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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 5, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

A ridge of surface high pressure over the southeastern United States should gradually shift eastward into the western Atlantic later this week. Dry and stable atmospheric conditions over Florida in association with the ridge should ensure no measurable total District rainfall through at least Thursday. Some increase of low-level moisture on Friday could result in light shower activity developing over portions of the southeastern or eastern half of the District, but insufficient atmospheric instability should both limit the overall coverage and intensity of the rain. A cold front moving eastward along the Gulf coast on Thursday and Friday should slow down and stall over the northern or central portion of the District on Saturday, when it encounters a strong mid-level ridge of high pressure forecast to build from the Gulf of Mexico to Florida. Low-level convergence associated with the boundary, an overall increase in low-level moisture and a marginal increase of instability should contribute to enhanced rains over the northeastern or eastern half of the District on Saturday, with a notable concentration of greater areal average rainfall likely north and east of Lake Okeechobee through or north of the upper east coast. Enhanced shower activity is expected to persist on Sunday over the northeastern or eastern half of the District but to a lesser extent as the front over central Florida becomes diffuse and gradually dissipates. All in all, there is a high chance that this weekend's total District rainfall would be the greatest since Friday-Saturday of the previous week. Relatively drier conditions are seen on Monday, but indications are that it would not be as dry across the District as it is expected to be early this week. For the week ending next Tuesday morning the deterministic total QPF is a little under two tenths of an inch or about 35-40% of normal, the bulk of which should occur this coming weekend. The probabilistic model output shows a likelihood of about 0.15" of total District rainfall, an even chance that it would add up to just under a quarter of an inch (normal is close to 0.5"), and an unlikely scenario of it resulting normal to above normal. Wetter conditions are possible across the District around the middle and latter part of next week thanks to changes to the large-scale weather pattern, but it is still too soon to offer any specific details nor to be sufficiently confident about the transition.

Kissimmee

Tuesday morning stages were 57.2 feet NGVD (0.8 feet below schedule) in East Lake Toho, 54.2 feet NGVD (0.8 feet below schedule) in Toho, and 51.2 feet NGVD (1.1 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.9 feet NGVD at S-65D. Tuesday morning discharges were 2445 cfs at S-65, 2442 cfs at S-65A, and 1300 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 5.2 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 0.53 feet. Recommendations for the week, 2/4/2019-Increase discharge at S-65/S-65A to begin reducing KCH stage to reach 50.75 ft on 2/15/2019. The purpose is to reduce to the stage at which the seasonal recession will begin.

Lake Okeechobee

Lake Okeechobee stage is 12.74 feet NGVD, rising 0.15 feet from the previous week, about half the rate as the week before. The Lake is 0.13 feet higher than 30 days ago and is now in the Base Flow sub-bands. However, the lake is still nearly 1.5 feet below the bottom of the ecological envelope, which varies seasonally from 12.5 – 15.5 ft NGVD. Given 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 673 cfs over the past week with 0 cfs coming from Lake Okeechobee. Over the past week, salinity decreased over the entire 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 3,829 cfs over the past week with only 6 cfs coming from the Lake. Over the past week, surface salinity decreased throughout the estuary. The 30-day moving average surface salinity is 2.2 at Val I-75 and 6.4 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 6,600 acre-feet of Lake releases. The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 1,379,000 acre-feet, which includes approximately 348,000 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 below target. STA-1W Northern Flow-way is offline for STA-1W Expansion project construction 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 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 relatively similar amounts of rainfall. However, stages across the Everglades did not rise in a uniform fashion with WCA-2A experiencing the most dramatic rise. Stages remain just at or below regulation schedule in the WCAs with the exception of WCA-2A, which remains above schedule. Canal stages at S-11B_HW have risen quickly to equalize with the marsh. Taylor Slough stages increased this week and remain above average for this time of year. Salinity in Florida Bay rose this week with the largest weekly change being an increase in the west-central shoreline area. Flows from the 5 creeks used in the FI Bay MFL increased slightly.

Supporting Information

KESSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 1.98 inches of rainfall in the past week and the Lower Basin received 1.90 inches (SFWMD Daily Rainfall Report 2/3/2018).

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: 2/5/2019

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)						
							2/3/19	1/27/19	1/20/19	1/13/19	1/6/19	12/30/18	12/23/18
Lakes Hart and Mary Jane	S-62	97	LKMJ	61.0	R	61.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.3
Lakes Myrtle, Preston, and Joel	S-57	37	S-57	61.3	R	61.3	0.0	-0.2	0.0	0.1	0.0	-0.1	-0.3
Alligator Chain	S-60	0	ALLI	63.5	R	64.0	-0.5	-0.7	-0.8	-0.7	-0.7	-0.7	-0.7
Lake Gentry	S-63	39	LKGT	61.4	R	61.5	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
East Lake Toho	S-59	693	TOHOE	57.2	R	58.0	-0.8	-0.5	-0.5	-0.4	0.0	0.0	-0.1
Lake Toho	S-61	1,749	TOHOW, S-61	54.2	R	55.0	-0.8	-0.7	-0.5	-0.4	-0.5	-0.5	-0.1
Lakes Kissimmee, Cypress, and Hatchineha	S-65	1,615	KUB011, LKIS5B	51.3	R	52.4	-1.1	-1.5	-1.7	-1.8	-1.8	-2.0	-2.6

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: 2/5/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days ¹								12/2/18
		2/3/2019	2/3/19	1/27/19	1/20/19	1/13/19	1/6/19	12/30/18	12/23/18	12/16/18	12/9/18	
Discharge (cfs)	S-65	2,171	1,615	950	392	343	273	277	253	301	330	337
Discharge (cfs)	S-65A ²	1,969	1,517	764	306	261	194	201	182	180	252	232
Discharge (cfs)	S-65D ²	1,385	1,221	621	341	261	241	242	238	253	298	276
Headwater Stage (feet NGVD)	S-65D ²	25.86	25.90	26.00	25.94	25.91	25.86	25.88	25.73	25.80	25.84	25.82
Discharge (cfs)	S-65E ²	1,329	1,151	606	309	261	215	218	266	242	292	302
Discharge (cfs)	S-67	0	0	0	0	0	0	0	0	0	0	0
DO (mg/L) ³	Phase I river channel	3.8	5.2	6.6	6.8	6.4	6.1	6.6	6.7	6.4	6.2	6.3
Mean depth (feet) ⁴	Phase I floodplain	0.53	0.46	0.12	0.07	0.08	0.09	0.11	0.12	0.10	0.10	0.12

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)

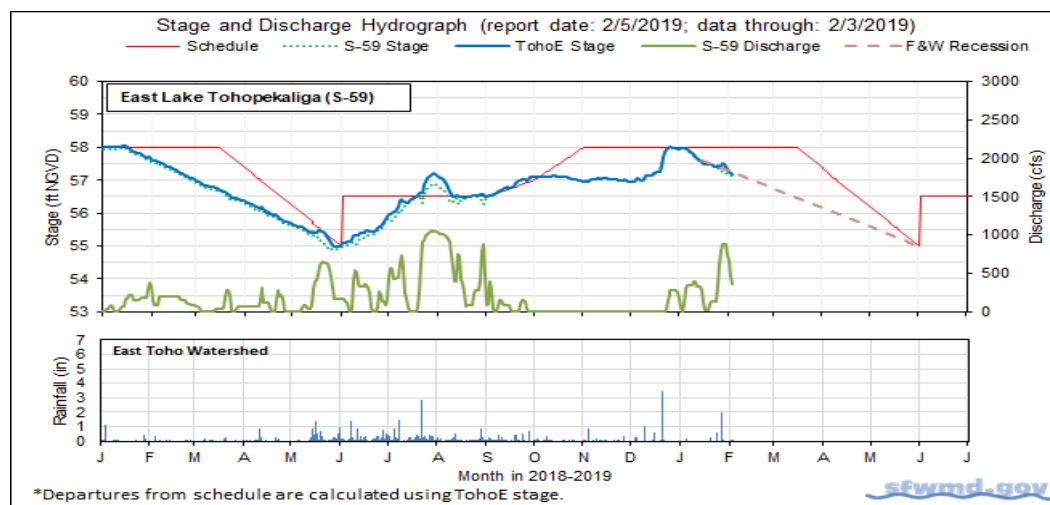


Figure 1.

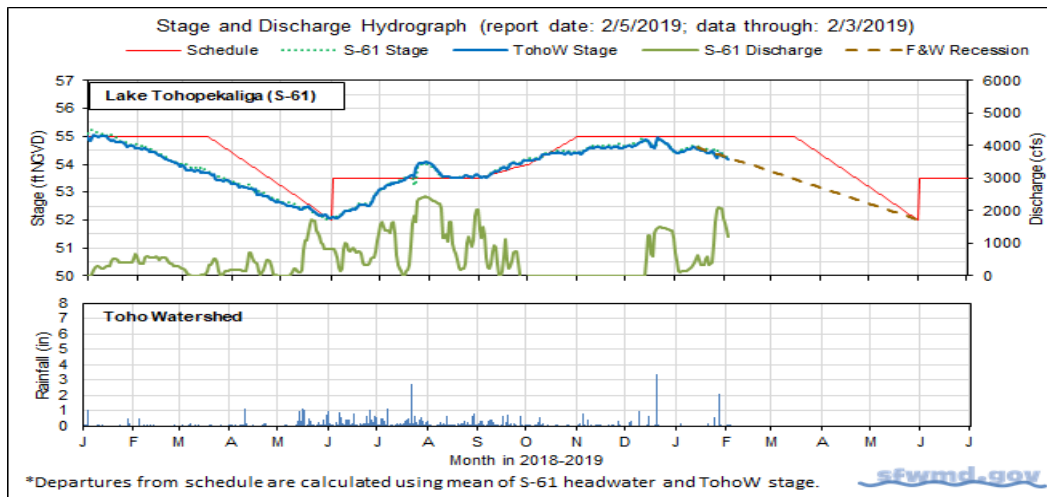


Figure 2.

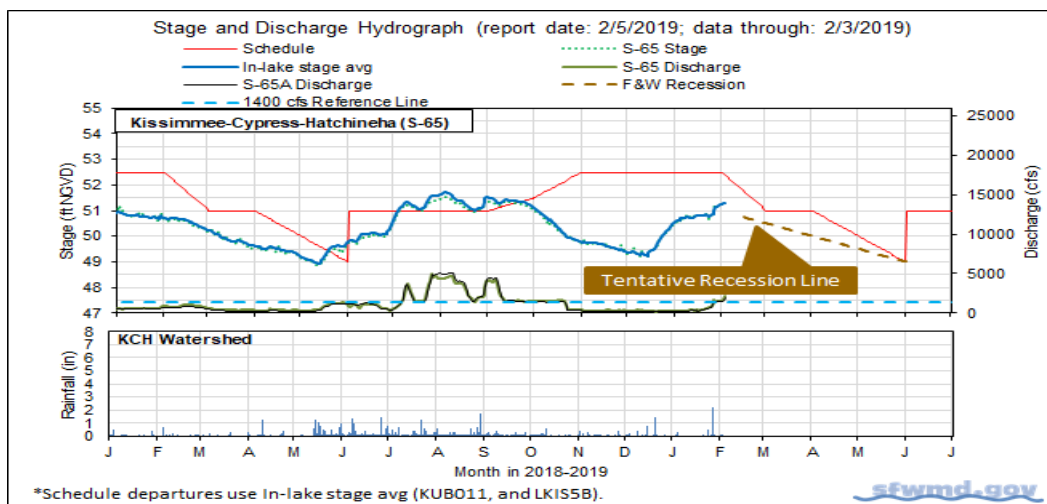


Figure 3.

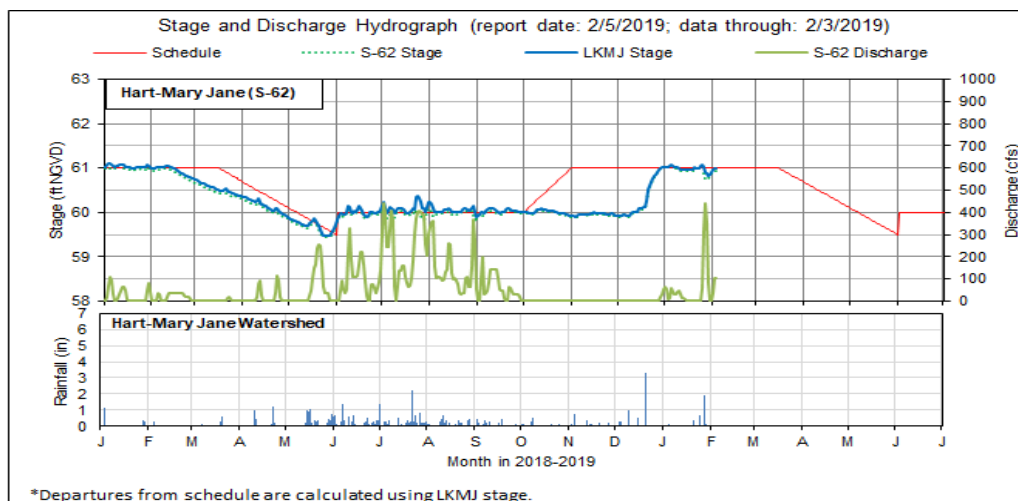


Figure 4.

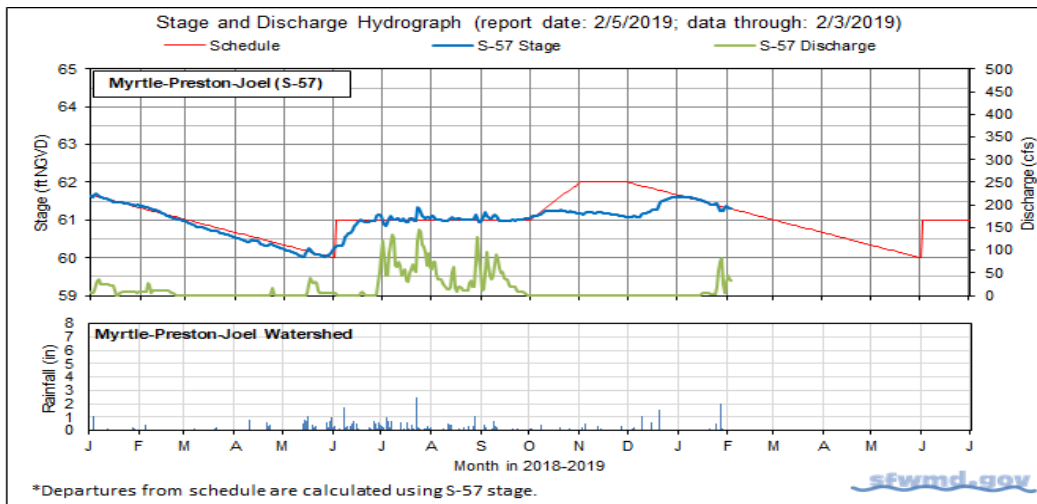


Figure 5.

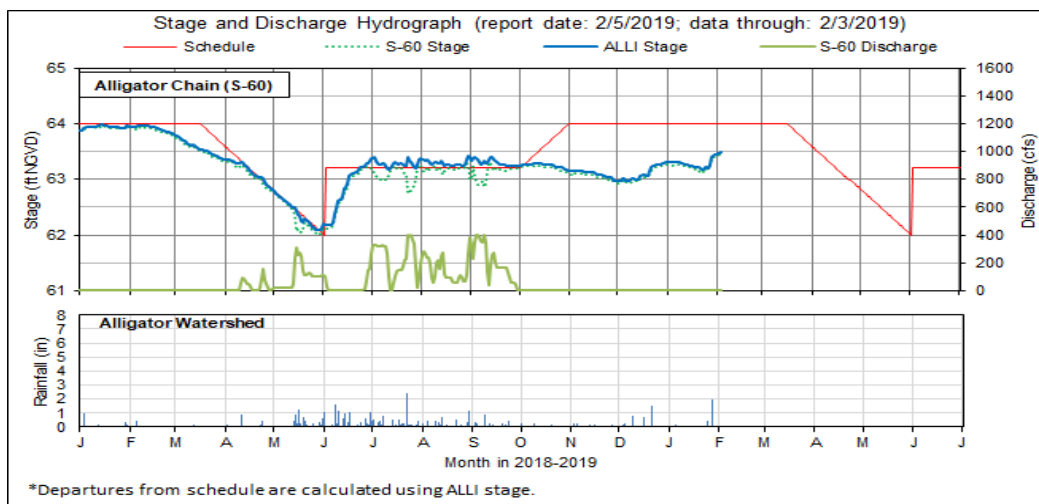


Figure 6.

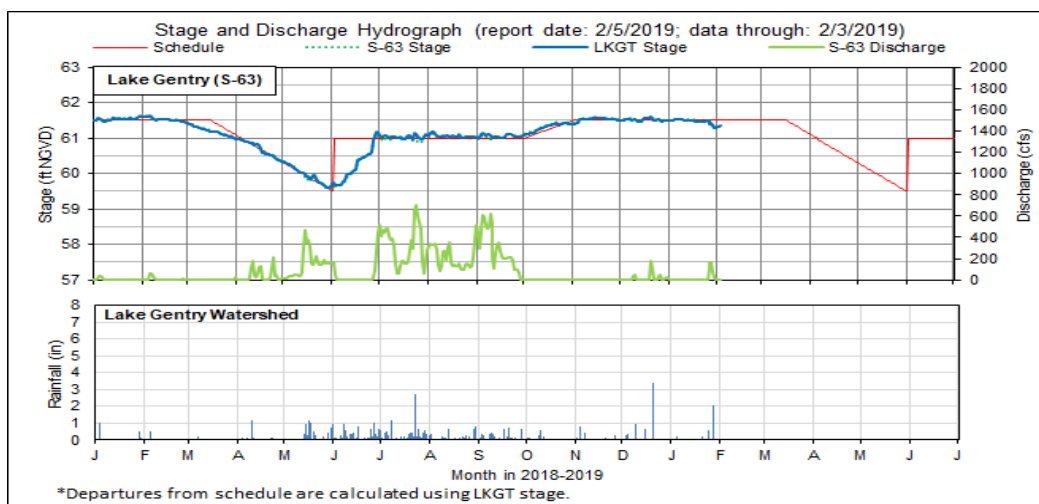


Figure 7.

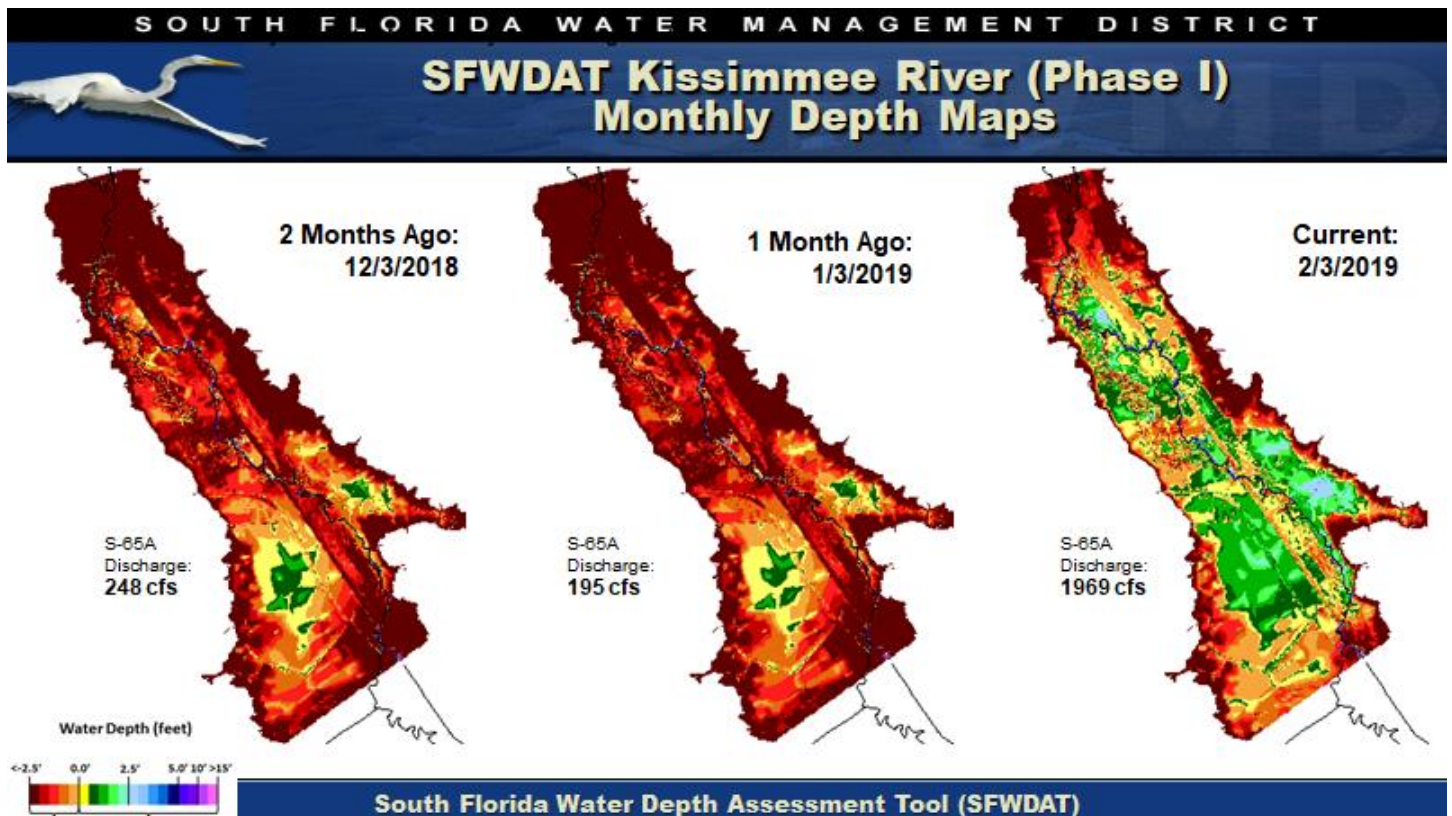


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

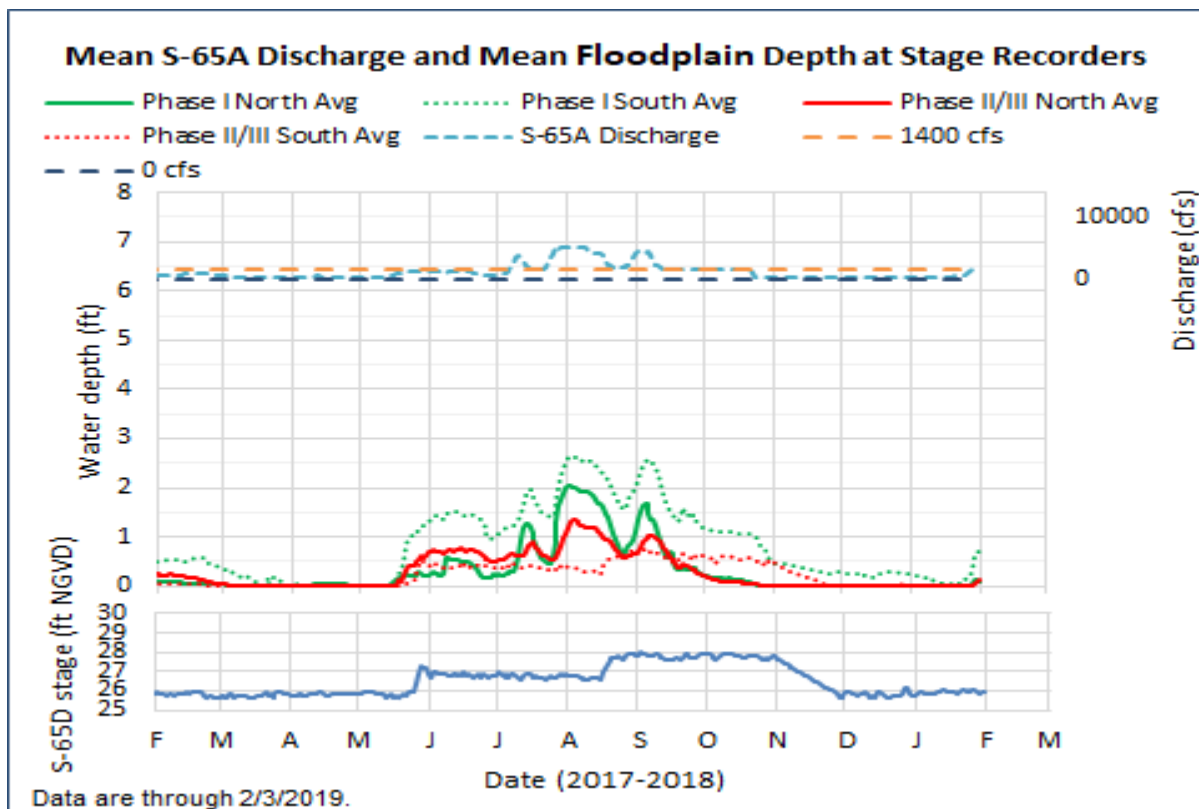


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.

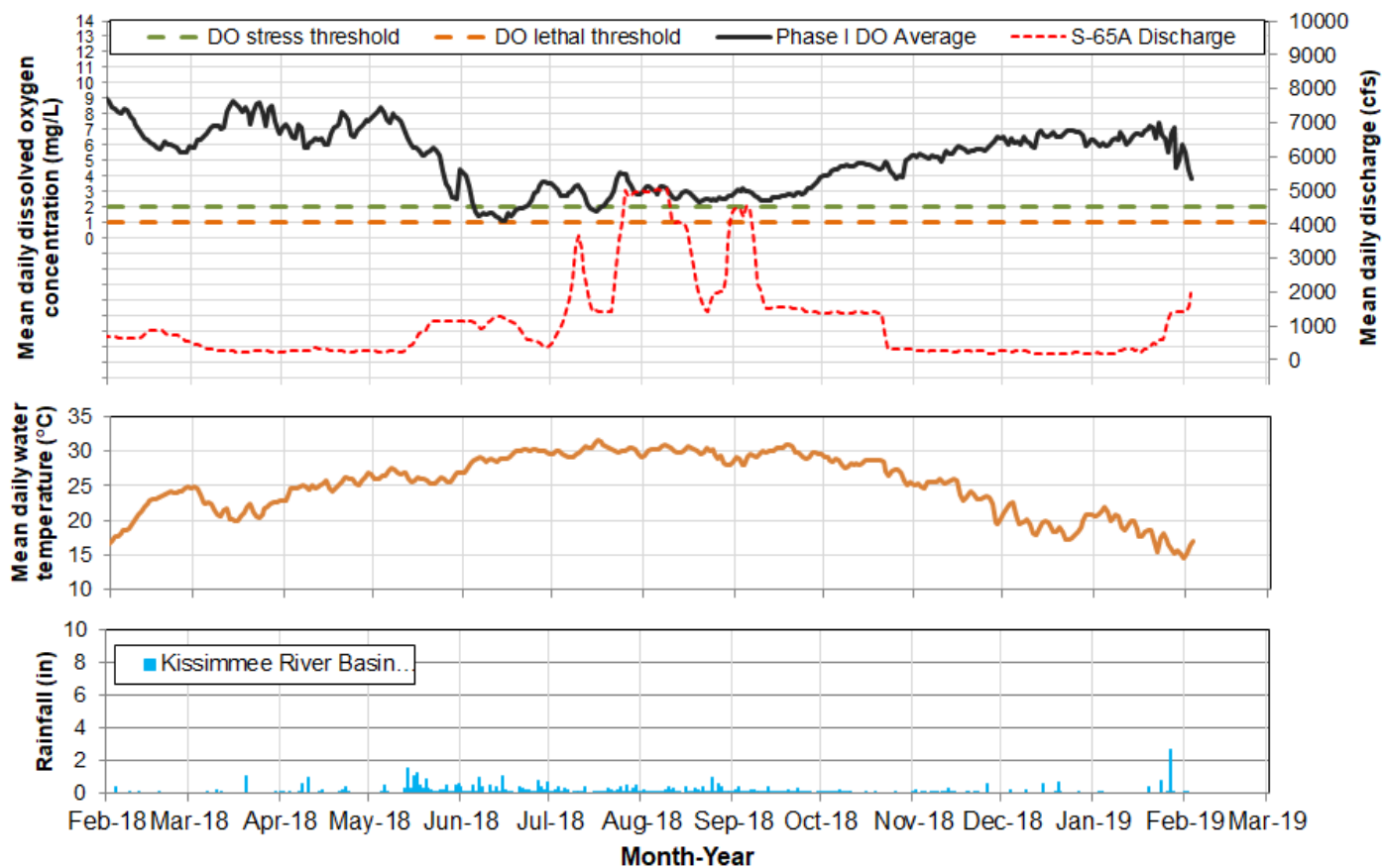


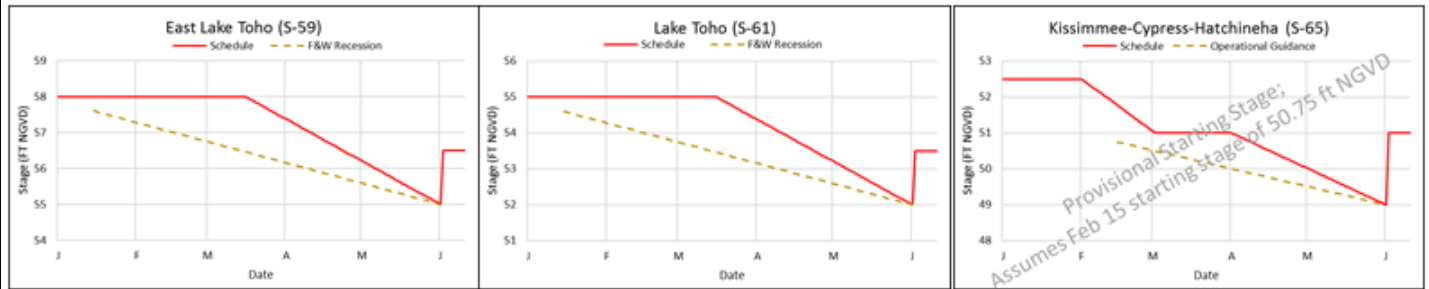
Figure 10. Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phase I river channel.

Water Management Recommendations

Kissimmee Basin Adaptive Recommendations and Operational Actions

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
2/4/2019	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	SFWMD Water Mgt/KB Ops	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
7/13/2018	Maintain at least 1400 cfs at S-65A while Lake Kissimmee stage is above 50 feet. (See revised 2018 discharge plan).	To the extent possible, maintain sufficient discharge to keep areas under snail nest kites in Pool D hydrated until nests fledge.	N/A	KB Ops	7/17/2018
7/13/2018	Reduce S-65/S-65A discharge by 600 cfs/day until 1400 cfs is reached. (See revised 2018 discharge plan, below).	Reach 1400 cfs faster to help stabilize Lake Kissimmee stage.	Implemented	SFWMD Water Mgt/KB Ops	7/17/2018
7/9/2018	Increase S-65/S-65A discharge by 300 cfs if needed.	Stabilize Lake Kissimmee stage.	N/A	SFWMD Water Mgt/KB Ops	7/10/2018
7/8/2018	Increase S-65/S-65A discharge by 900 cfs today in 3 increments of 300 cfs each.	Stabilize Lake Kissimmee stage.	Implemented	KB Ops	7/10/2018

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 modification 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.

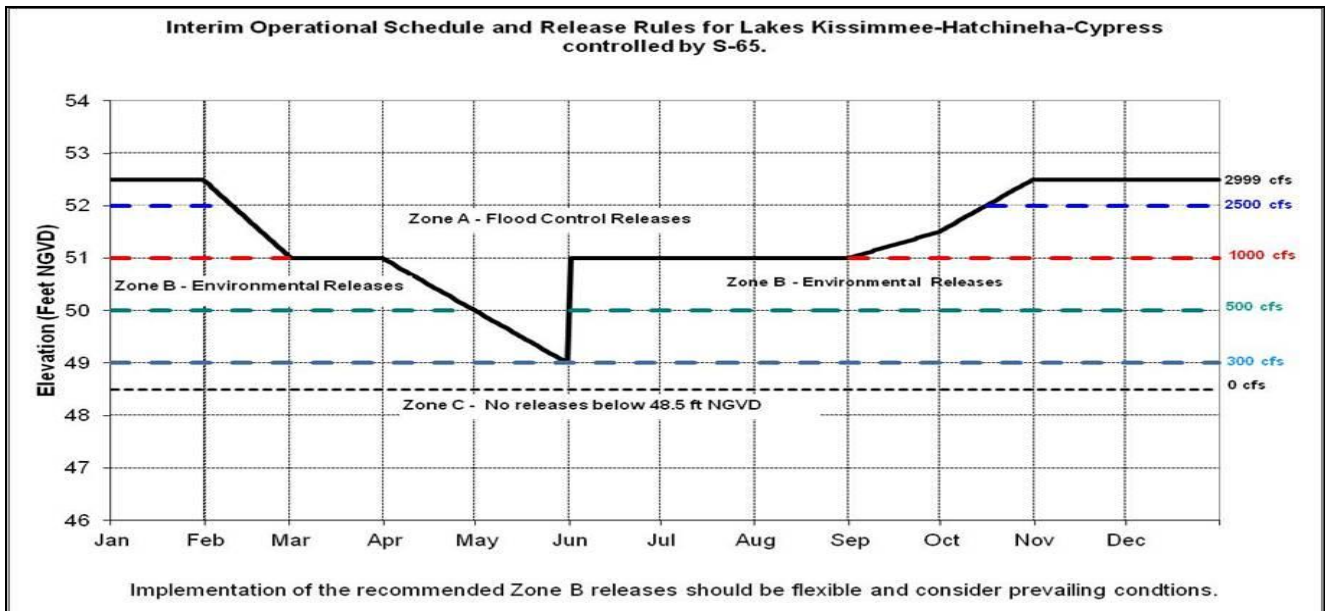


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

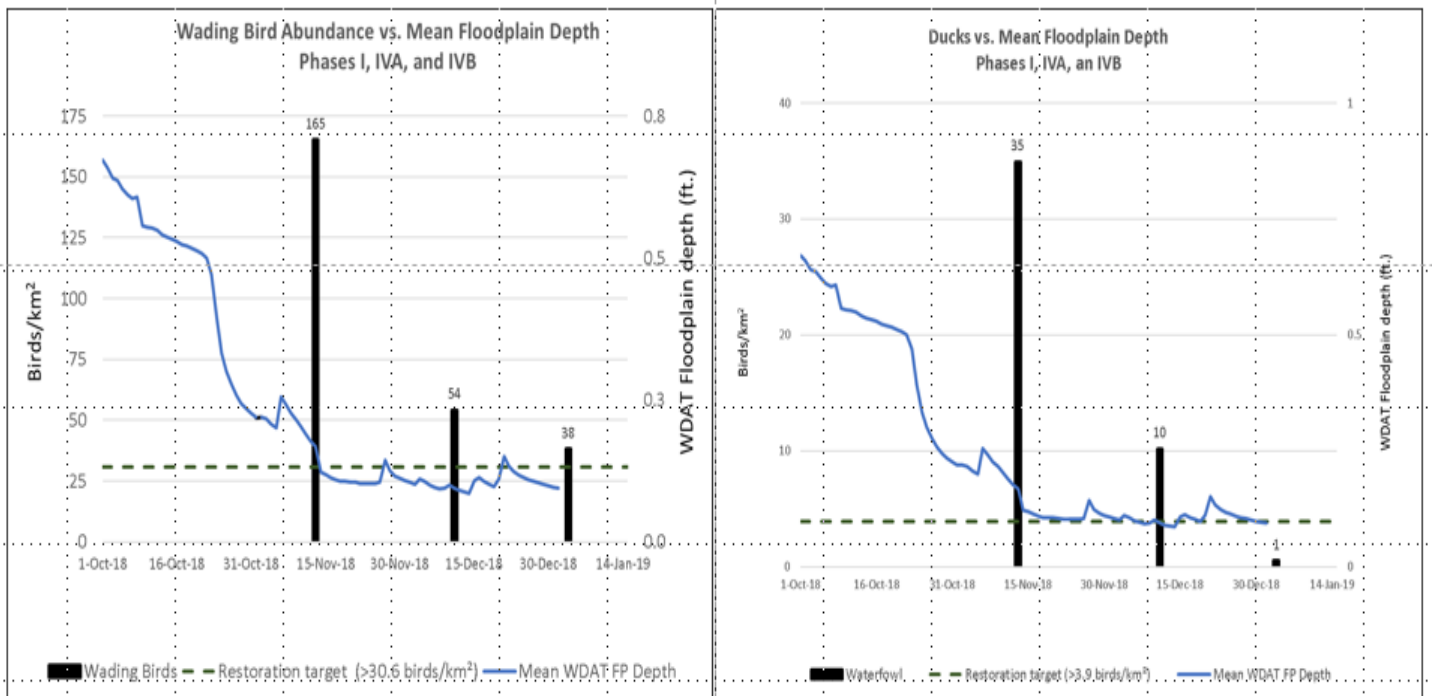


Figure 13. Kissimmee River Wading Bird and Waterfowl Surveys from November 2018 to January 2019.

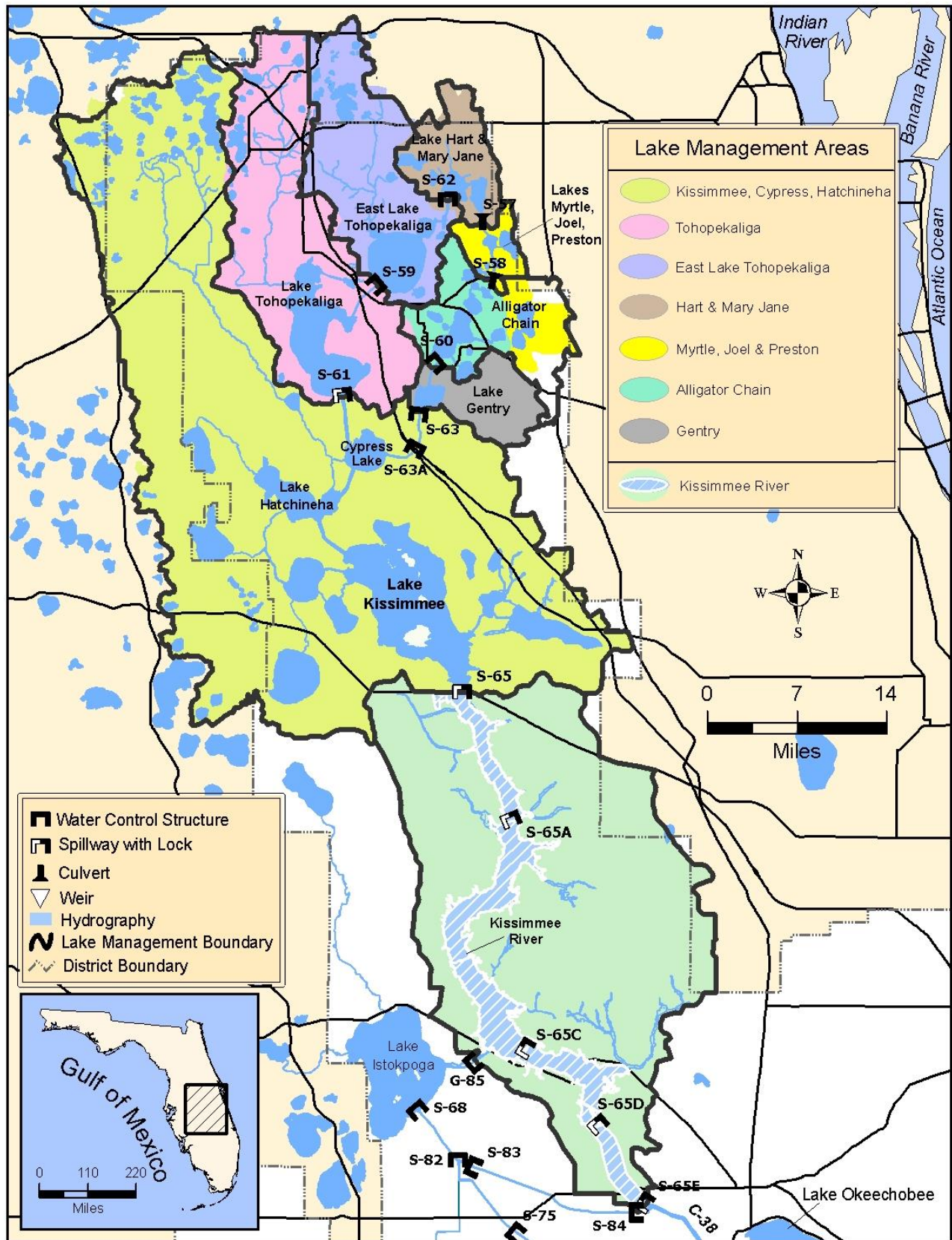


Figure 14. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee stage is at 12.74 feet NGVD for the period ending at midnight on February 4, 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 0.13 feet higher than it was a month ago and 2.46 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 4 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 RAINDAR, only 0.002 inches of rain fell directly over the Lake during the week January 29, 2019 – February 4, 2019, after having 3.69 inches the previous week (Figure 4). Most of the watershed received similar rainfall as well.

Average daily inflows (minus rainfall) to the Lake increased substantially over the previous three weeks, going from 320 cfs to 886 cfs, and then to 2007 cfs this past week. The largest increases and inflows were from the Kissimmee River, going from 703 cfs to 1201 cfs, and from Istokpoga via the S-84 structures, going from 59 cfs to 479 cfs this past week.

Total outflows (minus evapotranspiration) also increased from the previous week, going from 200 average daily cfs to 414 cfs this past week (Table 1). Outflows west via S-77 fell from 215 cfs to just 6 cfs in the past week, and there were negative flows (flowing back into the lake) through the S-308 and L-8 (Culvert 10A) which averaged -82 daily cfs and -45 daily cfs, respectively, for the week. Outflows south through the S-350 structures increased, going from 64 average daily cfs the previous week to 490 cfs this past week. The corrected average daily evapotranspiration value for the week based on the L006 weather platform solar radiation was 0.06 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.

Water quality samples collected on January 8 – 9 found six of seven stations in the nearshore zone with Chlorophyll a (Chla) values $>20 \mu\text{g/L}$, with a high of $29.5 \mu\text{g/L}$. Pelagic stations had values between $6.6 \mu\text{g/L}$ and $16.4 \mu\text{g/L}$ (Figure 6). Microcystin was below the detection limit of $0.2 \mu\text{g/L}$ at all six sites measured.

Water Management Recommendations

Lake Okeechobee stage is 12.74 feet NGVD, rising 0.15 feet from the previous week, about half the rate as the week before. The Lake is 0.13 feet higher than 30 days ago and is now in the Base Flow sub-bands. However, the lake is still nearly 1.5 feet below the bottom of the ecological envelope, which varies seasonally from 12.5 – 15.5 ft NGVD. Given 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 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	703	1201	0.5
S71 & 72	159	206	0.1
S84 & 84X	59	479	0.2
Fisheating Creek	23	38	0.0
S154	0	0	0.0
S191	0	4	0.0
S133 P	0	8	0.0
S127 P	0	4	0.0
S129 P	22	38	0.0
S131 P	9	24	0.0
S135 P	0	50	0.0
S2 P	0	0	0.0
S3 P	0	0	0.0
S4 P	0	0	0.0
L8 Backflow	-88	-45	0.0
Rainfall	671	23	0.0
Total	1557	2030	0.9

OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S77	215	6	0.0
S308	-79	-82	0.0
S351	0	0	0.0
S352	64	0	0.0
S354	0	490	0.2
L8 Outflow			
ET	429	963	0.4
Total	629	1377	0.6

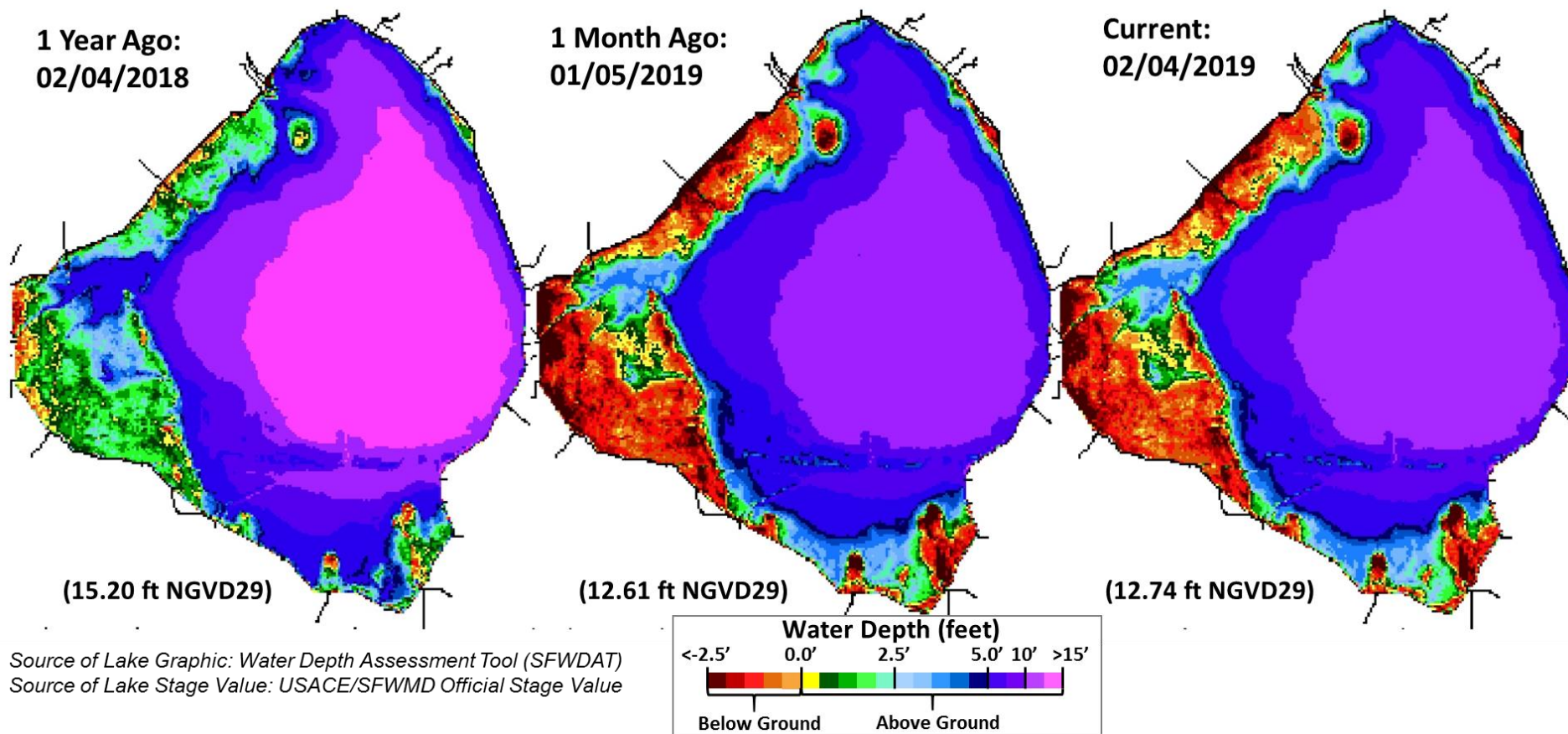
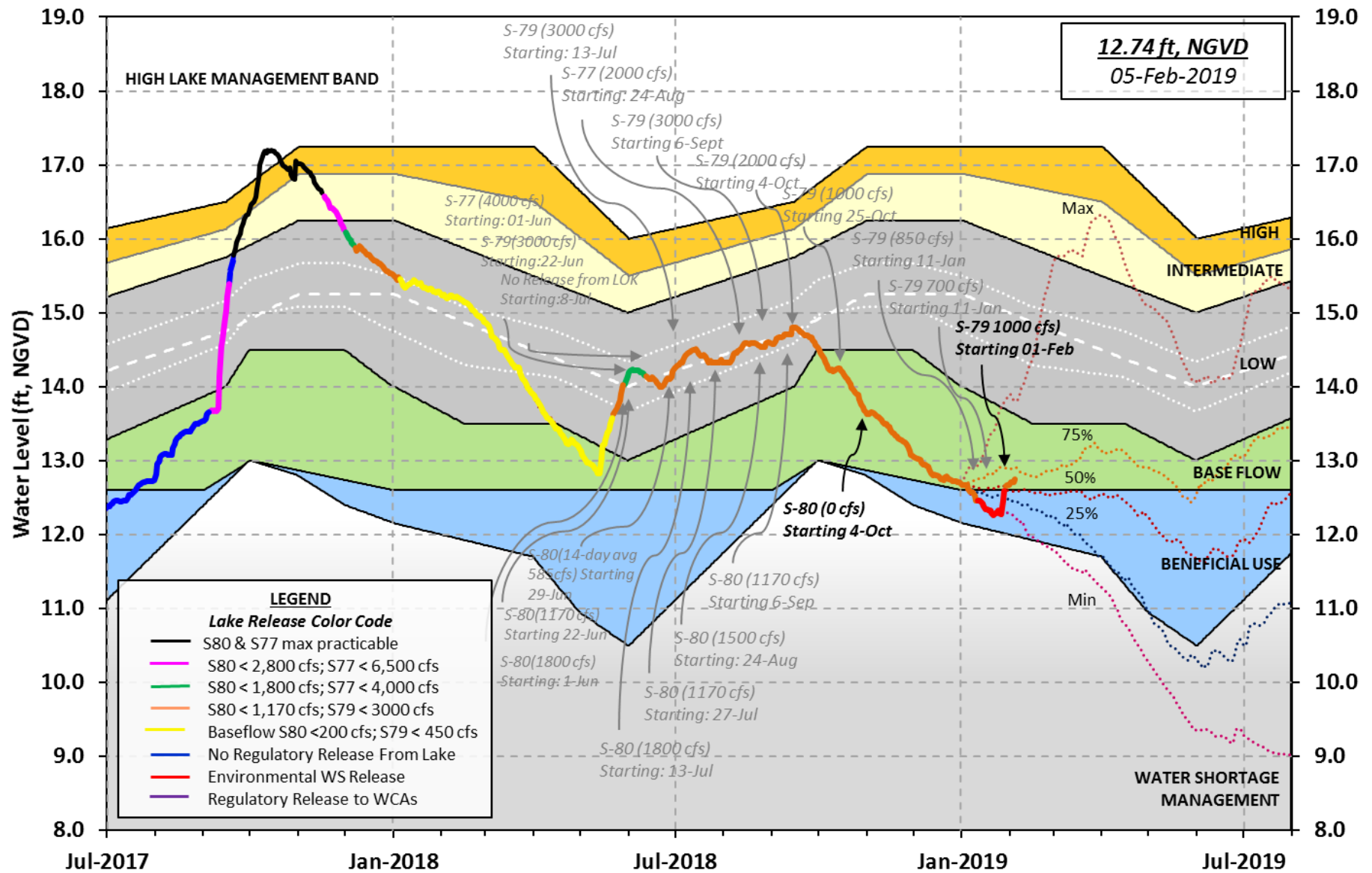


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

Lake Okeechobee Water Level History and Projected Stages



LORS-2008
Adopted by USACE 28-April-2008

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

Lake Okeechobee Water Level Comparison

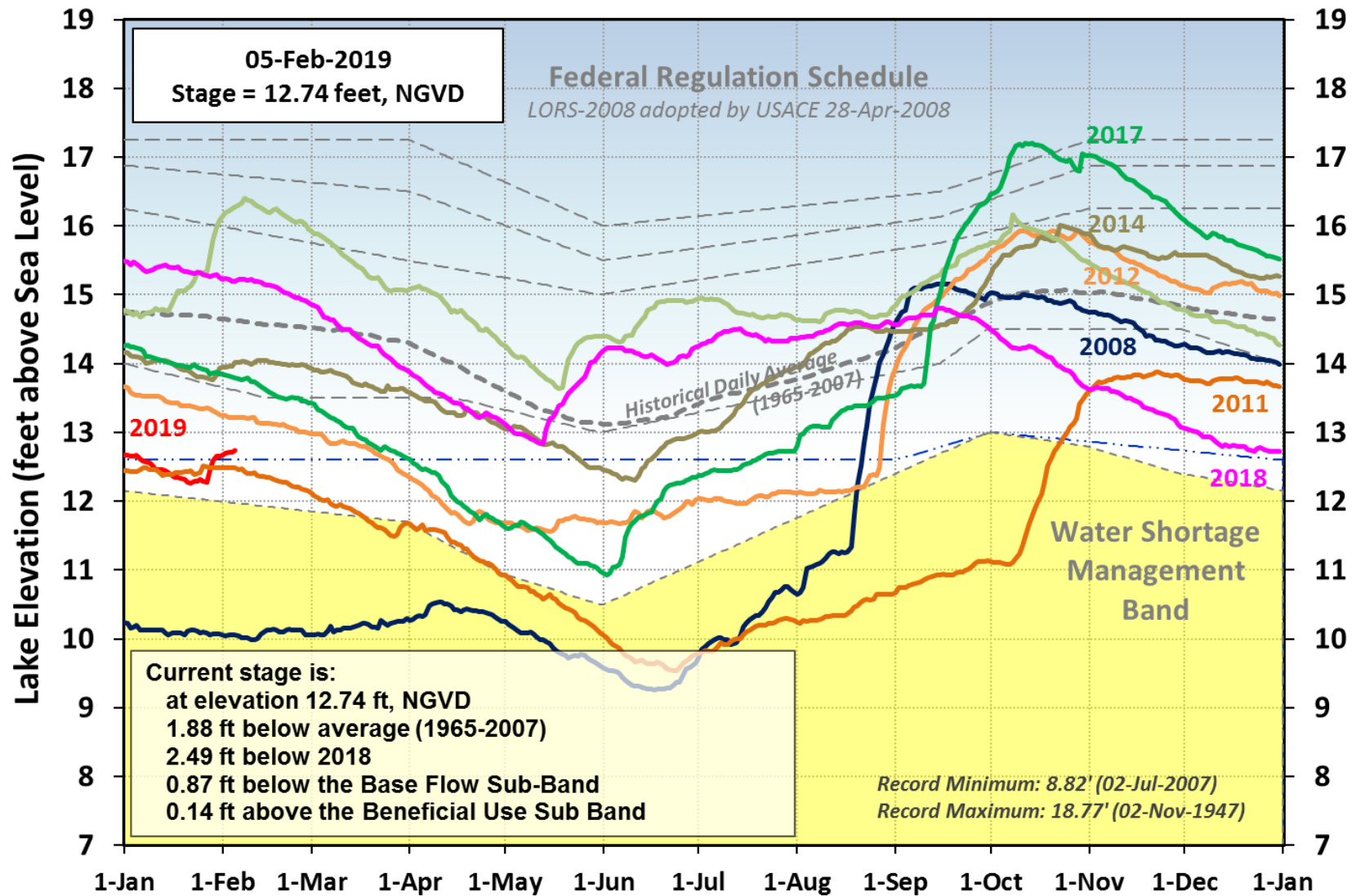


Figure 3. Select annual stage hydrographs for Lake Okeechobee from 2008 – 2019.

SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES

FROM: 0615 EST, 01/29/2019 THROUGH: 0615 EST, 02/05/2019

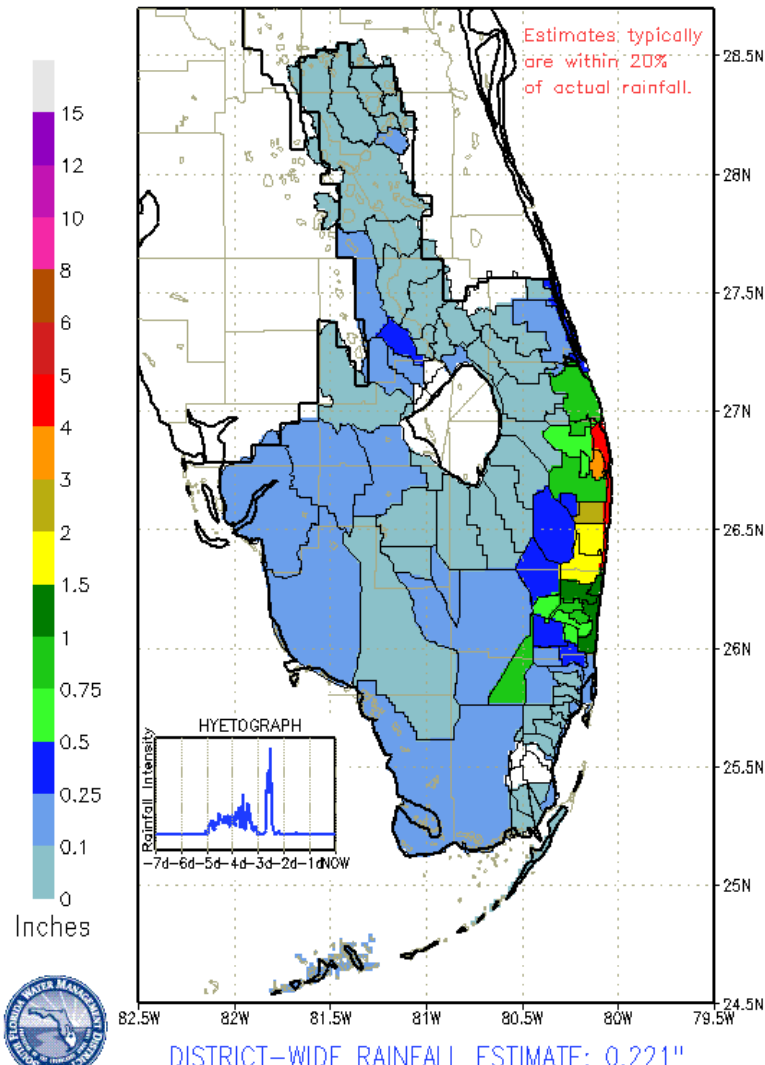


Figure 4. Rainfall estimates by basin.

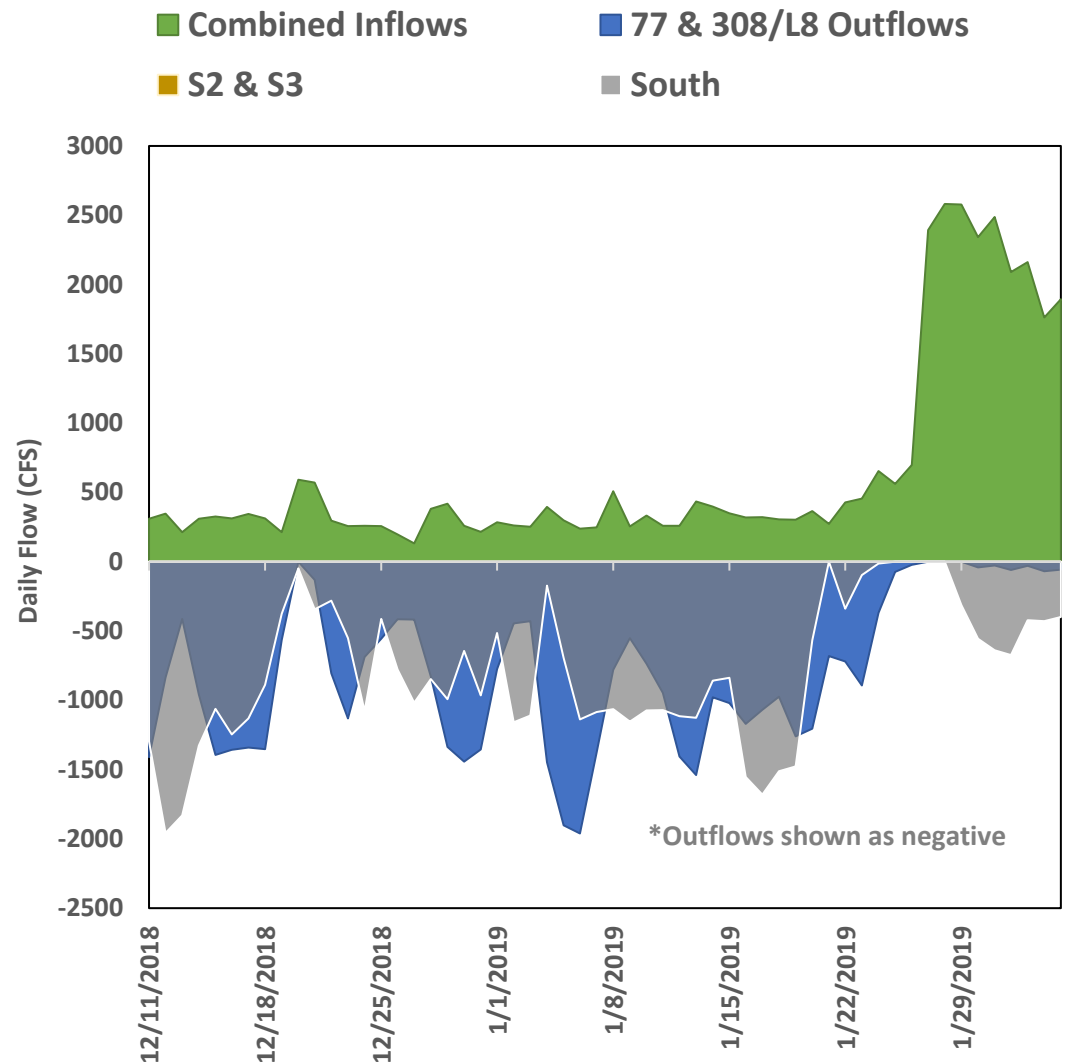


Figure 5. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 canal flows through culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive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

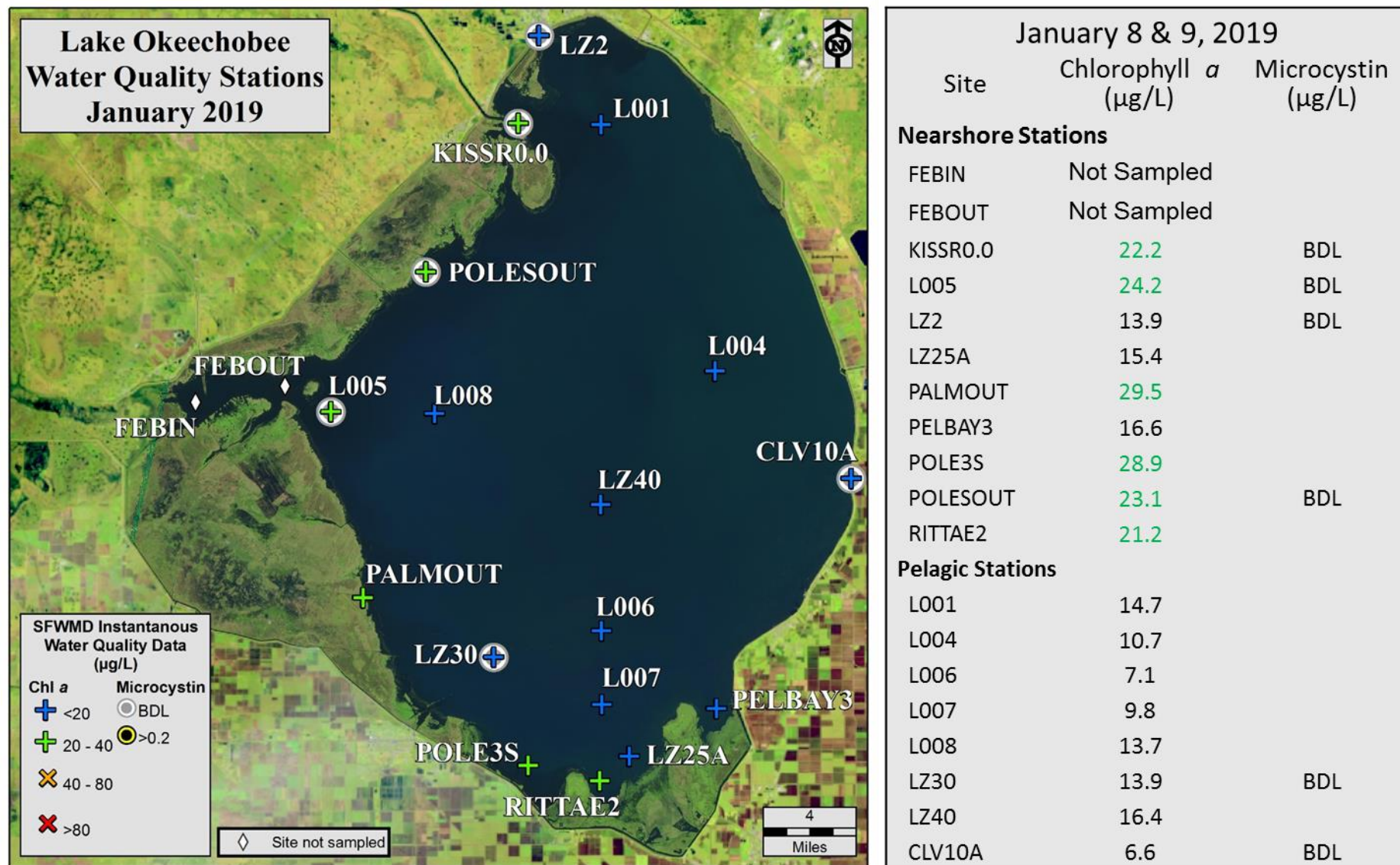


Figure 6. Chlorophyll *a* (µg/L) and microcystin (µg/L) values for nearshore and pelagic stations for mid-January 2019. SFWMD classifies an algal bloom as having Chl_a values >40 µg/L. Microcystin values <0.20 µg/L are below the detection limit (BDL).

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 673 cfs (Figures 1 and 2) and last month inflow averaged about 491 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	249
S-80	115
S-308	-82
S-49 on C-24	54
S-97 on C-23	58
Gordy Rd. structure on Ten Mile Creek	197

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 19.9. 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)	16.4 (23.7)	21.4 (25.5)	NA ¹
US1 Bridge	19.3 (26.1)	20.5 (25.7)	10.0-26.0
A1A Bridge	EM ² (31.5)	28.5 (32.2)	NA ¹

¹Envelope not applicable and ²Equipment Malfunction.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 3,829 cfs (Figures 5 and 6) and last month inflow averaged about 1,875 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	6
S-78	1482
S-79	2970
Tidal Basin Inflow	859

Over the past week, salinity decreased 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 2.2 at Val I-75 and 6.4 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 (1.4)	0.2 (1.4)	NA ¹
Val I75	0.3 (2.7)	0.4 (3.1)	0.0-5.0 ²
Ft. Myers Yacht Basin	2.5 (7.3)	5.1 (8.8)	NA
Cape Coral	8.5 (15.6)	11.2 (16.7)	10.0-30.0
Shell Point	19.5 (24.6)	19.5 (24.1)	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 1.7 to 3.5 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 475 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	475	3.5	1.9
B	300	475	2.5	1.7
C	375	475	2.3	1.6
D	450	475	2.1	1.6
E	650	475	1.7	1.6

Red tide

The Florida Fish and Wildlife Research Institute reported, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background concentrations in one sample and not present in all other samples collected from Lee County since January 28, 2019. *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from Palm Beach or Broward counties. No samples were collected from St. Lucie, Martin, or Miami-Dade counties.

Water Management Recommendations

Lake stage is in the Base Flow sub-band of 2008 LORS. Tributary hydrological conditions are very 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.

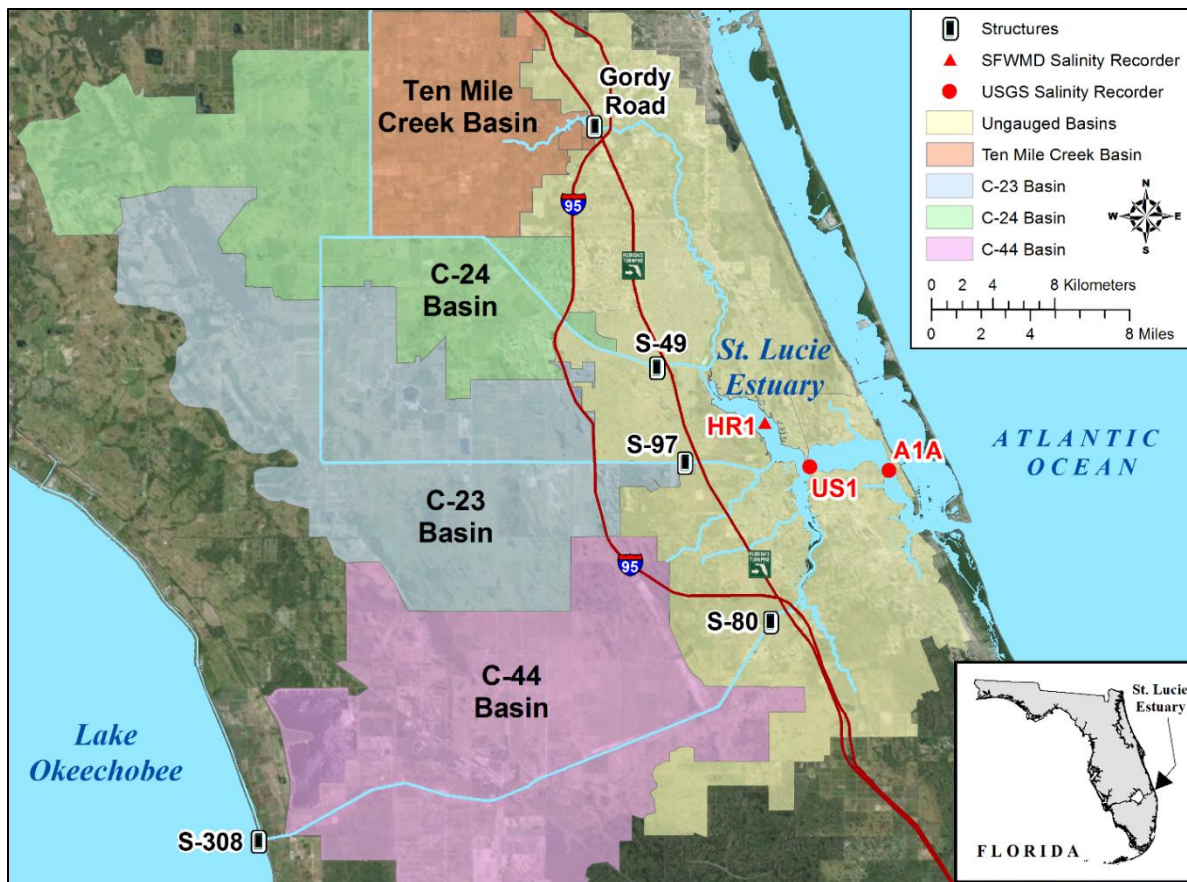


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

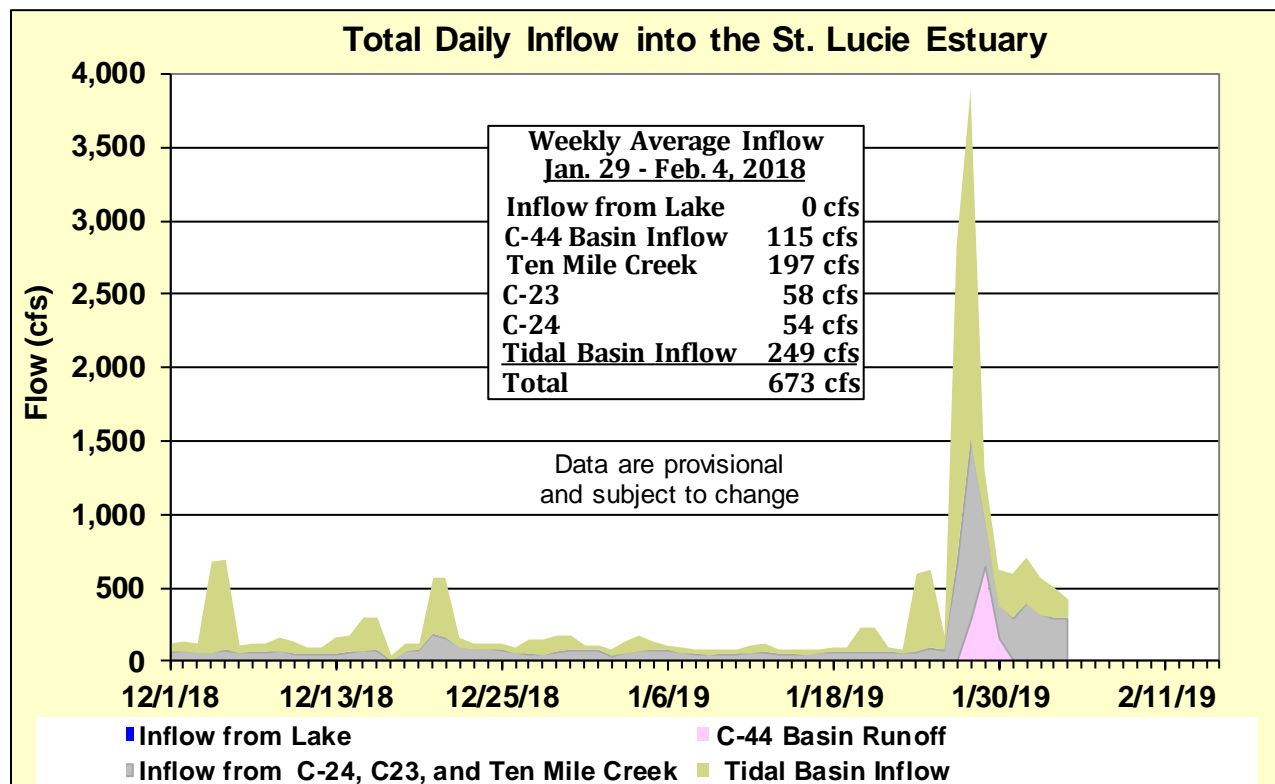


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

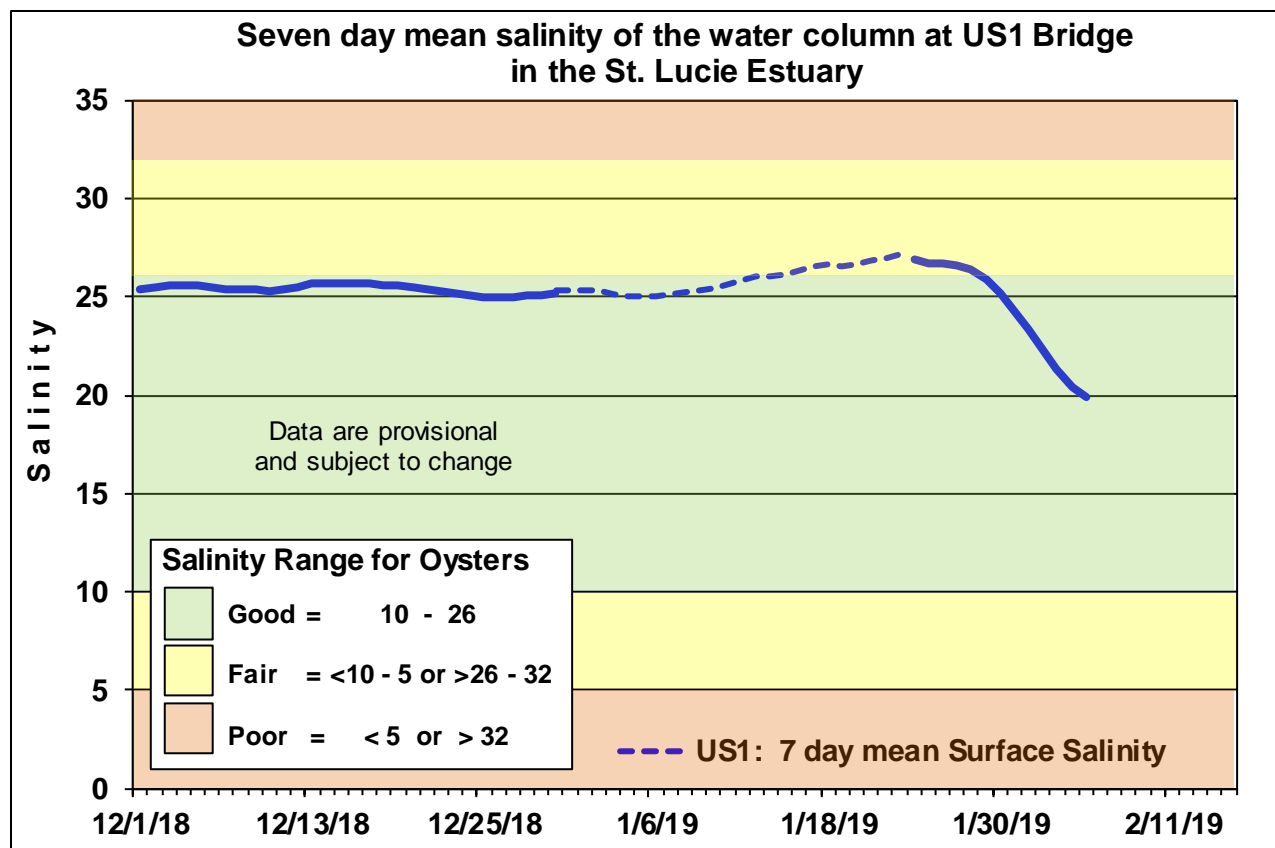


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

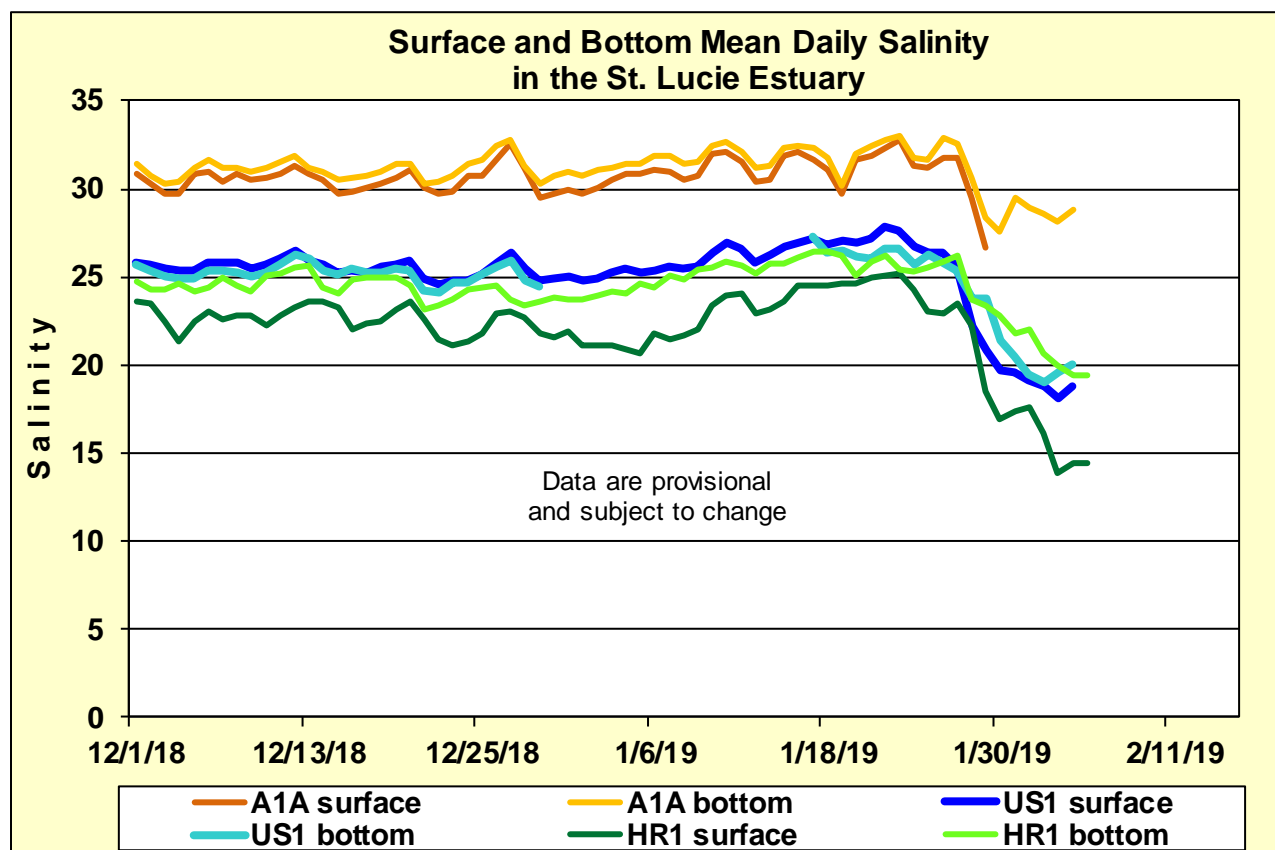


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

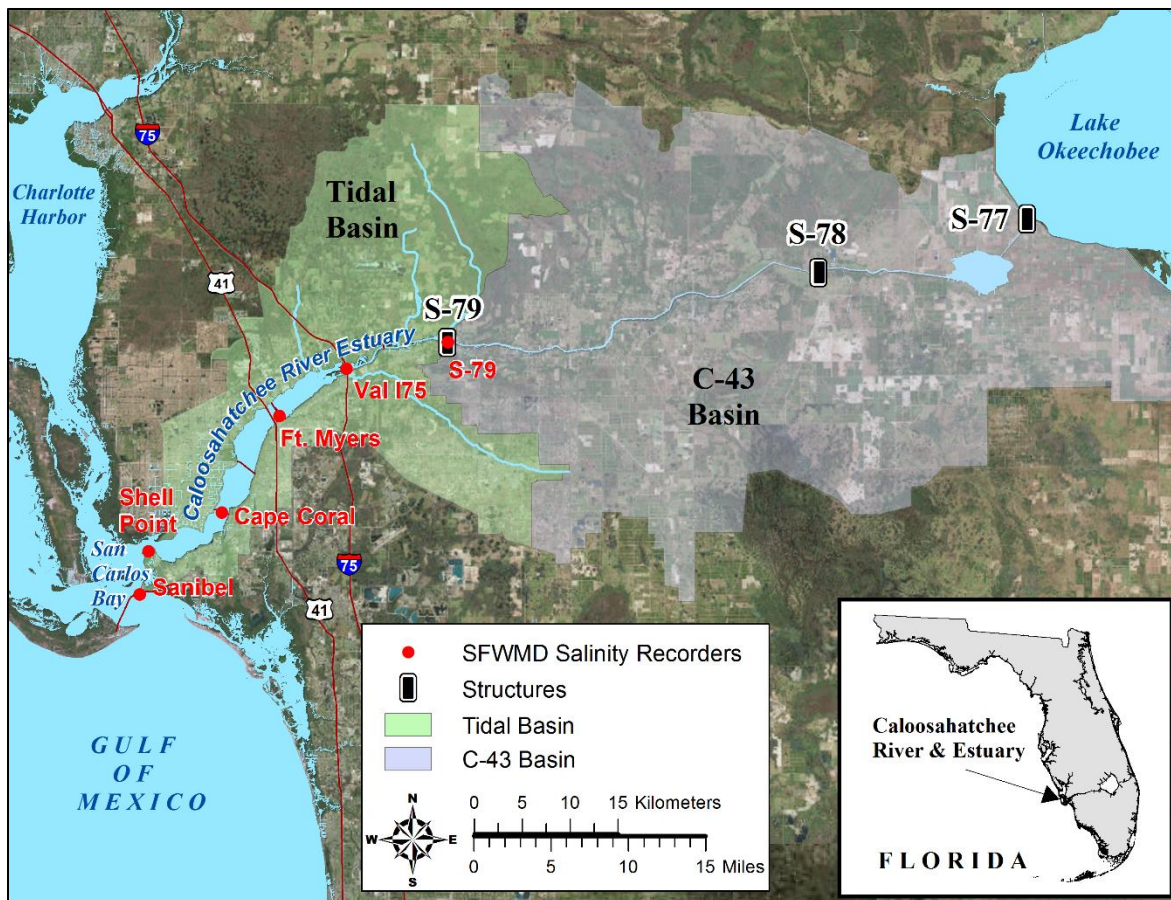


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

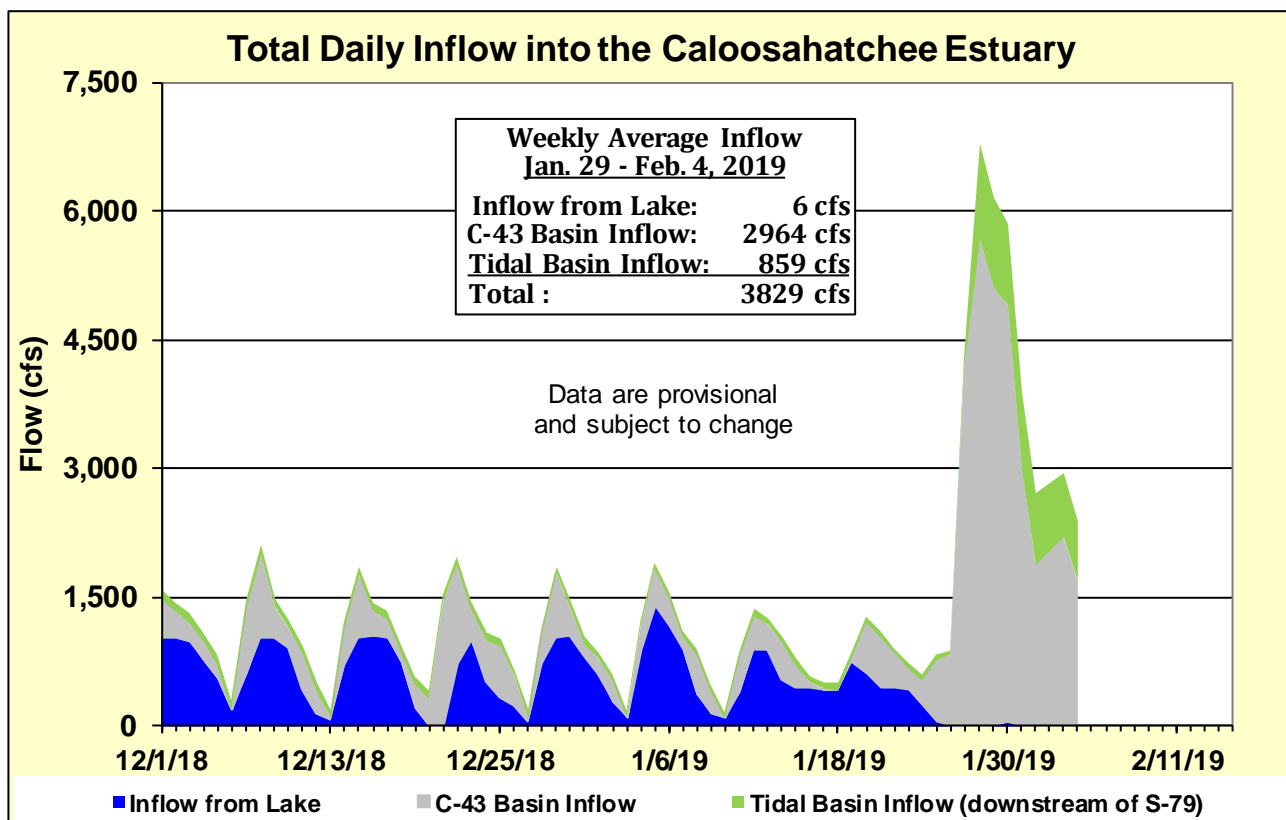


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

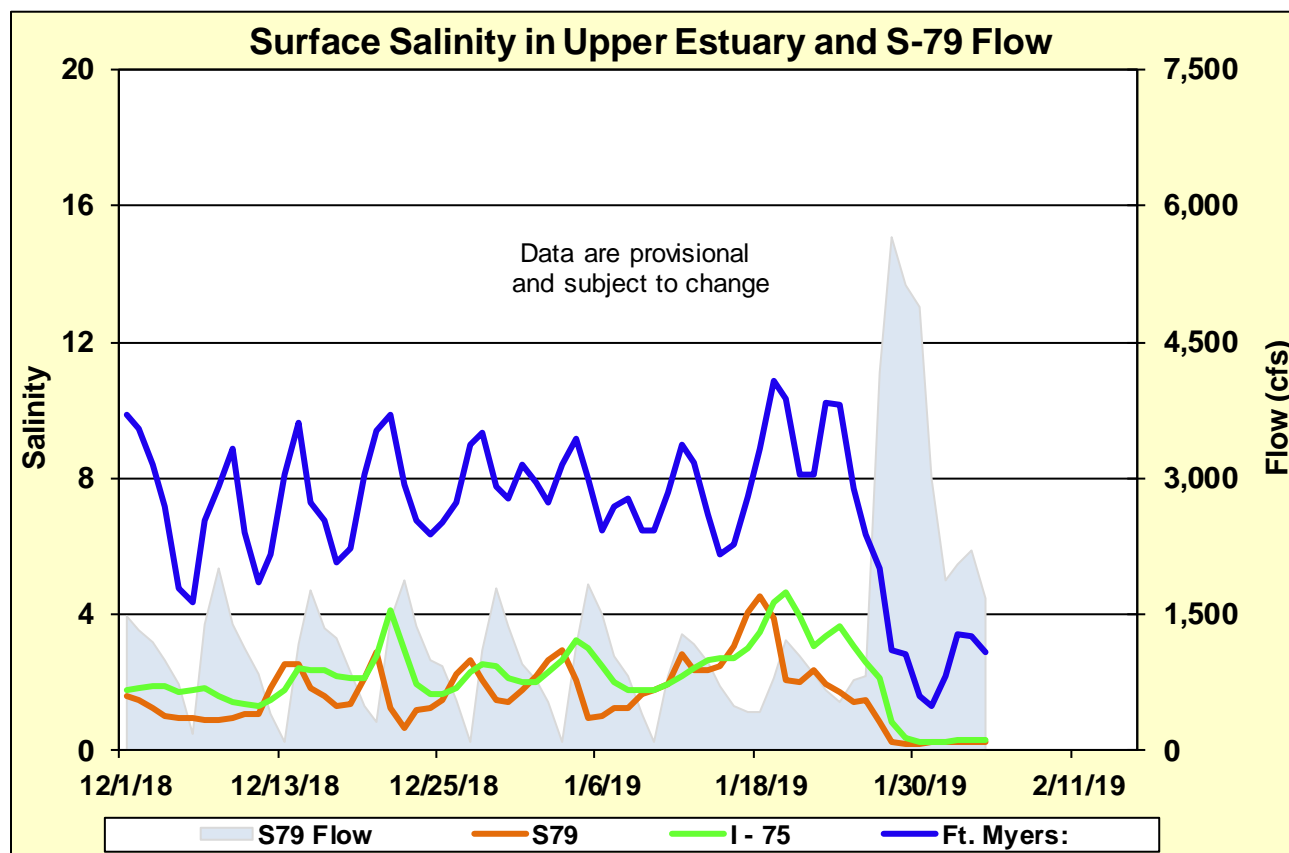


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

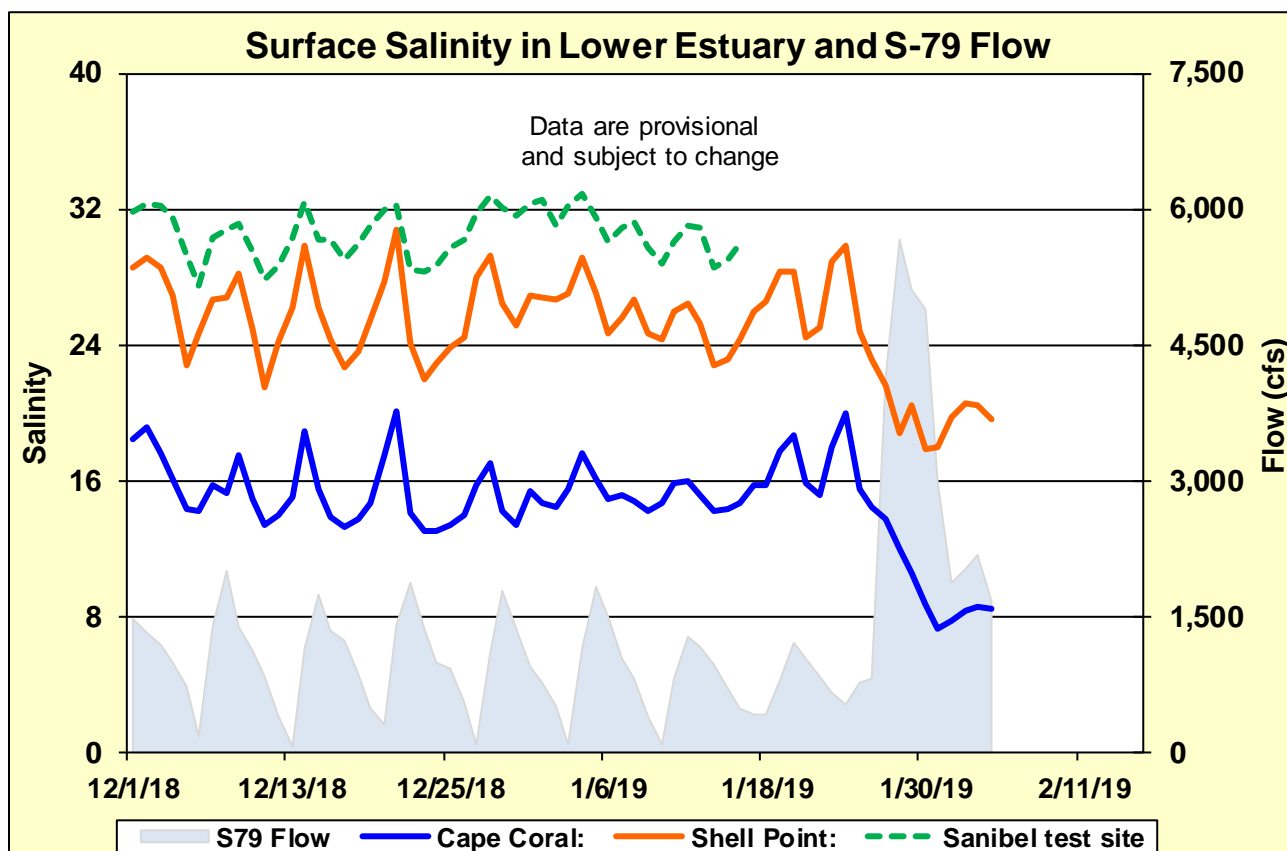


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

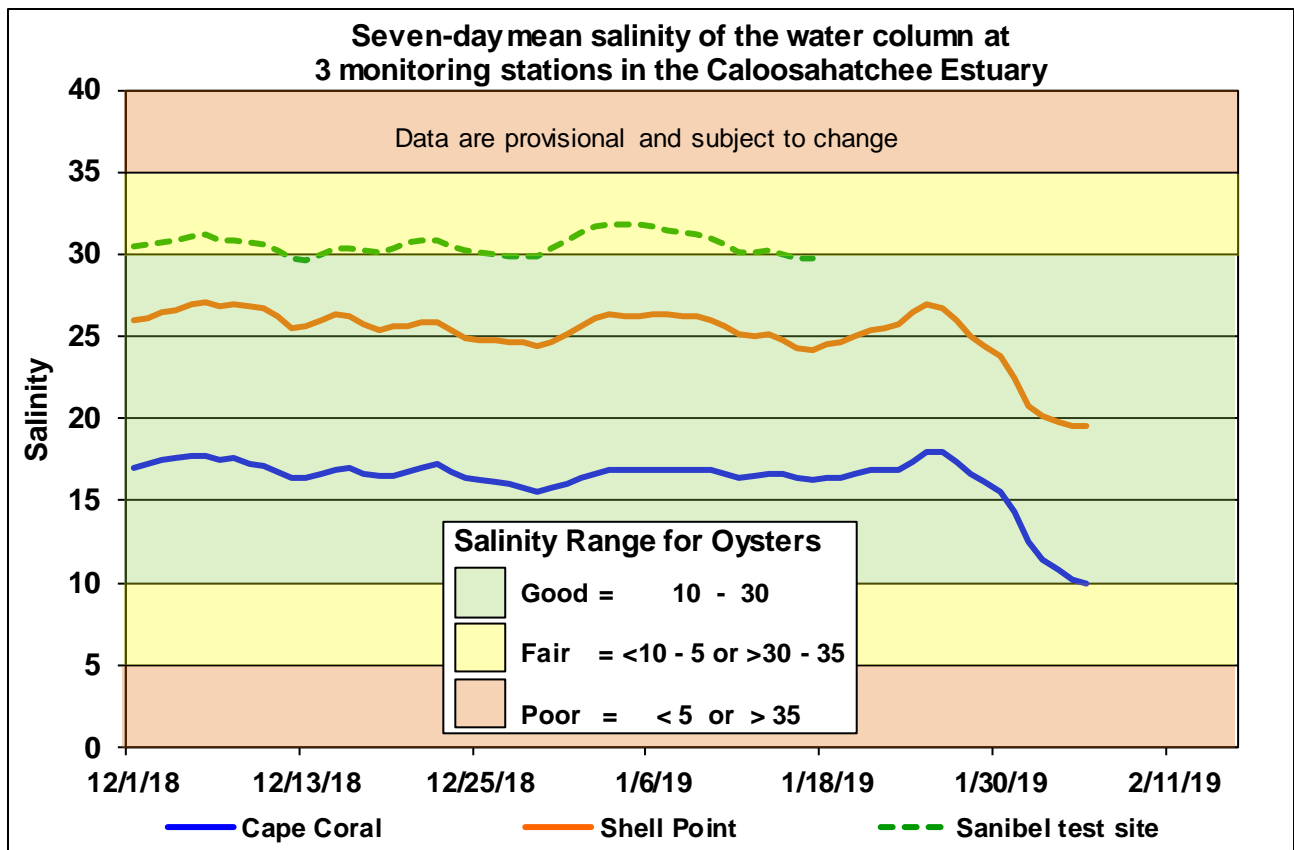


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

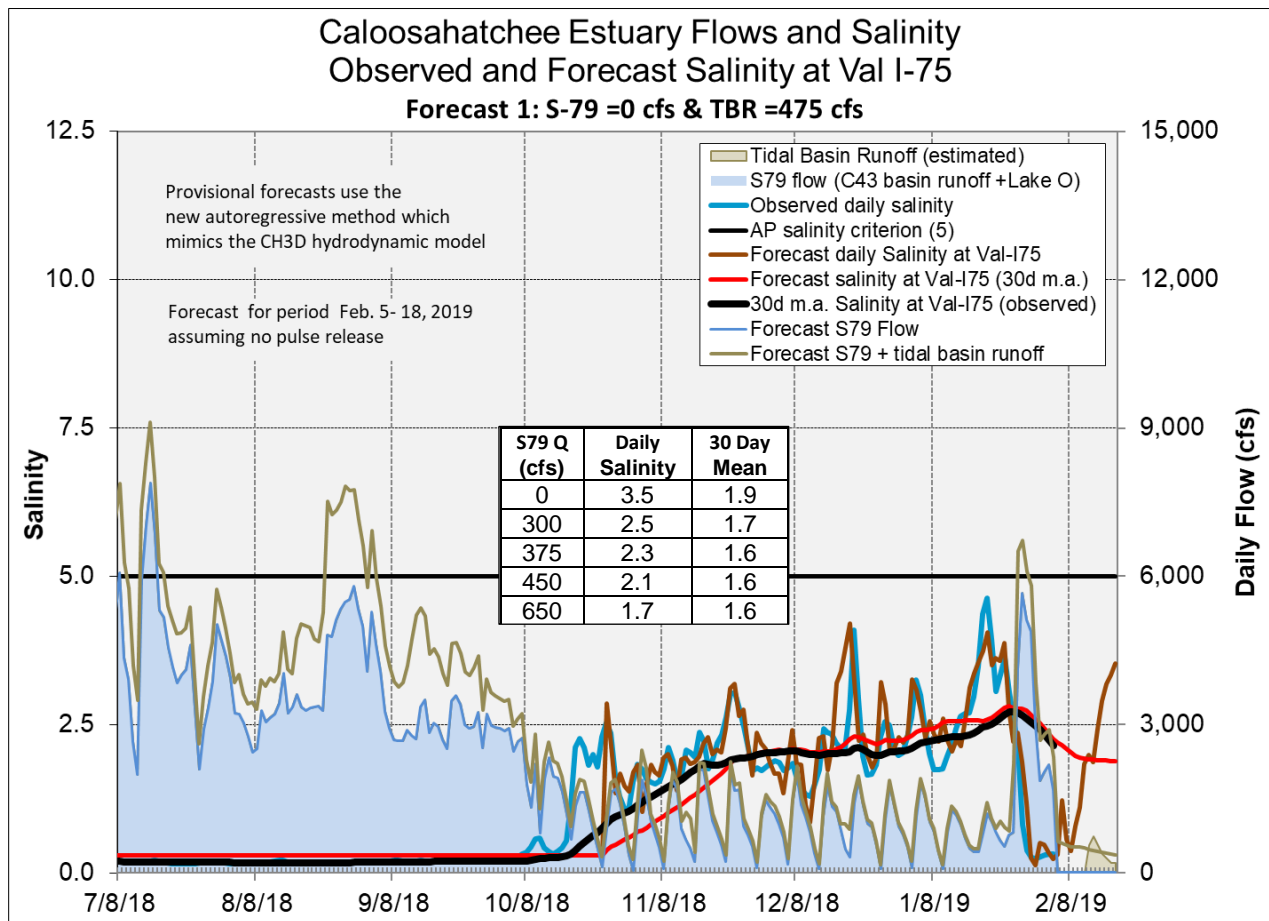
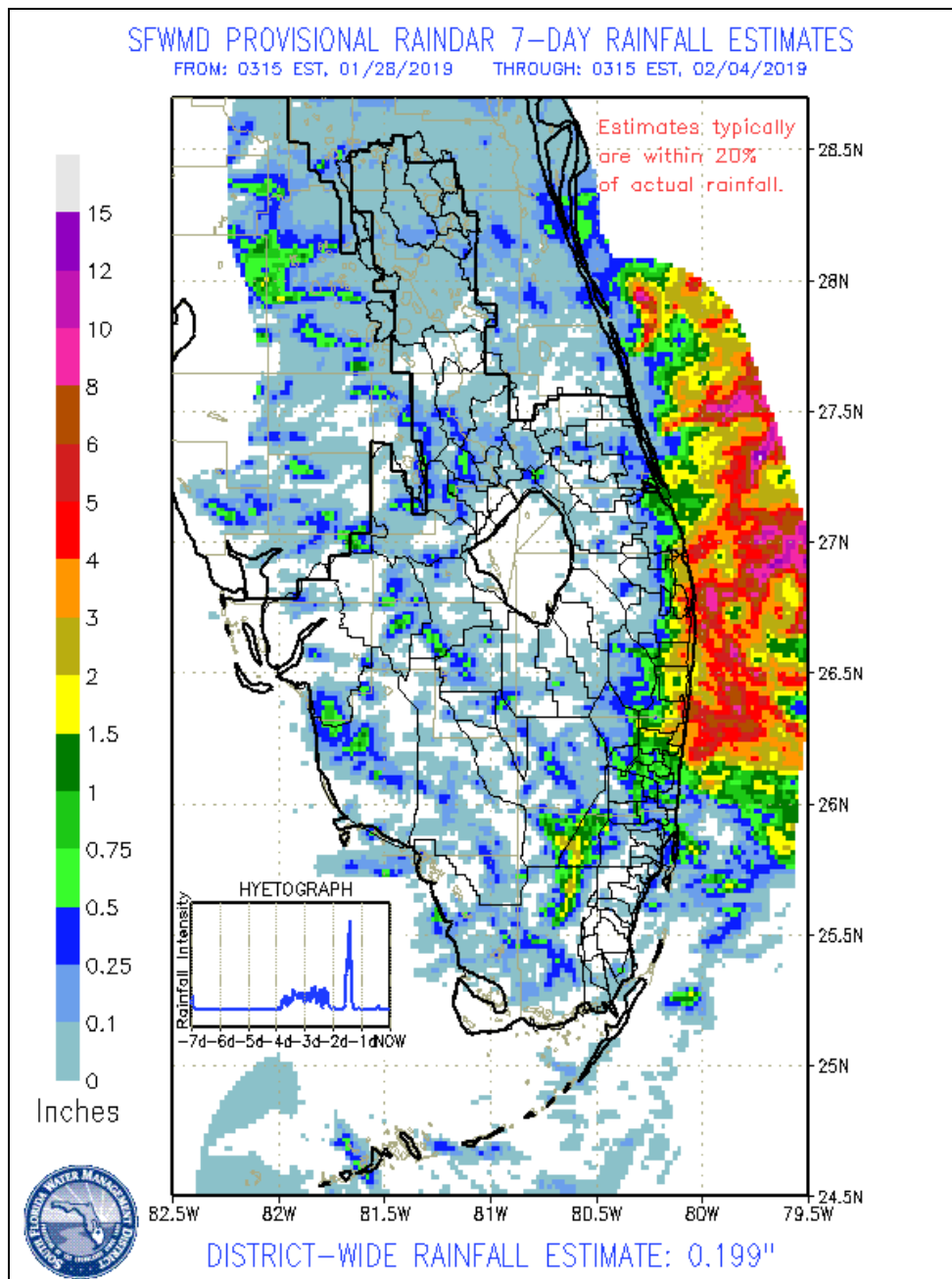


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

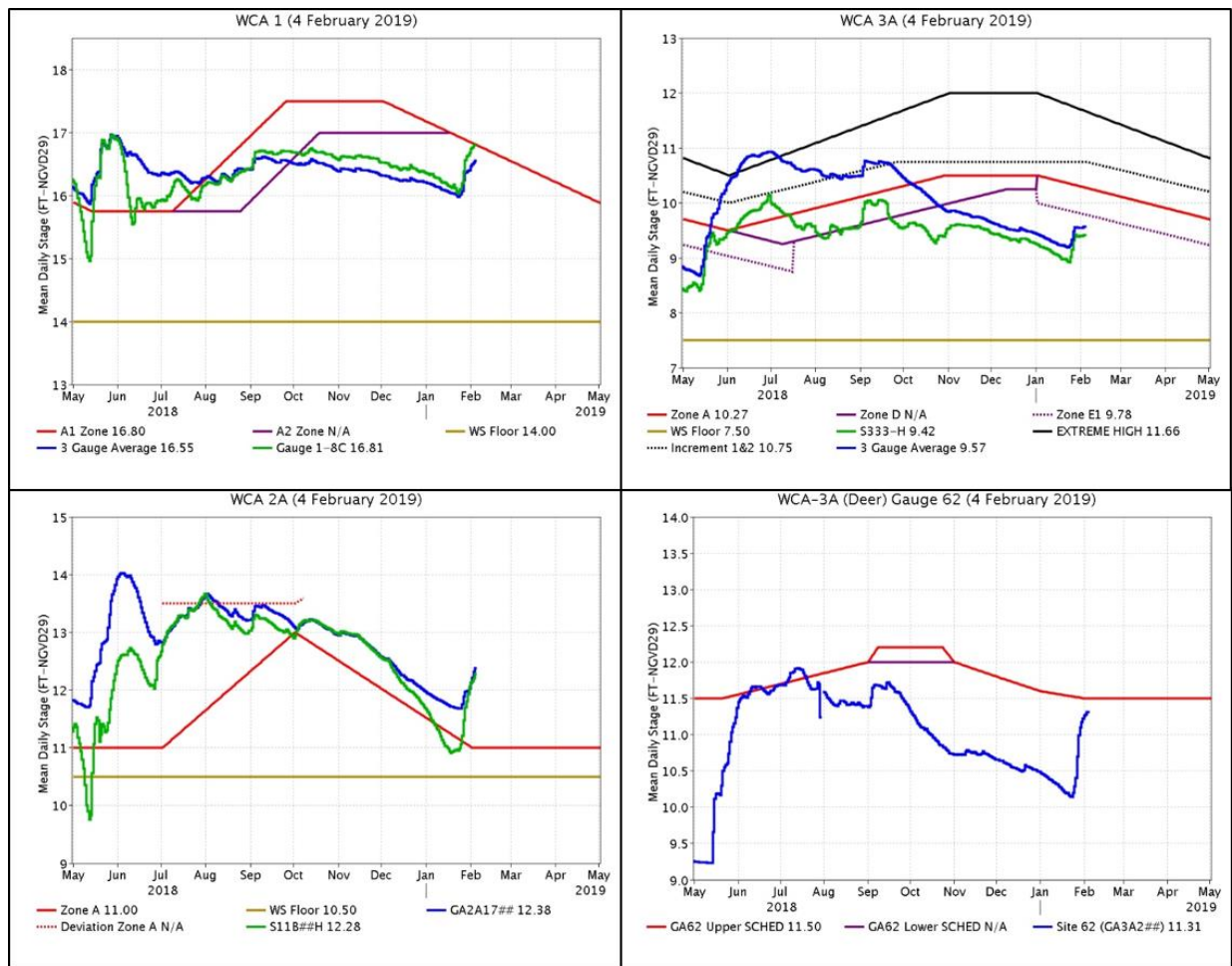
EVERGLADES

At the gauge locations monitored for this report stages rose unevenly across the WCAs. The most moderate and extreme individual gauge changes within the WCAs ranged from -0.06 feet (WCA-3B) to 0.40 feet (WCA-3A northwest*). Pan evaporation was estimated at 0.94 inches this week. *2nd week in a row.

Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.35	+0.18
WCA-2A	0.25	+0.39
WCA-2B	0.48	-0.03
WCA-3A	0.17	+0.11
WCA-3B	0.90	+0.00
ENP	0.14	-0.01



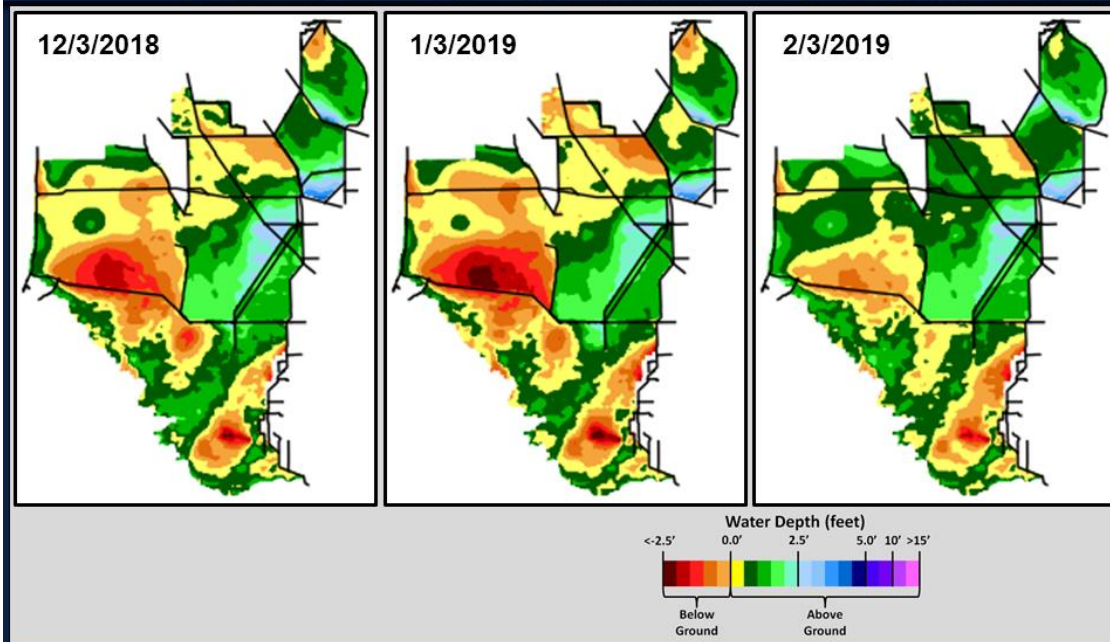
Regulation Schedules: Gauge 1-8C is 0.01 feet above the Zone A1 regulation line. The three-gauge average is 0.26 below the canal stage. S-11B Headwater stages have risen quickly, now 1.28 feet above Zone A. Gauge 2A17 is 0.10 feet above the canal stage. WCA-3A three-gauge average stage is 0.21 feet below the Zone E1 regulation line. WCA-3A at gauge 62 (northwest corner) rose dramatically over the last two weeks (+1.14') to now just 0.19 feet below the lower schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate conditions remain unseasonably dry, but the recent rains have had an impact on stages. The model indicates now only the eastern third of WCA-3A North with depths below or near ground surface. In the extreme northeast of that basin we see some recovery of stages where we see a shrinking extent of habitat that is indicating depths greater than 0.5 feet below ground. WDAT difference output indicates that water level changes across the Everglades over the month were moderate and the WCAs are wetter than a month ago except for mixed changes in WCA-2A. In the “1 Year” inset there are continued differences between current depth conditions in WCA-3A South and in WCA-1 and post Hurricane Irma’s lessening impact on water depths a year ago. This previous year’s high-water event suggests the current lower-than-seasonal water depths, while precarious, may be allowing ecological processes to recover from high-water stress.



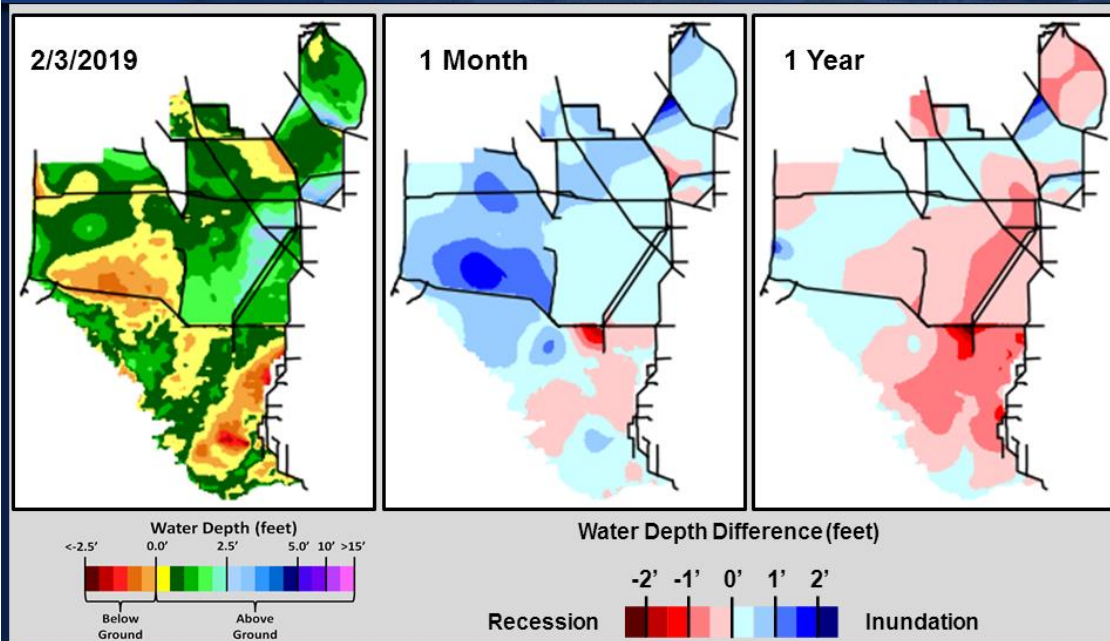
SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)



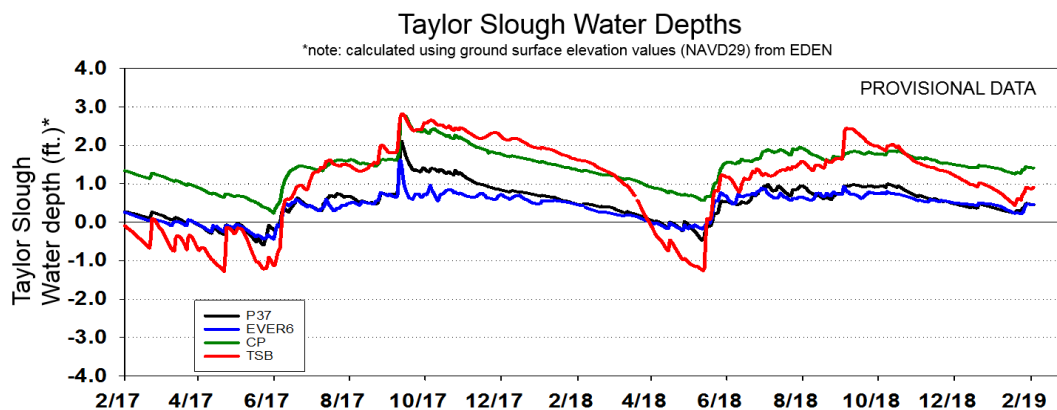
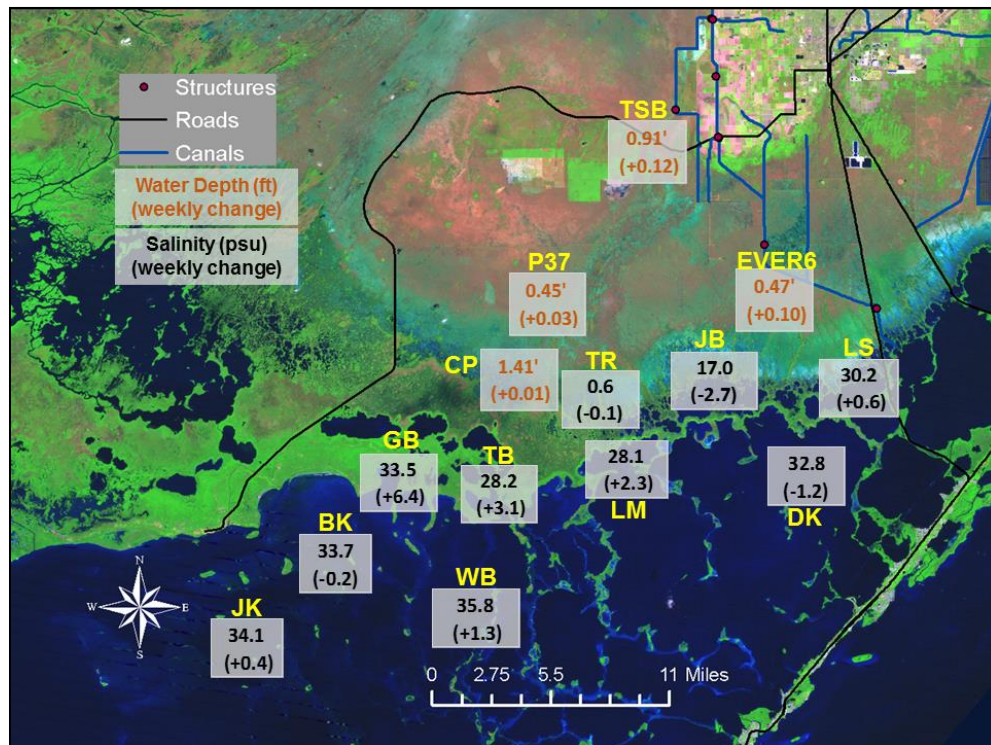
SFWDAT Everglades Difference Maps (Present - Past)

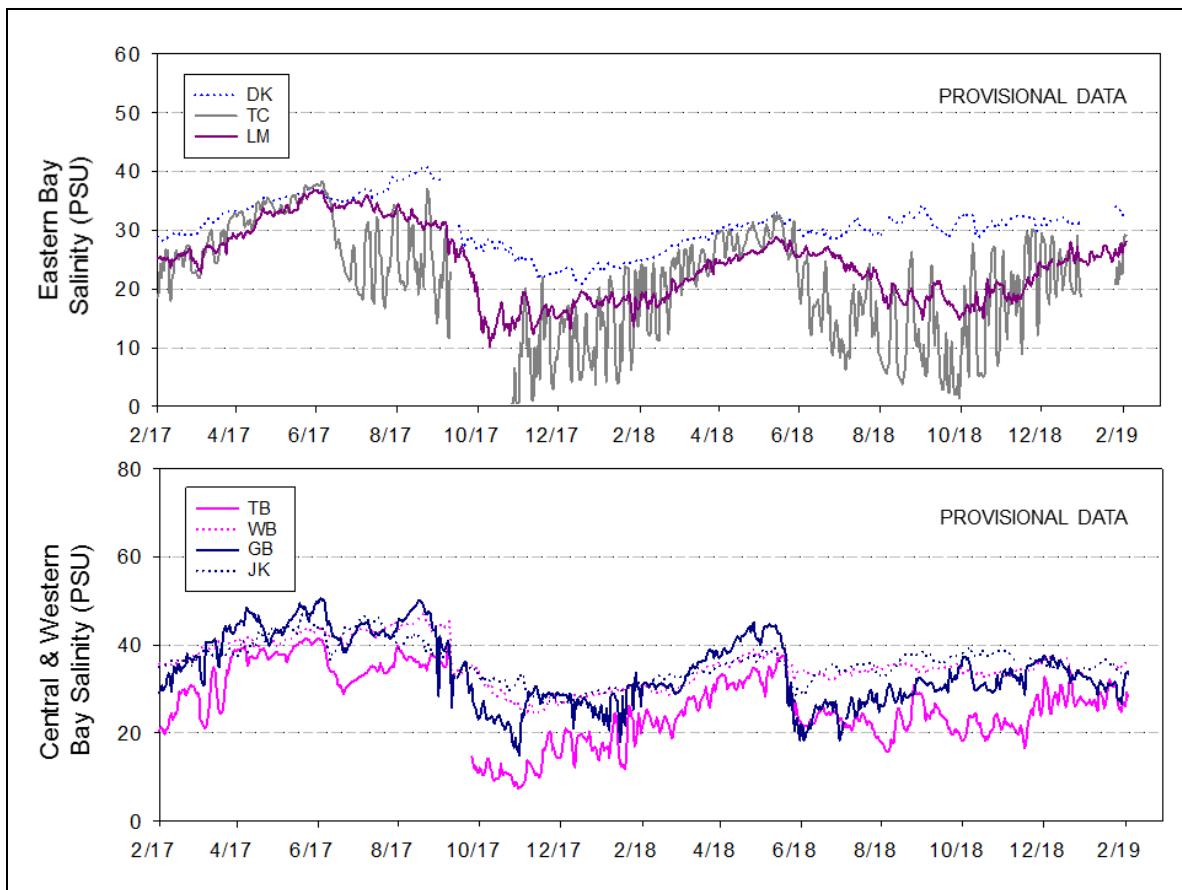


South Florida Water Depth Assessment Tool (SFWDAT)

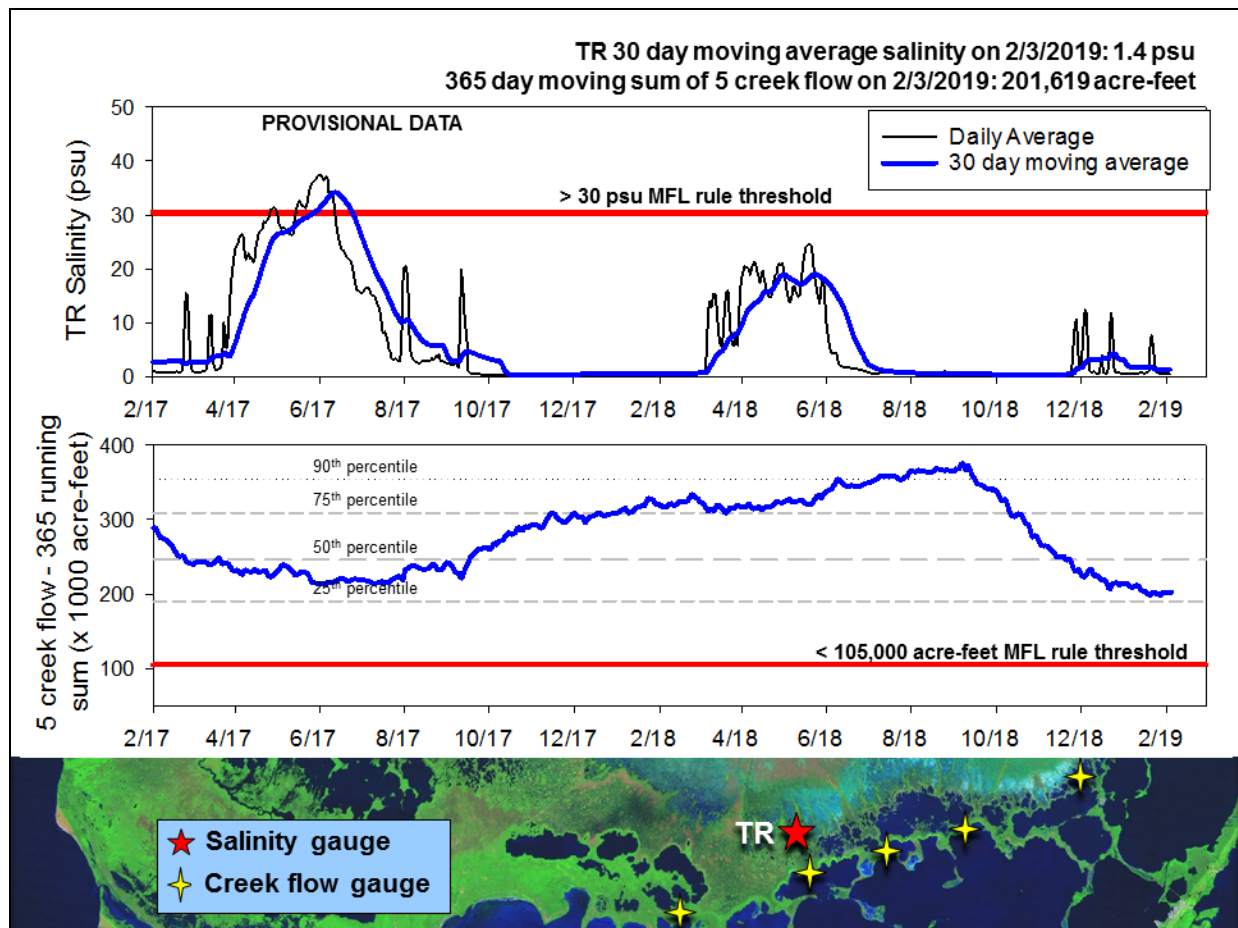
Taylor Slough Water Levels: An average of 0.12 inches of rain fell on Taylor Slough and Florida Bay this past week which increased stage by 0.06 feet on average by the end of the week. Water depths averaged 0.75 feet across Taylor Slough and were declining by the end of the week. Conditions are about 4.4 inches above average for this time of year.

Florida Bay Salinities: Salinity in Florida Bay rose an average of 1.1 psu for the week. The largest weekly change was an increase of 6.4 psu in west-central shoreline area. Daily average salinities ranged from 17 psu in the northeast to 36 psu in the central bay and are average in the west-central Bay area to 8 psu above average for this time of year in the northeast area of the Bay.





Florida Bay MFL: Salinity in the mangrove zone stayed at 0.6 psu for most of the last week. 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 3,600 acre-feet for the last week, which is 3,000 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 201,619 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

Water management that protects peat soils, especially in WCA-3A North, as the dry season becomes established has increasing ecological benefit as unusually dry conditions pervade the WCA-3A basin. Rotenburger WMA is below regulation and would benefit ecologically from additional inflows. Wading bird foraging was noted in WCA-2A and absent from the rest of the Everglades, and conditions there looking forward into the dry season 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 very nearby in northeastern WCA-3A, we recommend that priority be given to water management that can route water into WCA-3A versus WCA-2A when possible, and yet to take caution not to over drain that basin as we move into wading bird nesting season. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, February 5th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stages increased ranging from 0.32' to 0.07'	Maintain depths at regulation schedule. Moderate ascension rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage increased by 0.39'	Maintain depths at regulation schedule. Moderate ascension rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
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 <u>continues to have</u> high ecological value due to unseasonably dry conditions.
WCA-3A NW	Stage increased by 0.40'	Maintain depths at regulation schedule.	
Central WCA-3A S	Stage decreased by 0.04'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect <u>upstream</u> /downstream habitat and wildlife.
Southern WCA-3A S	Stage increased by 0.01'		
WCA-3B	Stage changes ranged from -0.06 to +0.07	Maintain depths at temporary regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
ENP-SRS	Stage decreased by 0.01'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/ <u>downstream</u> habitat and wildlife.
Taylor Slough	Stage changes ranged from +0.01' to +0.12'	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 -2.7 to +6.4 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.