from the previous week, after rising about 0.15 feet the week before. The Lake is 0.23 feet higher than 30 days ago and is now in the Base Flow sub-band. However, the Lake is still nearly 1.35 feet below the bottom of the ecological envelope which varies seasonally from 12.5 – 15.5 feet 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, these 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 297 cfs over the past week with 0 cfs coming from Lake Okeechobee. Over the past week, salinity decreased slightly at HR1 and US1. 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 1,744 cfs over the past week with 574 cfs coming from the Lake. Over the past week, surface salinity changed very little throughout the estuary. The 30-day moving average surface salinity is 1.8 at Val I-75 and 5.8 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 17,300 acre-feet of Lake releases. The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 1,406,000 acre-feet, which includes approximately 365,000 acre-feet of Lake releases. Most STA cells are at or above target depths except the emergent aquatic vegetation cells in STA-5/6 which are at or near target. 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 initiation of levee repairs in 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

All the WCAs received low rainfall amounts last week and stage changes across the Everglades were more uniform this week. Stages remain just at or below regulation schedule in the WCAs except for WCA-2A, which remains above schedule. Canal stages at S11B_HW rose quickly to equalize with the marsh and are now receding. Taylor Slough stages resumed a recession this week but remain above average for this time of year. Salinity in Florida Bay remained unchanged on average this week. Flows from the 5 creeks used in the Florida Bay MFL increased slightly and remain just above the 25th percentile.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.61 inches of rainfall in the past week and the Lower Basin received 0.03 inches (SFWMD Daily Rainfall Report 2/11/2018).

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: 2/12/2019

Water Body	Structure	7-day Average Discharge (cfs) ¹	Stage Monitoring Site ²	Lake Stage (feet)	Schedule Type ³	Schedule Stage (feet)	Daily Departure (feet)						
							2/10/19	2/3/19	1/27/19	1/20/19	1/13/19	1/6/19	12/30/18
Lakes Hart and Mary Jane	S-62	67	LKMJ	61.0	R	61.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
Lakes Myrtle, Preston, and Joel	S-57	24	S-57	61.3	R	61.2	0.1	0.0	-0.2	0.0	0.1	0.0	-0.1
Alligator Chain	S-60	0	ALLI	63.6	R	64.0	-0.4	-0.5	-0.7	-0.8	-0.7	-0.7	-0.7
Lake Gentry	S-63	0	LKGT	61.5	R	61.5	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
East Lake Toho	S-59	274	TOHOE	57.2	R	58.0	-0.8	-0.8	-0.5	-0.5	-0.4	0.0	0.0
Lake Toho	S-61	799	TOHOW, S-61	54.1	R	55.0	-0.9	-0.8	-0.7	-0.5	-0.4	-0.5	-0.5
Lakes Kissimmee, Cypress, and Hatchineha	S-65	2,656	KUB011, LKIS5B	51.0	R	52.0	-1.0	-1.1	-1.5	-1.7	-1.8	-1.8	-2.0

¹ Seven-day average of weighted daily means through midnight.

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

³ 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: 2/12/2019

Metric	Location	1-Day Average			Average for the Preceding 7-Days ¹							12/9/18
		2/10/2019	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	3,070	2,656	1,615	950	392	343	273	277	253	301	330
Discharge (cfs)	S-65A ²	2,879	2,472	1,517	764	306	261	194	201	182	180	252
Discharge (cfs)	S-65D ²	1,845	1,564	1,221	621	341	261	241	242	238	253	298
Headwater Stage (feet NGVD)	S-65D ²	25.78	25.82	25.90	26.00	25.94	25.91	25.86	25.88	25.73	25.80	25.84
Discharge (cfs)	S-65E ²	1,734	1,442	1,151	606	309	261	215	218	266	242	292
Discharge (cfs)	S-67	0	0	0	0	0	0	0	0	0	0	0
DO (mg/L) ³	Phase I river channel	4.9	5.0	6.5	6.6	6.8	6.4	6.1	6.6	6.7	6.4	6.2
Mean depth (feet) ⁴	Phase I floodplain	0.94	0.71	0.46	0.12	0.07	0.08	0.09	0.11	0.12	0.10	0.10

¹Seven-day average of weighted daily means through Sunday midnight.

²S-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.

³DO is the average for sondes at PC62 and PC33.

⁴1-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)

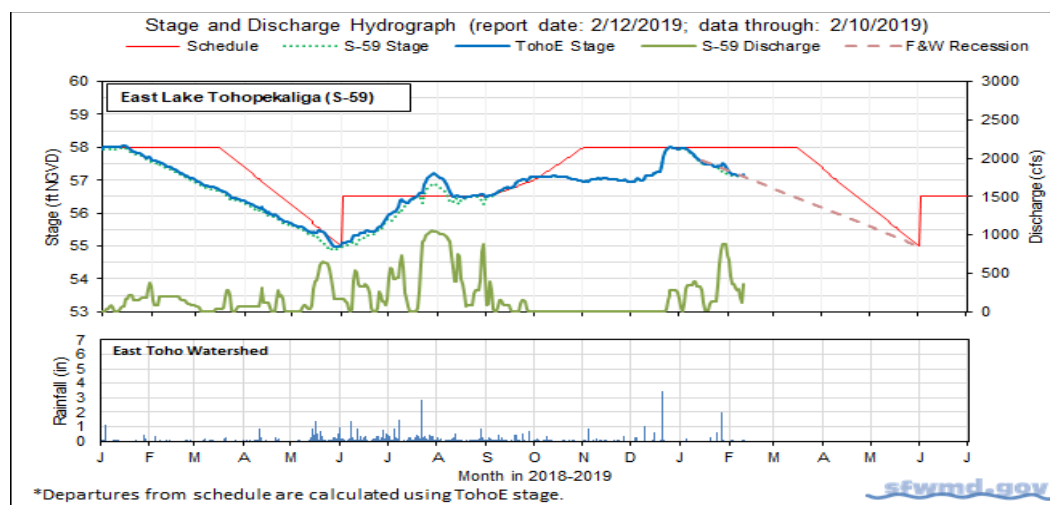


Figure 1.

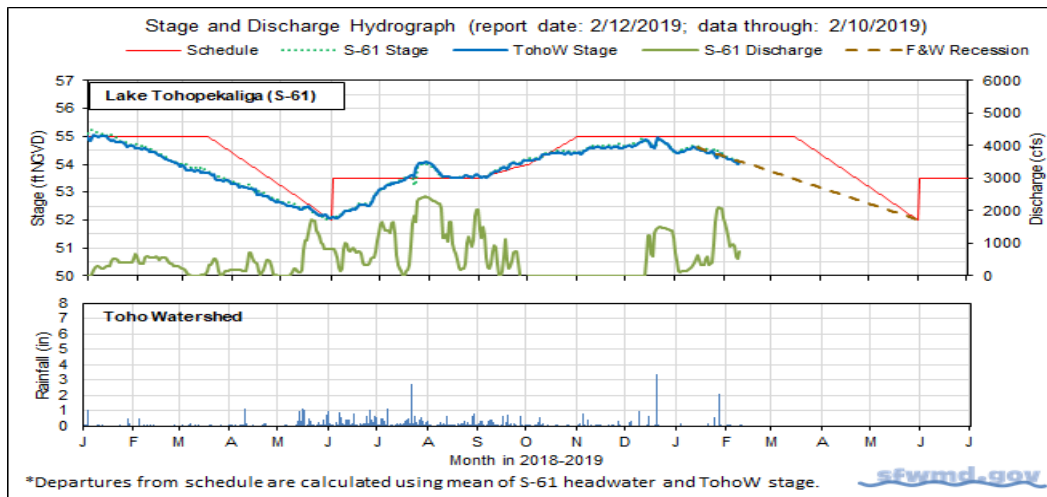


Figure 2.

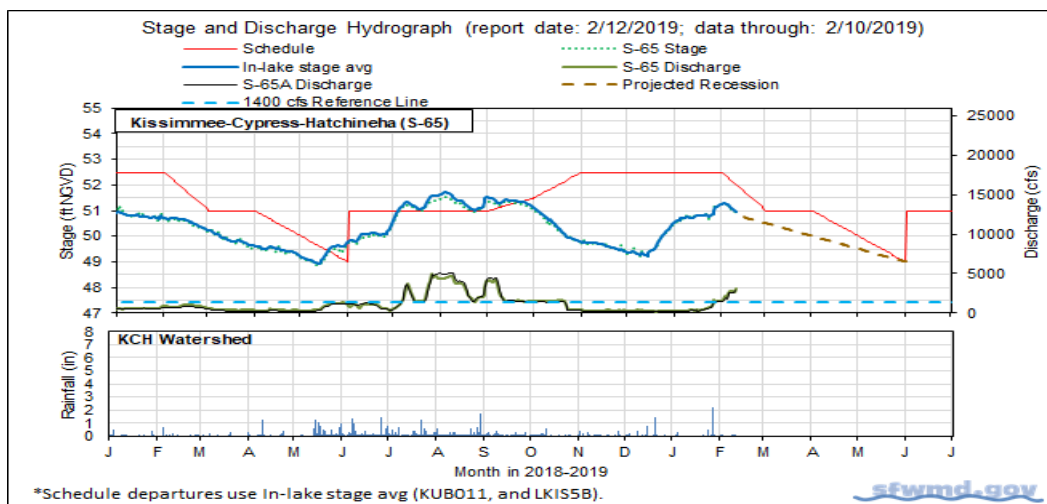


Figure 3.

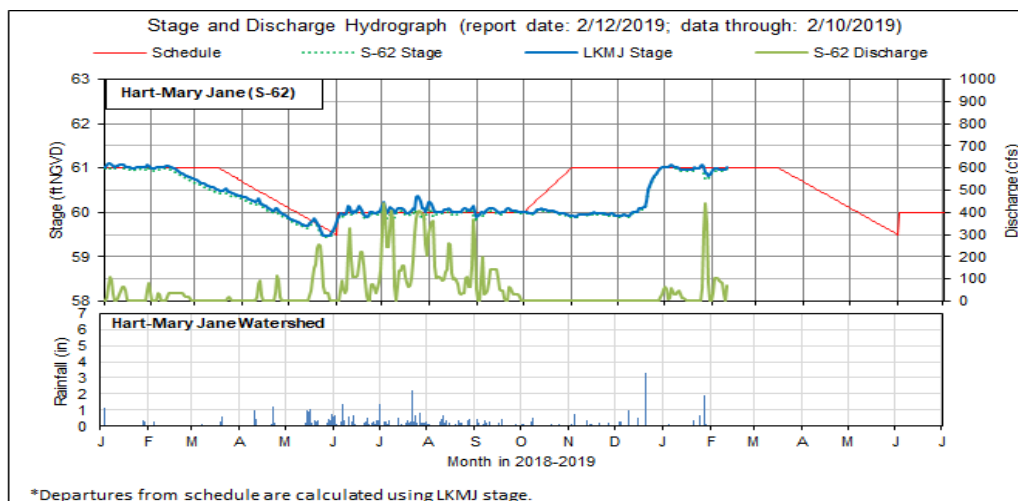


Figure 4.

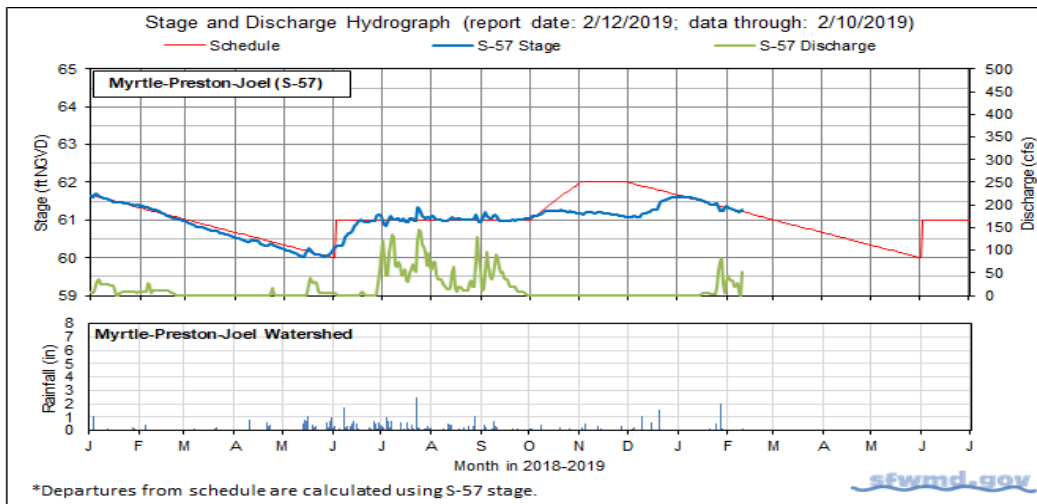


Figure 5.

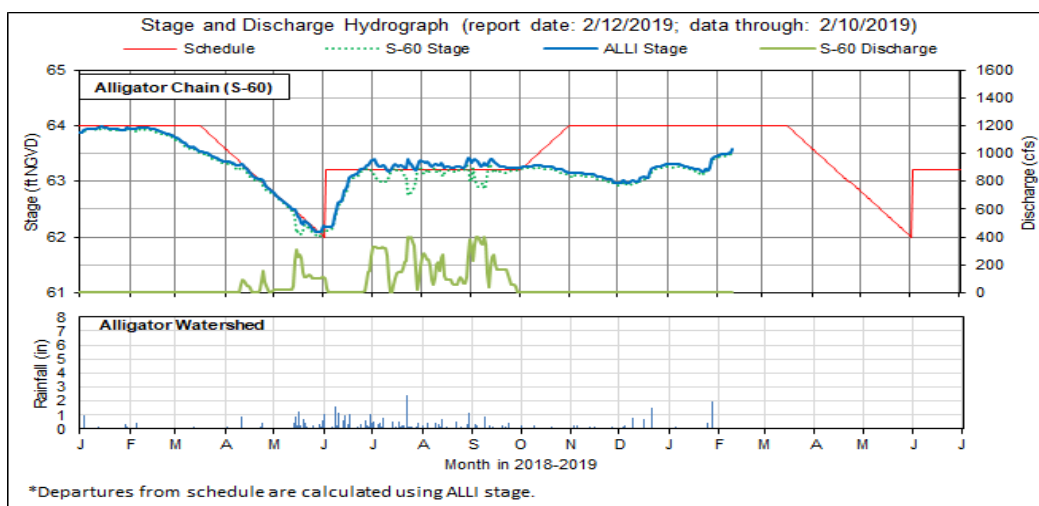


Figure 6.

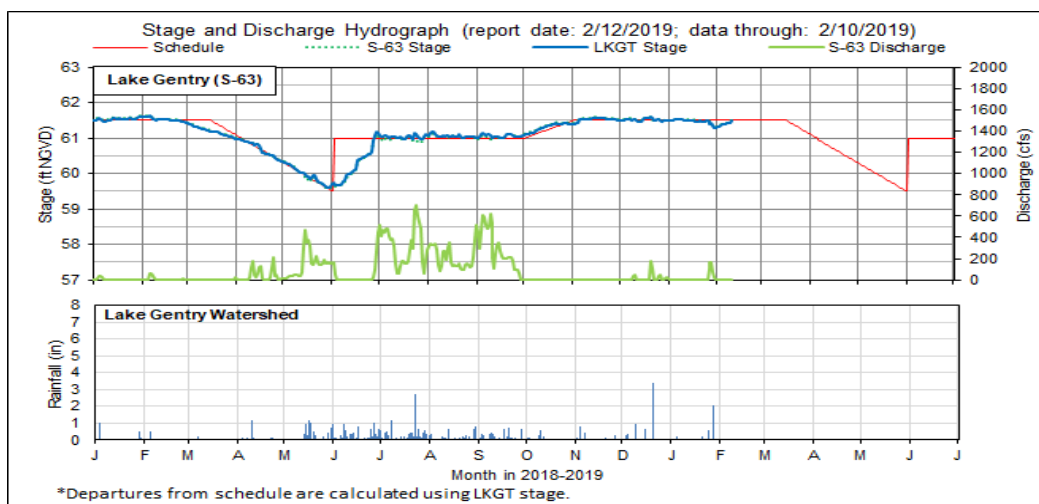


Figure 7.

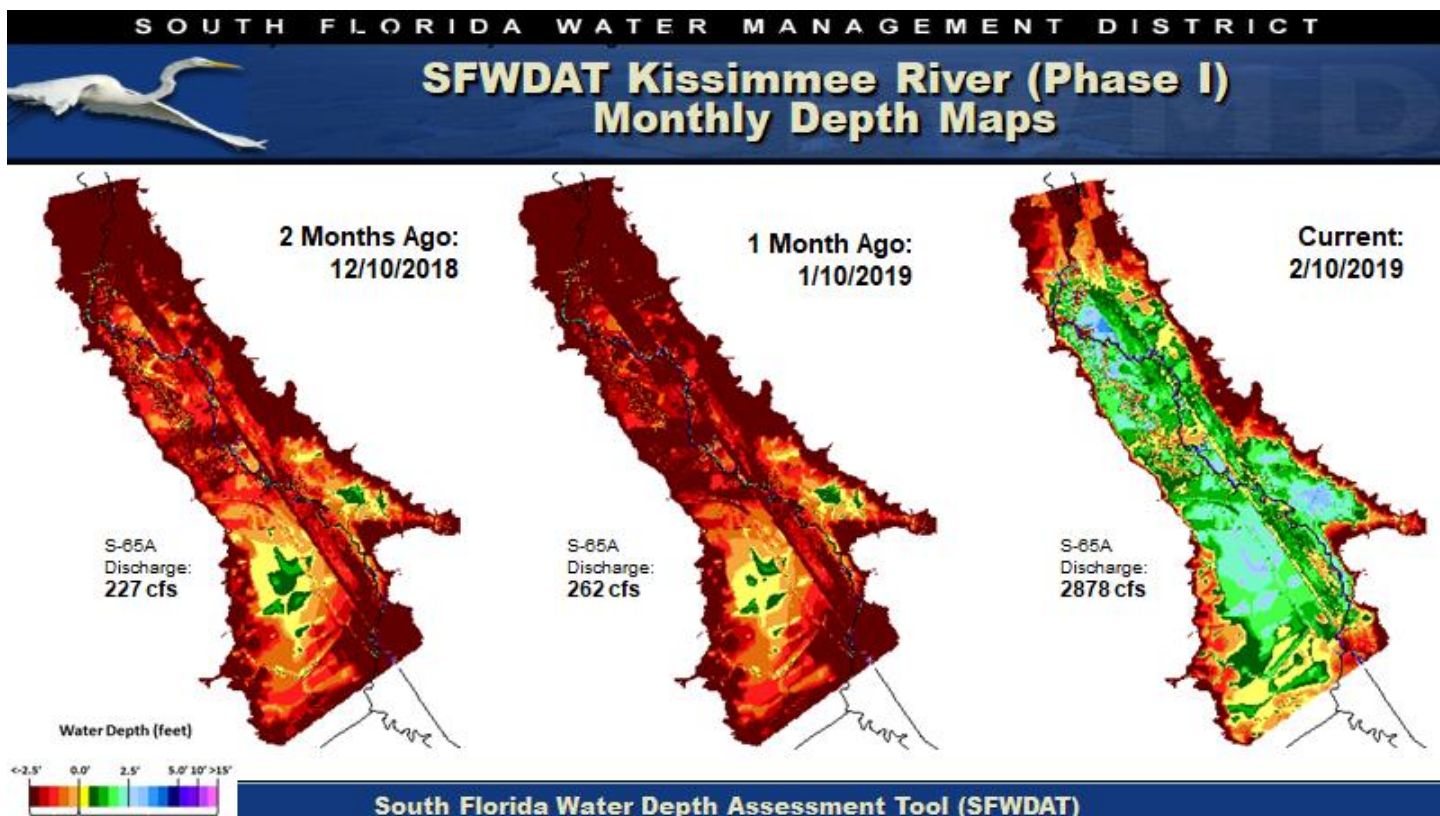


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

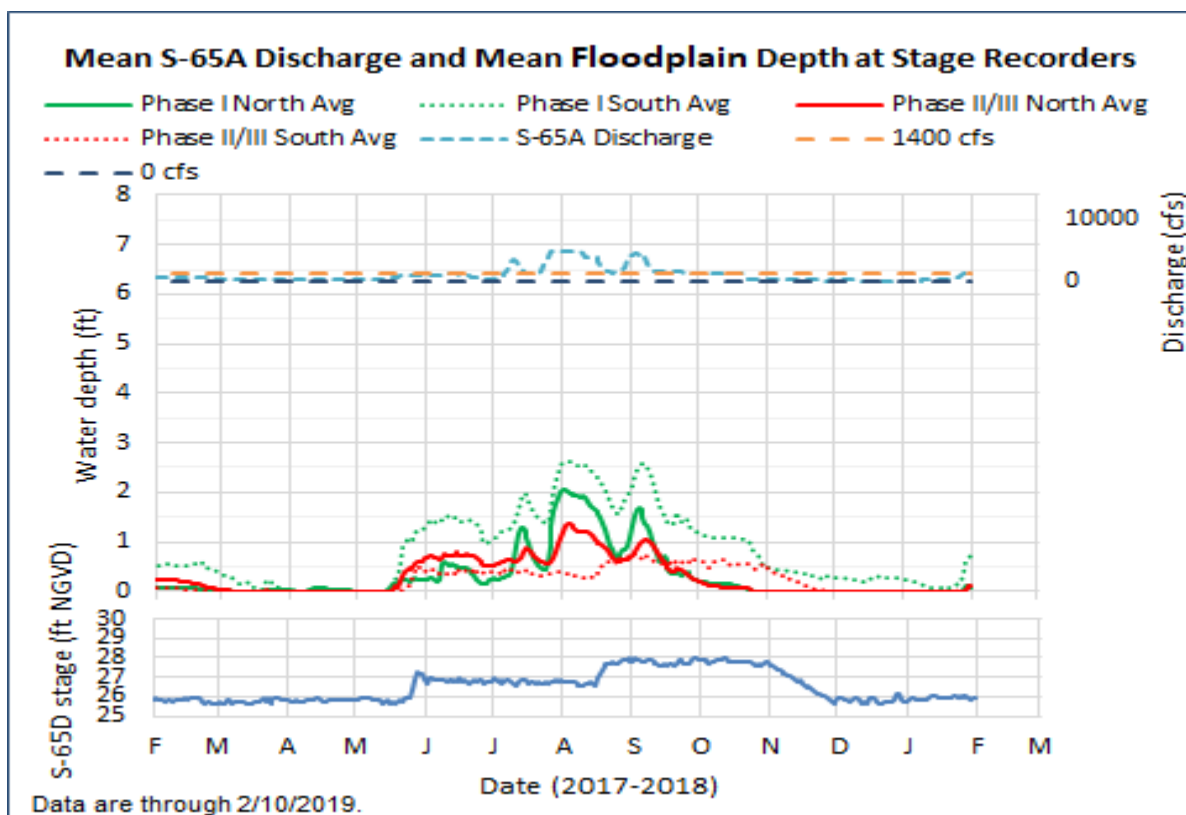
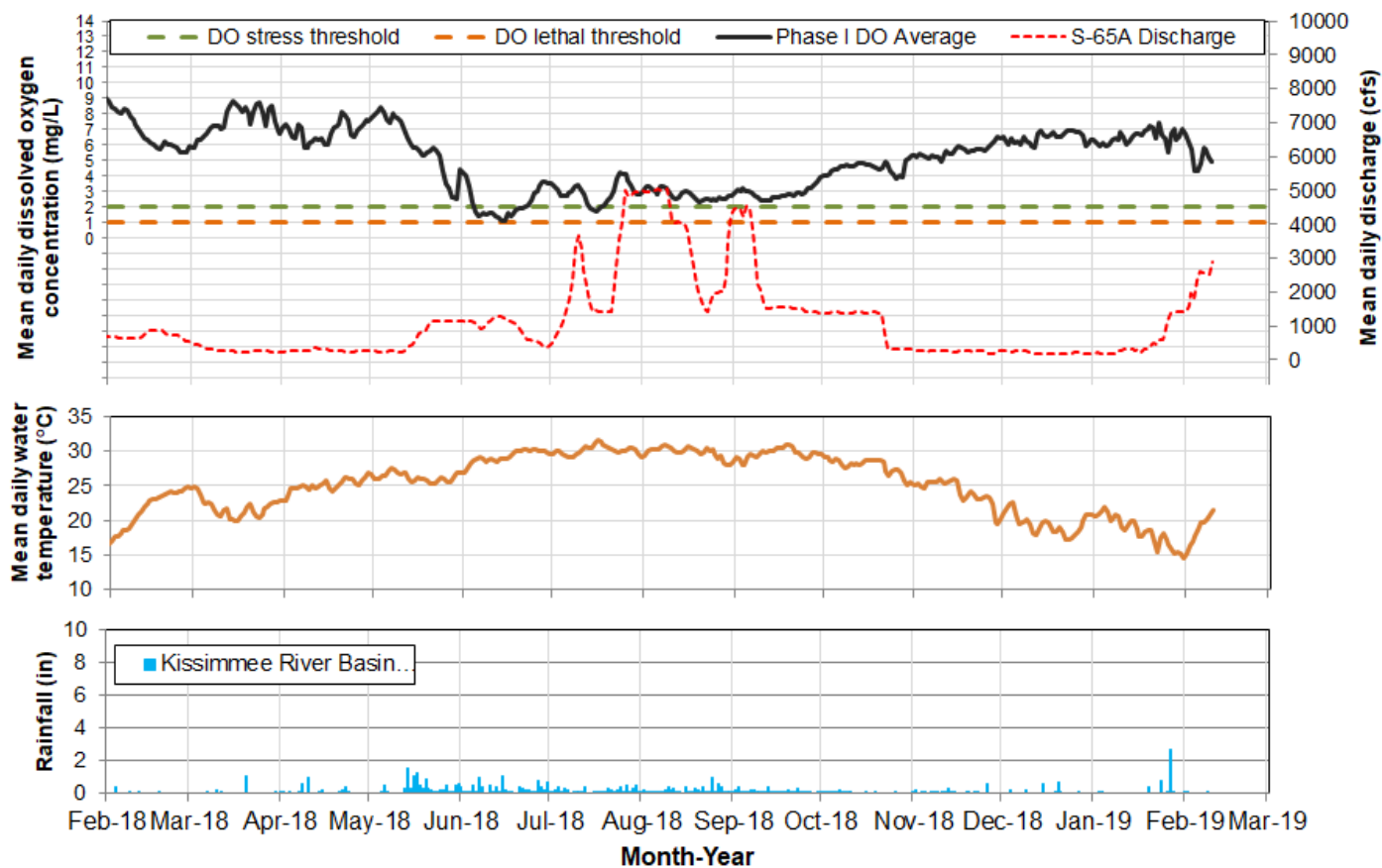


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.



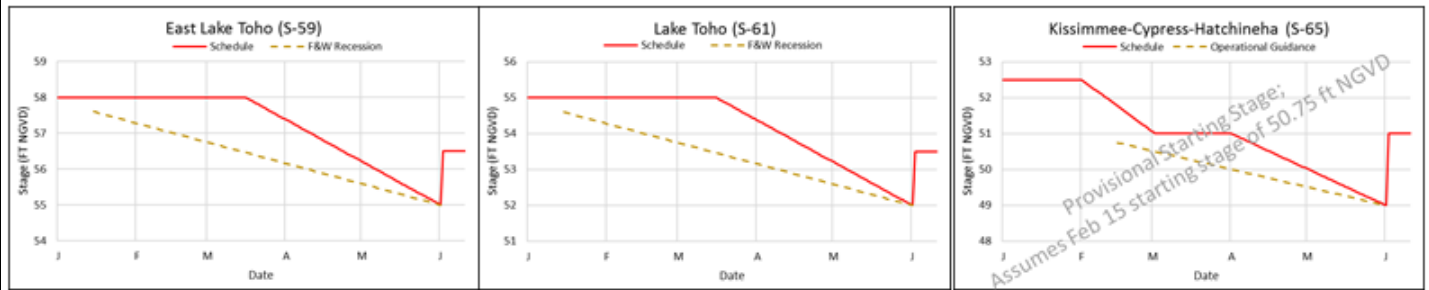
Report Date: 2/12/2019; data are through: 2/10/2019.

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

Water Management Recommendations

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
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 kite 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 kite nests 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

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 31st 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.

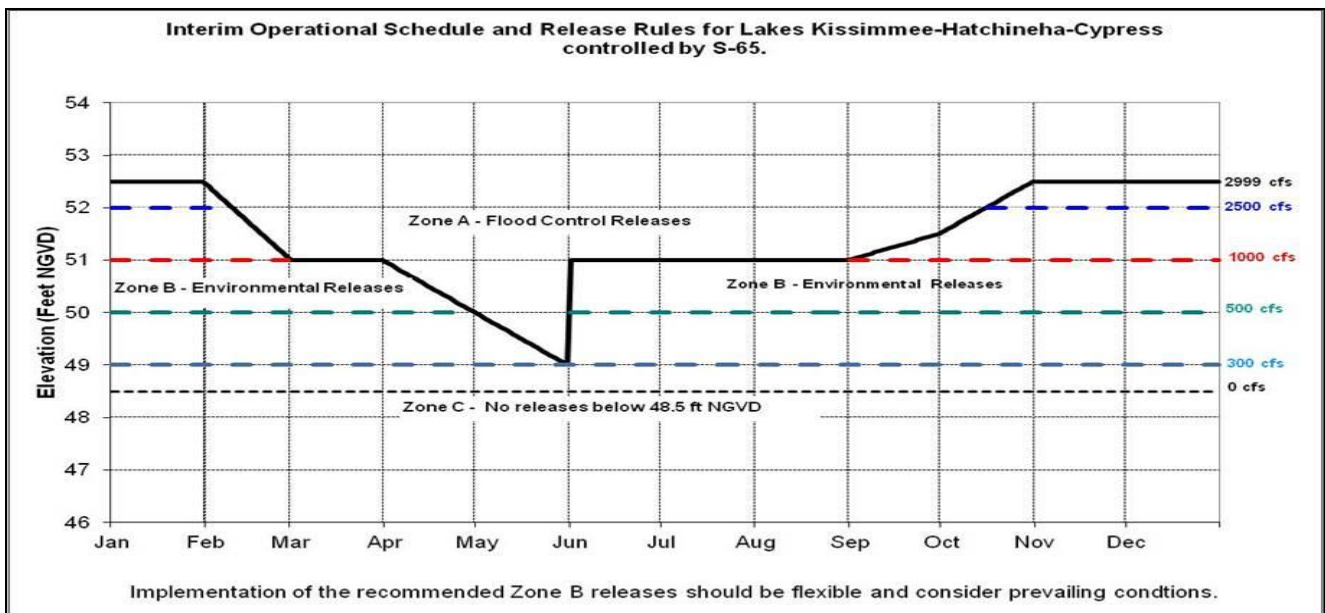


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

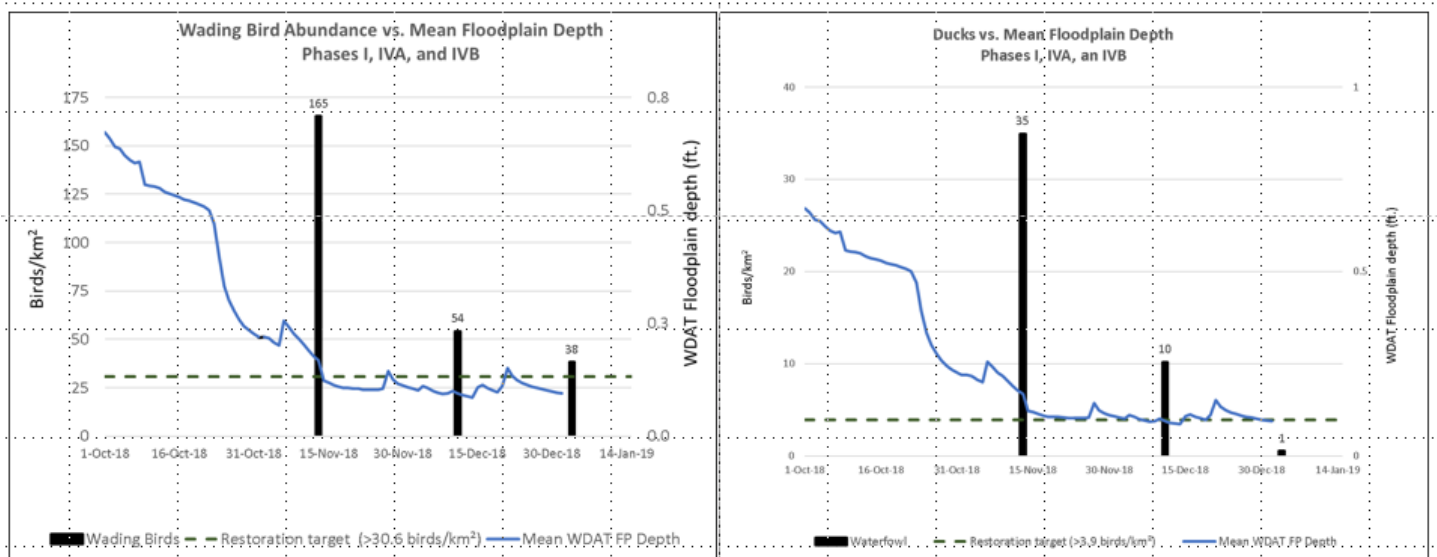


Figure 13. Kissimmee River Wading Bird and Waterfowl Surveys from November 2018 to January 2019.

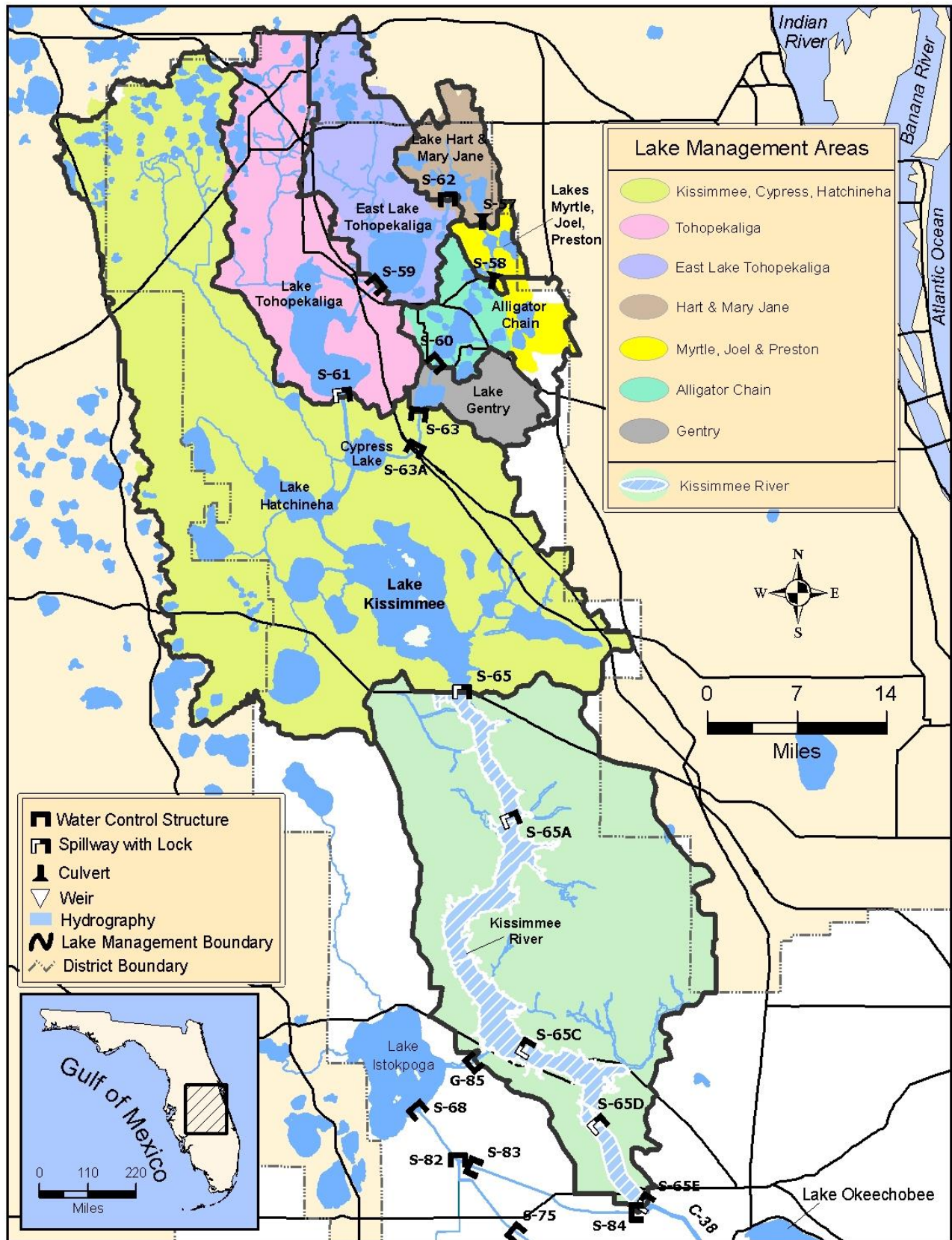


Figure 14. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee stage is at 12.69 feet NGVD for the period ending at midnight on February 11, 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 0.23 feet higher than it was a month ago and 2.50 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 11 lake stage was the lowest for this time of year since 2011, which followed a very dry wet season in 2010 (Figure 3). According to RAINДАР, no rain fell directly over the Lake during the week of February 5 to February 11, 2019, after having 3.69 inches fall in mid to late January (Figure 4). The upper Kissimmee Valley received between 0.25 and 1 inches of rain while the remainder of the watershed received little to no rainfall.

Average daily inflows (minus rainfall) to the Lake was similar to last week at 2,012 cfs. The inflows from the Kissimmee River increased, going from 1,201 cfs to 1,509 cfs but inflows from all of the other structures decreased this past week.

Total outflows (minus evapotranspiration) increased from the previous week, going from 495 average daily cfs to 2,819 cfs this past week (Table 1). Outflows west via S-77 increased from 6 cfs to 663 cfs and south outflows through the S-350 structures also increased, going from 571 average daily cfs the previous week to 1,593 cfs this past week. The negative flows (flowing back into the lake) through the S-308 last week reversed to 134 cfs exiting the lake this week. Outflows from the L-8 Canal (Culvert 10A) increased from 0 cfs to 429 cfs for the week. The corrected average daily evapotranspiration value for the week based on the L006 weather platform solar radiation was 0.15 inches.

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 10, 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 12.69 feet NGVD, decreasing 0.03 feet from the previous week. The Lake is 0.23 feet higher than 30 days ago and is now in the Base Flow sub-band. Even with the rain event in mid to late January, the Lake is still nearly 1.35 feet below the bottom of the ecological envelope which varies seasonally from 12.5 – 15.5 feet NGVD. Given the potential for heavy rainfall associated with El Niño conditions this winter and the poor condition of SAV and EAV in the nearshore zone, these lower lake stages are ideal for vegetation recovery. Recovery of vegetation in the nearshore zone from Hurricane Irma impacts and 2016 El Niño-associated rainfall will require lake stages in the lower portion of the ecological envelope or lower for extended periods, so efforts to prepare for such an event will help speed the rebound of this important community. However, low lake stages also encourage expansion of invasive vegetation in the upper marsh and temporarily reduce the quantity and quality of habitat for fish and wildlife.

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	1201	1509	0.7
S71 & 72	206	22	0.0
S84 & 84X	479	440	0.2
Fisheating Creek	38	37	0.0
S154	0	0	0.0
S191	4	1	0.0
S133 P	8	0	0.0
S127 P	4	0	0.0
S129 P	38	1	0.0
S131 P	24	2	0.0
S135 P	50	0	0.0
S2 P	0	0	0.0
S3 P	0	0	0.0
S4 P	0	0	0.0
L8 Backflow	-45		
Rainfall	4.5	0	0.0
Total	2013	2012	0.9

OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S77	6	663	0.3
S308	-82	134	0.1
S351	0	637	0.3
S352	85	374	0.2
S354	486	582	0.3
L8 Outflow		429	0.2
ET	1696	2359	1.0
Total	2191	5178	2.3

PROVISIONAL DATA

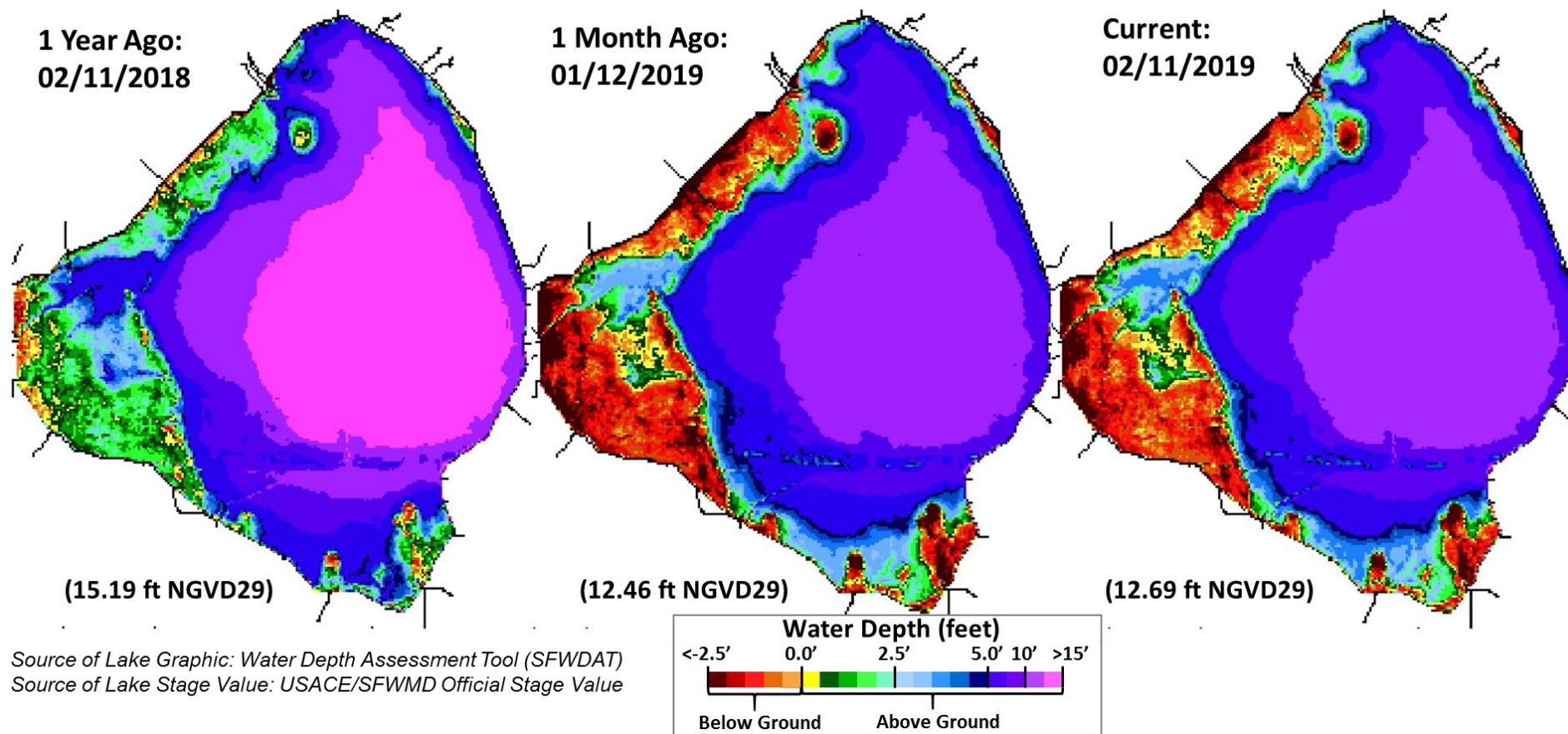
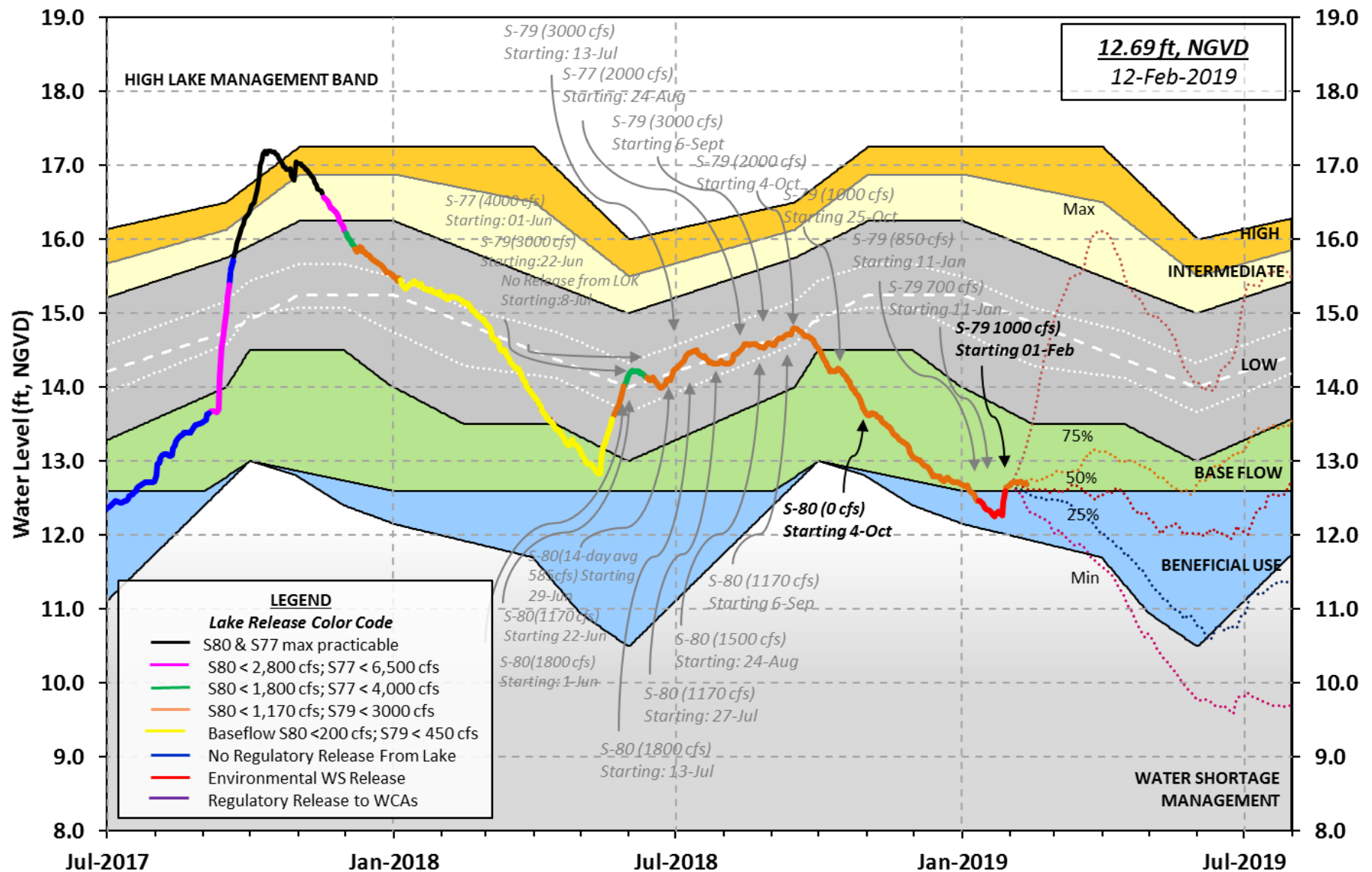


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

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

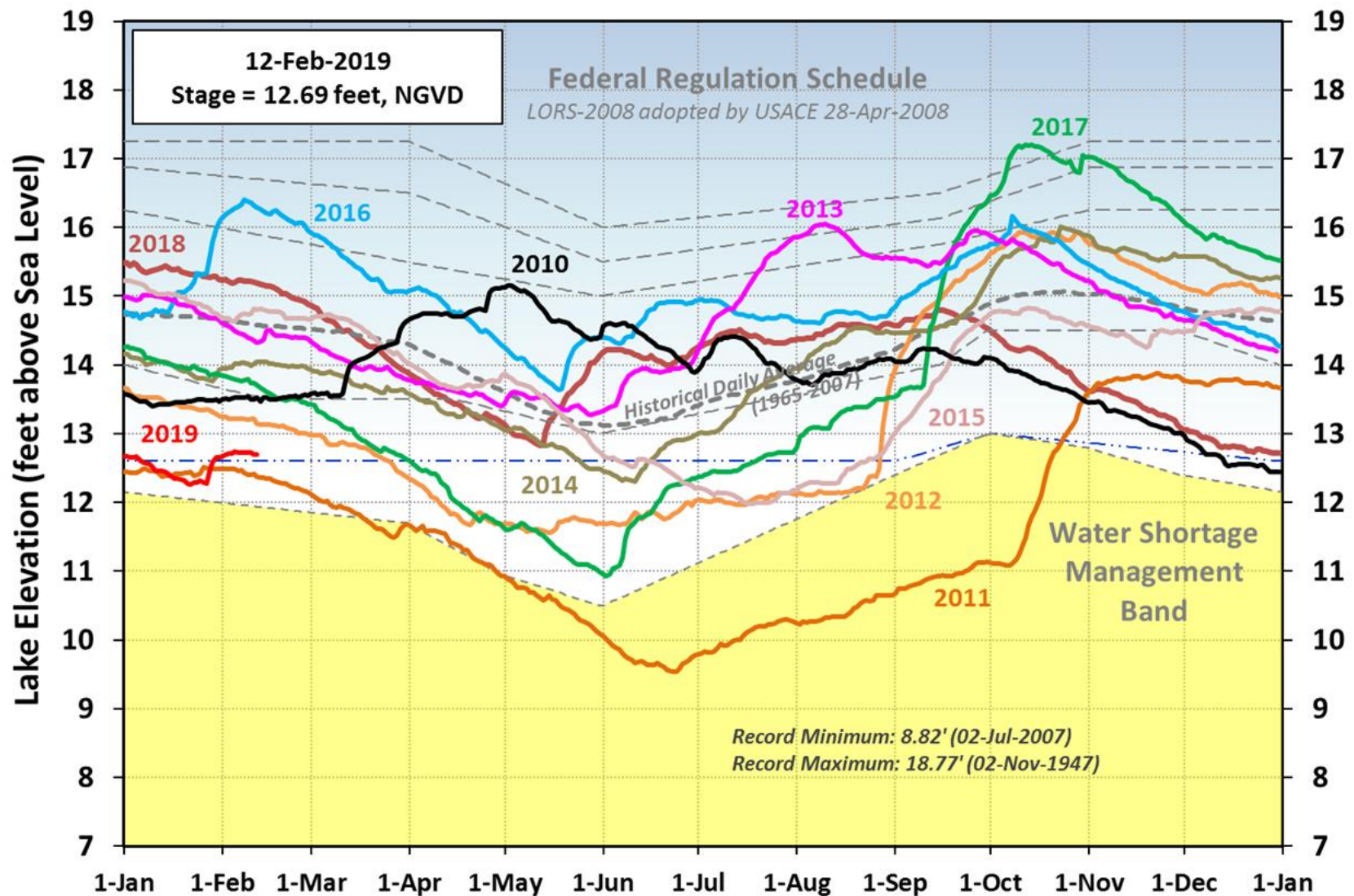


Figure 3. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

SFWMD PROVISIONAL RAINFALL 7-DAY BASIN RAINFALL ESTIMATES

FROM: 0615 EST, 02/05/2019 THROUGH: 0615 EST, 02/12/2019

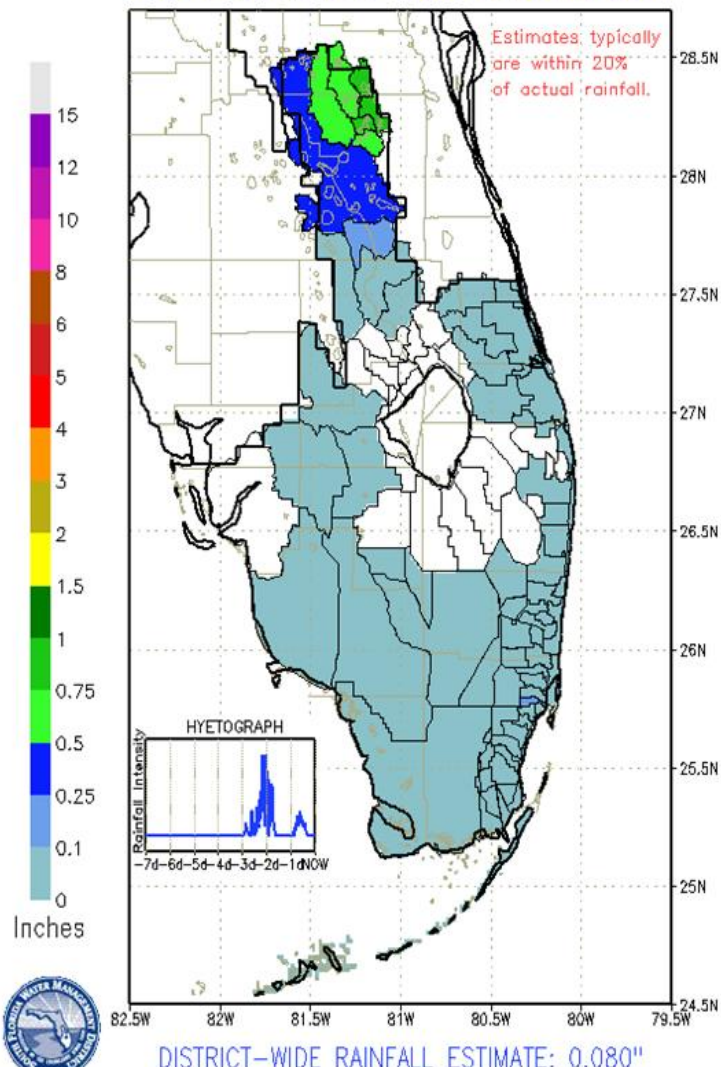


Figure 4. Rainfall estimates by basin.

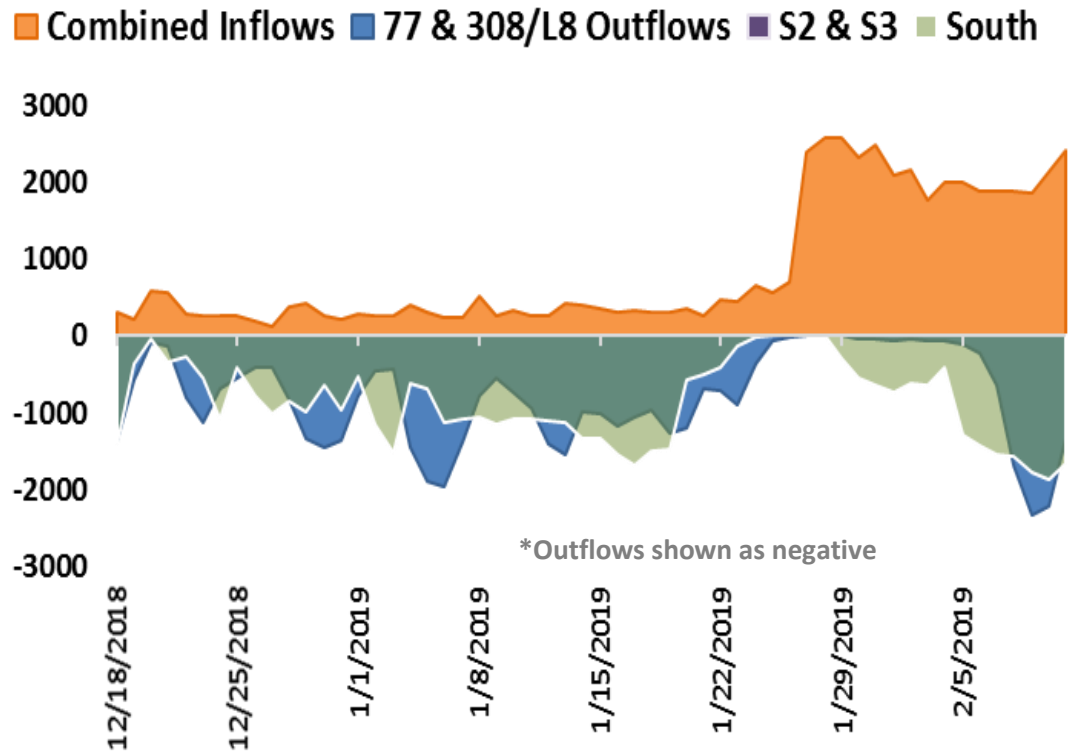


Figure 5. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive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

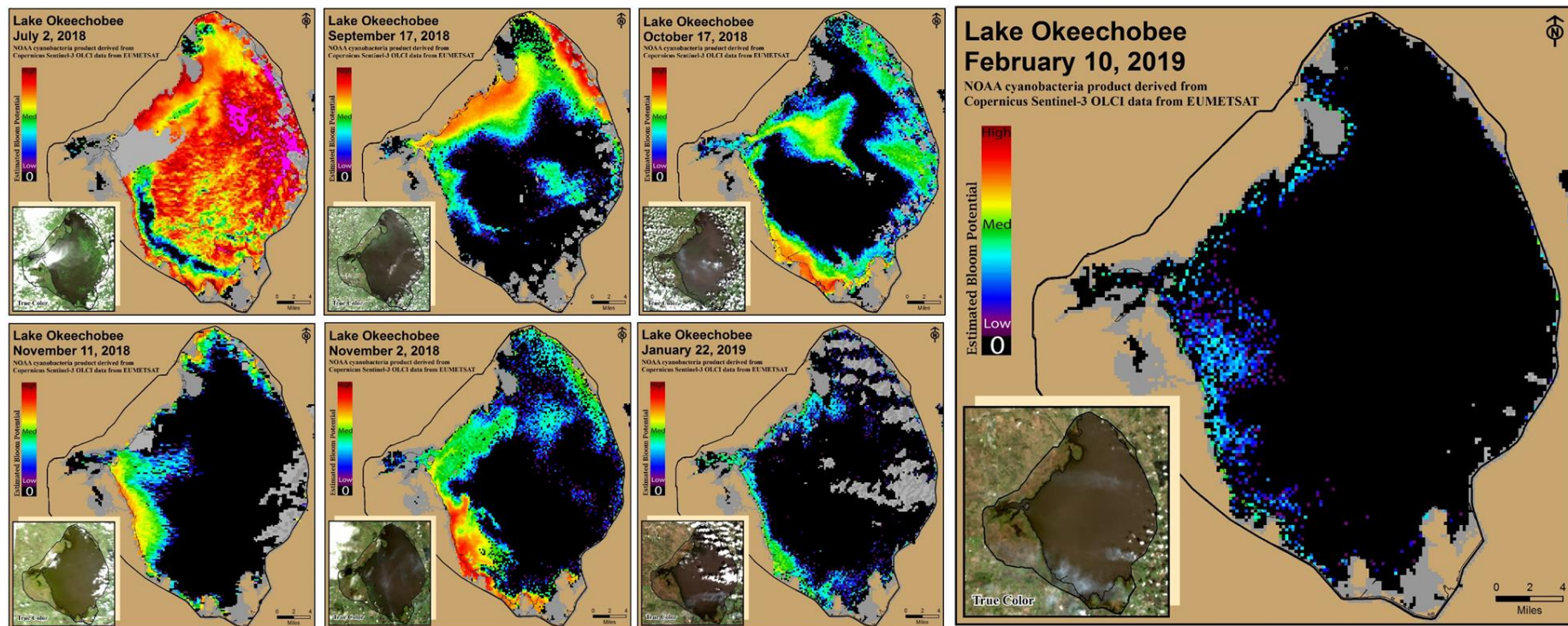


Figure 6. Potential for cyanobacterial blooms on Lake Okeechobee based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover. All data are experimental and unvalidated at this point in product development.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 297 cfs (Figures 1 and 2) and last month inflow averaged about 539 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	112
S-80	0
S-308	134
S-49 on C-24	16
S-97 on C-23	9
Gordy Rd. structure on Ten Mile Creek	160

Over the past week in the estuary, surface salinity decreased at HR1 and US1 bridge (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 19.0. 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)	15.2 (16.4)	18.2 (21.4)	NA ¹
US1 Bridge	19.0 (19.3)	19.0 (20.5)	10.0-26.0
A1A Bridge	EM ² (EM)	28.6 (28.5)	NA ¹

¹Envelope not applicable and ²Equipment Malfunction.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 1,744 cfs (Figures 5 and 6) and last month inflow averaged about 2,065 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	663
S-78	681
S-79	1195
Tidal Basin Inflow	549

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 fair range for adult eastern oysters at Cape Coral and within the good range at Shell Point (Figure 9). Salinity values were not available at Sanibel. The 30-day moving average surface salinity is 1.8 at Val I-75 and 5.8 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)	0.2 (0.2)	0.2 (0.2)	NA ¹
Val I75	0.4 (0.3)	0.5 (0.4)	0.0-5.0 ²
Ft. Myers Yacht Basin	3.8 (2.5)	4.8 (5.1)	NA
Cape Coral	8.4 (8.5)	11.0 (11.2)	10.0-30.0
Shell Point	20.2 (19.5)	19.4 (19.5)	10.0-30.0
Sanibel	NR ³ (NR)	NR (NR)	10.0-30.0

¹Envelope not applicable, ²Envelope is based on a 30-day average, and ³Not 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 1.8 to 4.2 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 375 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	375	4.2	1.4
B	300	375	2.6	1.0
C	375	375	2.4	0.9
D	450	375	2.2	0.9
E	650	375	1.8	0.8

Red tide

The Florida Fish and Wildlife Research Institute reported on February 8, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background concentrations in one sample collected offshore of Lee County. *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from and/or offshore of St. Lucie, Martin, or Palm Beach counties. No samples were collected from Broward or Miami-Dade 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.

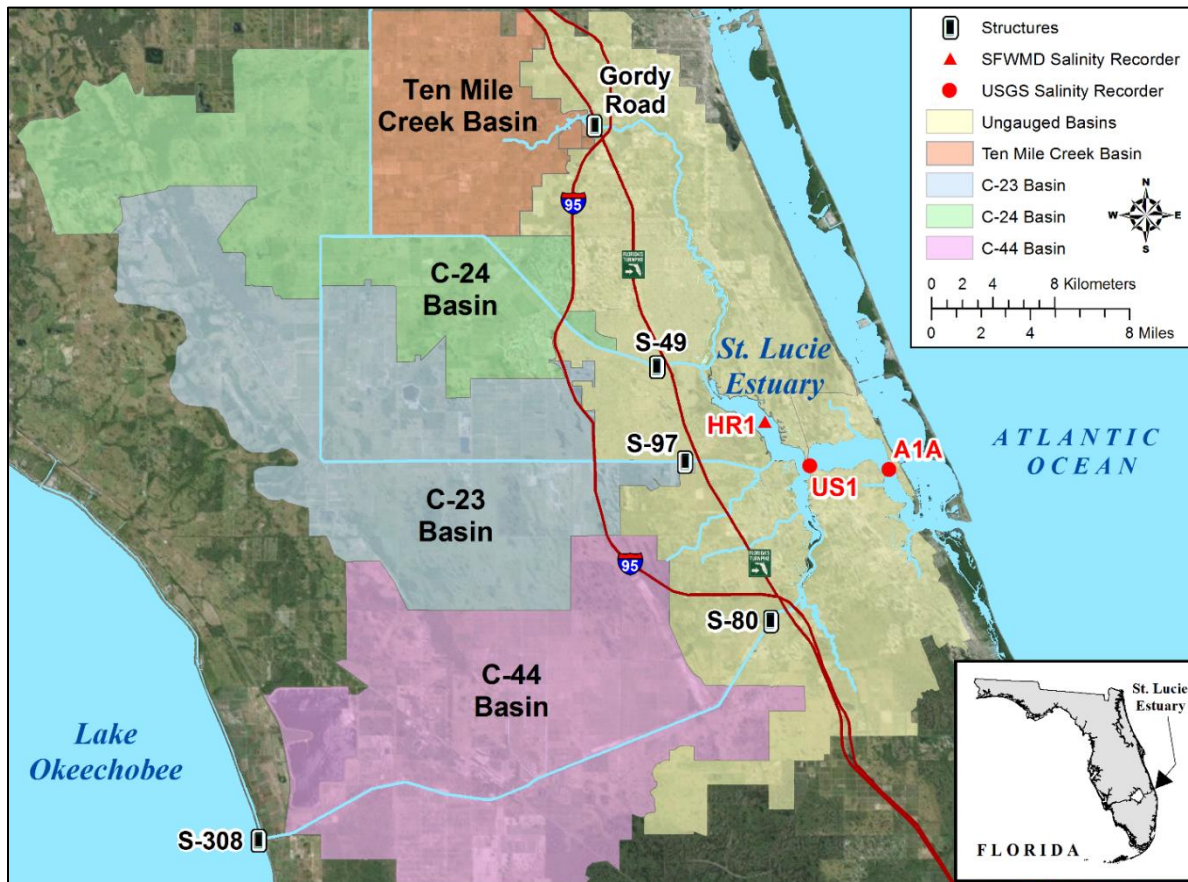


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

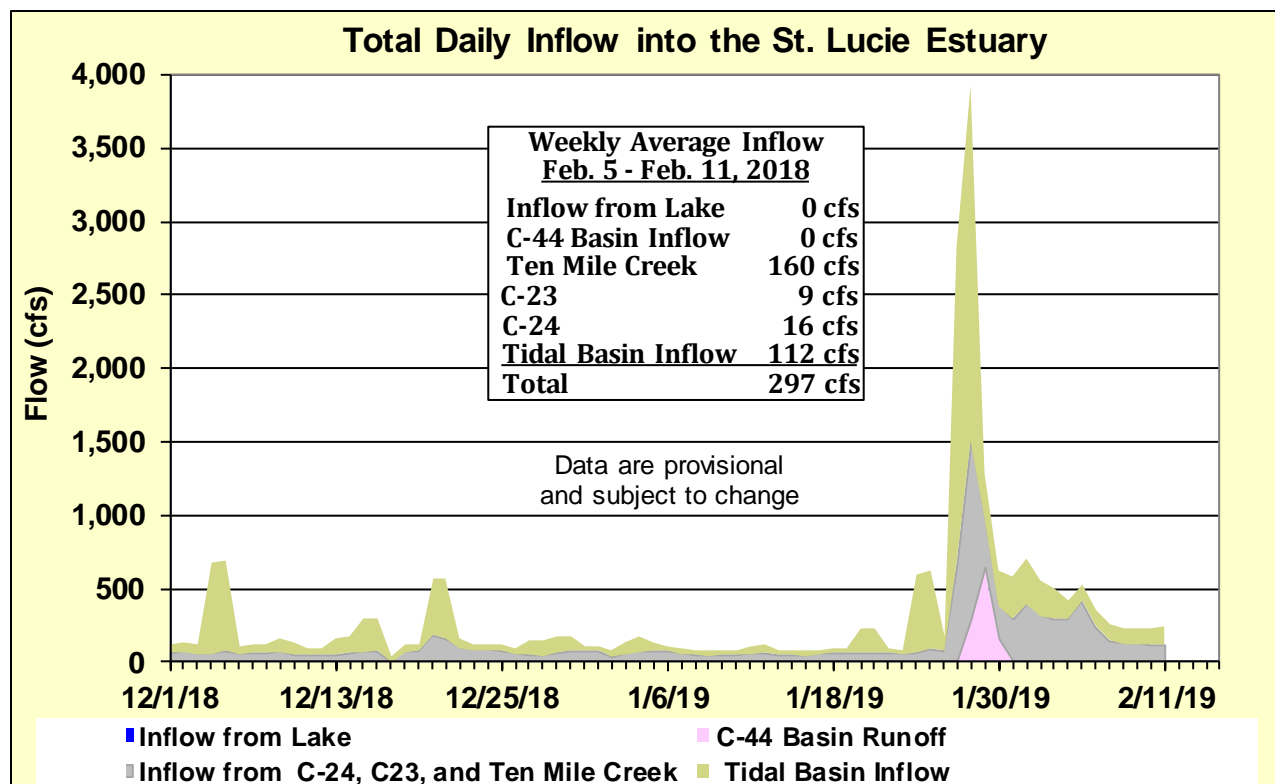


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

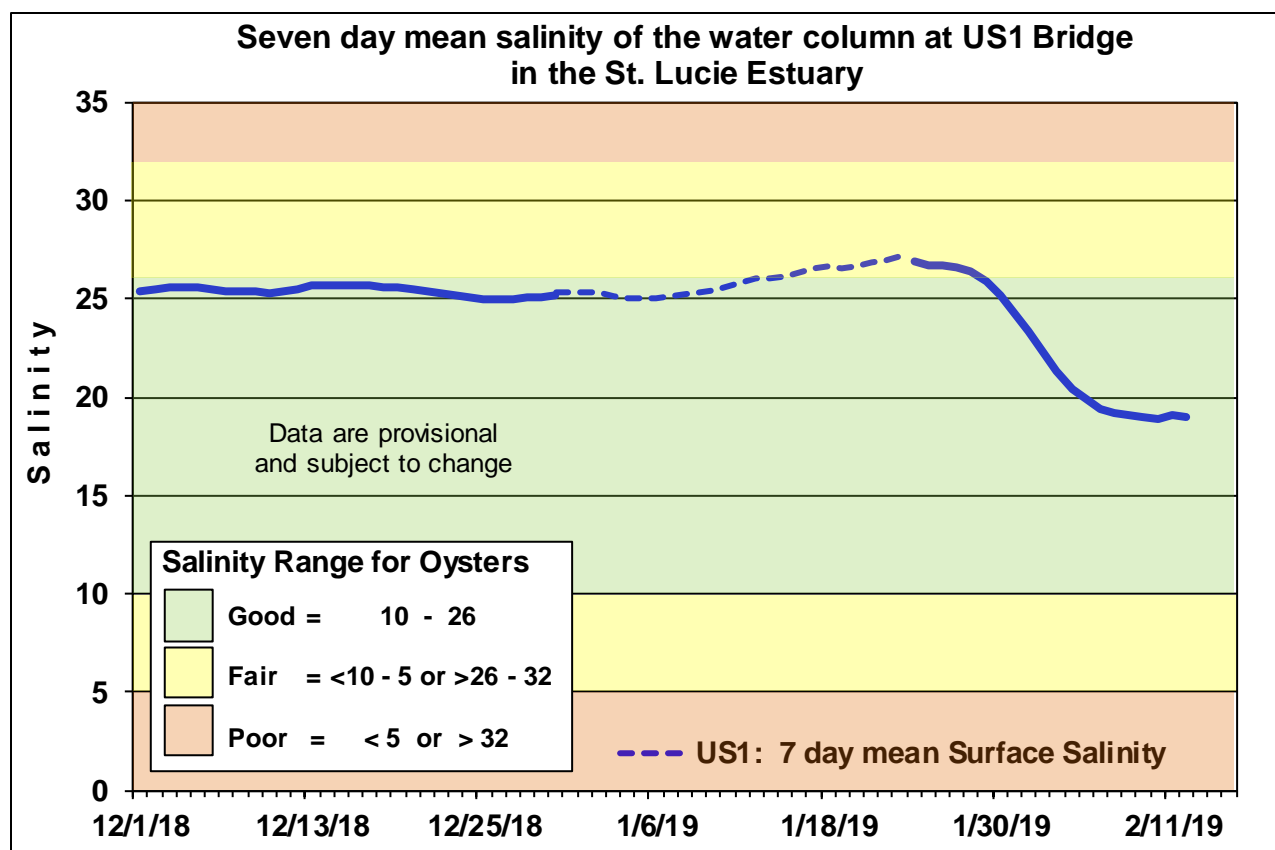


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

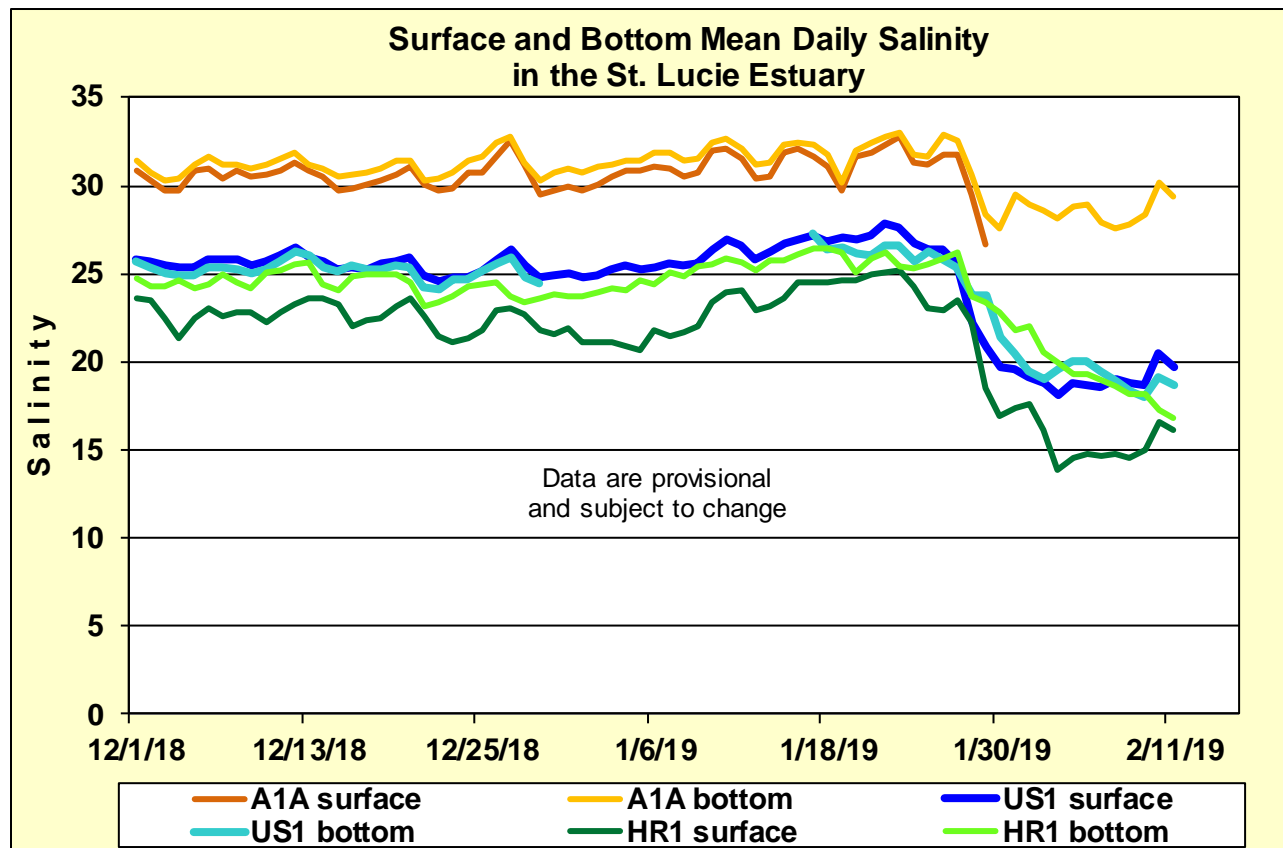


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

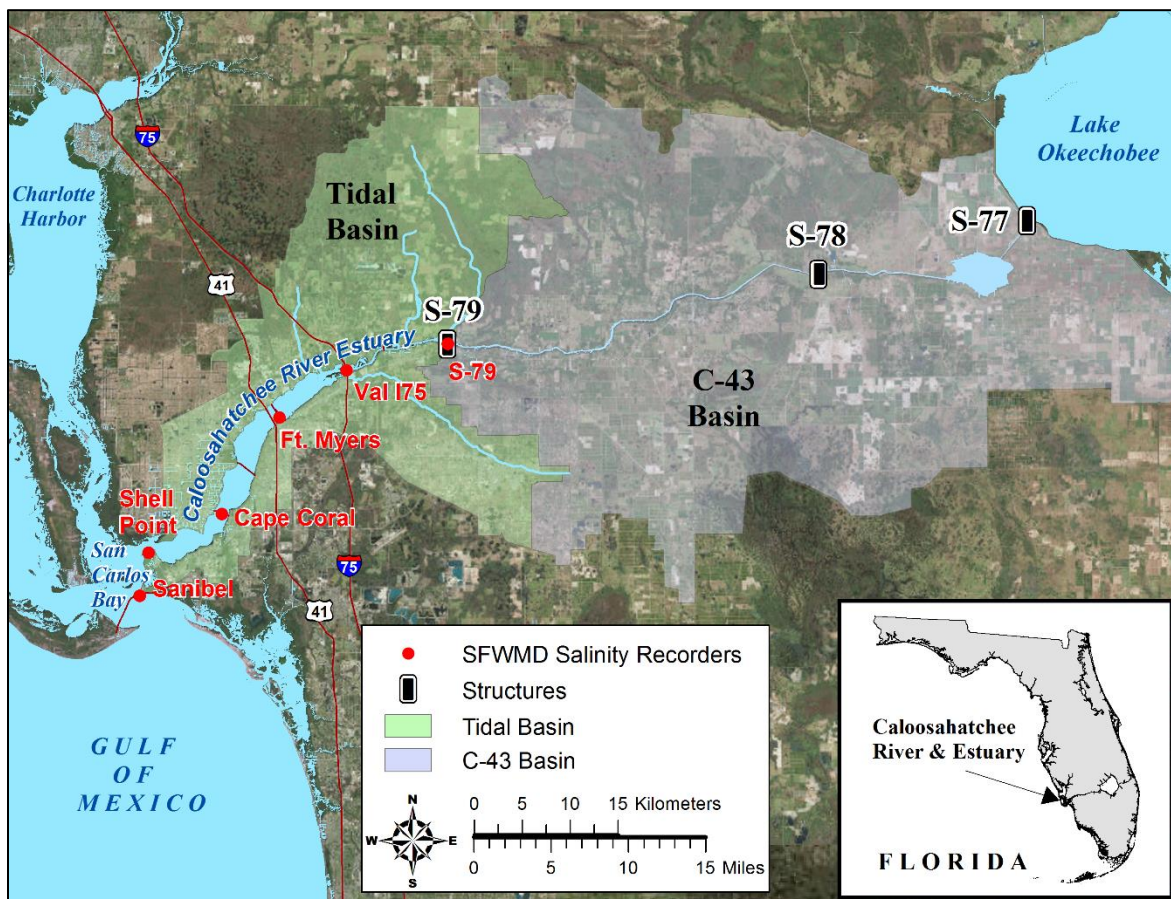


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

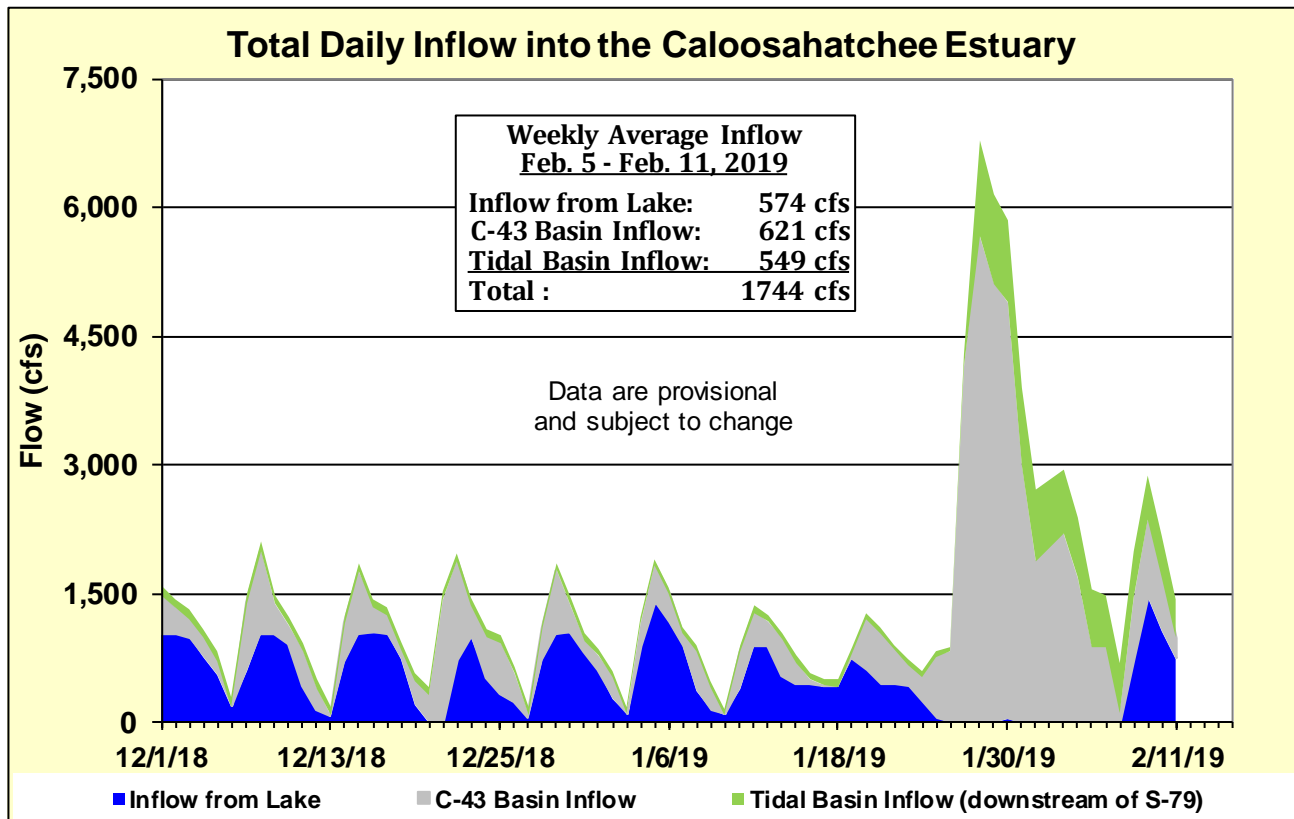


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

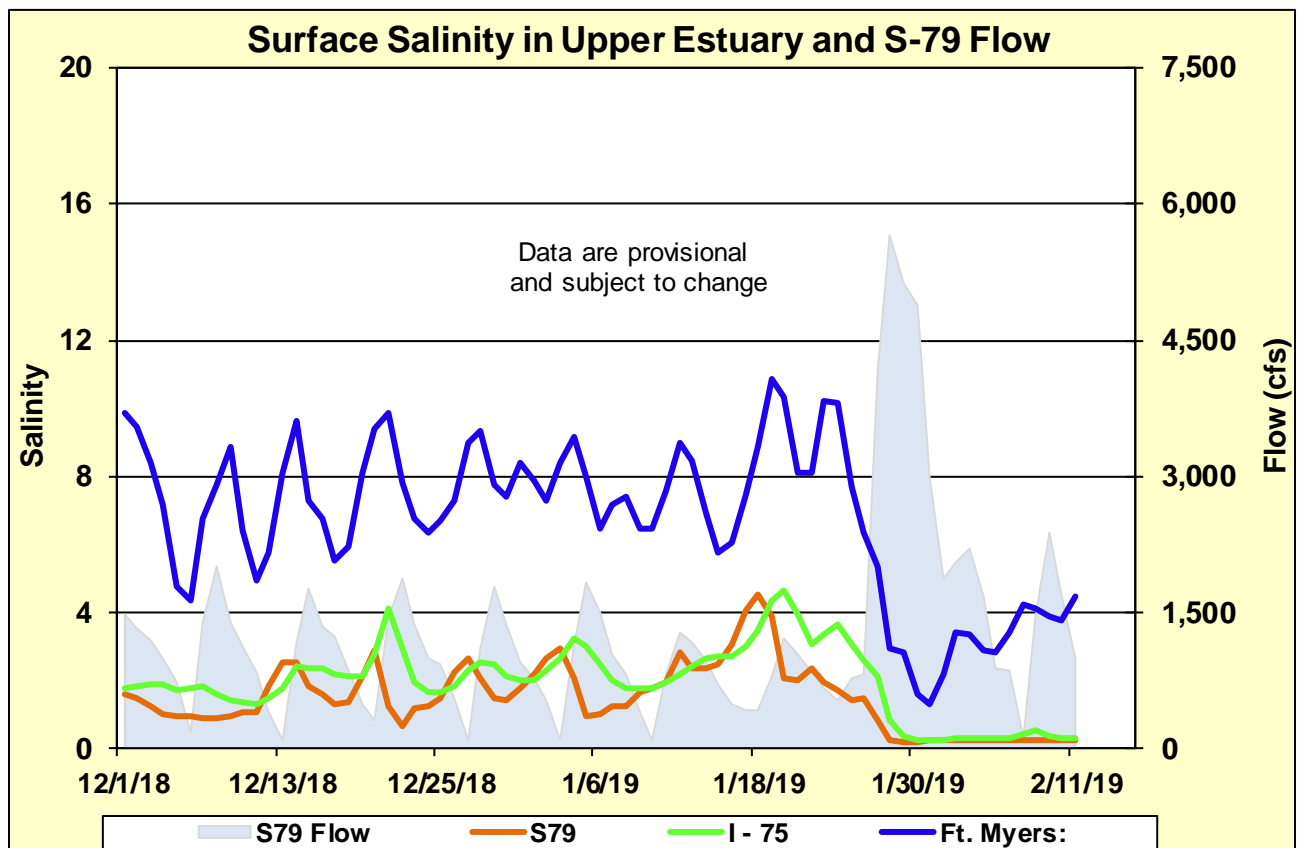


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

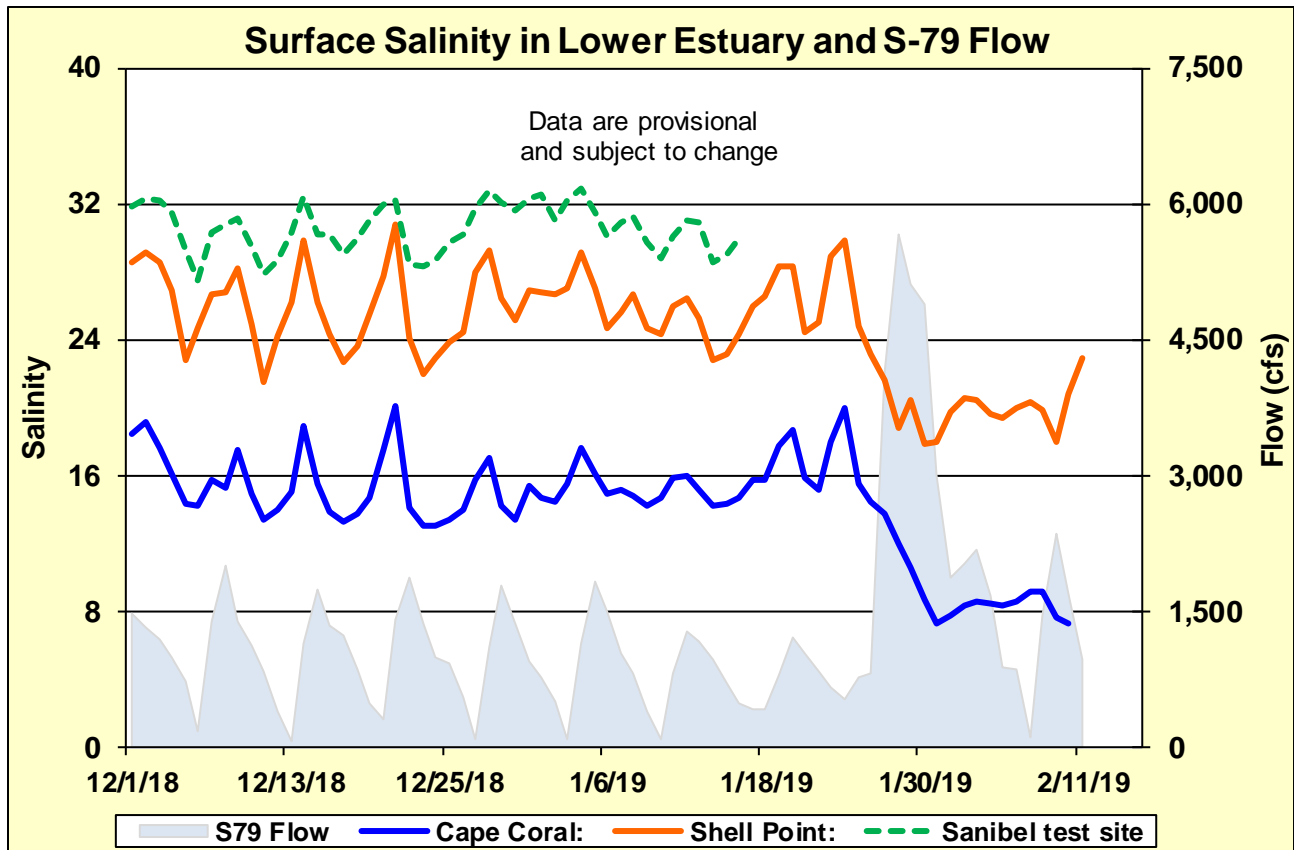


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

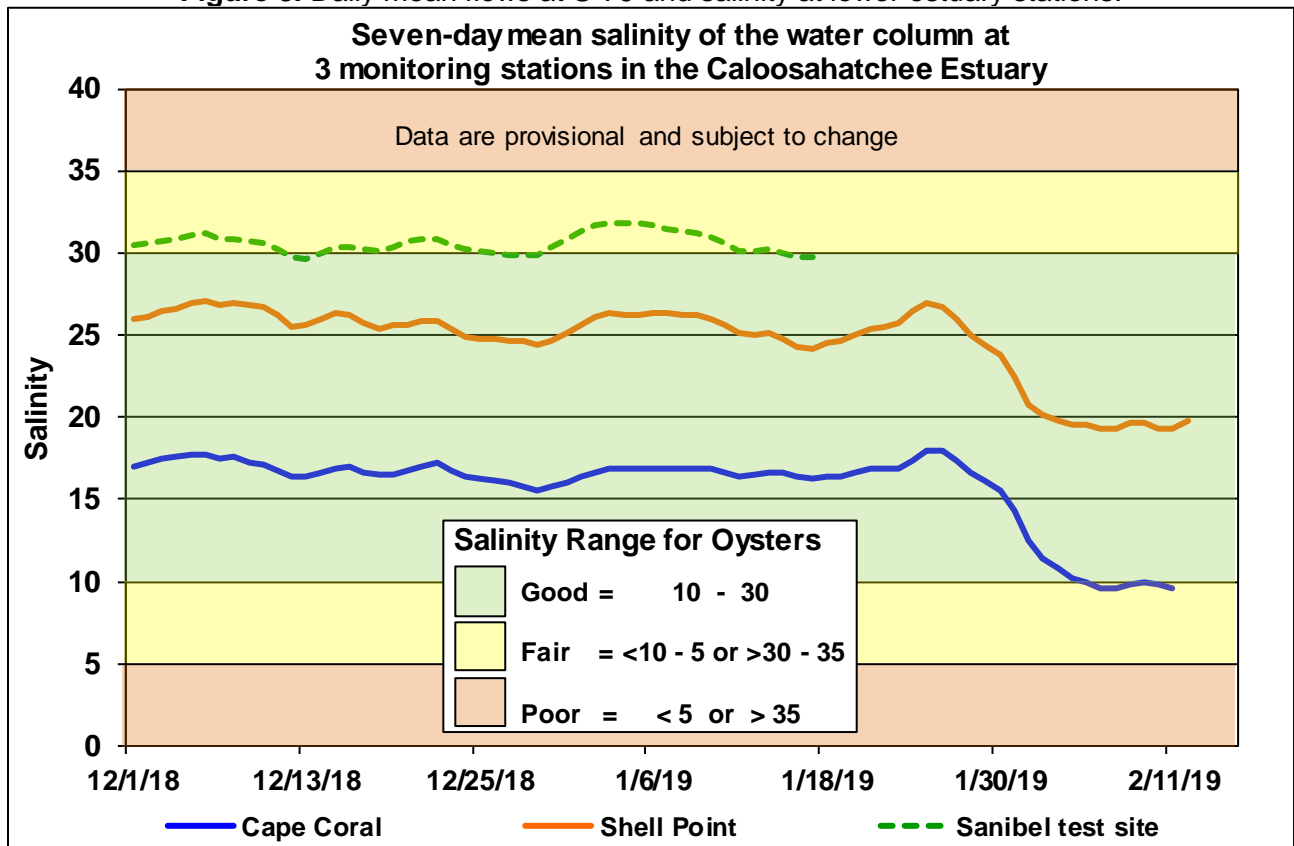


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

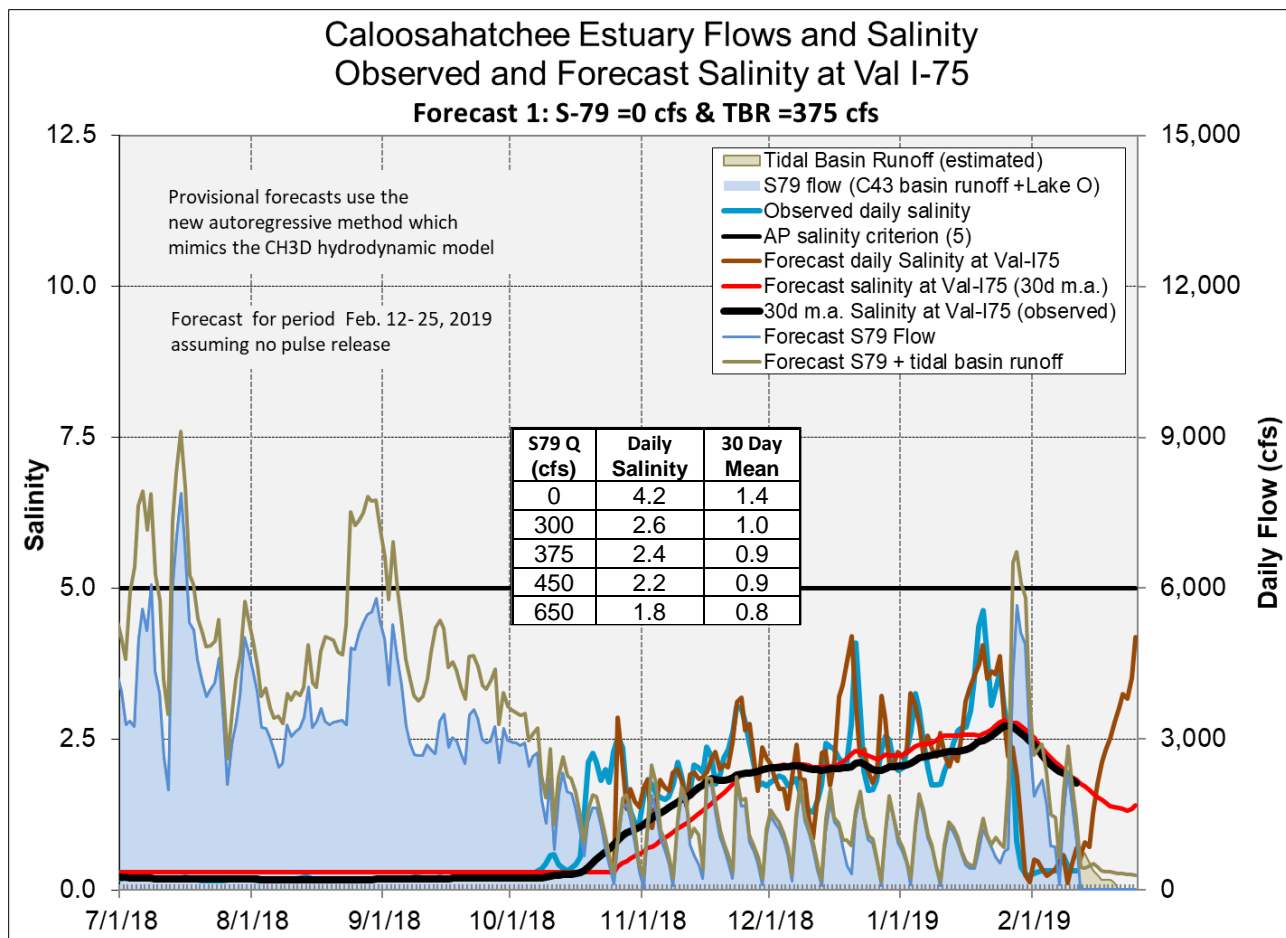
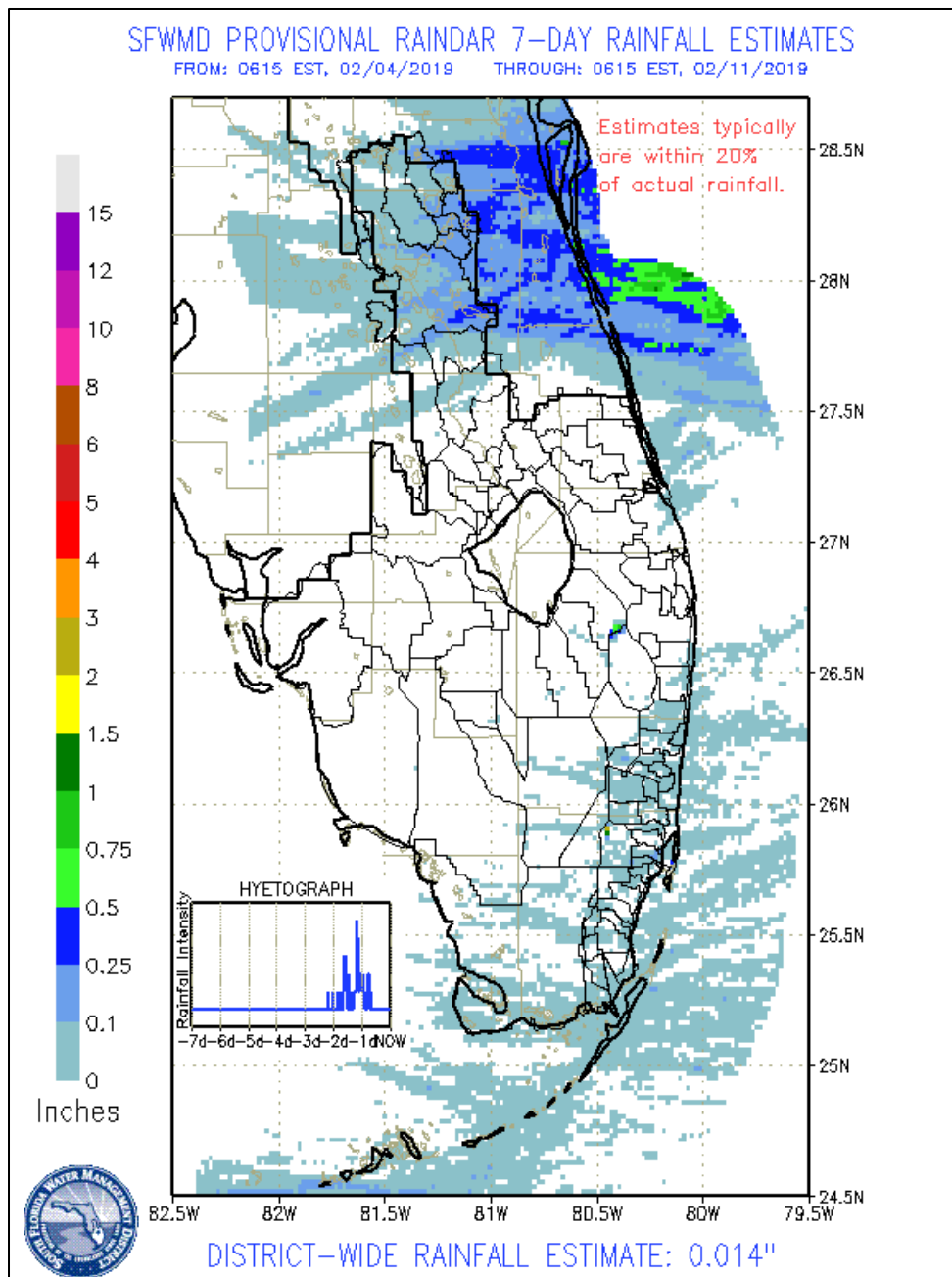


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S79.

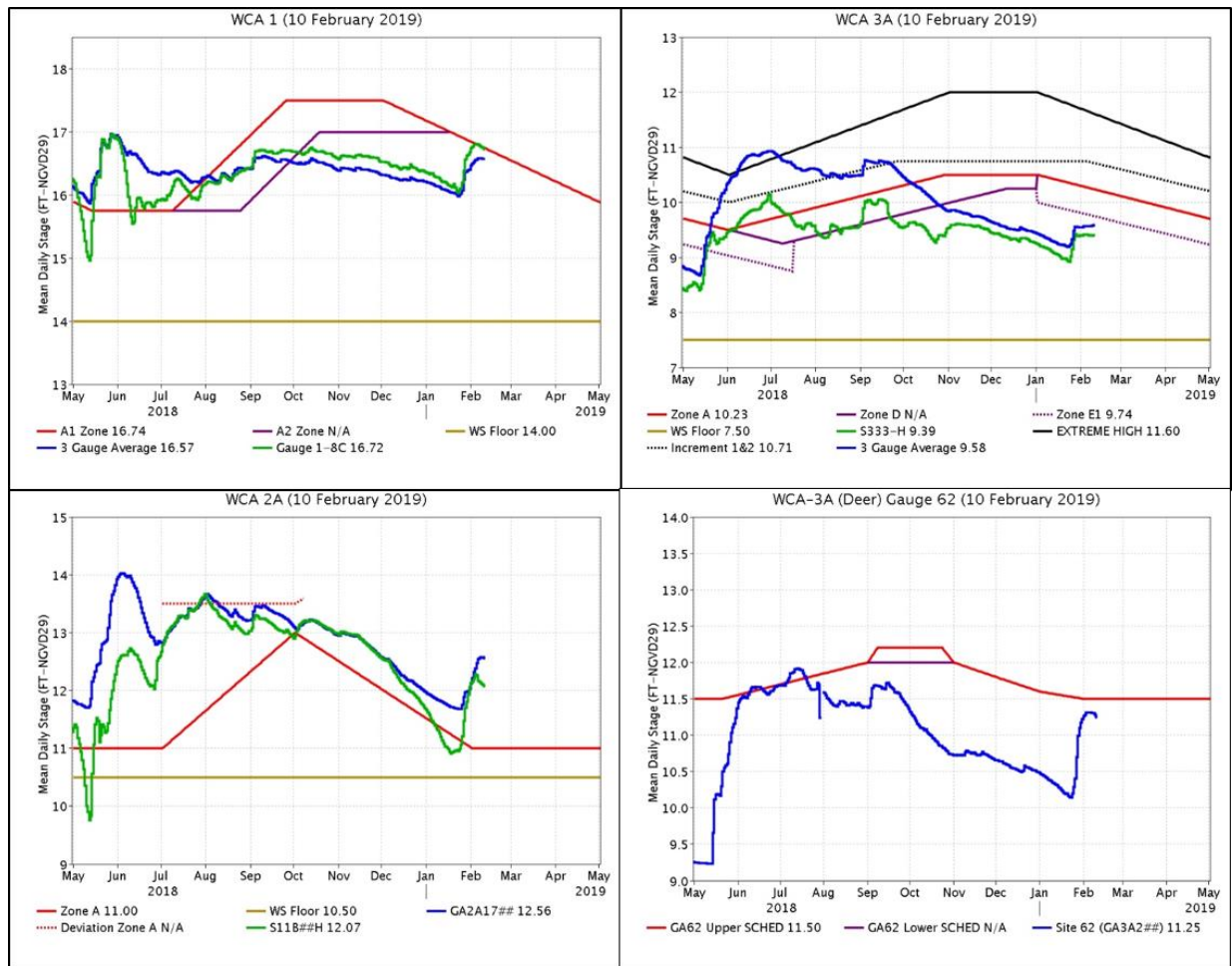
EVERGLADES

At the gauge locations monitored for this report, stages changed more consistently this week across the WCAs. The most extreme individual gauge changes within the WCAs ranged from -0.11 feet (WCA-3B) to +0.18 feet (WCA-2A). Pan evaporation was estimated at 1.01 inches this week.

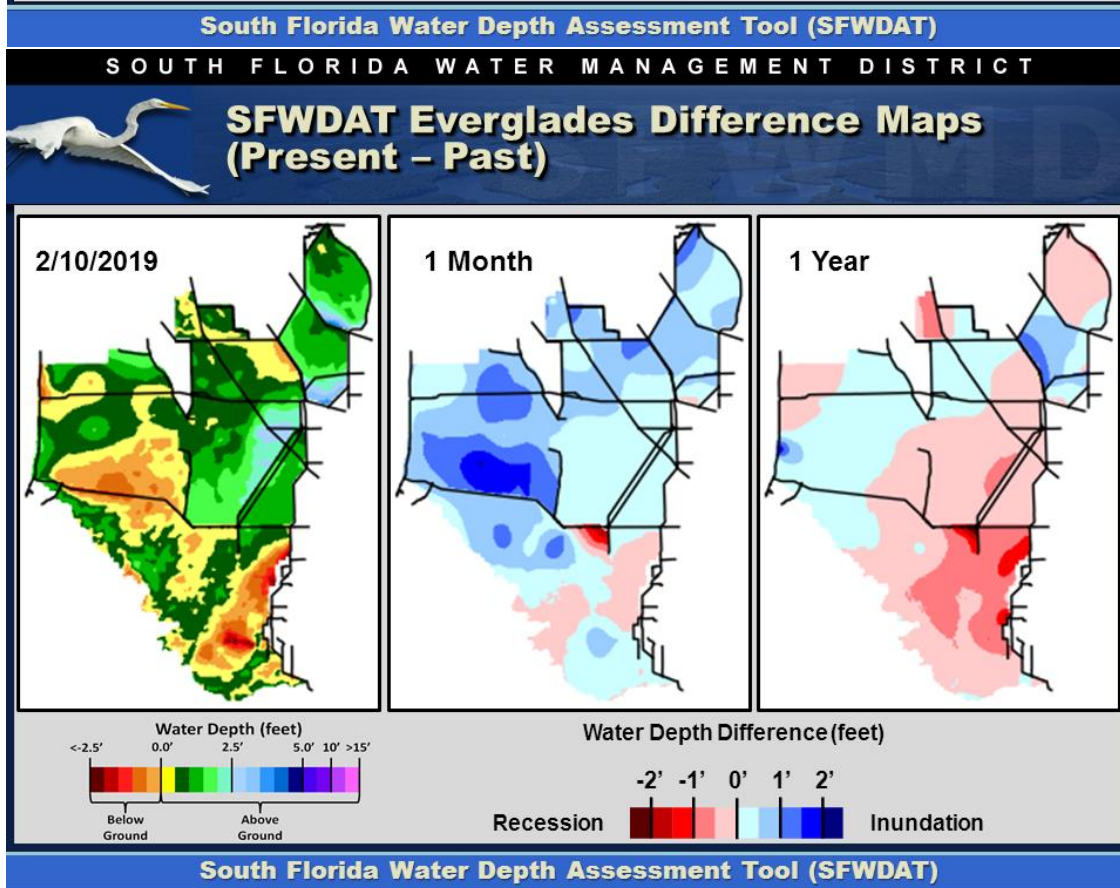
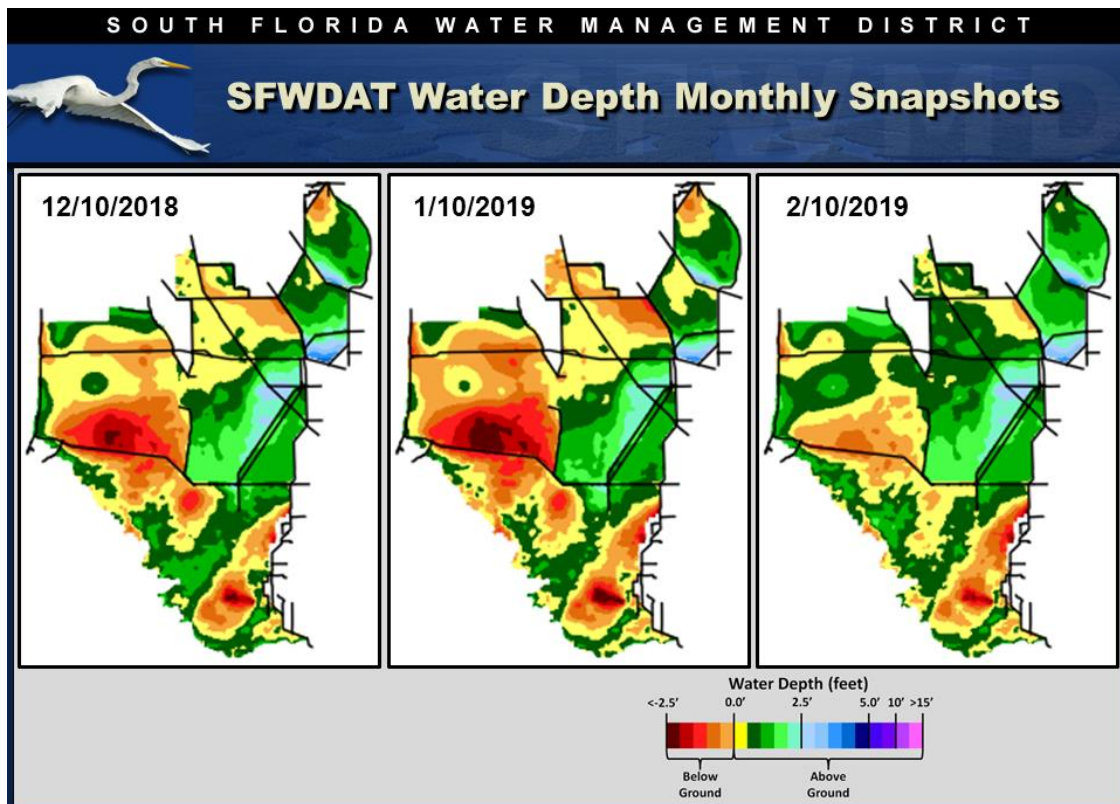
Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.01	+0.03
WCA-2A	<0.01	+0.18
WCA-2B	0.02	+0.04
WCA-3A	<0.01	-0.01
WCA-3B	<0.01	-0.08
ENP	<0.01	-0.04



Regulation Schedules: Gauge 1-8C is 0.02 feet below the Zone A1 regulation line. The three-gauge average is 0.17 feet below the canal stage. S-11B Headwater stage is 1.07 feet above Zone A. Gauge 2A17 is 0.49 feet above the canal stage. WCA-3A three-gauge average stage is trending towards Zone E1 regulation line, now 0.16 feet below. WCA-3A at gauge 62 (Northwest corner) rose dramatically over the previous two weeks but stabilized this week and is 0.25 feet below the lower schedule.

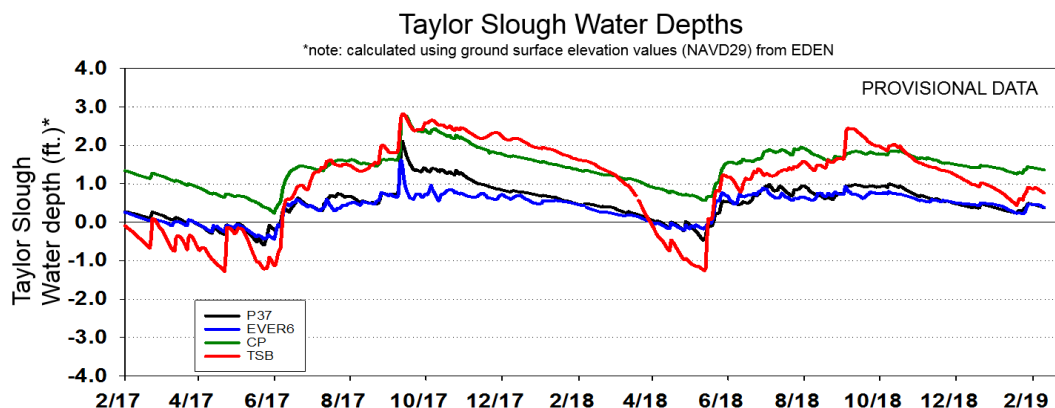
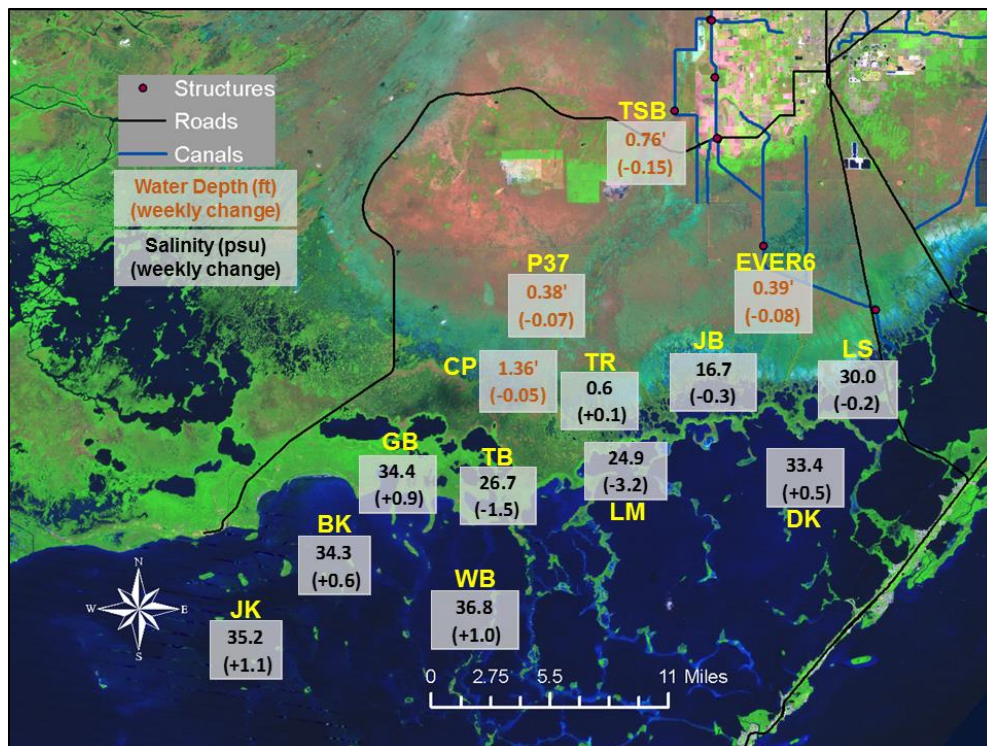


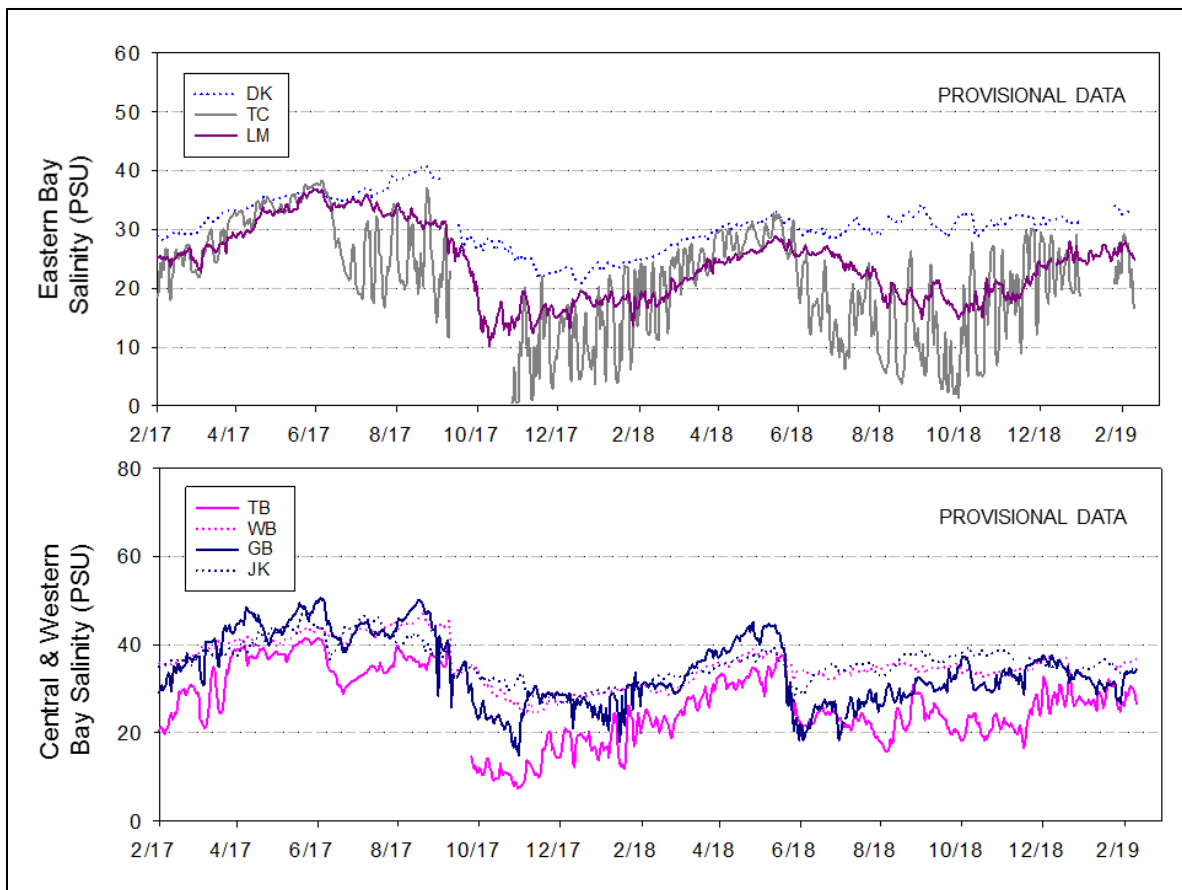
Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicates that conditions remain dry in portions of the WCAs, but the recent rains have had an impact on stages. The model indicates now only the eastern third of WCA-3A North has depths below or near ground surface. In the extreme northeast of that basin, 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 50 cfs last week. WDAT difference output indicates that water depth changes across all the Everglades over the month were near zero or moderate and the WCAs are deeper than a month ago. The “1 Year” inset shows the difference between current depth conditions in WCA-3A South and WCA-1 and post Hurricane Irma’s lessening impact on water depths a year ago. The previous year’s high-water event suggests that the current lower than seasonal water depths may be allowing ecological processes to recover from high water stress.



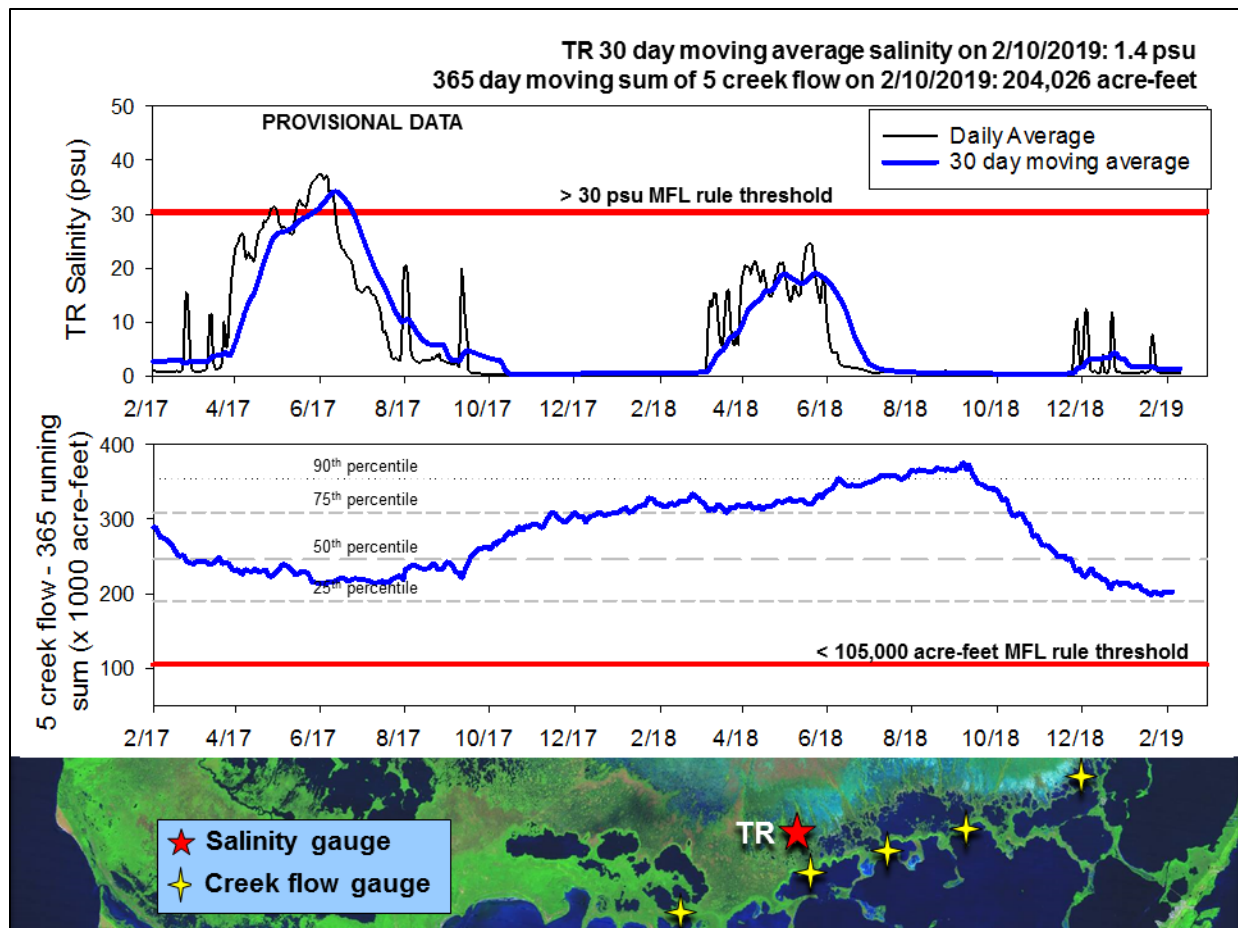
Taylor Slough Water Levels: An average of 0.2 inches of rain fell on Taylor Slough and Florida Bay this past week but stages have resumed recession. Water depths averaged 0.68 feet across Taylor Slough after receding about 0.07 feet over the week. Conditions are 4.0 inches above average for this time of year.

Florida Bay Salinities: Salinity in Florida Bay stayed the same as last week on average with individual station changes ranging from a decrease of 3 psu to an increase of 1 psu. Daily average salinities ranged from 17 psu in the northeast to 37 psu in the central bay and are about 4 psu above average for this time of year.





Florida Bay MFL: Salinity in the mangrove zone stayed at 0.6 psu. The 30-day moving average also stayed at 1.4 psu over the last week. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about 5,500 acre-feet for the last week, which is 1,100 acre-feet more than the average weekly five-creek flow for this time of year. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) has increased slightly to 204,026 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

Water management that protects peat soils especially in WCA-3A North as the dry season becomes established has increasing ecological benefit as dry conditions remain in that basin. Rotenberger Wildlife Management Area is below regulation and would benefit ecologically from additional inflows. Wading bird foraging was noted in WCA-2A but was absent from the rest of the Everglades. Looking forward into the dry season, conditions in WCA-2A seem the most promising (relative to other historical foraging locations) to support the limited number of nesting wading birds expected this year. Given this and the drier than average conditions in northeastern WCA-3A, it is recommended that priority be given to route water into WCA-3A versus WCA-2A when possible, and to begin a careful recession with the goal to reach suitable wading bird foraging depths in WCA-2A within the next month while being careful not to over drain that basin. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, February 12th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stages changes ranged from -0.08' to +0.11'	Maintain depths at regulation schedule. Moderate ascension rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage increased by 0.18'	Maintain depths at regulation schedule. Moderate ascension rates to the extent possible.	Protect conditions that provide wading bird foraging habitat later into the nesting season.
WCA-2B	Stage decreased by 0.04'	Maintain depths at regulation schedule. Moderate ascension rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage increased by 0.11'	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 due to unseasonably dry conditions.
WCA-3A NW	Stage decreased by 0.08'	Maintain depths at regulation schedule.	
Central WCA-3A S	Stage decreased by 0.02'	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 0.03'		
WCA-3B	Stage decreased by 0.08'	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 -0.05' 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 -3.2 to +1.1 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.