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: April 16, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Widespread rains Friday. Dry conditions have spread across the District behind yesterday's cold front and should persist through Wednesday as high pressure builds over the area. Some light showers will push on shore late Wednesday night as winds switch back to the southeast ahead of the next frontal boundary. Daytime heating should develop scattered afternoon showers and thunderstorms Thursday and then a more widespread coverage of moderate to heavy showers and thunderstorms is forecast for Friday and Friday evening as the front moves through the District. Drier conditions should return behind the front Sunday and Monday. Some light showers are forecast to creep back in from the southeast on Tuesday and some scattered daily shower activity should then reappear by next Wednesday.

Kissimmee

Tuesday morning stages were 55.9 feet NGVD (0.9 feet below schedule) in East Lake Toho, 52.9 feet NGVD (0.9 feet below schedule) in Toho, and 49.7 feet NGVD (0.8 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.7 feet NGVD at S-65D. Tuesday morning discharges were 585 cfs at S-65, 449 cfs at S-65A, 793 cfs at S-65D and 674 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 6.3 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 0.15 feet. No new recommendations for the week.

Lake Okeechobee

Lake Okeechobee stage is 11.59 feet NGVD, decreasing 0.19 feet from the previous week. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is now 0.26 feet above the Water Shortage sub-band. The lake remains below the bottom of the ecological envelope (currently 1.3 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD. Given the potential for above average rainfall associated with a weak 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. Satellite imagery suggest the potential for algal blooms has increased along the western shore, particularly within Fisheating Bay.

Estuaries

Total inflow to the St. Lucie Estuary averaged 187 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinity increased slightly in the lower 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 906 cfs over the past week with 533 cfs coming from the Lake. Over the past week, salinity increased at Cape Coral and Shell Point. The 30-day moving average surface salinity is 0.3 at Val I-75 and 3.9 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 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 the areas further downstream.

Stormwater Treatment Areas

Over the past week, 1,700 acre-feet of Lake water was delivered to the STA-1W expansion cells for start-up purposes. The total amount of Lake releases sent to the STAs/FEBs in WY2019 (since May 1, 2018) is approximately 450,000 acre-feet. The total amount of inflows to the STAs in WY2019 is approximately 1,509,000 acre-feet. Most STA cells are at or near target depths. STA-1W Northern Flow-way is offline for STA-1W Expansion project construction activities, STA-1E Western Flow-way is offline for levee repairs in the West Distribution Cell, and STA-5/6 Flow-ways 2 and 3 are offline for the Restoration Strategies project to grade non-effective treatment areas. Operational restrictions are in place in STA-1E Central Flow-way for vegetation management activities and STA-5/6 Flow-ways 1 and 4 to facilitate the Restoration Strategies grading project in Flow-ways 2 and 3. This week, if Lake releases are sent to the WCAs and conditions allow, releases will be sent to STA-2.

Everglades

Keeping rainfall runoff within the Everglades system, distributing it equally across the WCAs and moving it south through the system when possible remains ecologically beneficial as the WCAs are at or near average stages for this time of year. The 30-day moving average salinity at the MFL sentinel site TR continues to climb, now 19 psu up 3.5 psu from last week. Salinities within the bay range remain above average for this time of year. So far, this season wading bird nesting is limited to two locations, the Alley North Colony in WCA-3A and the coastal colonies in ENP. Birds that were feeding in WCA-3A North last week have dispersed as water levels there are too low for foraging.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.57 inches of rainfall in the past week and the Lower Basin received 0.95 inches (SFWMD Daily Rainfall Report 4/15/2018).

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: 4/16/2019

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)						
							4/14/19	4/7/19	3/31/19	3/24/19	3/17/19	3/10/19	3/3/19
Lakes Hart and Mary Jane	S-62	19	LKMJ	60.1	R	60.4	**-0.3**	-0.4	-0.3	-0.4	-0.5	-0.3	-0.3
Lakes Myrtle, Preston, and Joel	S-57	4	S-57	60.5	R	60.5	**0.0**	0.0	0.0	0.0	0.0	0.0	-0.1
Alligator Chain	S-60	81	ALLI	63.2	R	63.3	**-0.1**	0.0	0.0	-0.1	-0.3	-0.2	-0.2
Lake Gentry	S-63	103	LKGT	60.8	R	60.8	**0.0**	0.0	0.0	0.0	0.0	0.0	-0.1
East Lake Toho	S-59	116	TOHOE	55.9	R	56.9	**-1.0**	-1.1	-1.2	-1.4	-1.5	-1.4	-1.4
Lake Toho	S-61	306	TOHOW, S-61	52.9	R	53.9	**-1.0**	-1.1	-1.2	-1.4	-1.6	-1.4	-1.3
Lakes Kissimmee, Cypress, and Hatchineha	S-65	710	KUB011, LKIS5B	49.7	R	50.6	**-0.9**	-0.9	-1.1	-0.9	-0.8	-0.8	-0.7

[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] A = projected ascension line, R = USACE regulation schedule, S = temporary recession target line, T = temporary schedule, 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: **4/16/2019**

Metric	Location	1-Day Average	Average for the Preceeding 7-Days[1]									
		4/14/2019	4/14/19	4/7/19	3/31/19	3/24/19	3/17/19	3/10/19	3/3/19	2/24/19	2/17/19	2/10/19
Discharge (cfs)	S-65	576	710	434	452	833	529	513	1,368	2,386	3,220	2,653
Discharge (cfs)	S-65A[2]	443	558	334	353	699	420	409	1,190	2,280	3,154	2,472
Discharge (cfs)	S-65D[2]	722	703	367	563	859	505	1,103	2,310	3,097	2,668	1,564
Headwater Stage (feet NGVD)	S-65D[2]	25.76	25.77	25.73	25.76	25.77	25.78	25.72	25.76	25.77	25.81	25.82
Discharge (cfs)	S-65E[2]	673	679	330	539	855	497	1,026	2,167	2,945	2,533	1,442
Discharge (cfs)	S-67	110	106	0	9	162	0	51	30	53	0	0
DO (mg/L)[3]	Phase I river channel	6.2	6.3	6.9	7.4	6.7	5.9	5.6	4.1	3.6	4.0	5.3
Mean depth (feet)[4]	Phase I floodplain	0.15	0.18	0.16	0.21	0.34	0.29	0.43	0.86	1.20	1.25	0.71

[1]Seven-day average of weighted daily means through Sunday midnight.
[2]S-65A discharge combines S-65A with auxillary strucutures; 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.
[3]DO is the average for sondes at PC62 and PC33.
[4]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)

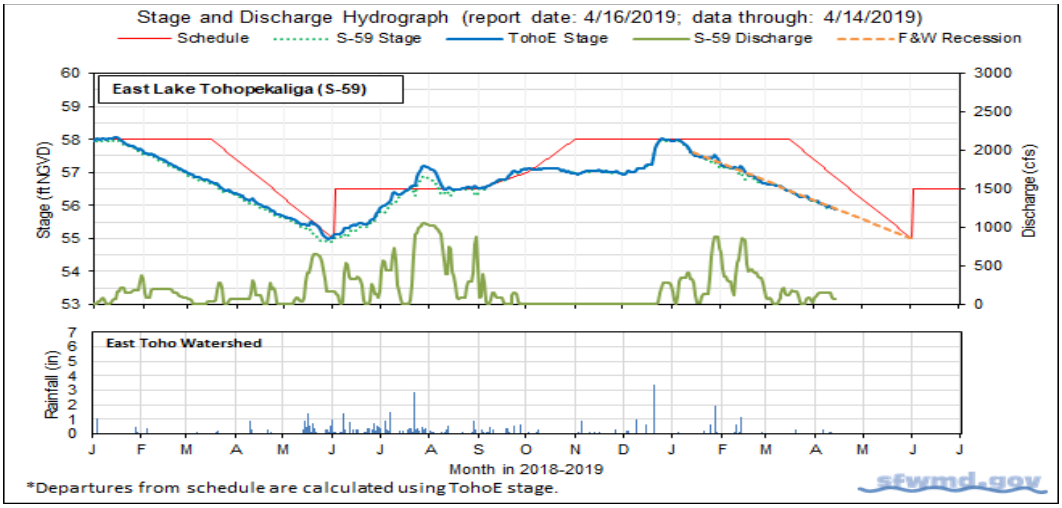


Figure 1.

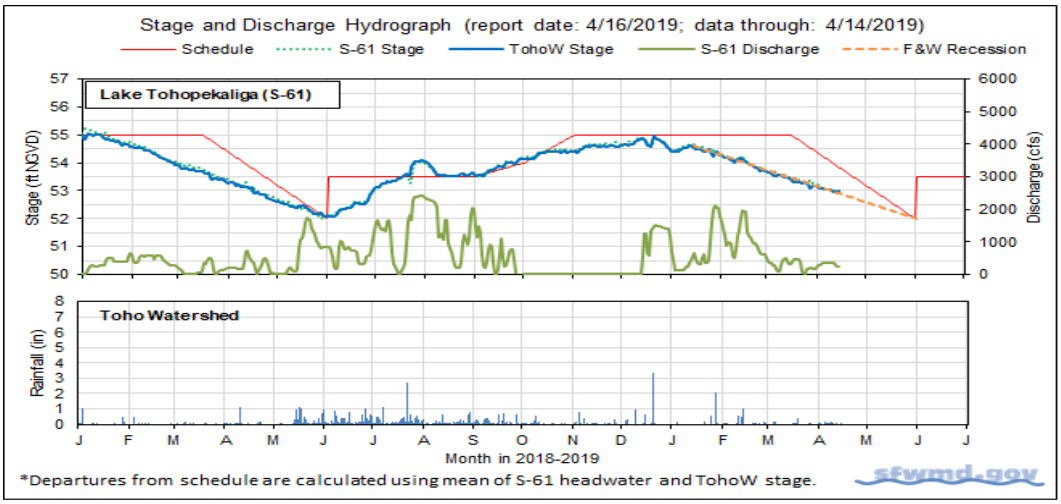


Figure 2.

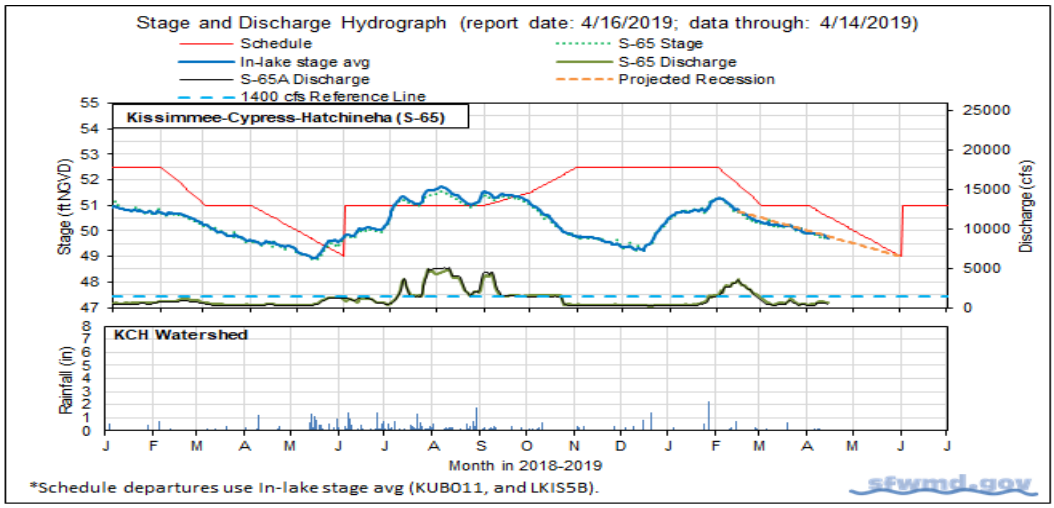


Figure 3.

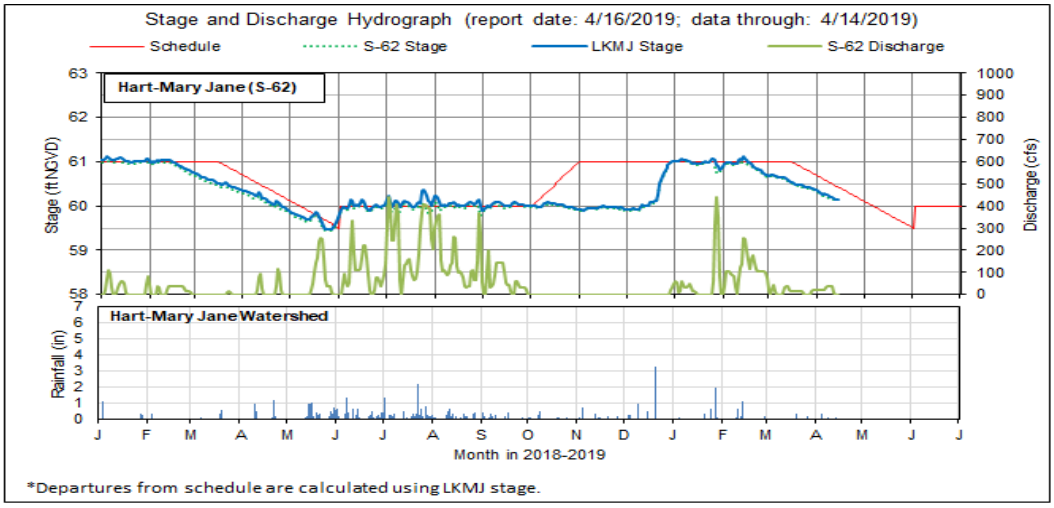


Figure 4.

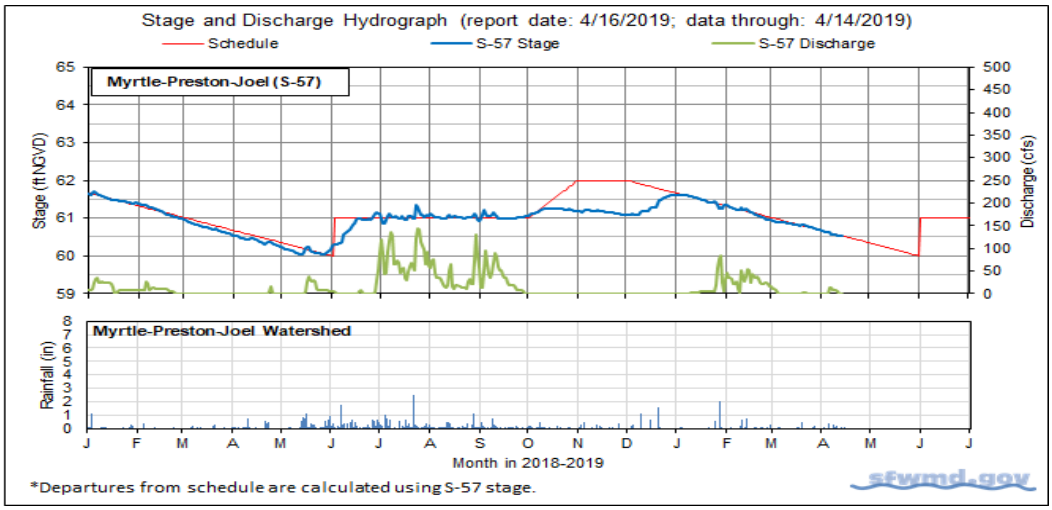


Figure 5.

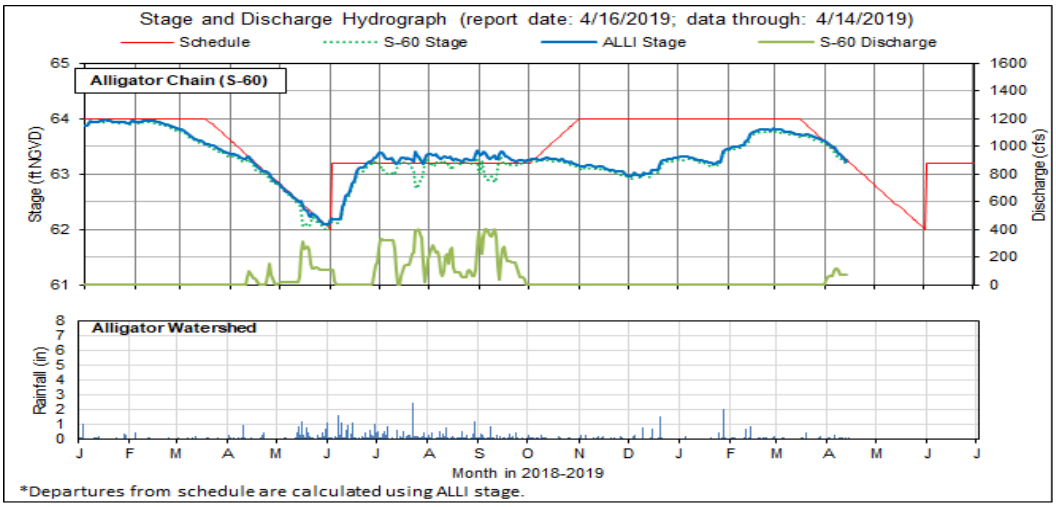


Figure 6.

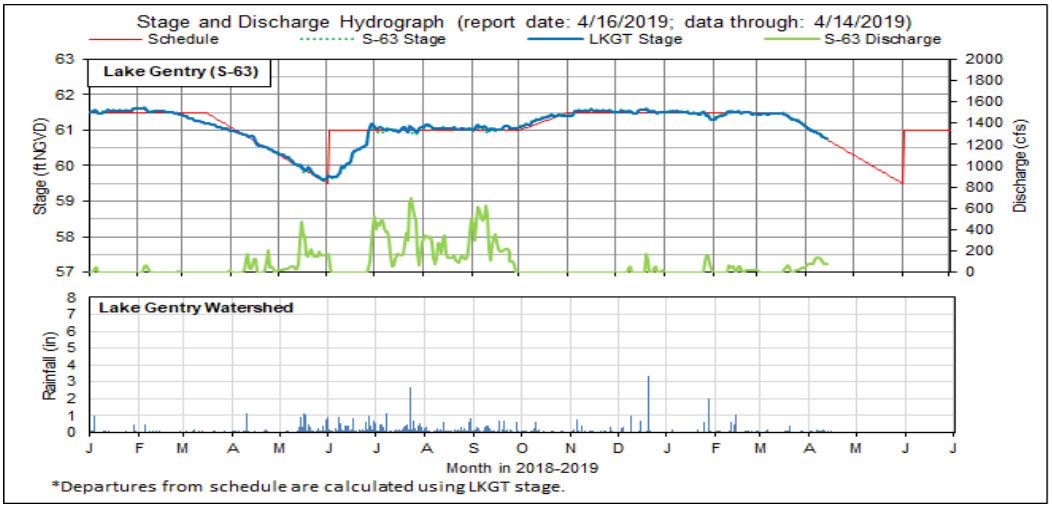


Figure 7.

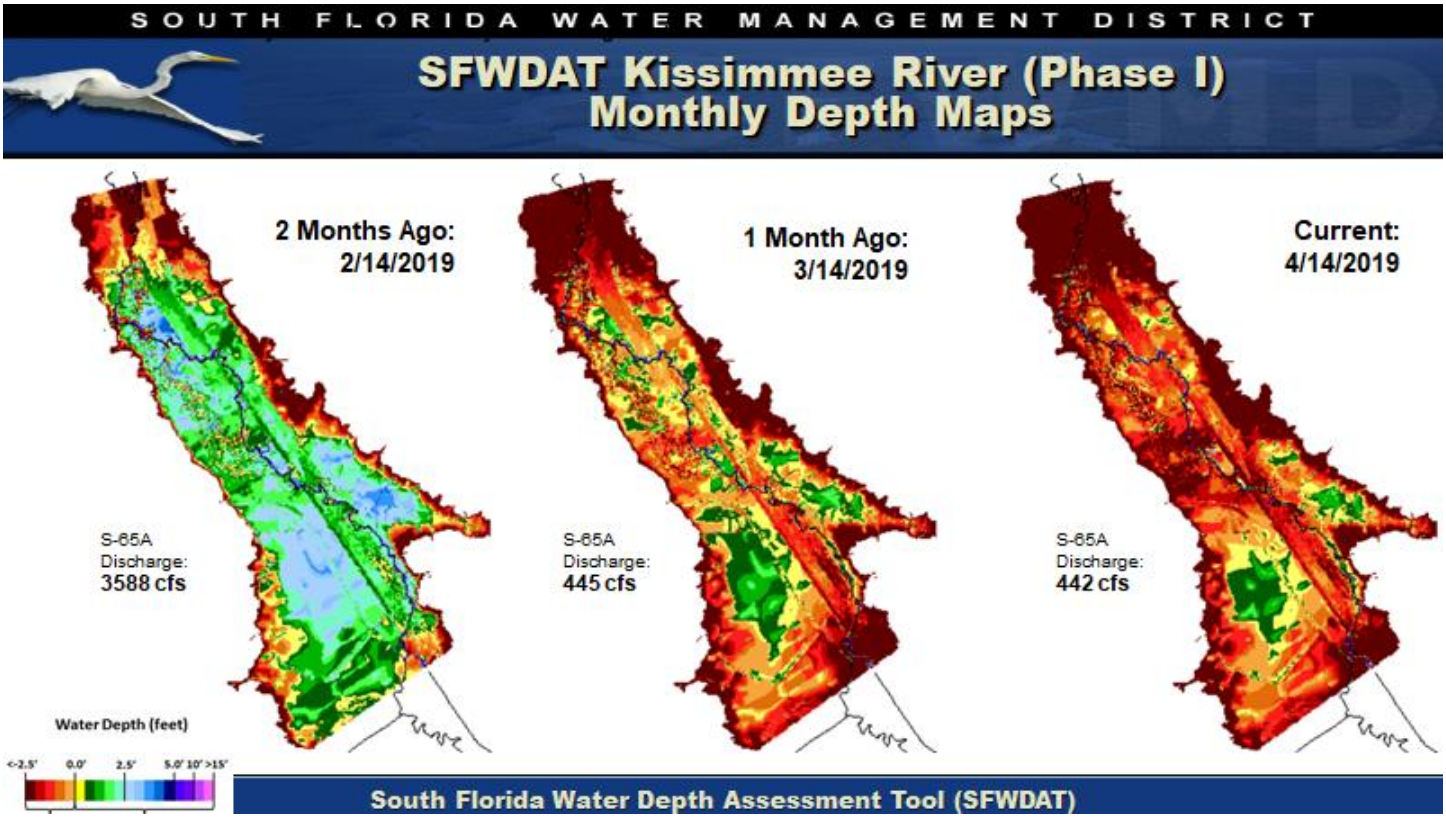


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

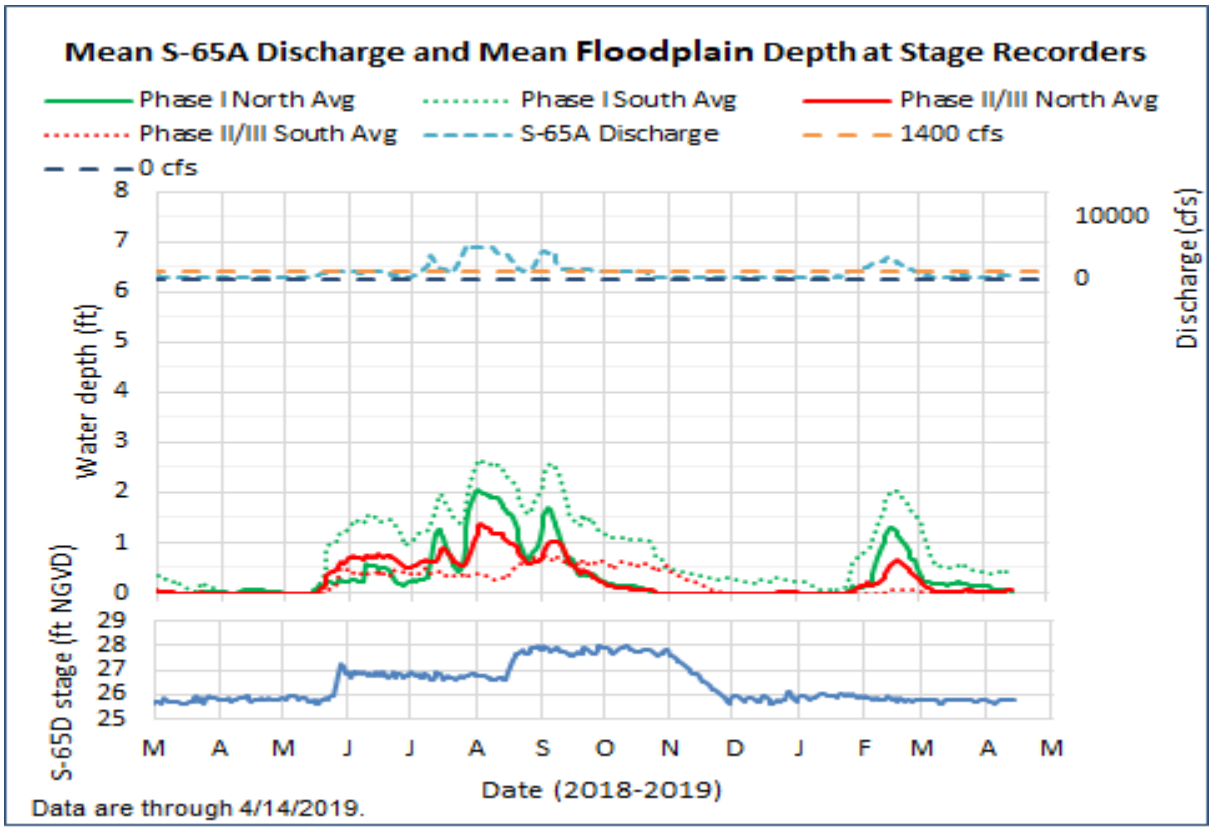


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.

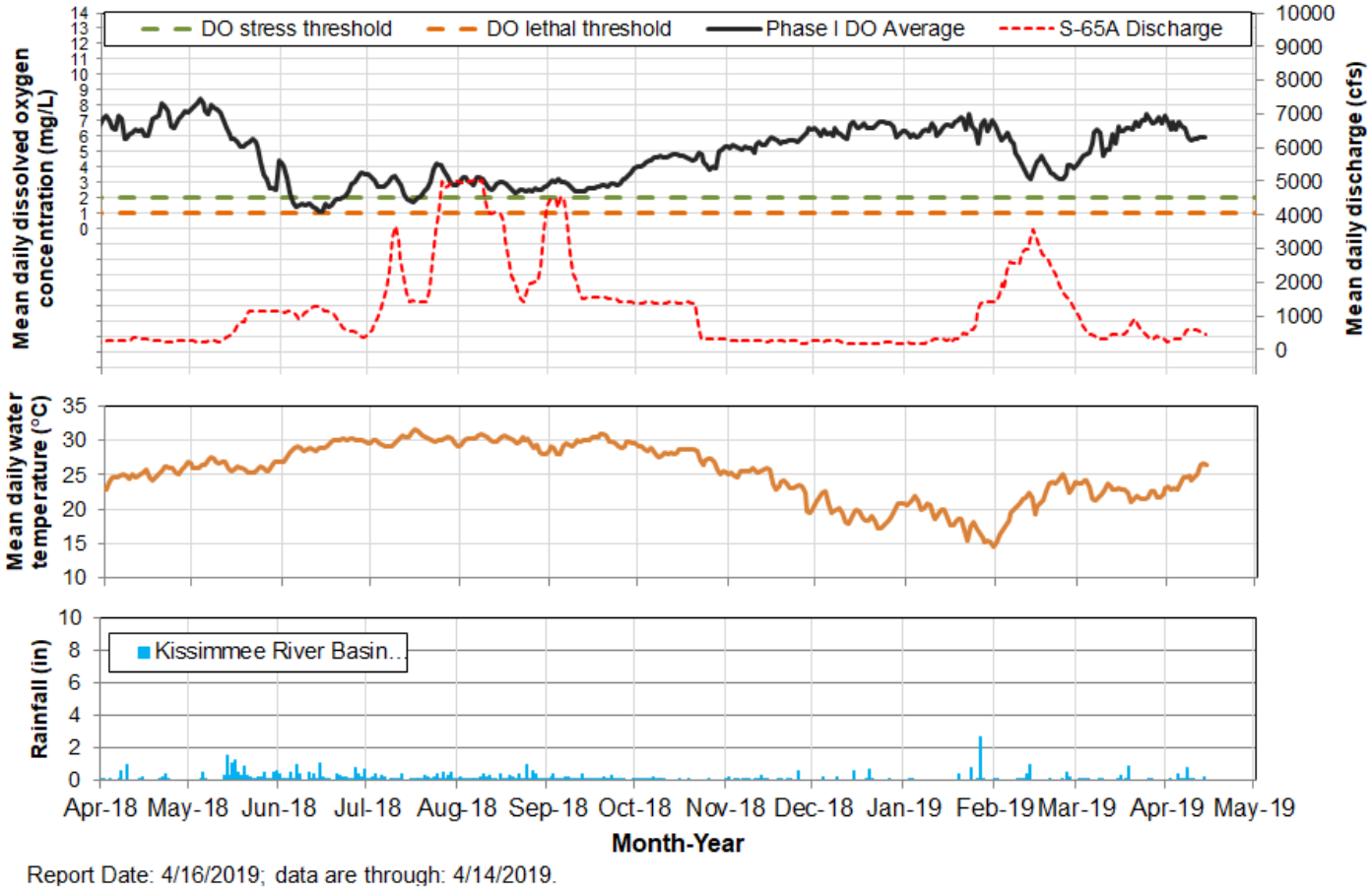


Figure 10. Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phase I river channel.

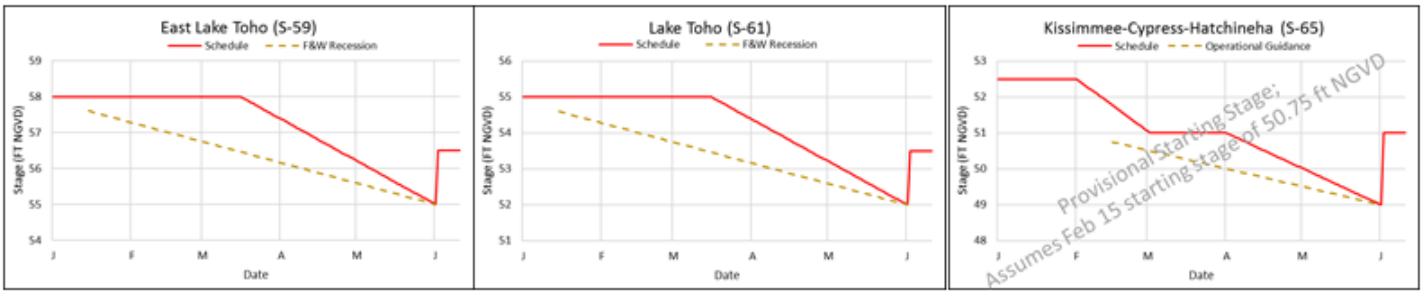
Water Management Recommendations

Kissimmee Basin Adaptive Recommendations and Operational Actions

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
4/15/2019	No new recommendations.		N/A		4/16/2019
4/8/2019	No new recommendations.		N/A		4/9/2019
4/1/2019	No new recommendations.		N/A		4/2/2019
3/25/2019	No new recommendations.		N/A		3/26/2019
3/18/2019	No new recommendations.		N/A		3/19/2019
3/11/2019	No new recommendations.		N/A		3/12/2019
3/4/2019	No new recommendations.		N/A		3/5/2019
2/26/2019	No new recommendations.		N/A		2/26/2019
2/19/2019	No new recommendations.		N/A		2/19/2019
2/10/2019	Increase discharge at S-65 by 600 cfs.	To compensate for increased inflow and rain forecast for Tuesday.	Implemented	KB Ops/SFWMD Water Mgt	2/12/2019
2/4/2019	Increase discharge at S-65/S-65A to begin reducing KCH stage to reach 50.75 ft on 2/15/2019.	Reduce to the stage at which the seasonal recession will begin.	Implemented	KB Ops/SFWMD Water Mgt	2/5/2019
1/26/2019	Increase S65A dishcarge 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
1/15/2019	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. 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. Discharge and reversal guidelines are provided in the Dry Season Operations slides.	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
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

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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.

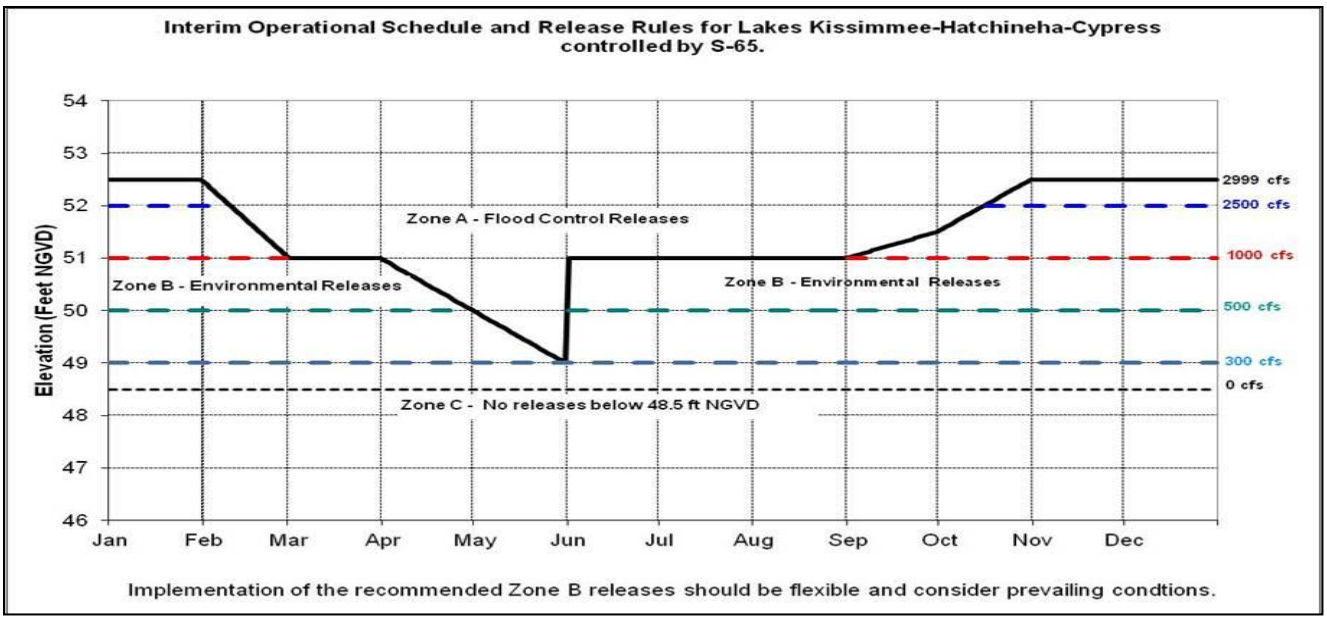


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

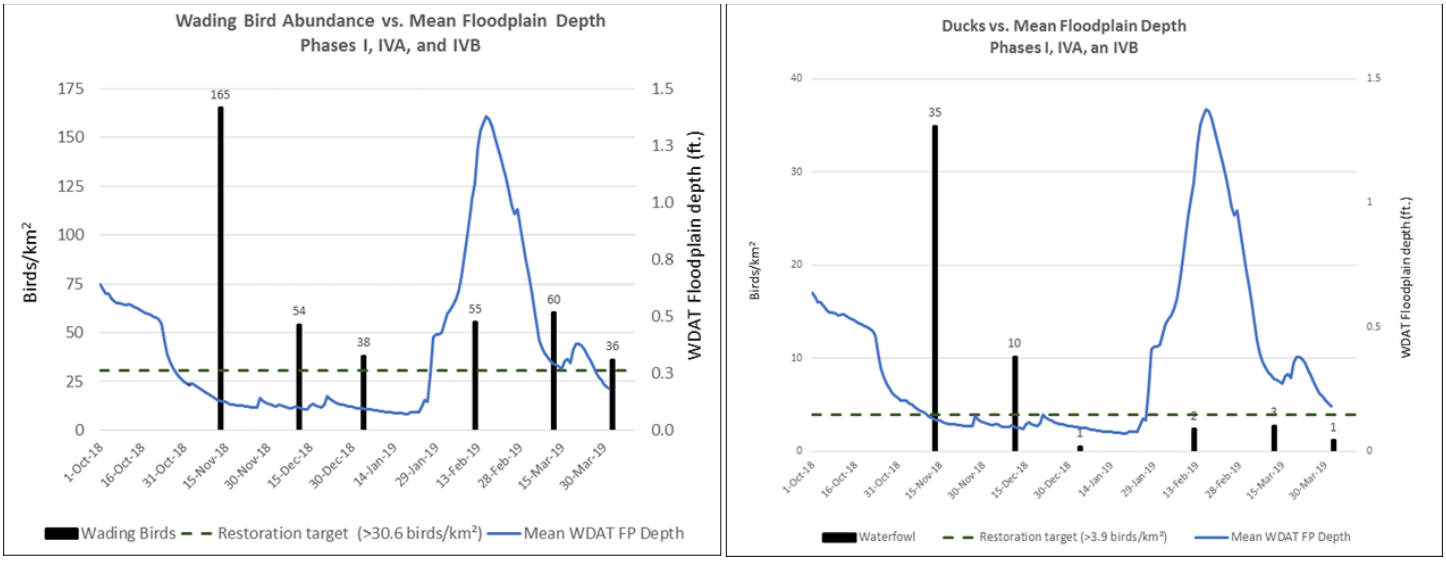


Figure 13. Kissimmee River Wading Bird and Waterfowl Surveys from November 2018 to March 2019.

Table 3. Upper Kissimmee Basin Snail Kite Survey in April 2019

Survey 2	Date	Snail Kites	Total Nests	Active Nests
Kissimmee	4/5/2019	172	22	21
Cypress	4/6/2019	0	0	0
Hatchineha	4/6/2019	0	0	0
East Toho	4/6/2019	10	2	0
Toho	4/7/2019	157	41	32

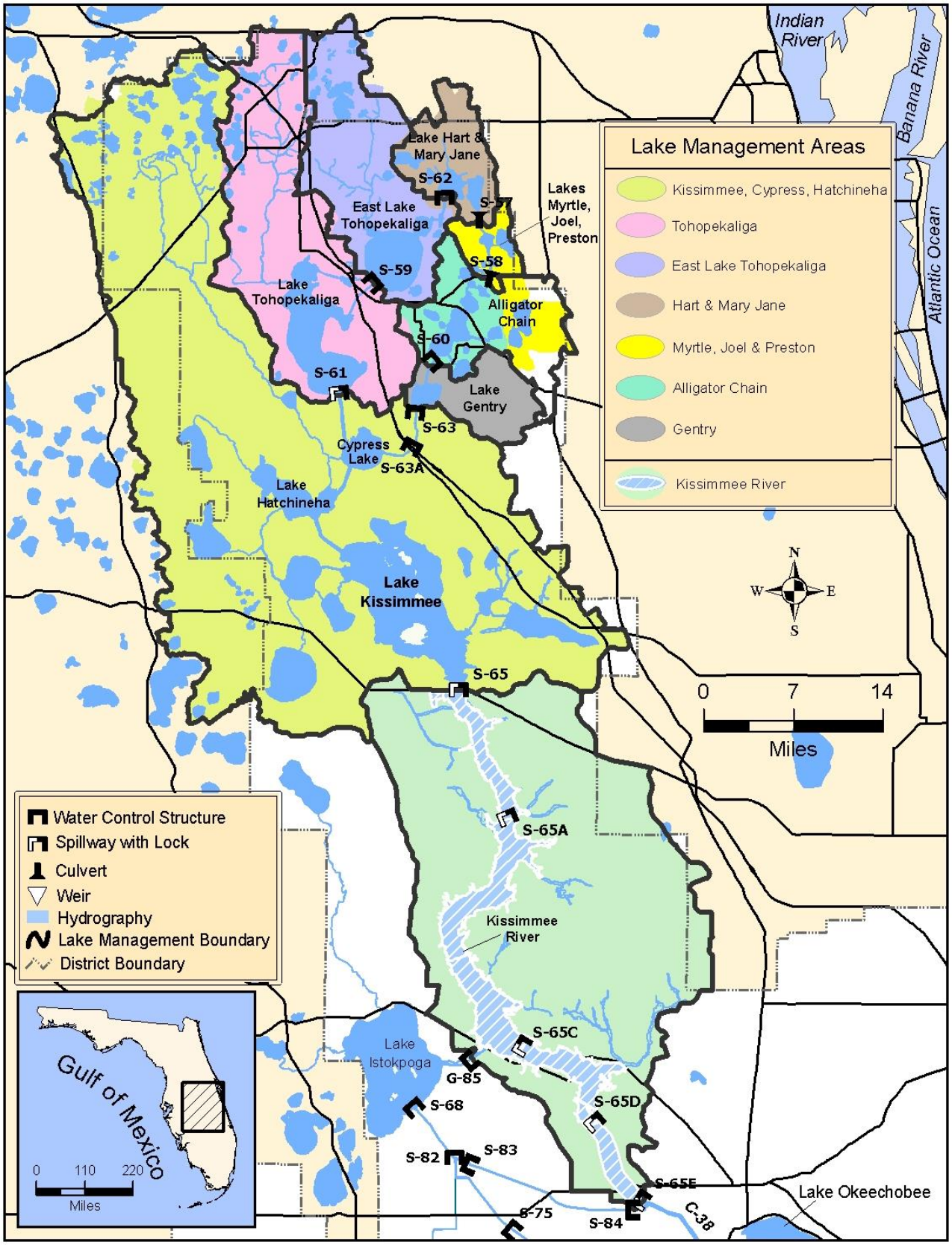


Figure 14. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 11.59 feet NGVD for April 15, 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 0.63 feet lower than a month ago and 1.84 feet lower than a year ago when stages were still recovering from Hurricane Irma (Figure 1). The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is currently 0.26 feet above the Water Shortage sub-band (Figure 2). Lake stage is the lowest for this time of year since 2011, which followed a very dry rainy season in 2010 (Figure 3). According to RAINDAR, during the week of April 9-15, 2019, 0.42 inches of rain fell directly over the Lake. There were large variations in rainfall across the rest of the District, with basins receiving between 0.1 and 2.0 inches of rain (Figure 4).

Average daily inflows (minus rainfall) to the Lake this week were higher than last week at 938 cfs compared to 444 cfs, respectively. The inflows from the Kissimmee River also increased, going from 366 cfs to 687 cfs. Inflows from the remaining structures increased from the previous week, including the L-8 canal at Canal Point, which averaged 27 cfs of backflow into the Lake vs no backflow the previous week. Passive inflow from S308 decreased from the previous week going from 100 cfs to 38 cfs this week (Table 1).

Total outflows (minus evapotranspiration) increased from the previous week, going from 2,395 average daily cfs to 2,599 cfs this past week mostly due to increased outflows south through the S-350 structures (Table 1). Outflows south increased from 1,406 cfs to 2,018 cfs. Outflows west via S-77 decreased from the previous week going from 1,087 cfs to 619 cfs. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiations was 0.12 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 April 2 and 3 found six of nine stations in the nearshore zone with Chlorophyll a (Chla) values >20 µg/L, with a high of 33.1 µg/L. One of seven stations in the pelagic had values of Chla >20 µg/L (20.1 µg/L) while all other stations were between 8.0 µg/L and 16.6 µg/L (Figure 6). Two nearshore and one pelagic site had microcystin levels above detection limits (0.20 µg/L).

The most recent satellite imagery (April 13, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel OLCI sensor data showed bloom potential is low for most of the Lake but is increasing and in the medium range along the northwestern shore and particularly in Fisheating Bay (Figure 7).

Water Management Recommendations

Lake Okeechobee stage is 11.59 feet NGVD, decreasing 0.19 feet from the previous week. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is now 0.26 feet above the Water Shortage sub-band. The lake remains below the bottom of the ecological envelope (currently 1.3 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD. Given the potential for above average rainfall associated with a weak 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. Satellite imagery suggest the potential for algal blooms has increased along the western shore, particularly within Fisheating Bay.

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	366	687	0.3
S71 & 72	15	74	0.0
S84 & 84X	47	188	0.1
Fisheating Creek	15	17	0.0
S154	0	0	0.0
S191	0	0	0.0
S133 P	0	0	0.0
S127 P	0	0	0.0
S129 P	0	0	0.0
S131 P	0	0	0.0
S135 P	0	0	0.0
S2 P	0	0	0.0
S3 P	0	0	0.0
S4 P	0	0	0.0
L8 Backflow		-27	0.0
Rainfall	1044	883	0.4
Total	**1488**	**1821**	**0.9**

OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S77	1087	619	0.3
S308	-100	-38	0.0
S351	395	734	0.3
S352	581	614	0.3
S354	430	670	0.3
L8 Outflow			
ET	1809	1835	0.9
Total	**4204**	**4435**	**2.1**

Provisional Data

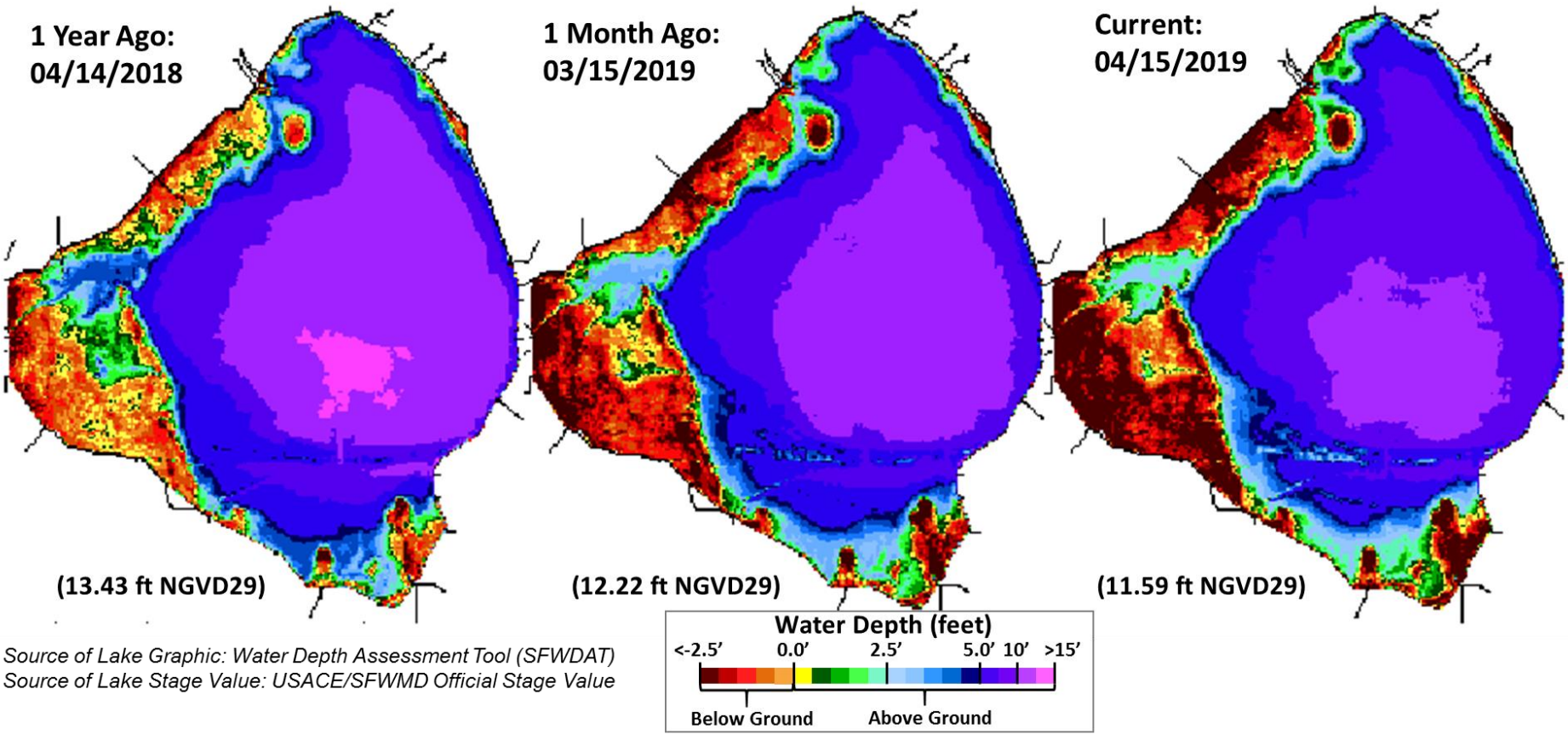


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

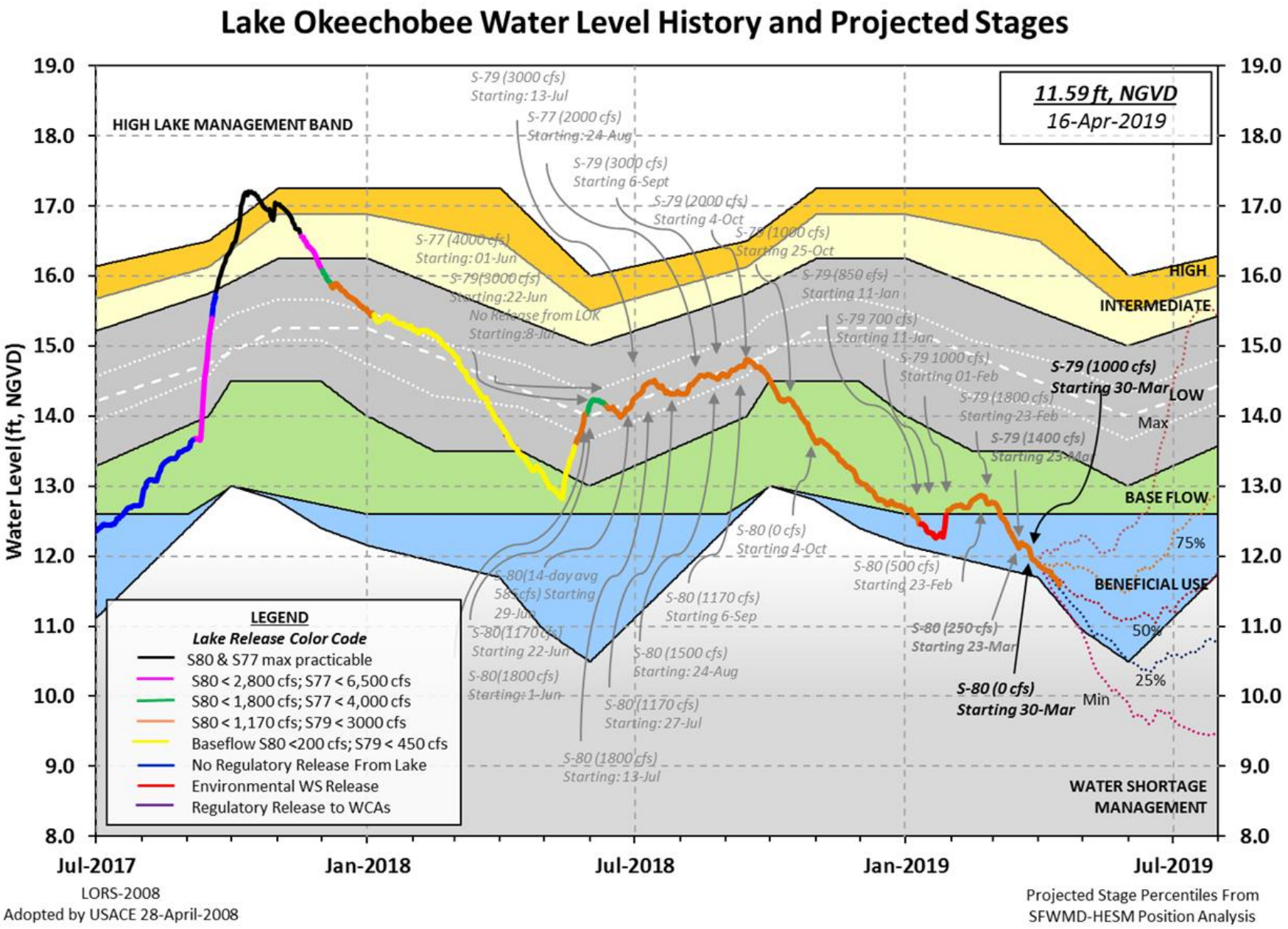


Figure 2. Recent Lake Okeechobee stage and releases, with projected stages based on a dynamic position analysis.

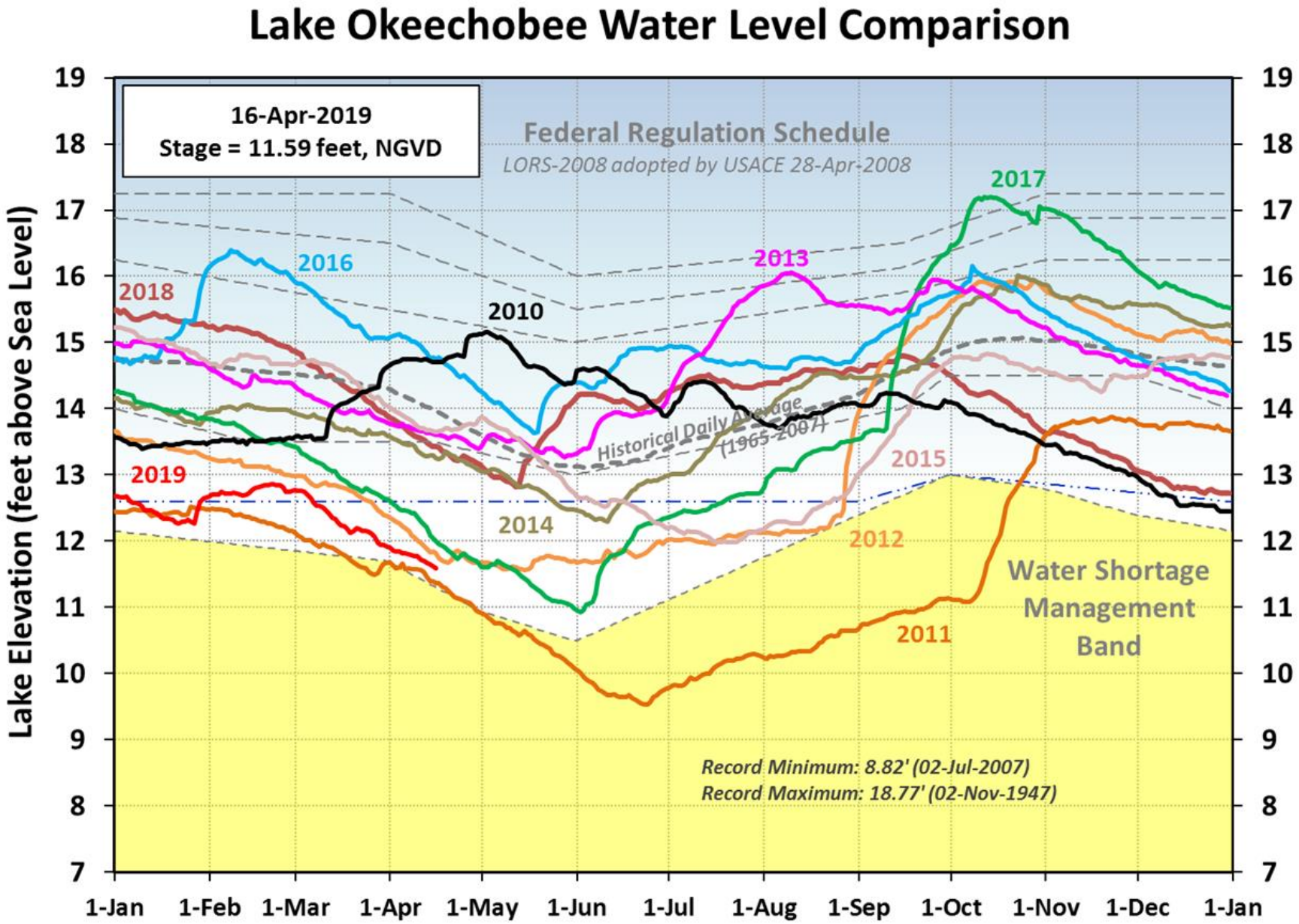


Figure 3. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

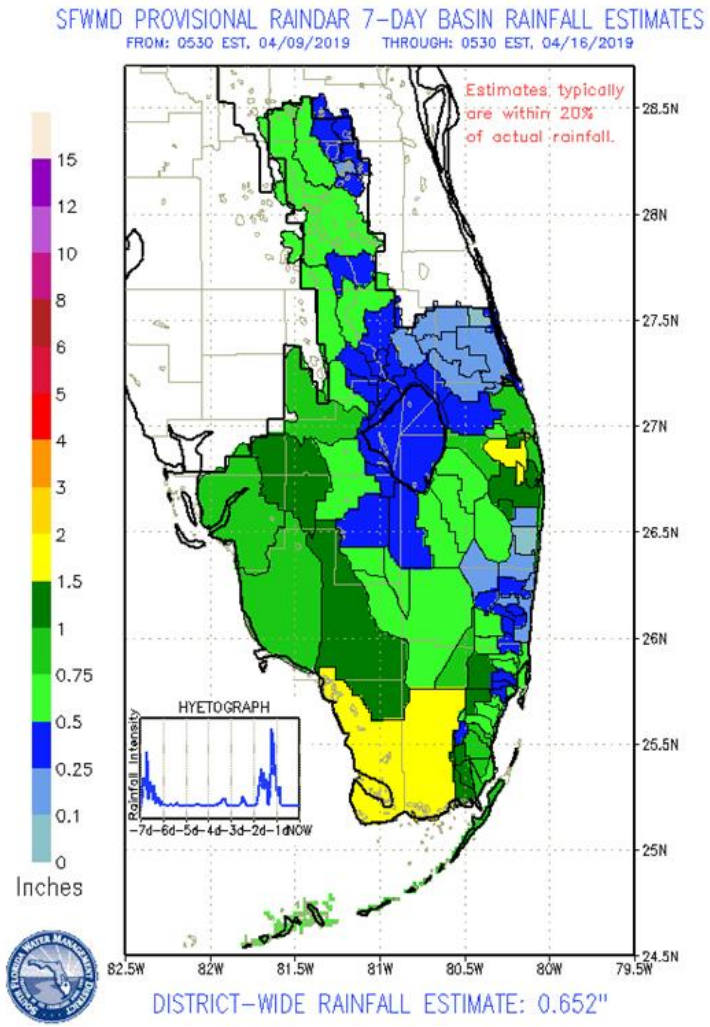


Figure 4. Rainfall estimates by basin.

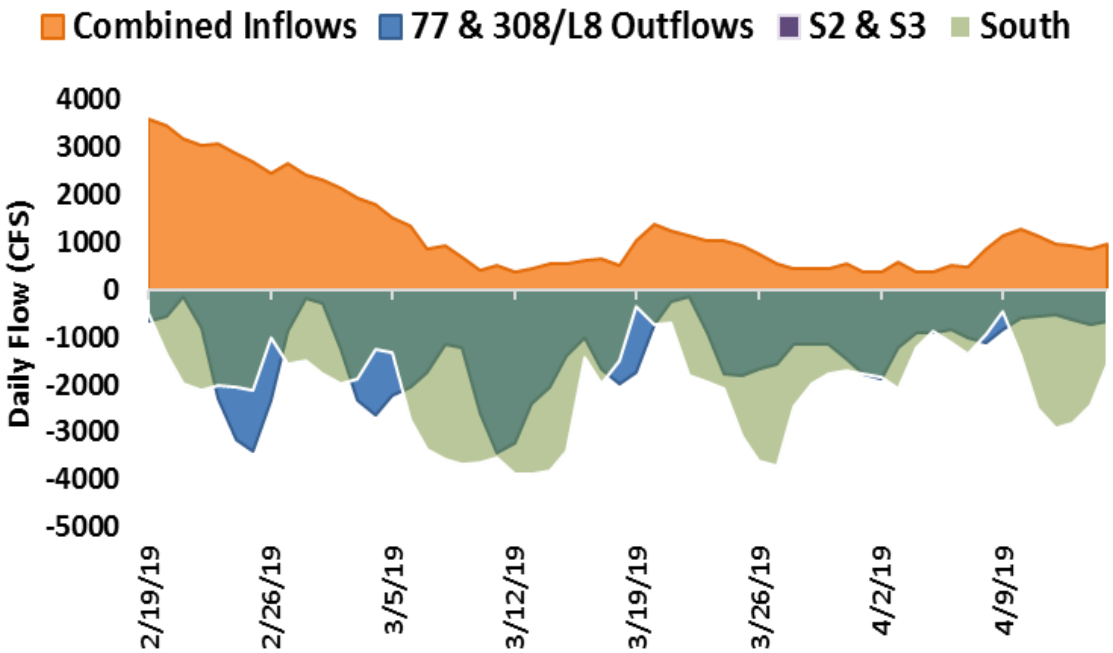
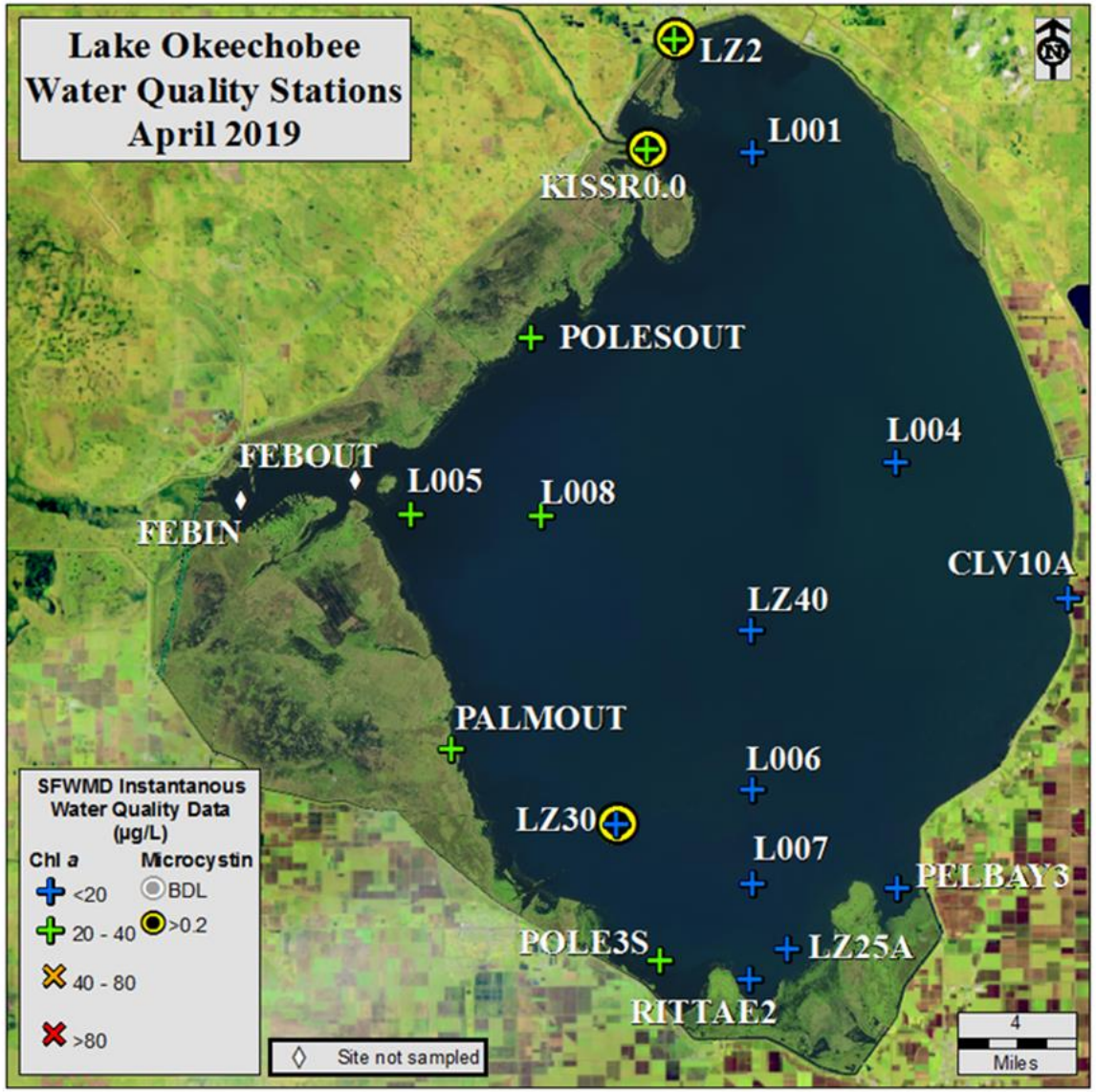


Figure 5. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive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



April 2-3, 2019

Site	Chlorophyll *a* (µg/L)	Microcystin (µg/L)
Nearshore Stations		
KISSR0.0	**22.2**	0.29
L005	**22.0**	BDL
LZ2	**33.1**	0.30
LZ25A	7.7	
PALMOUT	**23.4**	
PELBAY3	10.3	
POLE3S	**23.0**	
POLESOUT	**23.8**	BDL
RITTAE2	10.8	
Pelagic Stations		
L001	11.4	
L004	8.0	
L006	11.8	
L007	8.0	
L008	**20.1**	
LZ30	16.6	0.29
LZ40	10.3	
CLV10A	12.4	BDL

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

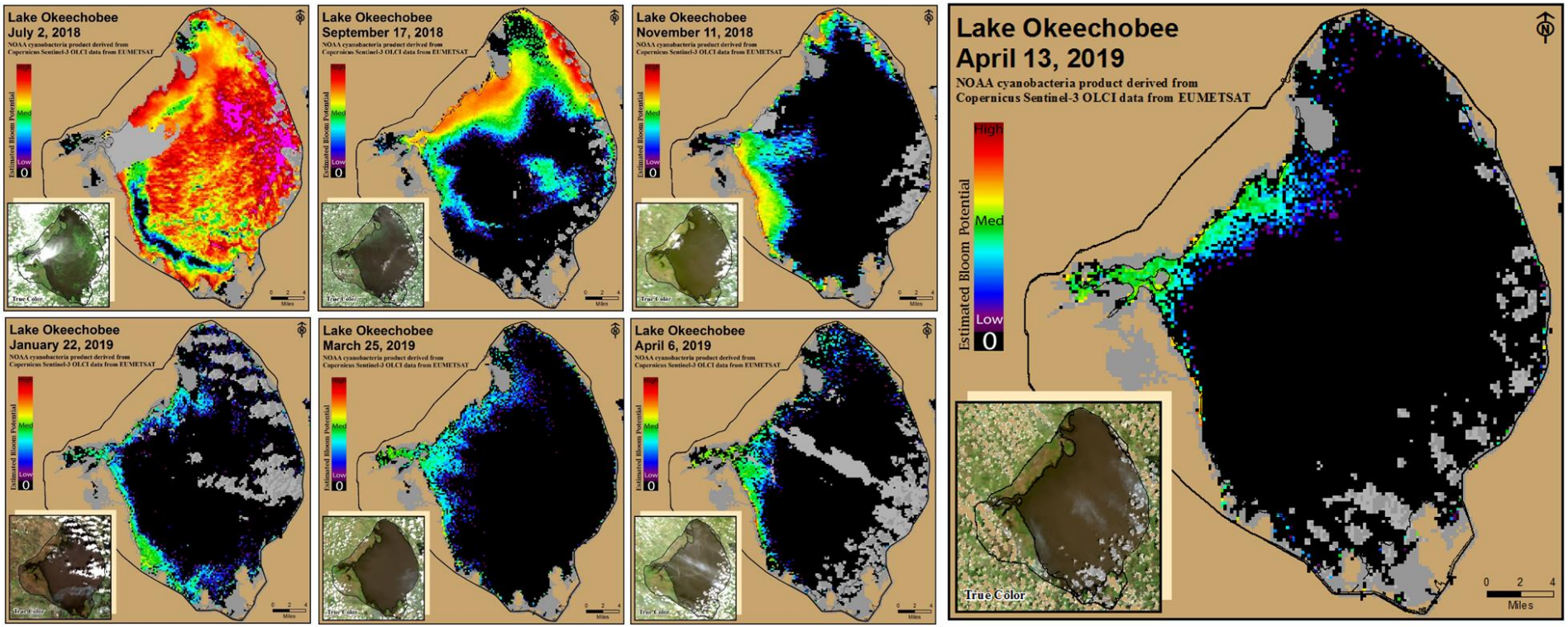


Figure 7. Potential for cyanobacterial blooms on Lake Okeechobee based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover. All data are experimental and unvalidated at this point in product development.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 187 cfs (Figures 1 and 2) and last month inflow averaged about 391 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	124
S-80	0
S-308	-38
S-49 on C-24	0
S-97 on C-23	0
Gordy Rd. structure on Ten Mile Creek	63

Over the past week in the estuary, salinity remained about the same at HR1 and increased downstream (Table 2, Figures 3 and 4). The seven-day moving average salinity of the water column (an average of the surface and bottom salinity) at the US1 Bridge is estimated to be 19.7. 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)	**14.9** (15.5)	**17.6** (17.3)	NA[1]
US1 Bridge	**19.4** (18.4)	**20.1** (19.1)	10.0-26.0
A1A Bridge	**26.1** (24.8)	**29.5** (27.8)	NA[1]

[1]Envelope not applicable

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 906 cfs (Figures 5 and 6) and last month inflow averaged about 1,426 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	619
S-78	582
S-79	805
Tidal Basin Inflow	101

Over the past week in the estuary, salinity remained about the same 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). The seven-day average salinity value was not available at Sanibel. The 30-day moving average surface salinity is 0.3 at Val I-75 and 3.9 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	**0.3** (0.4)	**0.4** (0.4)	0.0-5.0[2]
Ft. Myers Yacht Basin	**5.1 (**5.2)	**5.8** (5.9)	NA
Cape Coral	**14.8** (12.8)	**17.1** (14.7)	10.0-30.0
Shell Point	**27.9** (24.5)	**28.1** (23.9)	10.0-30.0
Sanibel	**NR**[3](NR)	**NR** (NR)	10.0-30.0

[1]Envelope not applicable, [2]Envelope is based on a 30-day average, and [3]Not Reporting.

Forecast of surface salinity (Table 5 and Figure 10) at Val I-75 for the next two weeks using the autoregression model (Qiu and Wan, 2013) coupled with a linear reservoir model for the tidal basin predicts daily salinity ranging from 0.8 to 3.7 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 1000 cfs and Tidal Basin inflows of 190 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	190	3.7	1.4
B	300	190	2.6	1.0
C	450	190	1.9	0.8
D	650	190	1.5	0.8
E	1000	190	0.8	0.6

Red tide

The Florida Fish and Wildlife Research Institute reported on April 12, 2019, that *Karenia brevis,* the Florida red tide dinoflagellate, was not observed in samples collected from Lee, St. Lucie, Martin, Palm Beach, Broward or Miami-Dade counties.

Water Management Recommendations

Lake stage is in the Beneficial Use sub-band of 2008 LORS. Tributary hydrological conditions are normal. The 2008 LORS recommends no release at S-79 and 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.

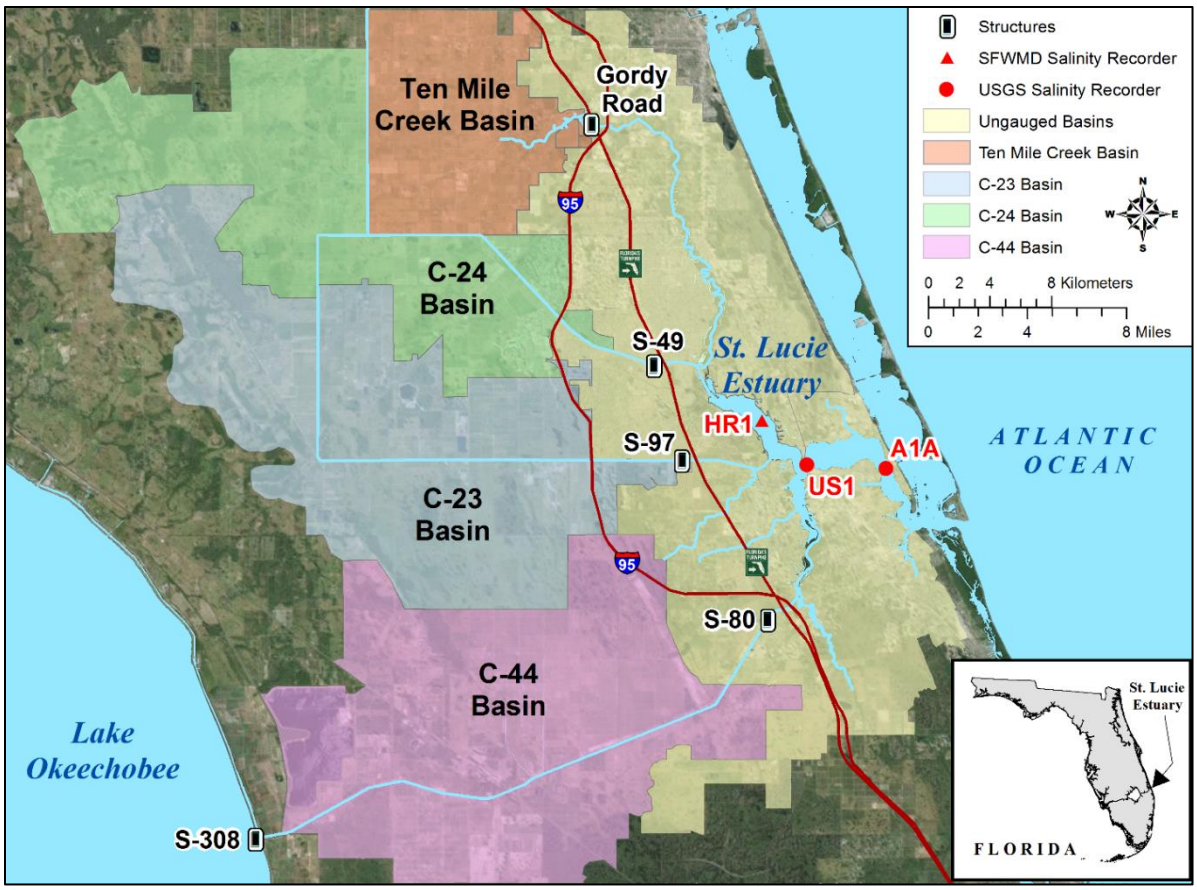


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

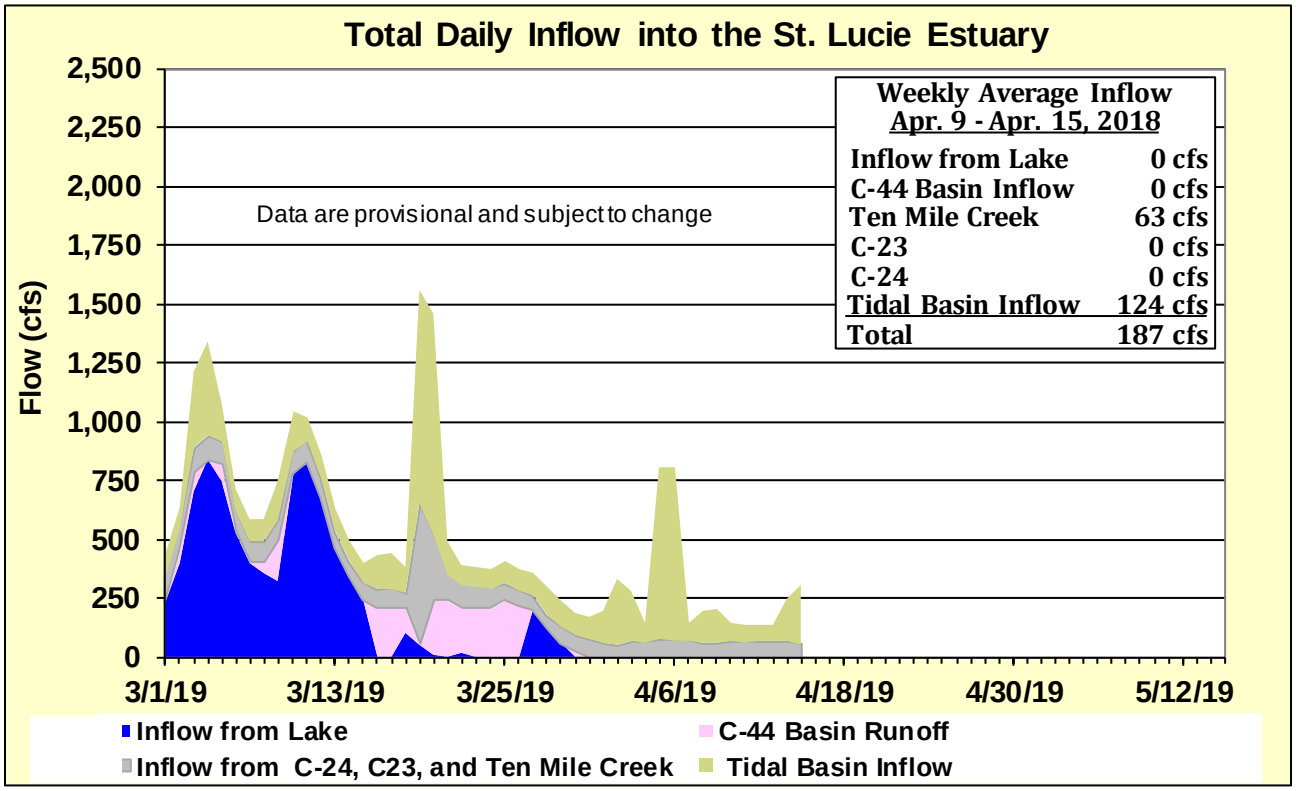


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

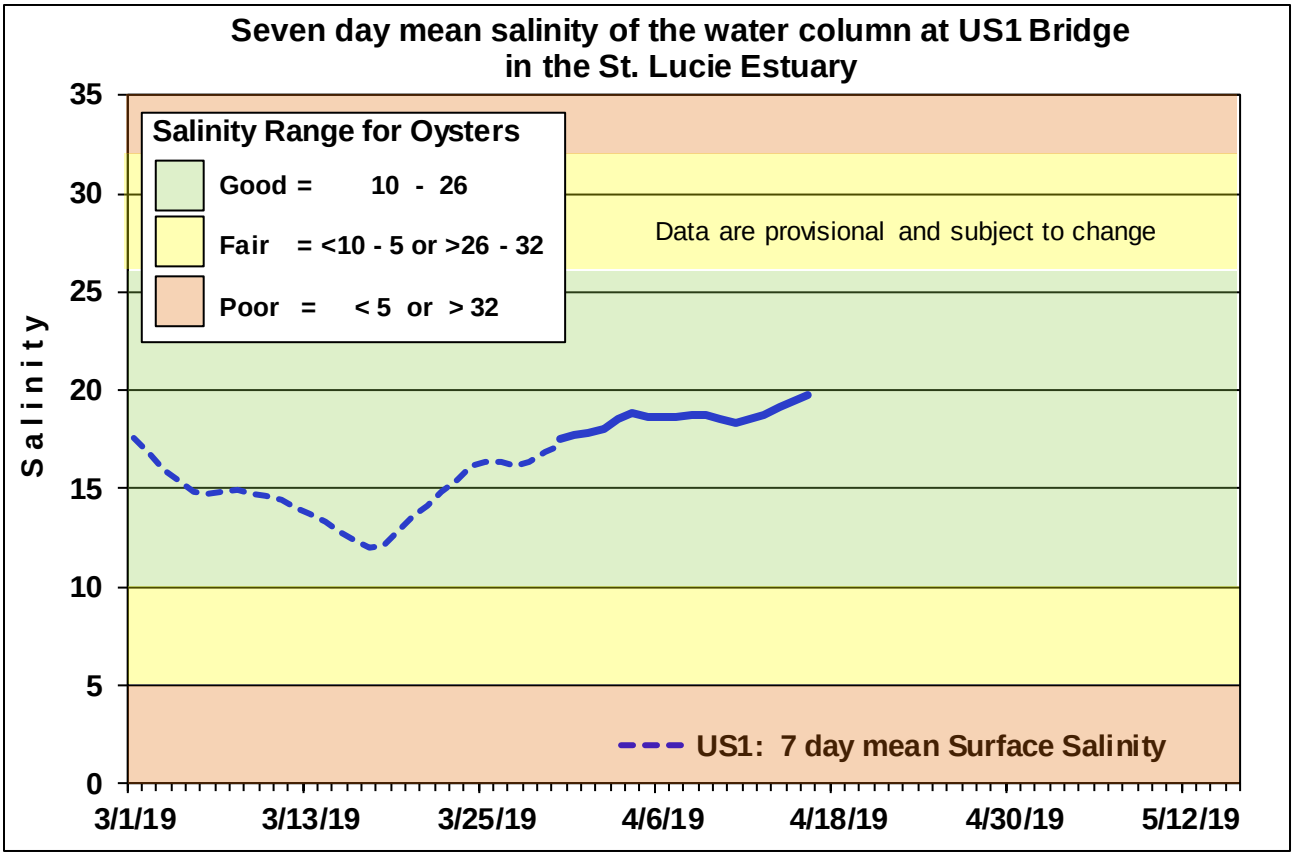


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

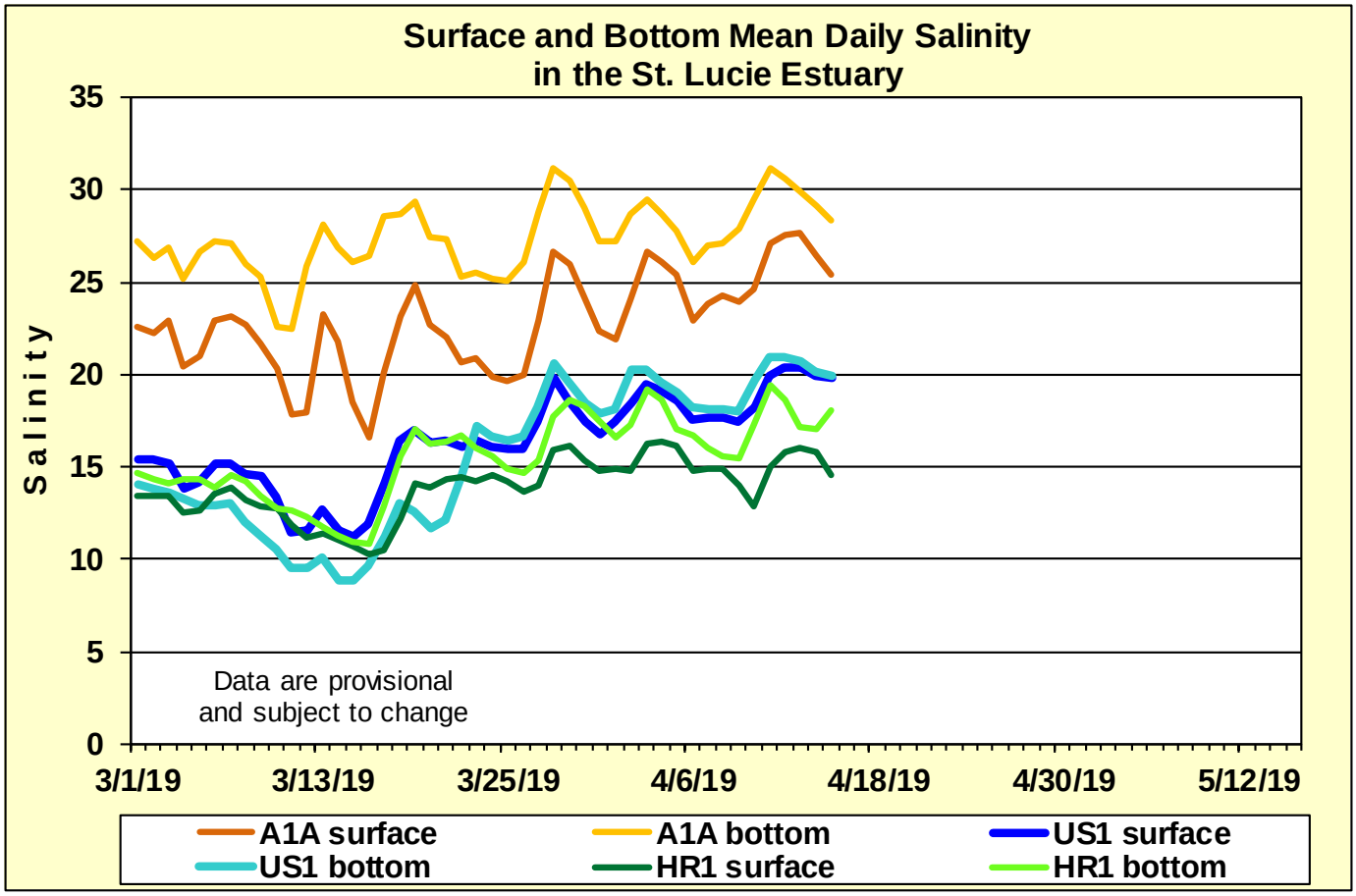


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

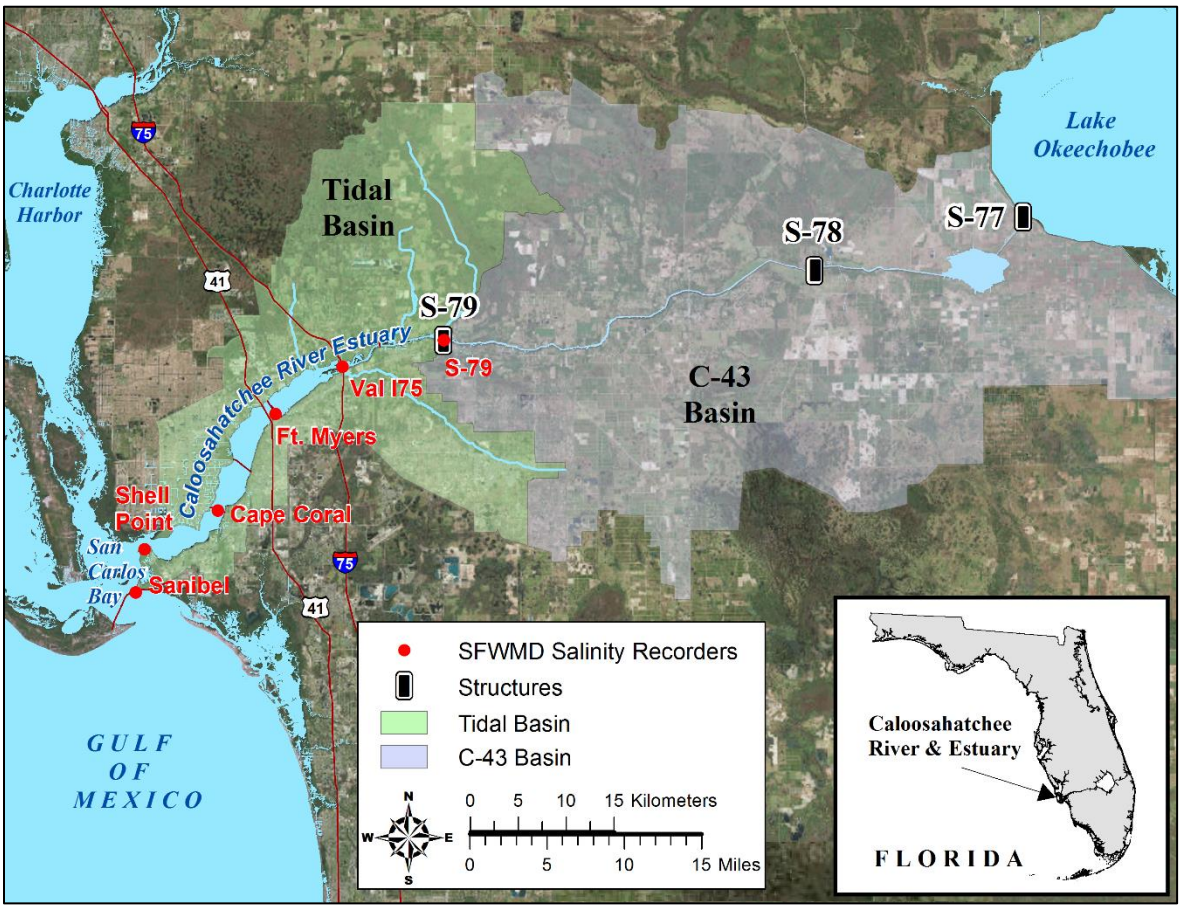


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

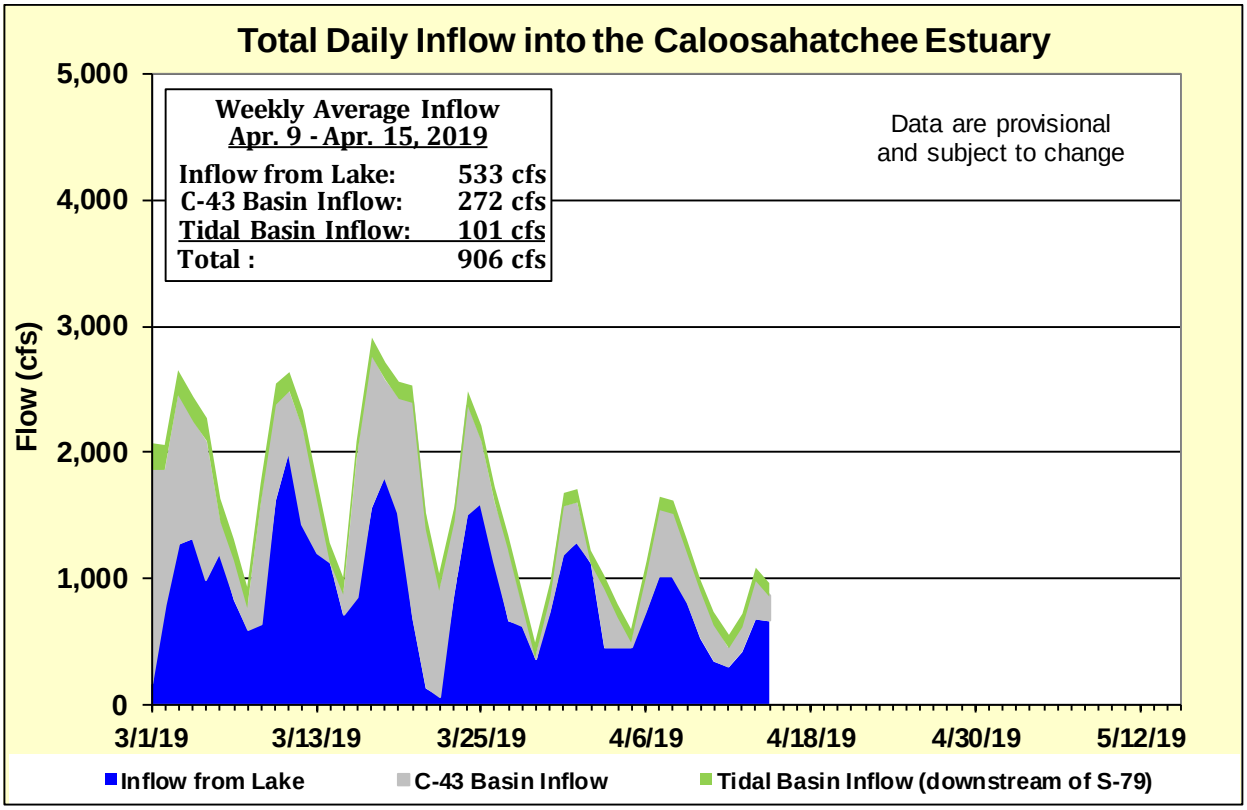


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

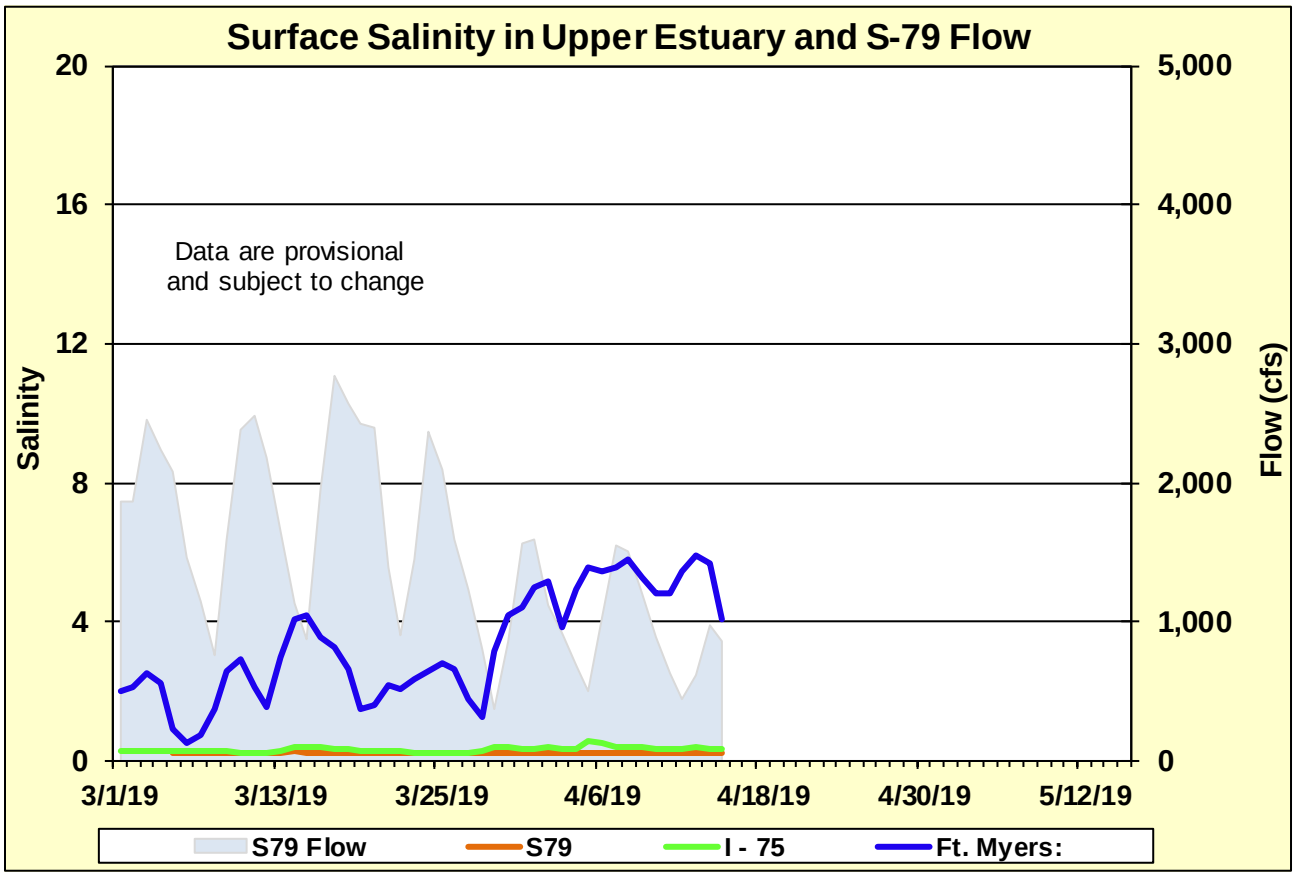


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

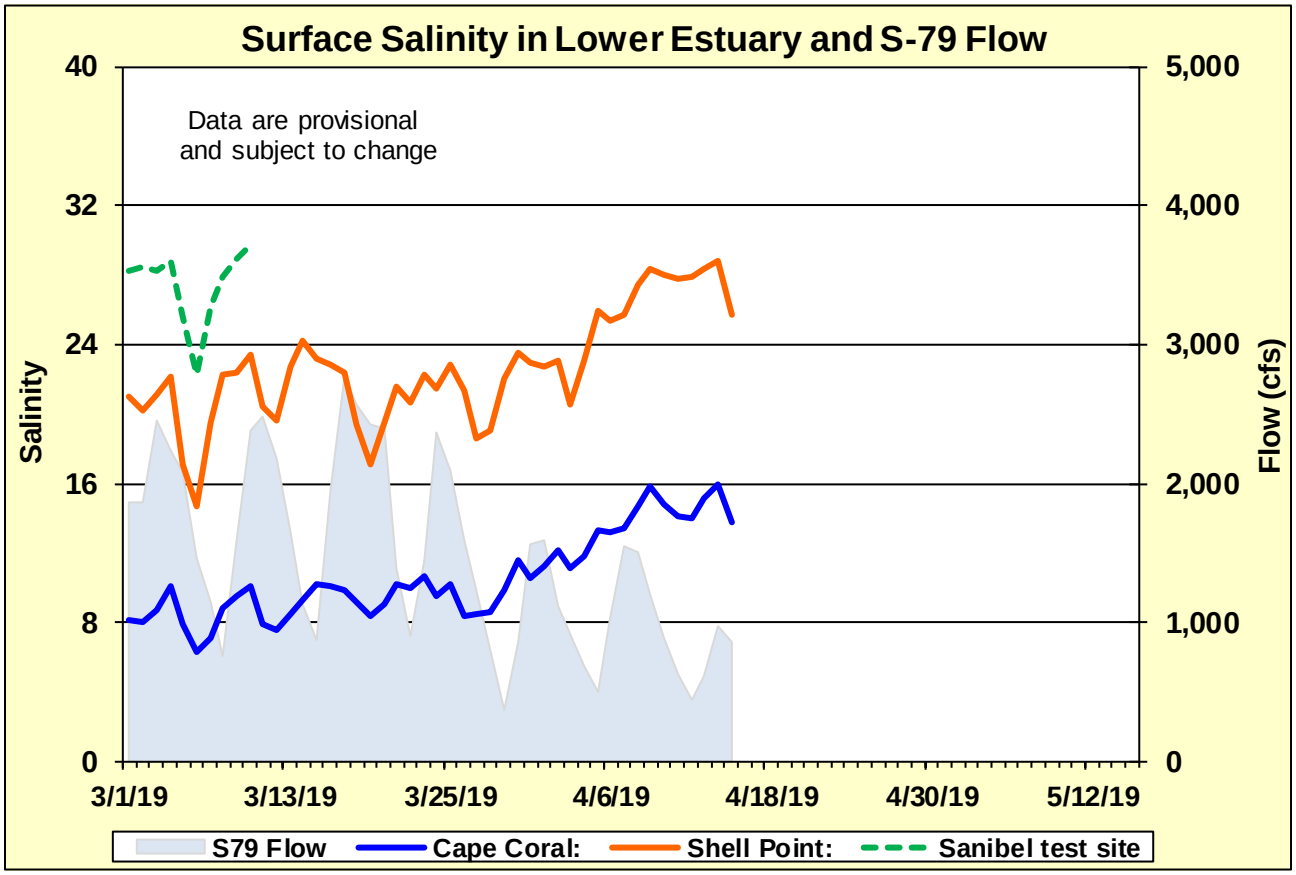


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

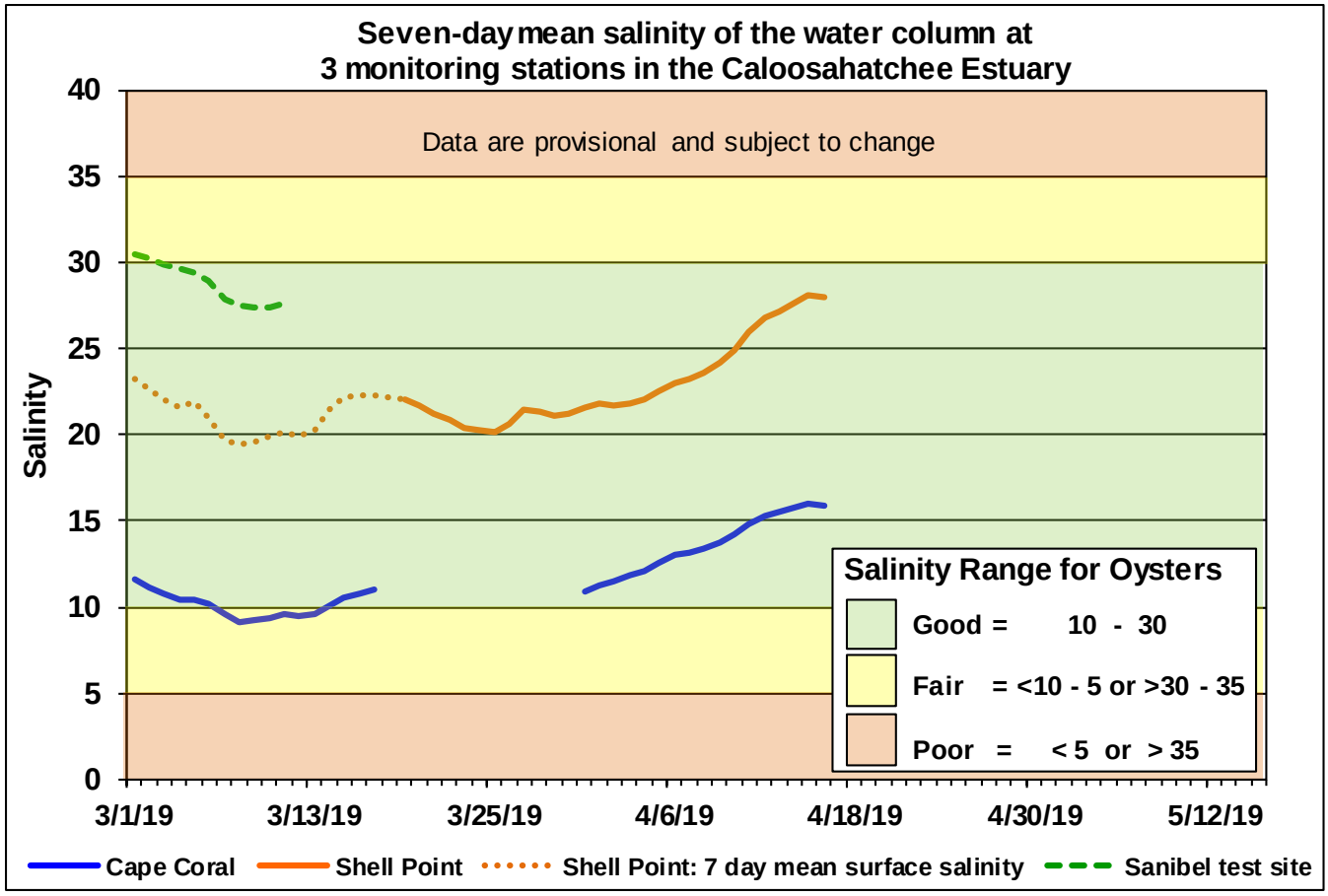


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

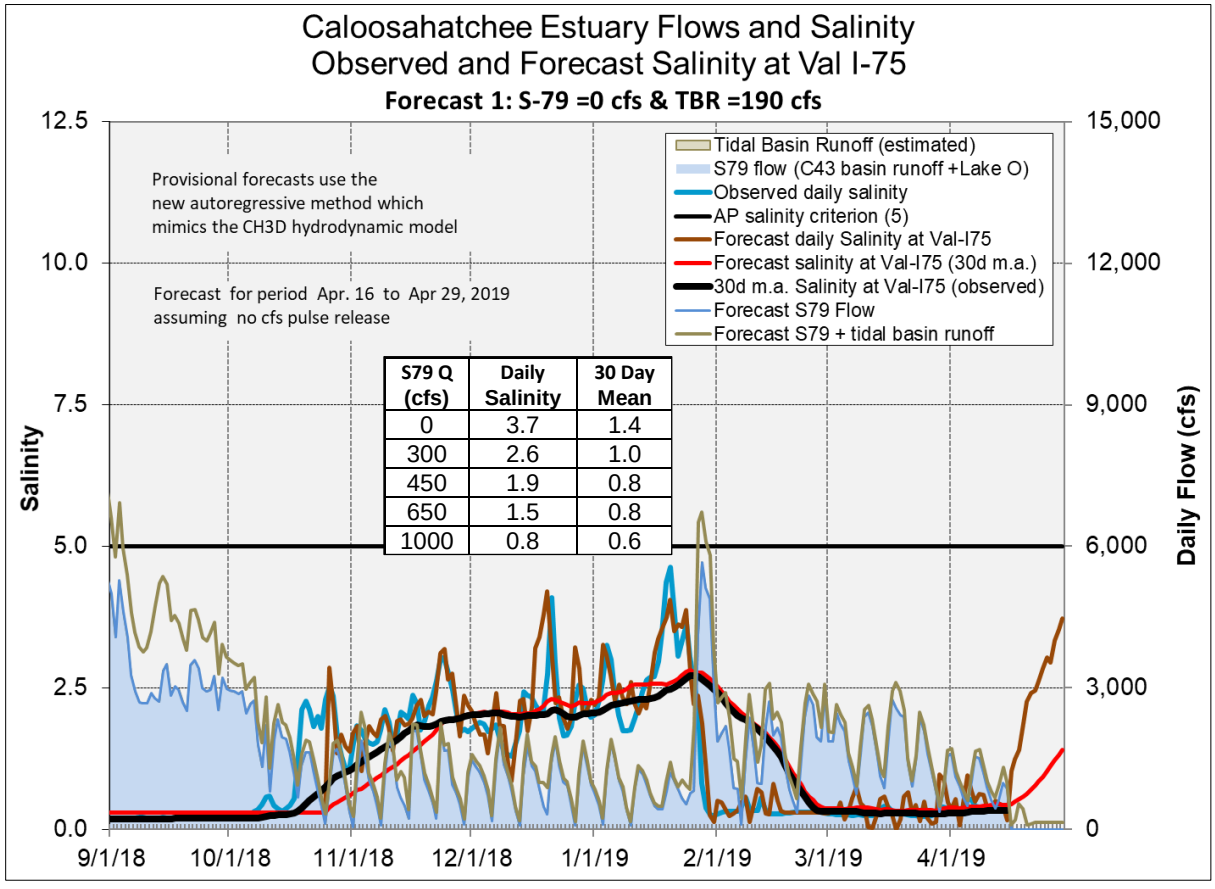
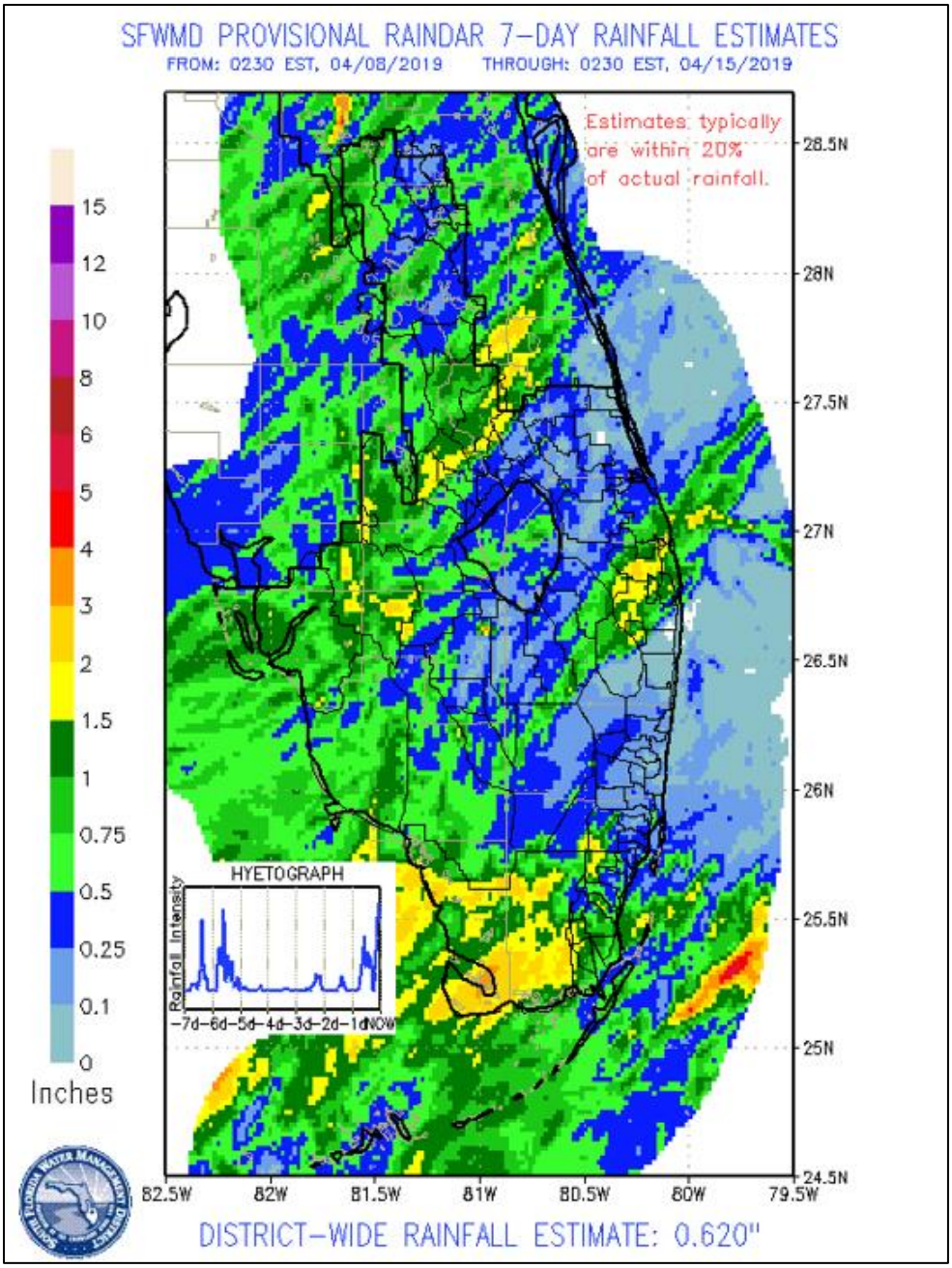


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

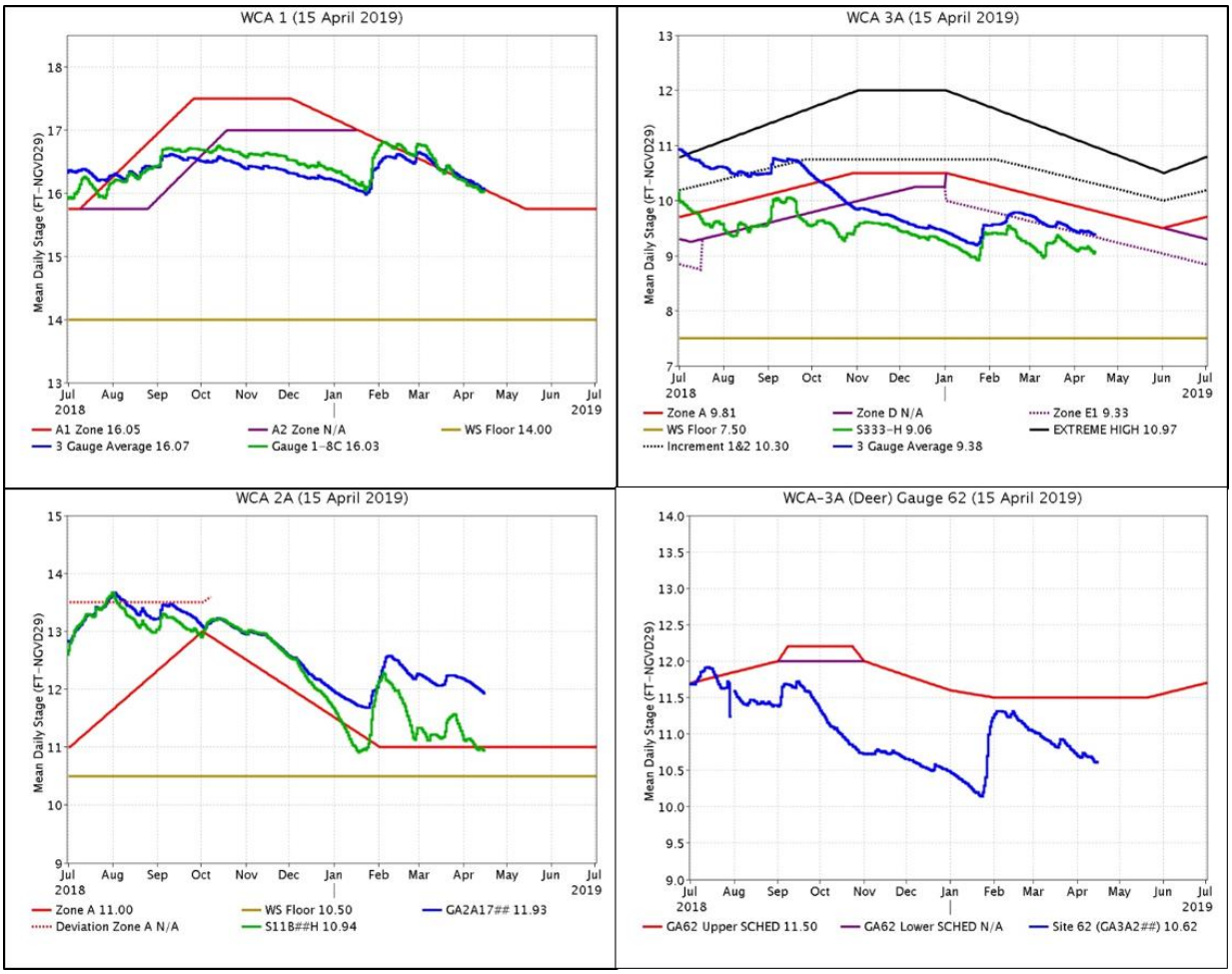
EVERGLADES

At the gauges monitored for this report the stages in the Everglades declined on average 0.08 feet last week. All of the basins were very near the optimal rate of recession for wading bird foraging and there were no reversals. The most extreme and moderate individual gauge changes ranged from -0.13 feet (WCA-2A) to -0.02 feet (ENP). Pan evaporation was estimated at 1.71 inches this week.

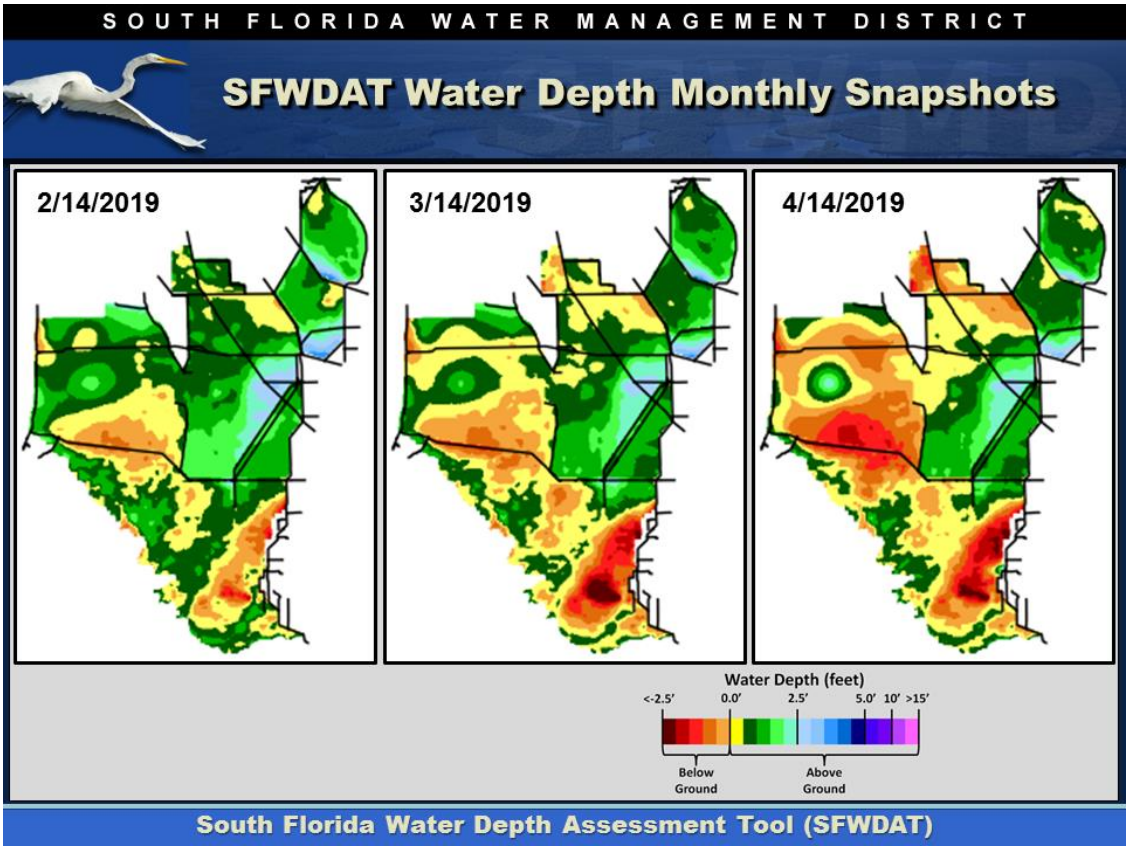
Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.53	−0.10
WCA-2A	0.18	−0.13
WCA-2B	0.38	−0.11
WCA-3A	0.41	−0.06
WCA-3B	0.46	−0.05
ENP	1.58	−0.02

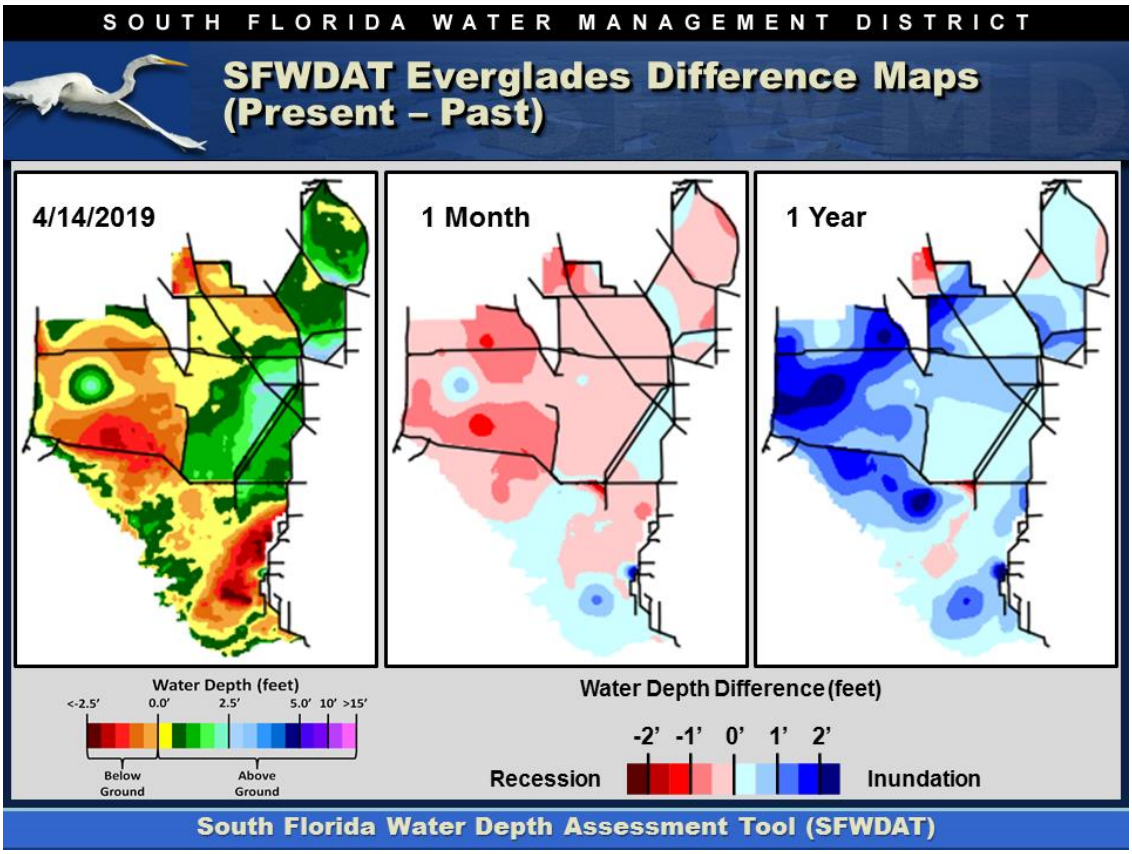


Regulation Schedules: WCA1: Gauge 1-8C is 0.02 feet below the Zone A1 regulation line and following the seasonal recession. WCA2A: S-11B Headwater stage is now 0.06 feet below the Zone A regulation line after an extended time above regulation. WCA-3A: The Three Gauge Average stage is 0.05 feet above Zone E1 regulation line and continues to follow the regulation line. WCA-3A at gauge 62 (northwest corner) is 0.88 feet below the upper schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate a gradual drying down from north to south in WCA-3A and depths across WCA-3A North are approaching the soil surface. WDAT difference output indicates that water levels fell gradually across the majority of the Everglades during the last month and there is the more water in western ENP (Lostman's slough). In the "1 Year" inset we see the difference between current depth conditions and those a year ago. Currently the depths are significantly greater across the majority of the Everglades system, particularly in northwestern WCA-3A.


SOUTH FLORIDA WATER MANAGEMENT DISTRICT
SFWDAT Water Depth Monthly Snapshots
2/14/2019
3/14/2019
4/14/2019
Water Depth (feet)
<-2.5'
0.0'
2.5'
5.0'
10'
>15'
Below Ground
Above Ground
South Florida Water Depth Assessment Tool (SFWDAT)


SOUTH FLORIDA WATER MANAGEMENT DISTRICT
SFWDAT Everglades Difference Maps
(Present – Past)
4/14/2019
1 Month
1 Year
Water Depth (feet)
<-2.5'
0.0'
2.5'
5.0'
10'
>15'
Below Ground
Above Ground
Water Depth Difference (feet)
-2'
-1'
0'
1'
2'
Recession
Inundation
South Florida Water Depth Assessment Tool (SFWDAT)

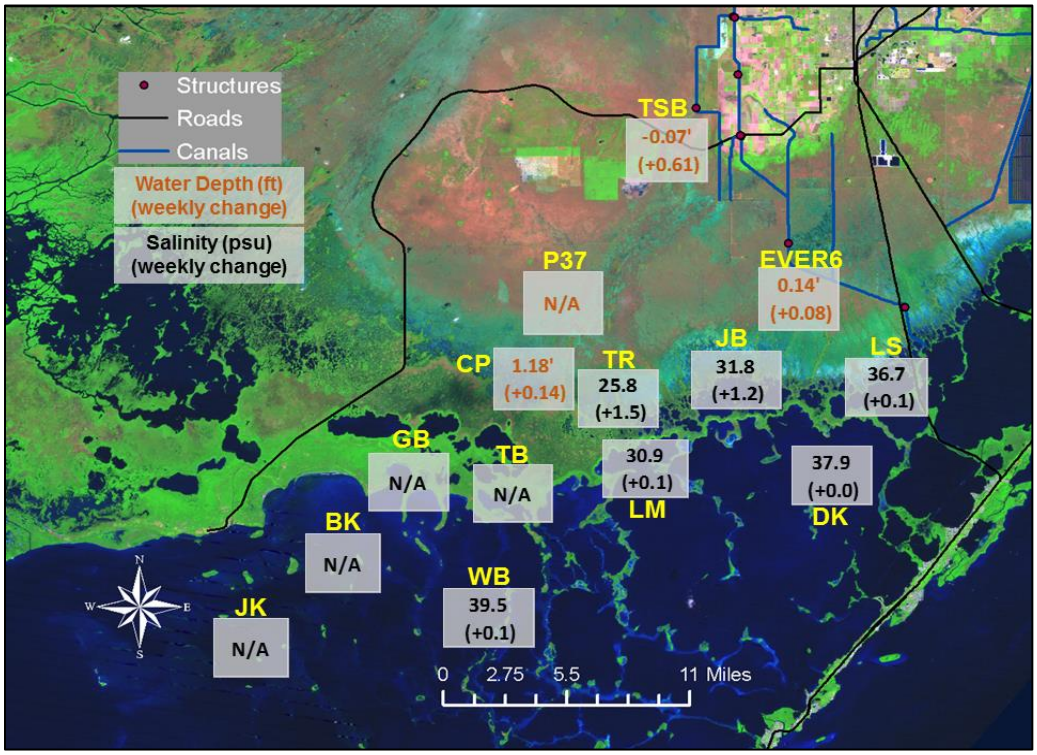
Wildlife Update (wading bird flight flown 4/15):

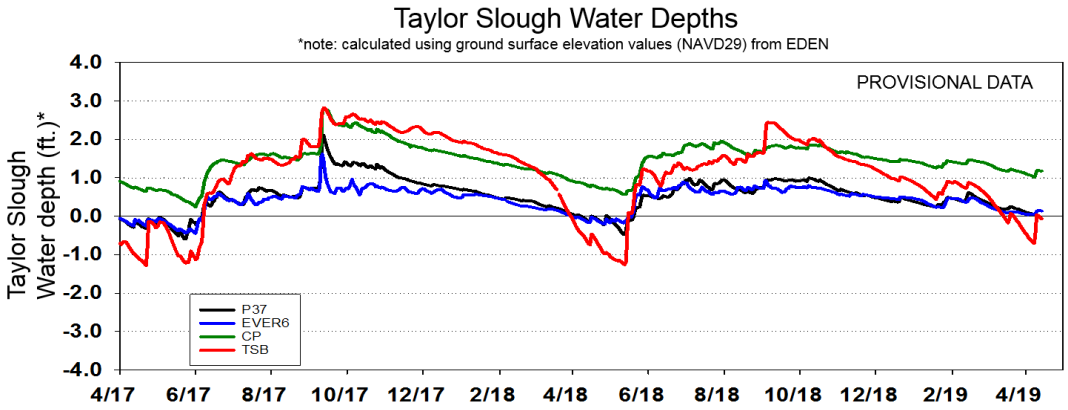
Wading Birds: Limited nesting due to low stages at start of nesting season and reversals impacting prey availability. Very few wading birds foraging or nesting in Lox. WHIB foraging in Rotenberger. 8,000 to 10,000 nests in Alley North in WCA-3A. Water levels in area look good in area around the colony. 8,000 WHIB nesting in ENP coastal colonies.

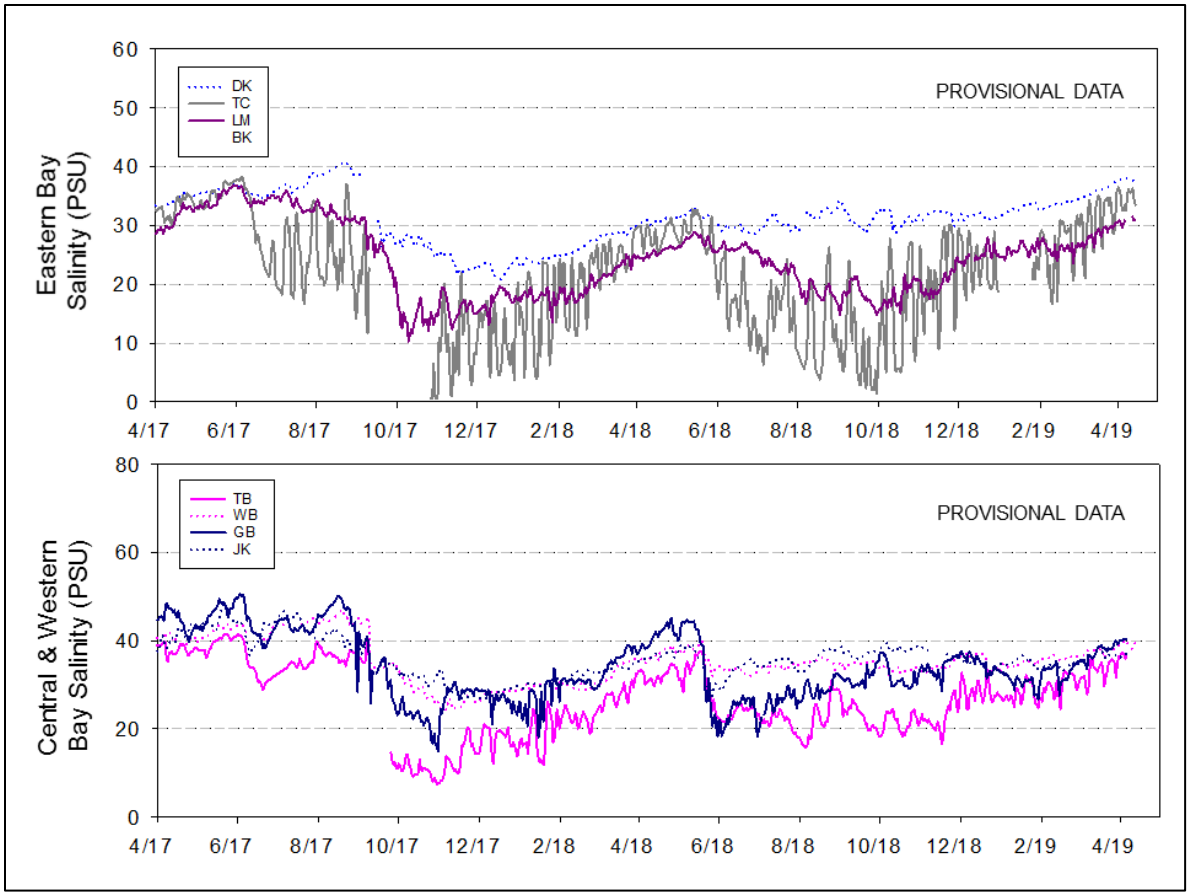
CSSS: Current conditions still look good for current breeding season even with recent rain and higher water levels. First and second population surveys are complete (Virzi). Several birds have completed their first broods.

Taylor Slough Water Levels: Most of the Everglades National Park gauges in Taylor Slough and Florida Bay went offline last week, and only a subset has been brought back online as of Monday, 4/15. Water depths increased by 0.1 feet on average to end at an average of 0.42 feet across Taylor Slough by Sunday. Taylor Slough Bridge (TSB) briefly rose above ground again this week before beginning to decrease again.

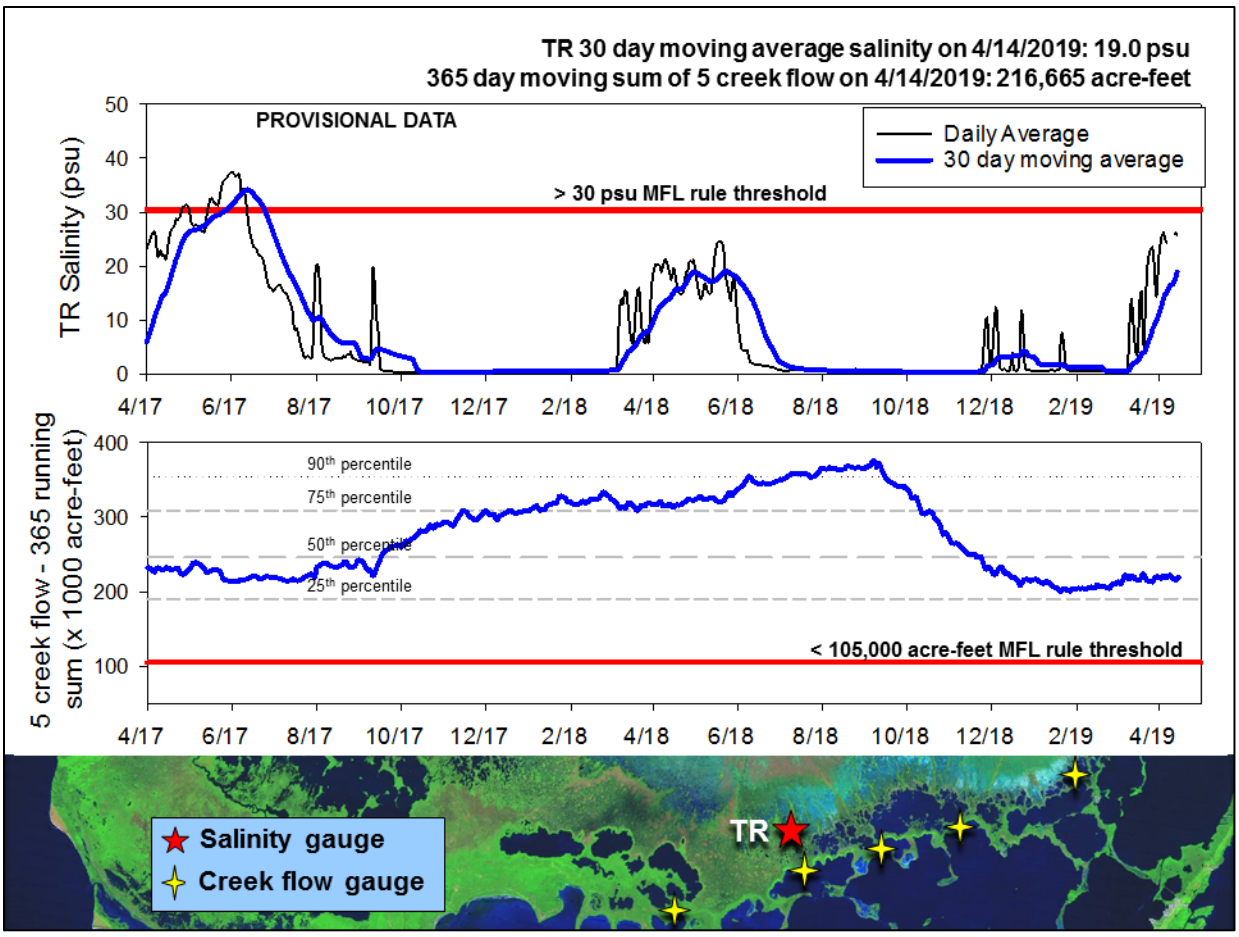
Florida Bay Salinities: Western Florida Bay and the central shoreline area had no data this week. Elsewhere, salinity averaged a 0.3 psu increase from last week with individual stations changing less than 1.2 psu. Daily average salinities ranged from 31 psu in the northeast to 40 psu in the central bay and are 6 psu above average for this time of year.







Florida Bay MFL: Salinity in the mangrove zone increased 2 psu over the week to end the week at 26 psu. The 30-day moving increased to 19.0 psu. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about −2,600 acre-feet with negative flows occurring 6 of the last 7 days. At this time of year, there is very little gravity driven downstream flow. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) has increased very slightly (400 acre-feet) to 216,665 acre-feet (less than the long-term average of 257,628 acre-feet but above the 25th percentile). Creek flow is provisional data from the USGS and is highly variable.



Water Management Recommendations

Keeping rainfall runoff within the Everglades system, distributing it equally across the WCAs and moving it south through the system when possible remains ecologically beneficial as the WCAs are at or near average stages for this time of year. Discharges into WCA-3A North continue to have ecological benefit by moderating the recession rates in the areas where wading birds are foraging and providing/protect hydration around the Alley North where approximately 10K white ibis began nesting over the last few weeks in that basin. Expectations for wading bird foraging in WCA-2A have been realized and foraging was documented there on 4/8. Protecting those foraging conditions by curtailing reversals and providing a recession rate between -0.05 and -0.09 for the remainder of the wading bird nesting season will provide ecological benefit. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, April 16th, 2019 (red is new)			
Area	Weekly change	Recommendation	Reasons
WCA-1	Stage decreased by 0.10'	Maintain depths at regulation schedule. Manage recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage decreased by 0.13'	Maintain depths at regulation schedule. Maintain 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 0.11'	Maintain depths at regulation schedule. Maintain recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage decreased by 0.10'	Maintain depths at regulation schedule. Maintain recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week.	Protect habitat including peat soil development and wildlife. Protect conditions that provide wading bird foraging habitat later into the nesting season.
WCA-3A NW	Stage decreased by 0.07'	Maintain depths at regulation schedule. Moderate recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week.	
Central WCA-3A S	Stage decreased by 0.03'	Maintain depths at regulation schedule. Moderate recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week.	Protect tree islands, upstream/downstream habitat and wildlife. Protect conditions that provide wading bird foraging habitat later into the nesting season.
Southern WCA-3A S	Stage decreased by 0.03'		
WCA-3B	Stage decreased by 0.05'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
ENP-SRS	Stage increased by 0.03'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from −0.26' to +0.60	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 +0.001 to +1.2 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.