

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

## MEMORANDUM

**TO:** John Mitnik, Interim Assistant Executive Director, Executive Office Staff

**FROM:** SFWMD Staff Environmental Advisory Team

**DATE:** June 3, 2020

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

### Summary

#### Weather Conditions and Forecast

Showers and thunderstorms moving westward across the District today; widespread areas of moderate to heavy thunderstorms forecast for Wednesday and Thursday. The frontal boundary which moved into central Florida yesterday has become diffuse over the area and the second push of drier air behind the boundary is expected to only progress as far south as Cape Canaveral tonight. Breezy east winds are blowing showers and thunderstorms onshore along the east coast and this activity is forecast to spread westward across the Kissimmee Valley as well as across portions of south Florida today bringing heavy thunderstorm activity to the southwestern portion of the District this afternoon and evening. Shower activity should persist along portions of the east overnight. A developing upper level trough over the Gulf of Mexico will begin to pump moisture and energy northward over the District Wednesday. Widespread moderate to heavy showers and thunderstorms are forecast to develop over the District Wednesday and Thursday. Plenty of moisture will remain over the District to allow seabreeze thunderstorms focused over the interior and north Friday. As Tropical Depression 3 (or whatever the system is at that point) moves into the west-central Gulf of Mexico Saturday, some drier air is forecast to nose in from the southeast resulting in a decrease in daily thunderstorm coverage Saturday, Sunday, and Monday. The forecast for Sunday and Monday assumes that the tropical cyclone will be in the northwestern Gulf of Mexico and then near the northwestern Gulf coast. If the tropical cyclone were to be further east, a corresponding increase in rains would be expected. We are in what has historically been the wettest 6-week period of the year (Memorial Day through 4<sup>th</sup> of July). With the trough developing over the eastern Gulf of Mexico this week, rainfall for the coming 7-day period (Week1) is forecast to keep pace and be near the historical average.

#### Kissimmee

Tuesday morning stages were 53.1 feet NGVD (3.4 feet below schedule) in East Lake Toho, 52.2 feet NGVD (1.3 feet below schedule) in Toho, and 49.9 feet NGVD (1.1 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 45.9 feet NGVD at S-65A and 25.6 feet NGVD at S-65D. Tuesday morning discharges were 823 cfs at S-65, 882 cfs at S-65A, 964 cfs at S-65D and 906 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 6.4 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.29 feet. ***This week's recommendations:*** Reduce flow at S-61 to slow the rate of stage rise in Lakes Kissimmee-Cypress-Hatchineha. ***2020 Wet Season Recommendations for Kissimmee Basin:*** Continue to use the IS-14-50 discharge plan through the 2020 Wet Season. The discharge rate of change limits for S-65/S-65A may be adjusted for individual events after consultation with KRREP staff. To the extent possible, attempt to control the ascension rate in East Lake Toho to be less than 1 ft/30d during the June 1-August 15 window. To the extent possible, attempt to control the ascension rate in Lakes Toho and Kissimmee-Cypress-Hatchineha to be less than 0.5 ft/14d during the June 1-August 15 window.

## **Lake Okeechobee**

Lake Okeechobee stage was 11.47 feet NGVD on June 1, 2020, up 0.23 feet from the previous week, and 0.06 feet from the previous month. The Lake entered the Beneficial Use sub-band on March 4, 2020 and is now almost 1 foot above the Water Shortage sub-band. Lake stage moved below the ecological envelope (which varies seasonally from 12 – 15 feet NGVD +/- 0.5 feet) on October 15, 2019 and is currently 0.03 feet below the bottom of the envelope. Low water levels (lake stages below the ecological envelope) will continue to benefit recovering submerged and emergent marsh vegetation at low elevations but will reduce aquatic habitat for fish and wildlife in the marshes. Wading bird and snail kite nesting efforts are low for the second consecutive year on the Lake due to low lake stages during the breeding season.

## **Estuaries**

Total inflow to the St. Lucie Estuary averaged 2,874 cfs over the past week with no flow coming from Lake Okeechobee. The seven-day average salinities decreased significantly in the estuary over the past week. Salinity at the US1 Bridge falls into low fair range (5-10) for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 2177 cfs over the past week with only 15 cfs (estimated) coming from the Lake. The seven-day average salinity decreased throughout the estuary over the past week. Salinities are in the good range (0-10) for tape grass at Val I-75 and in the fair range (10-15) at Ft. Myers. Salinities are in the good range for adult eastern oysters at Cape Coral and in the fair range at Shell Point and Sanibel.

## **Water Management Recommendations**

Lake stage is in the Beneficial Use sub-band of 2008 LORS. Tributary hydrological conditions are wet. The SFWMD's Lake Okeechobee Adaptive Protocol's Release Guidance suggests up to 300 cfs release at S-79 to the Caloosahatchee Estuary with supplemental release at S-77 as needed.

## **Stormwater Treatment Areas**

Over the past week, no Lake Okeechobee water was delivered to the FEBs/STAs. The total amount of Lake releases sent to the FEBs/STAs in WY2021 (since May 1, 2020) is approximately 9,500 ac-feet. The total amount of inflows to the STAs in WY2021 is approximately 91,000 ac-feet. Most STA cells are at or above target stage, except STA-5/6 cells. STA-1E Western Flow-way is offline for the Restoration Strategies project to fill and grade Cells 5 and 7. Operational restrictions are in place in STA-1W Northern Flow-way related to STA-1W Expansion #1 startup activities, in STA-1E Central Flow-way, STA-2 Flow-way 3, STA-2 Flow-way 4, STA-3/4 Eastern, Central, and Western Flow-ways for vegetation management activities, and in STA-5/6 Flow-ways 2 and 3 following the Restoration Strategies project to grade non-effective treatment areas. Nests of Migratory Bird Treaty Act (MBTA) protected species have been observed in STA-1W. This week, if 2008 LORS recommends Lake releases to the WCAs and conditions allow, releases will be sent to STA-2.

## **Everglades**

WCA-1 is at schedule, WCA-2A remained above schedule last week and WCA-3A remained in Zone E1 of that regulation schedule. Heavy rainfall once again last week meant continued stage reversals across the Everglades negatively impacting wading bird nesting. The core of the wading bird nesting effort in the Everglades is taking place in WCA-1, protecting foraging conditions there by moderating reversals in particular could have great ecological benefit by prolonging the nesting effort in that region; a survey flight on 5/22/20 noted that nesting was largely unaffected by the reversal (with the exception of wood storks which suffered widespread abandonment) and foraging was limited to a few flocks in WCA-1. Heavy rains fell over Taylor Slough and Florida Bay last week and stages increased with now all sites reporting water above soil surface. Phosphorus levels near the western structures are slightly elevated and a request has been made to keep them closed at this time. Florida Bay average salinities

decreased significantly and are within the middle 50% of historical values. The 30-day moving average salinity at the TR station in the mangrove zone decreased but remains over 30 psu.

## **Supporting Information**

### **KISSIMMEE BASIN**

#### **Kissimmee Basin Rainfall**

The Upper Kissimmee Basin received 4.52 inches of rainfall in the past week and the Lower Basin received 4.28 inches (SFWMD Daily Rainfall Report 5/31/2020).

#### **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 1-3.

**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: 6/2/2020**

Water Body	Structure	7-day Average Discharge (cfs) <sup>1</sup>	Stage Monitoring Site <sup>2</sup>	Lake Stage (feet)	Schedule Type <sup>3</sup>	Schedule Stage (feet)	Daily Departure (feet)						
							5/31/20	5/24/20	5/17/20	5/10/20	5/3/20	4/26/20	4/19/20
Lakes Hart and Mary Jane	S-62	115	LKMJ	59.6	R	59.5	0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
Lakes Myrtle, Preston, and Joel	S-57	24	S-57	60.0	R	60.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0
Alligator Chain	S-60	192	ALLI	62.1	R	62.0	0.1	0.0	0.0	-0.1	0.0	0.1	-0.2
Lake Gentry	S-63	303	LKGT	59.7	R	59.5	0.2	-0.1	0.1	0.0	0.0	0.1	0.1
East Lake Toho	S-59	0	TOHOE	53.0	R	55.0	-2.0	-3.0	-3.2	-3.4	-3.5	-3.8	-4.1
Lake Toho	S-61	387	TOHOW, S-61	52.3	R	52.0	0.3	-0.1	-0.3	-0.5	-0.5	-0.6	-0.7
Lakes Kissimmee, Cypress, and Hatchineha	S-65	695	KUB011, LKIS5B	49.8	R	49.0	0.8	0.0	-0.1	-0.1	-0.1	-0.1	-0.3

<sup>1</sup> Seven-day average of weighted daily means through midnight.

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

<sup>3</sup> 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 4. Mean daily dissolved oxygen concentrations, discharge, temperature, and rainfall are shown in Figure 5. The 2019-2020 Discharge Plan for S-65/S-65A, the interim regulation schedule for S-65, and a map of the Kissimmee Basin are shown respectively in Figures 6-8.

**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: 6/2/2020

Metric	Location	1-Day Average		Average for the Preceding 7-Days <sup>1</sup>							
		5/31/2020	5/31/20	5/24/20	5/17/20	5/10/20	5/3/20	4/26/20	4/19/20	4/12/20	4/5/20
Discharge (cfs)	S-65	671	695	496	353	738	760	611	372	365	357
Discharge (cfs)	S-65A <sup>2</sup>	839	788	438	313	656	679	550	353	323	310
Discharge (cfs)	S-65D <sup>2</sup>	976	903	325	441	667	722	485	317	308	302
Headwater Stage (feet NGVD)	S-65D <sup>2</sup>	25.63	25.76	25.84	25.61	25.81	25.84	25.84	25.83	25.75	25.78
Discharge (cfs)	S-65E <sup>2</sup>	892	926	312	411	617	677	435	282	283	262
Discharge (cfs)	S-67	0	0	0	0	0	0	0	0	0	0
DO (mg/L) <sup>3</sup>	Phases I & II/III river channel	6.3	6.4	8.0	8.0	8.0	7.9	7.5	7.9	7.4	7.4
Mean depth (feet) <sup>4</sup>	Phase I floodplain	0.29	0.28	0.08	0.07	0.09	0.14	0.10	0.06	0.07	0.07

<sup>1</sup>Seven-day average of weighted daily means through Sunday midnight.

<sup>2</sup>S-65A discharge combines S-65A with auxiliary structures; S-65D discharge combines discharge at S-65D, S-65DX1, and S-65DX2; S-65D stage averages stage at S-65D and S-65DX1; S-65E discharge combines S-65E and S-65EX1.

<sup>3</sup>DO is the average for sondes at KRBN, PC62, PC33, PD62R, and PD42R.

<sup>4</sup>1-day spatial average from South Florida Water Depth Assessment Tool (SFWDAT).

DATA ARE PROVISIONAL; N/A indicates that data were not available.

## KCOL Hydrographs (through Sunday midnight)

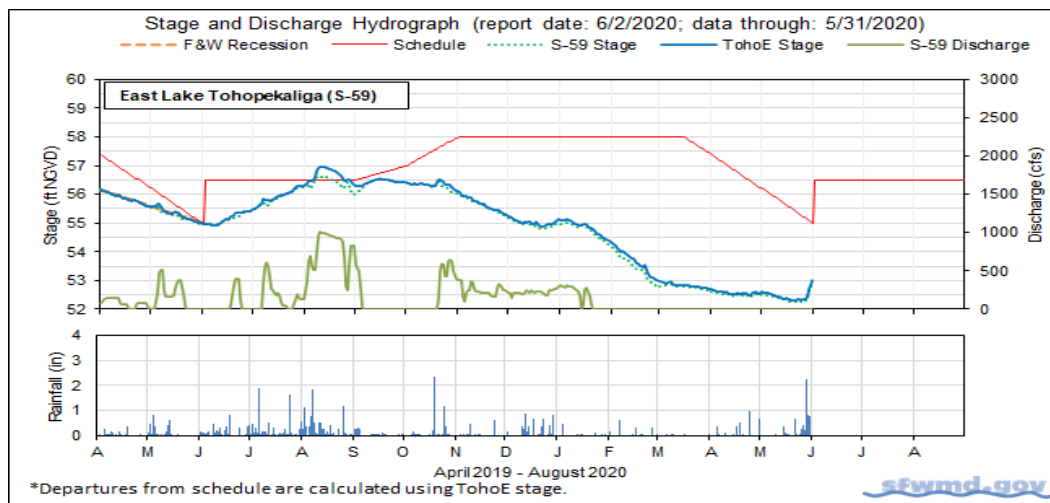


Figure 1.

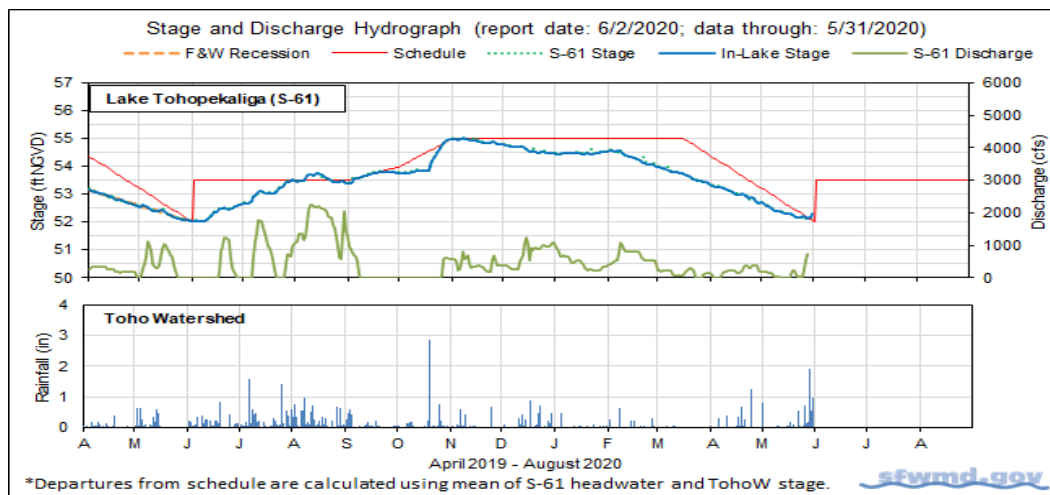


Figure 2.

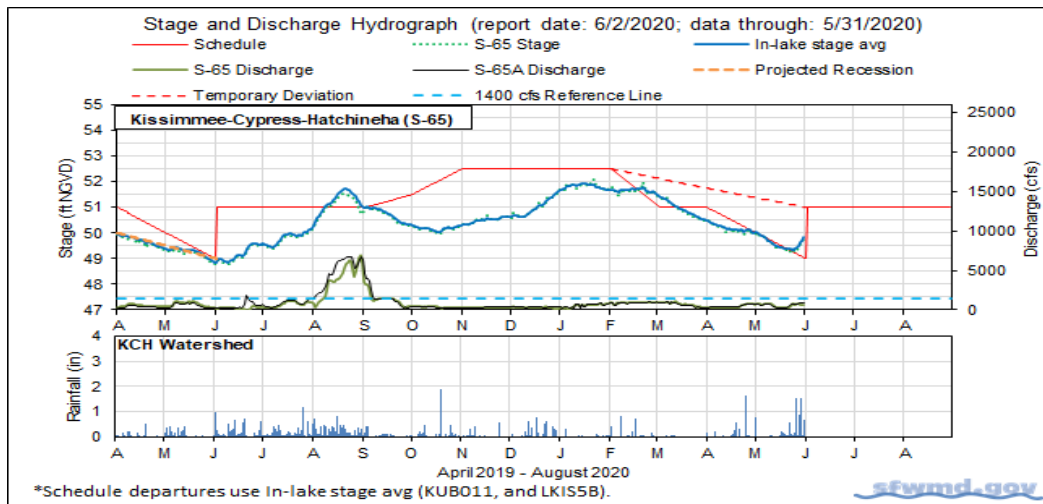
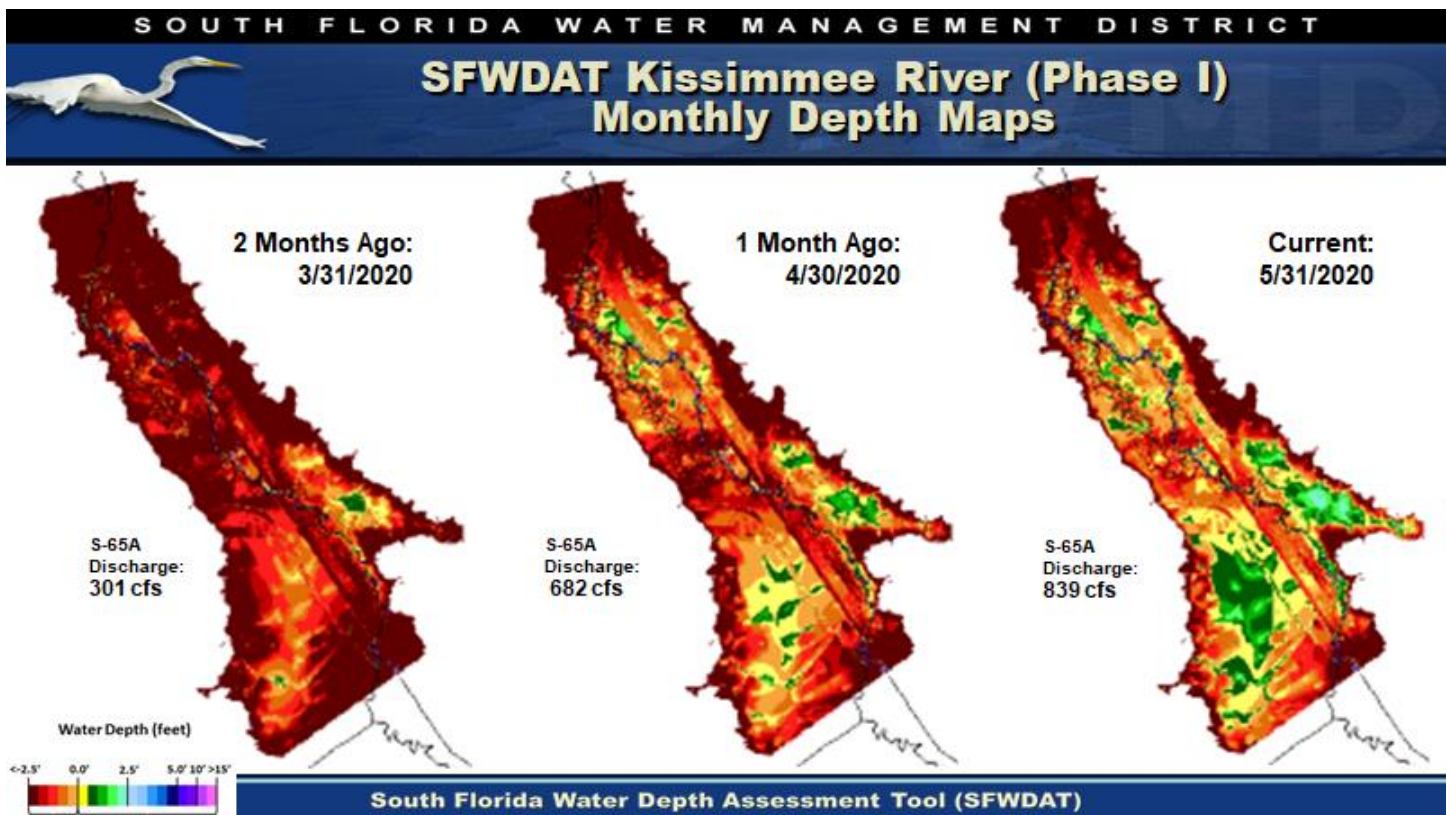
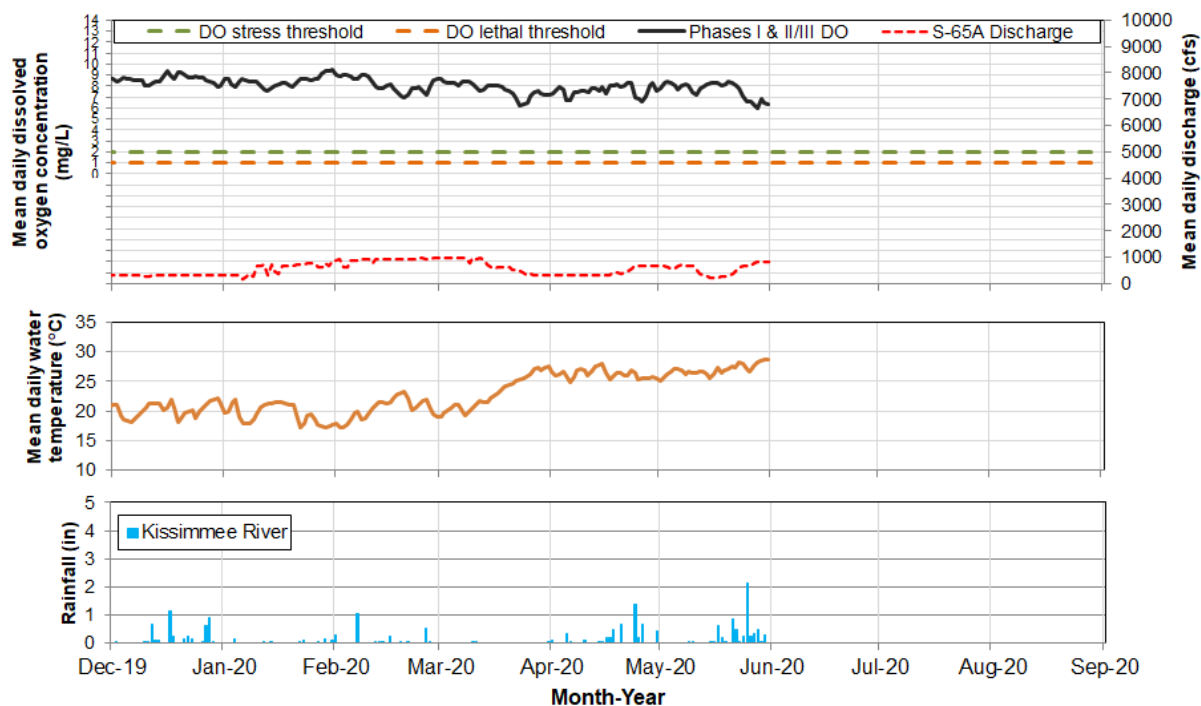


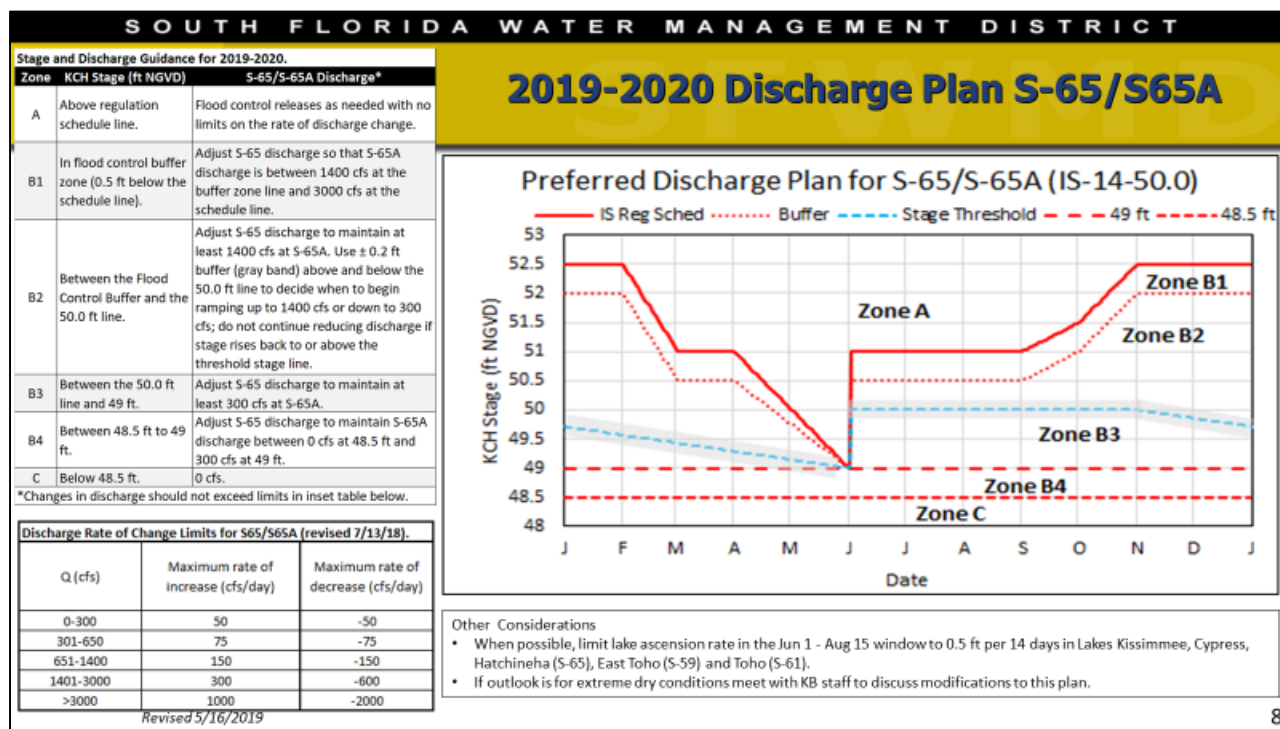
Figure 3.



**Figure 4.** 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.

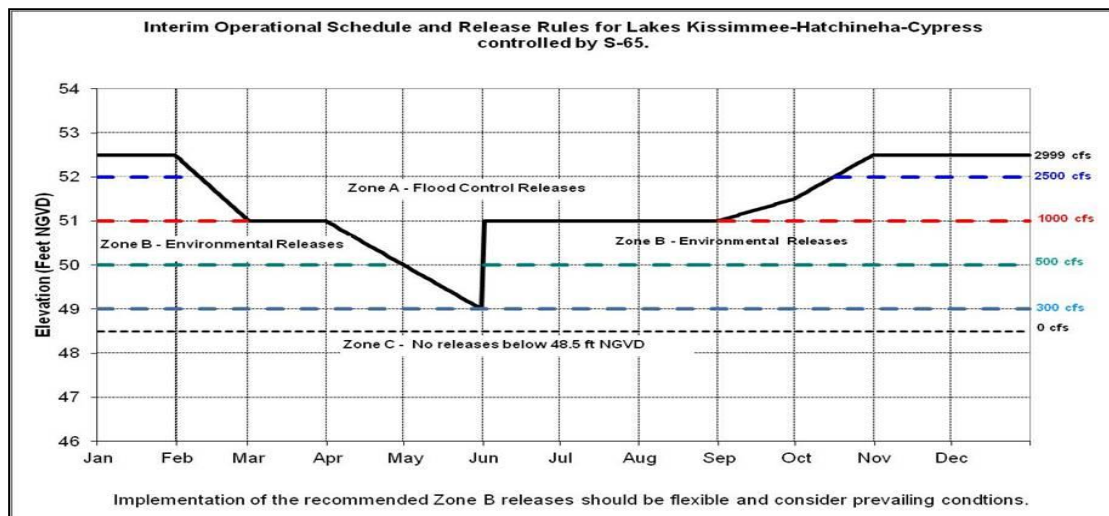


**Figure 5.** Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phases I/II/III river channel.



**Figure 6.** The 2019-2020 Discharge Plan for S-65/S-65A.





**Figure 7.** Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.



Figure 8. The Kissimmee Basin.



## **LAKE OKEECHOBEE**

Lake Okeechobee stage is 11.47 feet NGVD, 0.06 feet higher than a month ago and 0.68 feet higher than one year ago (Figure 1). The Lake is currently 0.03 feet below the preferred ecological envelope (Figure 2). Lake stage moved into the Base Flow sub-band on September 11, 2019 and entered the Beneficial Use sub-band on March 4, 2020 (Figure 3). Lake stage had been declining since late-February 2020 until the start of the wet season in mid-May. According to RAINDAR, 1.13 inches of rain fell directly over the Lake during the past week (Figure 4). Portions of the upper Kissimmee Basin received over 4 inches of rainfall, while many of the central and southern watersheds received less than an inch. The district wide average was 1.9 inches.

The average daily inflows (minus rainfall) increased considerably from 681 cfs to 3958 cfs, while the outflows (minus evapotranspiration) remained low, dropping from 169 cfs to just 7 cfs. Uncharacteristically, most of the inflow (1,887 cfs) came from the C-41a canal (S-84 & S-84X), although the Kissimmee River (S-65E & S-65EX1) also contributed 932 cfs. Outflows were only released west through the S-77 (C-43/Caloosahatchee Canal), averaging just 7 cfs, while flows through S-308 (C-44/St. Lucie Canal) were all into the Lake and averaged 438 cfs. 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 sampling occurs twice-monthly at 30 stations from May – October as part of expanded monitoring efforts to track and study Harmful Algal Blooms on the Lake. Results from early May (5-6<sup>th</sup>) sampling show Chlorophyll *a* values were elevated ( $>20 \mu\text{g/L}$ ) at 12 of 19 stations in nearshore areas, with 3 of those sites having bloom conditions ( $>40 \mu\text{g/L}$ ). Similarly, 5 of 9 stations in the pelagic areas had elevated values, with 1 having bloom conditions (Figure 6). Two stations were not sampled due to low water levels and logistical issues. None of the 4 stations (3 nearshore, 1 pelagic) which had Chla values greater than  $40 \mu\text{g/L}$  had toxin values greater than  $0.5 \mu\text{g/L}$ .

Current satellite imagery (May 29, 2020) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel 3 OLCI sensor data suggested low/moderate potential for cyanobacterial blooms along the northwestern shoreline of the Lake, lower than this time last year (Figure 7). Bloom conditions during this time of year can change substantially from week to week, particularly when hot, calm weather settles over the lake for several days.

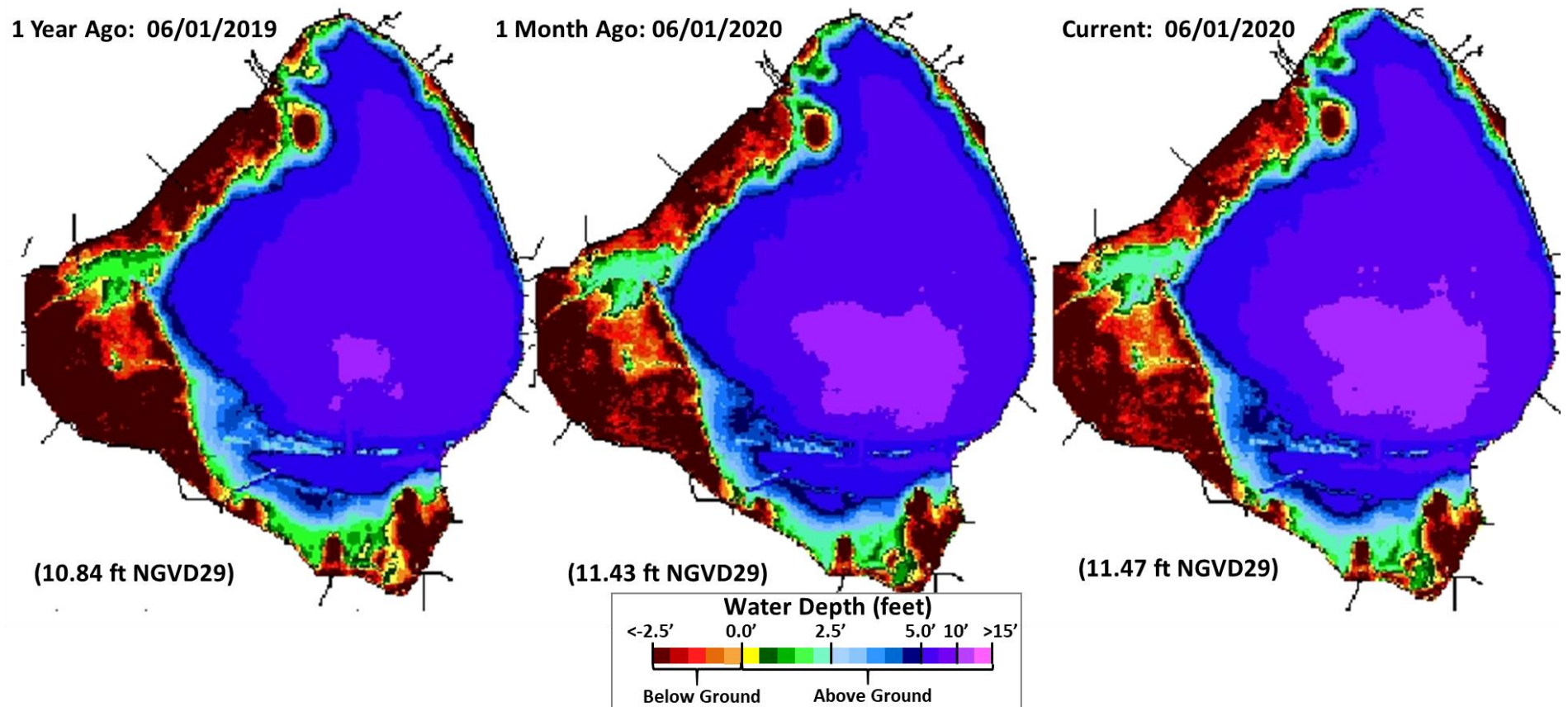
## **Water Management Summary**

Lake Okeechobee stage was 11.47 feet NGVD on June 1, 2020, up 0.23 feet from the previous week, and 0.06 feet from the previous month. The Lake entered the Beneficial Use sub-band on March 4, 2020 and is now almost 1 foot above the Water Shortage sub-band. Lake stage moved below the ecological envelope (which varies seasonally from 12 – 15 feet NGVD  $\pm 0.5$  feet) on October 15, 2019 and is currently 0.03 feet below the bottom of the envelope. Low water levels (lake stages below the ecological envelope) will continue to benefit recovering submerged and emergent marsh vegetation at low elevations but will reduce aquatic habitat for fish and wildlife in the marshes. Wading bird and snail kite nesting efforts are low for the second consecutive year on the Lake due to low lake stages during the breeding season.

**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 Flow cfs	Equivalent Depth Week Total (in)
S-65E & S-65EX1	415	932	0.4
S-71 & S-72	28	571	0.3
S-84 & S-84X	81	1887	0.9
Fisheating Creek	6	28	0.0
S-154	0	0	0.0
S-191	0	0	0.0
S-133 P	0	0	0.0
S-127 P	0	0	0.0
S-129 P	3	25	0.0
S-131 P	13	59	0.0
S-135 P	0	0	0.0
S-2 P	0	0	0.0
S-3 P	0	0	0.0
S-4 P	0	0	0.0
L-8 Backflow	11	20	0.0
Rainfall	4966	2355	1.1
<b>Total</b>	<b>5522</b>	<b>5875</b>	<b>2.8</b>

OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-77	93	7	0.0
S-308	-125	-438	-0.2
S-351	0	0	0.0
S-352	75	0	0.0
S-354	0	0	0.0
L-8 Outflow			
ET	2153	2606	1.3
<b>Total</b>	<b>2197</b>	<b>2176</b>	<b>1.0</b>



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

## Lake Okeechobee Stage vs Updated Ecological Envelope

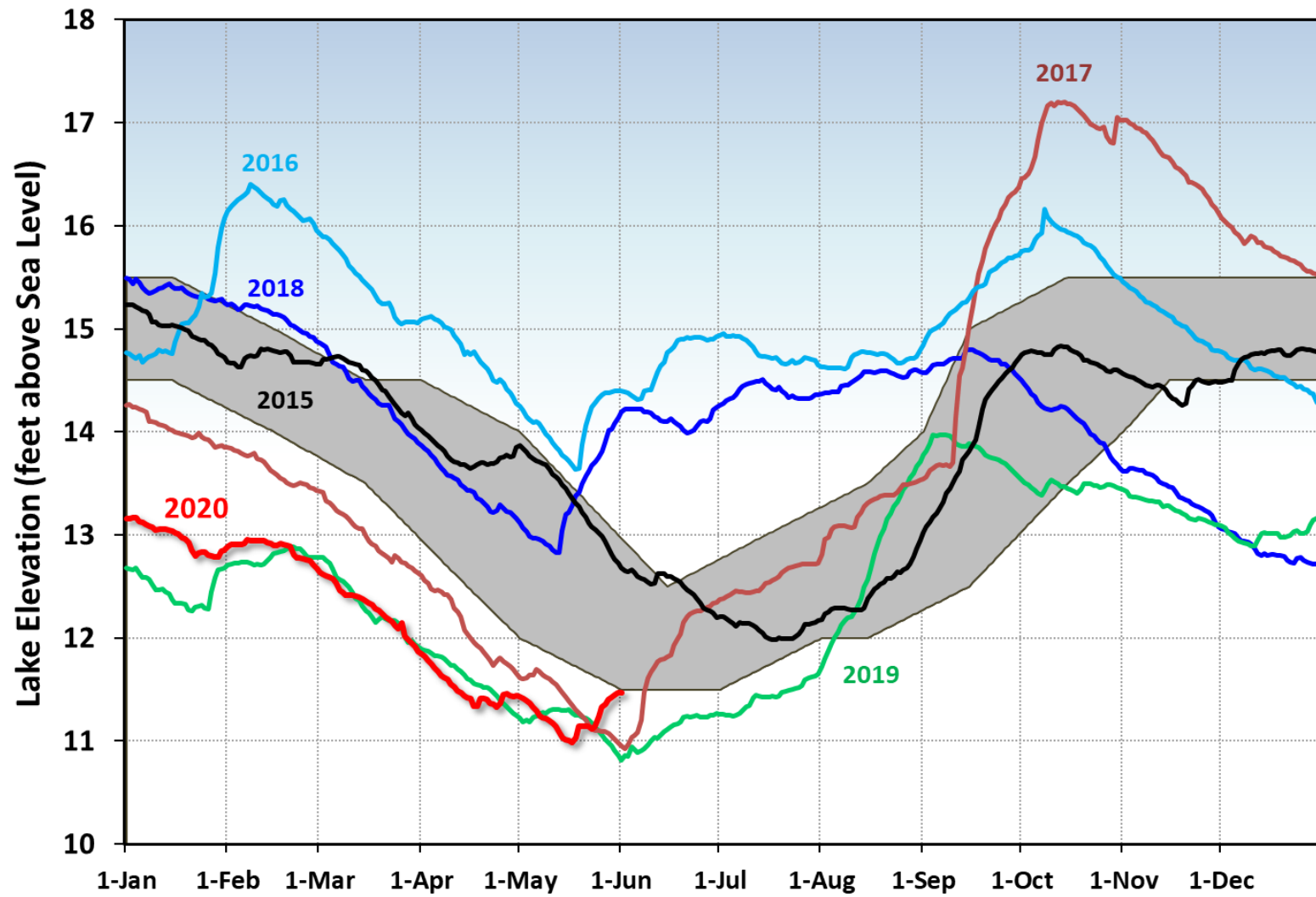
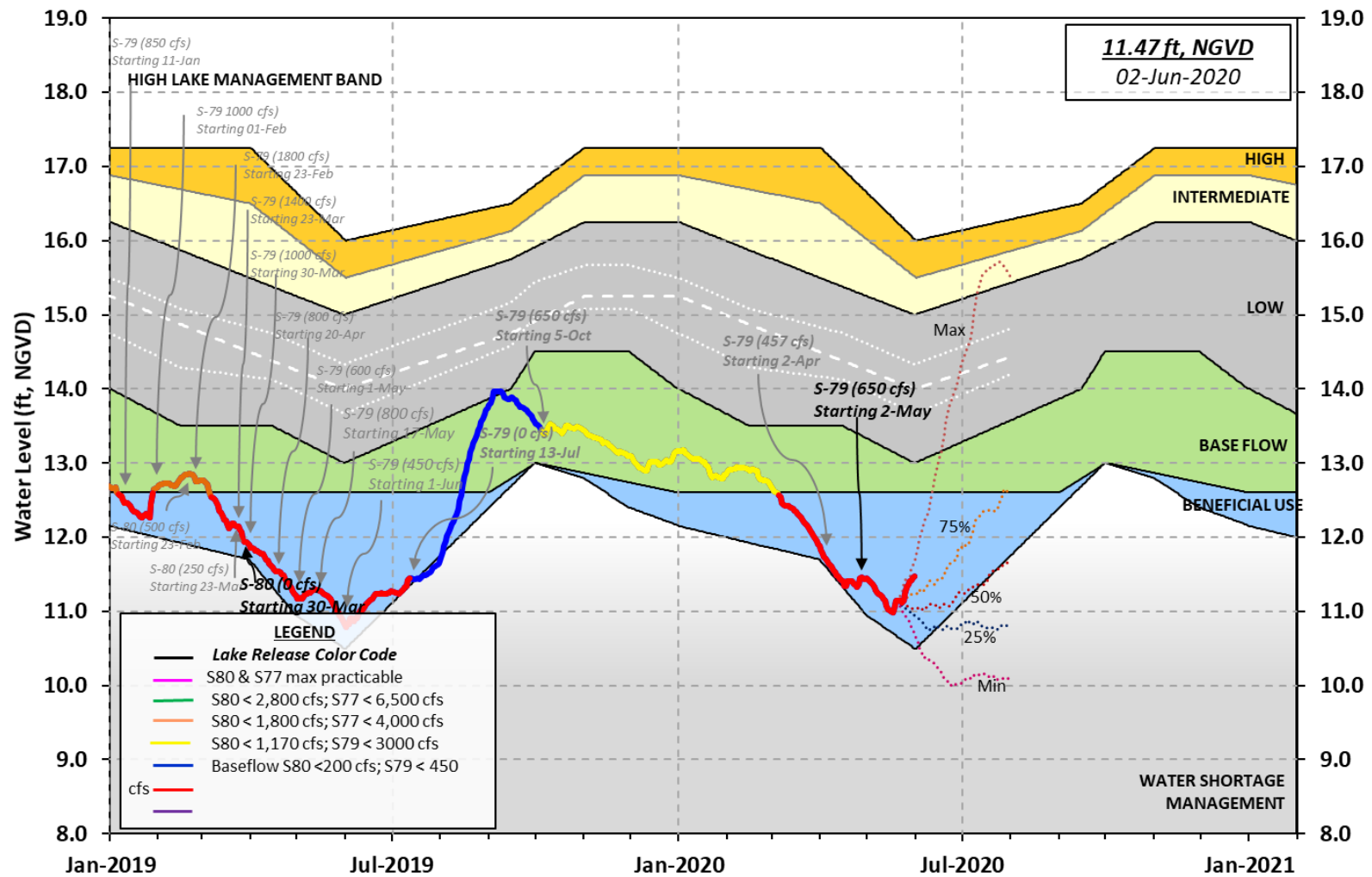


Figure 2. Select annual stage hydrographs for Lake Okeechobee in comparison to the updated Ecological Envelope.

## Lake Okeechobee Water Level History and Projected Stages

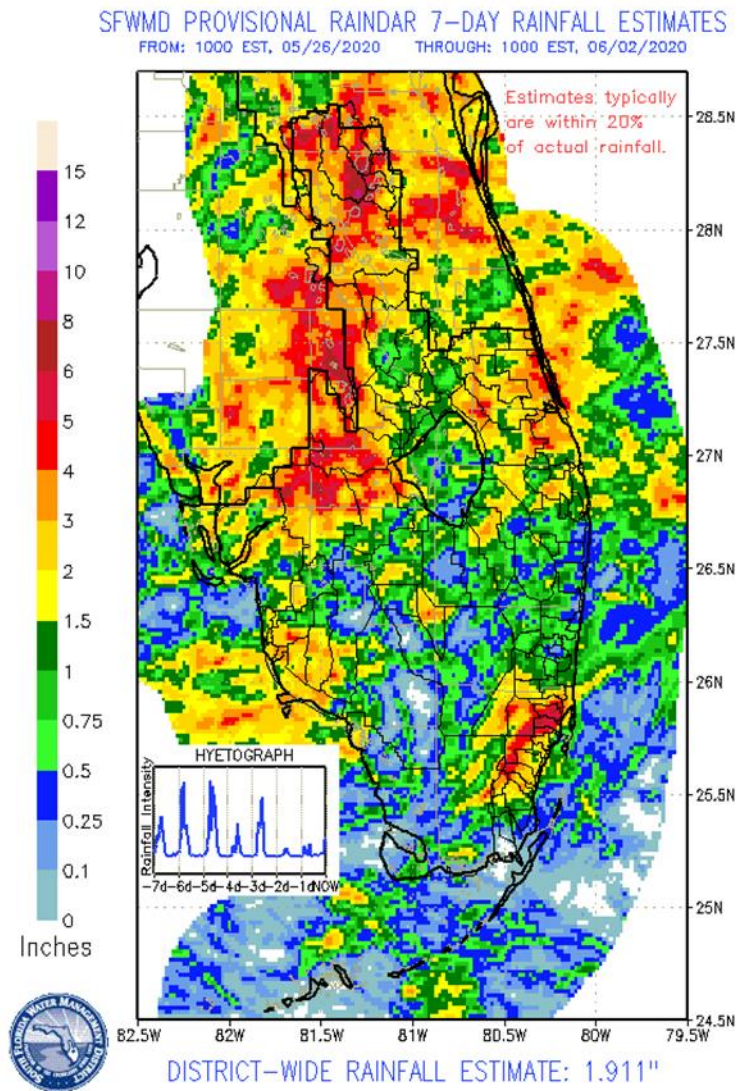


LORS-2008  
Adopted by USACE 28-April-2008

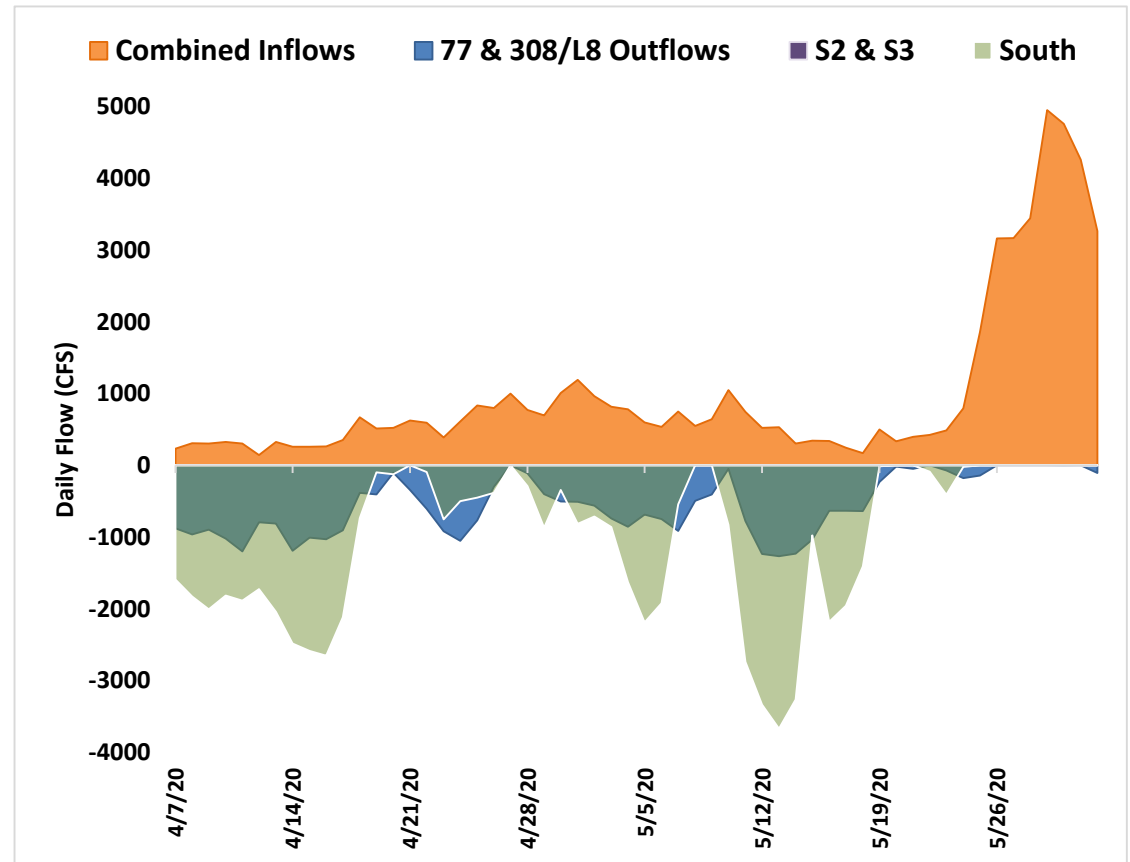
Projected Stage Percentiles From  
SFWMD-HESM Position Analysis

**Figure 3.** Recent Lake Okeechobee stage and releases, with projected stages based on a dynamic position analysis.





**Figure 4.** 7-Day rainfall estimates by RAINDAR.

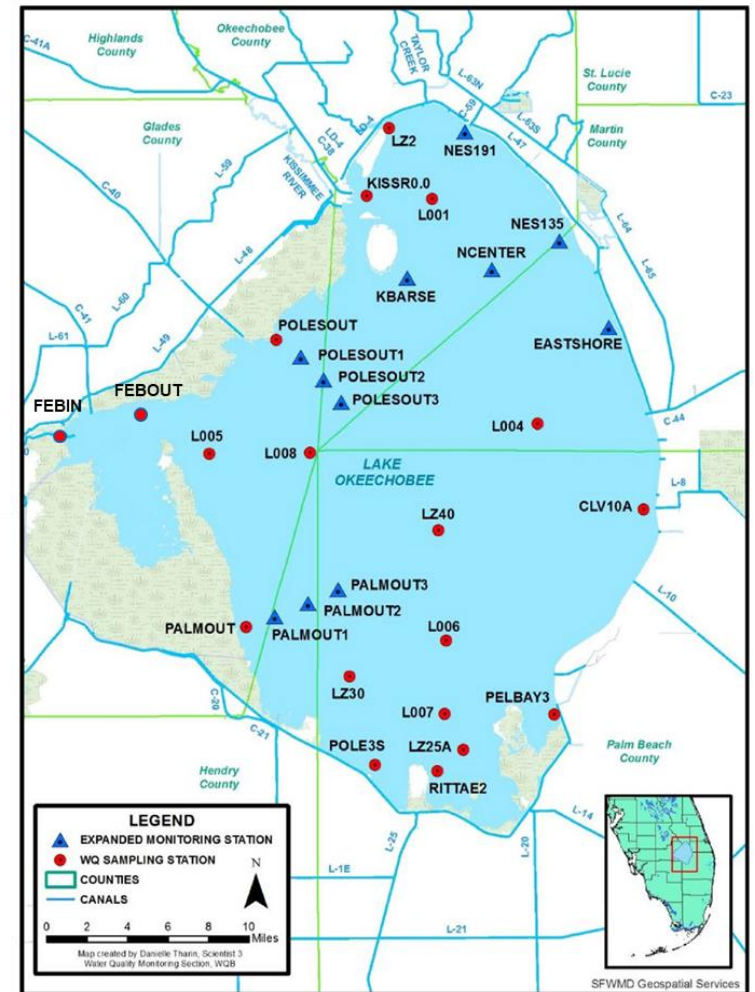


**Figure 5.** Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when back-flowing into the Lake. All inflows and outflows are shown as positive and negative, respectively, for visual purposes. Outflows through the S-77 and S-308 structures are shown based on their downstream gauges to account for lock openings for navigation.

Collected: May 5 – 6, 2020

NEARSHORE	CHL <sub>a</sub> (ug/L)	TOXIN (ug/L)	TAXA	PELAGIC	CHL <sub>a</sub> (ug/L)	TOXIN (ug/L)	TAXA
FEBIN	83.7	BDL	<i>Cylindro</i>	L001	48.9	0.28	Mixed
FEBOUT	26.8	BDL	<i>Cylindro</i>	L004	19.7	BDL	Mixed
KISSR0.0	22.8	BDL	Mixed	L006	9.3	BDL	Mixed
L005	13.4	BDL	Mixed	L007	19.2	6.80	<i>Microcystis</i>
LZ2	38.3	BDL	Mixed	L008	25.5	BDL	Mixed
KBARSE	54.3	0.50	<i>Cylindro</i>	LZ30	30.5	34.85	<i>Microcystis</i>
RITTAE2	NS	NS	NS	LZ40	24.8	BDL	Mixed
PELBAY3	9.2	2.60	<i>Microcystis</i>	CLV10A	15.6	0.60	<i>Microcystis</i>
POLE3S	NS	NS	NS	NCENTER	28.4	2.70	<i>Microcystis</i>
LZ25A	4.9	1.50	<i>Microcystis</i>				
PALMOUT	6.3	BDL	<i>Microcystis</i>				
PALMOUT1	24.1	9.17	<i>Microcystis</i>				
PALMOUT2	30.3	0.53	<i>Microcystis</i>				
PALMOUT3	13.4	0.98	<i>Microcystis</i>				
POLESOUT	18.8	BDL	Mixed				
POLESOUT1	29.6	BDL	<i>Cylindro</i>				
POLESOUT2	44.7	0.61	<i>Microcystis</i>				
POLESOUT3	29.5	1.40	Mixed				
EASTSHORE	28.2	BDL	Mixed				
NES135	10.7	2.50	<i>Microcystis</i>				
NES191	47.5	BDL	Mixed				

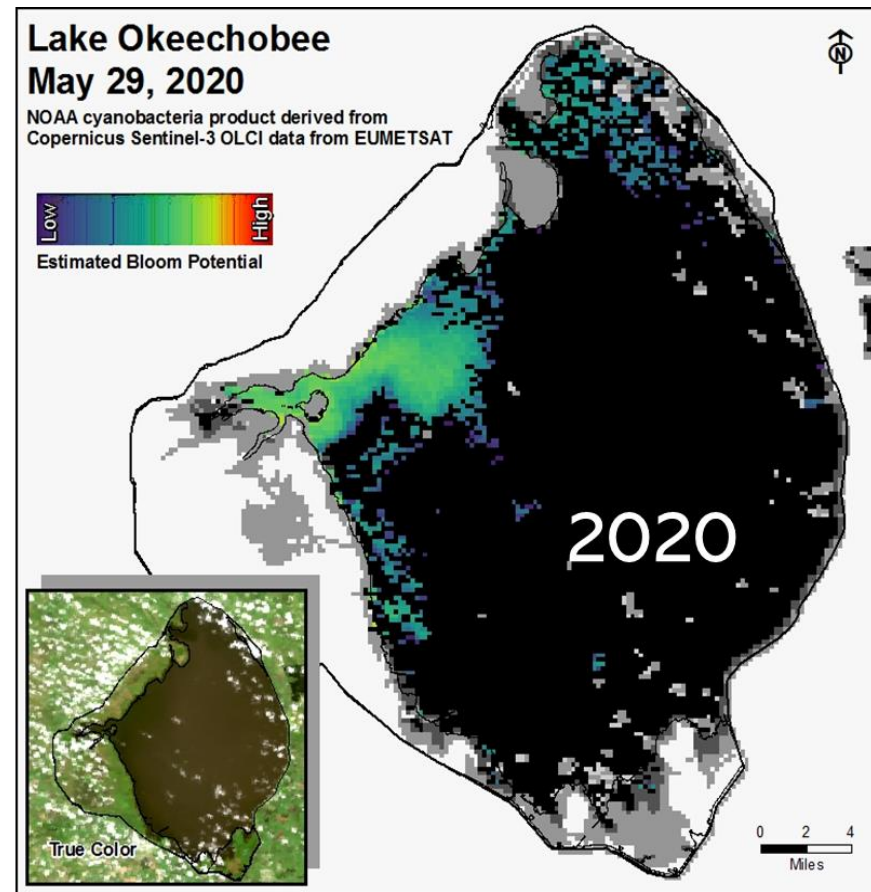
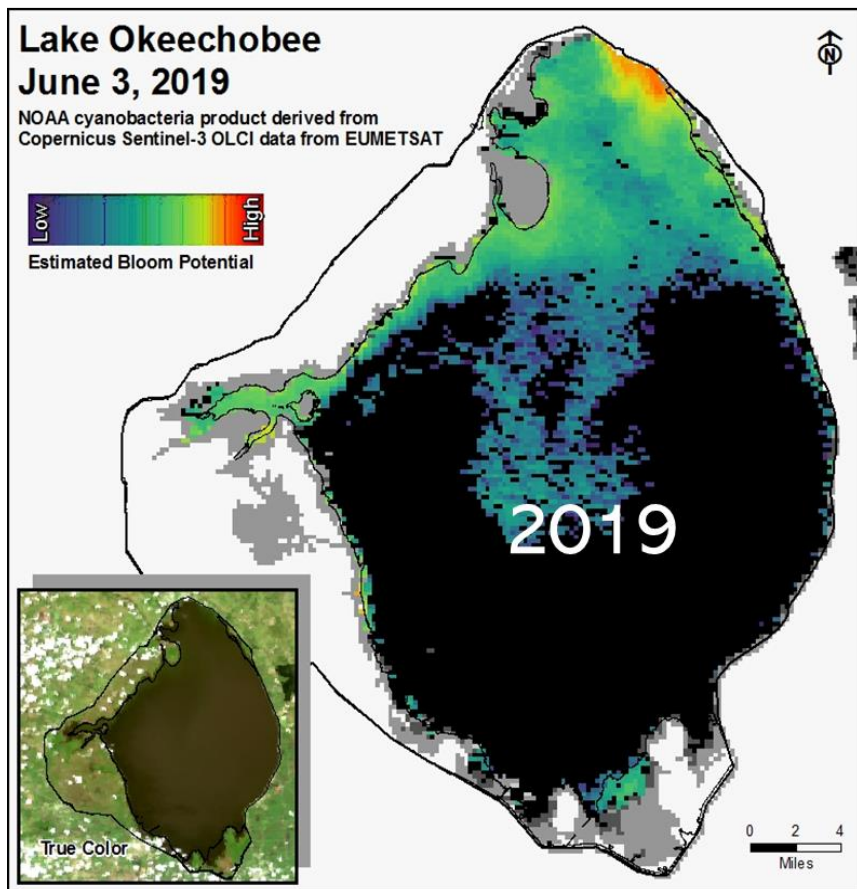
- SFWMD considers >40 µg/L Chlorophyll *a* (Chl<sub>a</sub>) an algal bloom
  - BDL – Below Detectable Limit of 0.25 µg/L
  - ND – No Dominant taxa
  - P – Pending
  - NS – Not Sampled
  - Bold – crew observed possible bloom
  - Chlorophyll *a* analyzed by SFWMD
  - Toxin and Taxa analyzed by FDEP
- Cylindro* = *Cylindrospermopsis*  
*Planktol* = *Planktolyngbya*  
*Dolicho* = *Dolichospermum*



**Figure 6.** Water quality parameters at nearshore (n=21) and pelagic (n=9) stations for May 5-6<sup>th</sup> 2020.

Locations of stations are shown in the map inset. All data are provisional.





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

**Figure 7.** Potential for cyanobacterial blooms on Lake Okeechobee in mid-May 2019 and 2020, based on NOAA's harmful algal bloom monitoring system. Gray color indicates cloud cover.

## **ESTUARIES**

### **St. Lucie Estuary:**

Last week total inflow to the St. Lucie Estuary averaged approximately 2,874 cfs (Figures 1 and 2) and last month inflow averaged about 1,142 cfs. Last week's provisional averaged inflows from the tidal basin and the structures are shown in Table 1.

**Table 1.** Weekly average inflows (data are provisional).

<b>Location</b>	<b>Flow (cfs)</b>
Tidal Basin Inflow	1759
S-80	0
S-308	-438
S-49 on C-24	446
S-97 on C-23	505
Gordy Rd. structure on Ten Mile Creek	164

Over the past week, salinity decreased throughout the estuary (Table 2, Figures 3 and 4). The seven-day moving average of the water column (an average of the surface and bottom salinity) at the US1 Bridge is 8.4. Salinity conditions in the middle estuary are estimated to be within the fair range for adult eastern oysters (Figure 3).

**Table 2.** Seven-day average salinity at three monitoring sites in the St. Lucie Estuary. Current average is in bold face type, previous average in parentheses. The envelope reflects the preferred salinity range for adult eastern oysters (*Crassostrea virginica*) in the middle estuary.

<b>Sampling Site</b>	<b>Surface</b>	<b>Bottom</b>	<b>Envelope</b>
HR1 (North Fork)	<b>3.0</b> (15.0)	<b>7.2</b> (20.8)	NA <sup>1</sup>
US1 Bridge	<b>6.7</b> (21.8)	<b>7.8</b> (22.8)	10.0-26.0
A1A Bridge	<b>13.3</b> (28.6)	<b>18.7</b> (29.7)	NA <sup>1</sup>

<sup>1</sup>Envelope not applicable

### **Caloosahatchee Estuary:**

Last week total inflow to the Caloosahatchee Estuary averaged approximately 2,177 cfs (Figures 5 and 6) and last month inflow averaged about 1,028 cfs. Last week's provisional averaged inflows from the structures and the tidal basin are shown in Table 3.

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

<b>Location</b>	<b>Flow (cfs)</b>
S-77	7
S-78	1235
S-79	2069
Tidal Basin Inflow	108

Over the past week, salinity decreased throughout the estuary (Table 4, Figures 7 & 8). The seven-day average salinity values are within the good range for adult eastern oysters at Cape Coral and in the fair range at Shell Point and at Sanibel (Figure 9). The seven-day average surface salinities (Table 4) are in the good range (0-10) for tape grass at Val I-75 and in the fair range (10-15) at Ft. Myers.

**Table 4.** Seven-day average salinity at six monitoring stations in the Caloosahatchee Estuary. Current average is in bold, previous average in parentheses. The envelope at Val I-75 is for the protection of tape grass in the upper estuary and the envelope in the lower estuary reflects the preferred salinity range for adult eastern oysters (*Crassostrea virginica*).

Sampling Site	Surface	Bottom	Envelope
S-79 (Franklin Lock)	<b>0.3</b> (0.7)	<b>0.7</b> (1.7)	NA <sup>1</sup>
Val I75	<b>2.8</b> (5.9)	<b>3.6</b> (7.3)	0.0-5.0 <sup>2</sup>
Ft. Myers Yacht Basin	<b>10.0</b> (15.2)	<b>13.4</b> (15.8)	NA
Cape Coral	<b>19.0</b> (22.7)	<b>20.8</b> (23.4)	10.0-30.0
Shell Point	<b>30.3</b> (32.3)	<b>30.8</b> (32.6)	10.0-30.0
Sanibel	<b>34.1</b> (35.0)	<b>34.5</b> (35.1)	10.0-30.0

<sup>1</sup>Envelope not applicable, <sup>2</sup>Envelope is based on a 2-week forecast 30-day average.

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 2.1 to 6.4 at the end of the two-week period for pulse release at S-79 ranging from 0 to 800 cfs and estimated Tidal Basin inflows of 400 cfs. The 30-day moving average surface salinity at Val I-75 is forecast to be between 3.5 and 5.1 (Table 5). The current salinity conditions at Val I-75 are within the envelope of salinity 0.0-5.0 for this site (Table 4).

**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	400	6.4	5.1
B	300	400	4.4	4.2
C	450	400	3.2	3.9
D	650	400	2.6	3.7
E	800	400	2.1	3.5

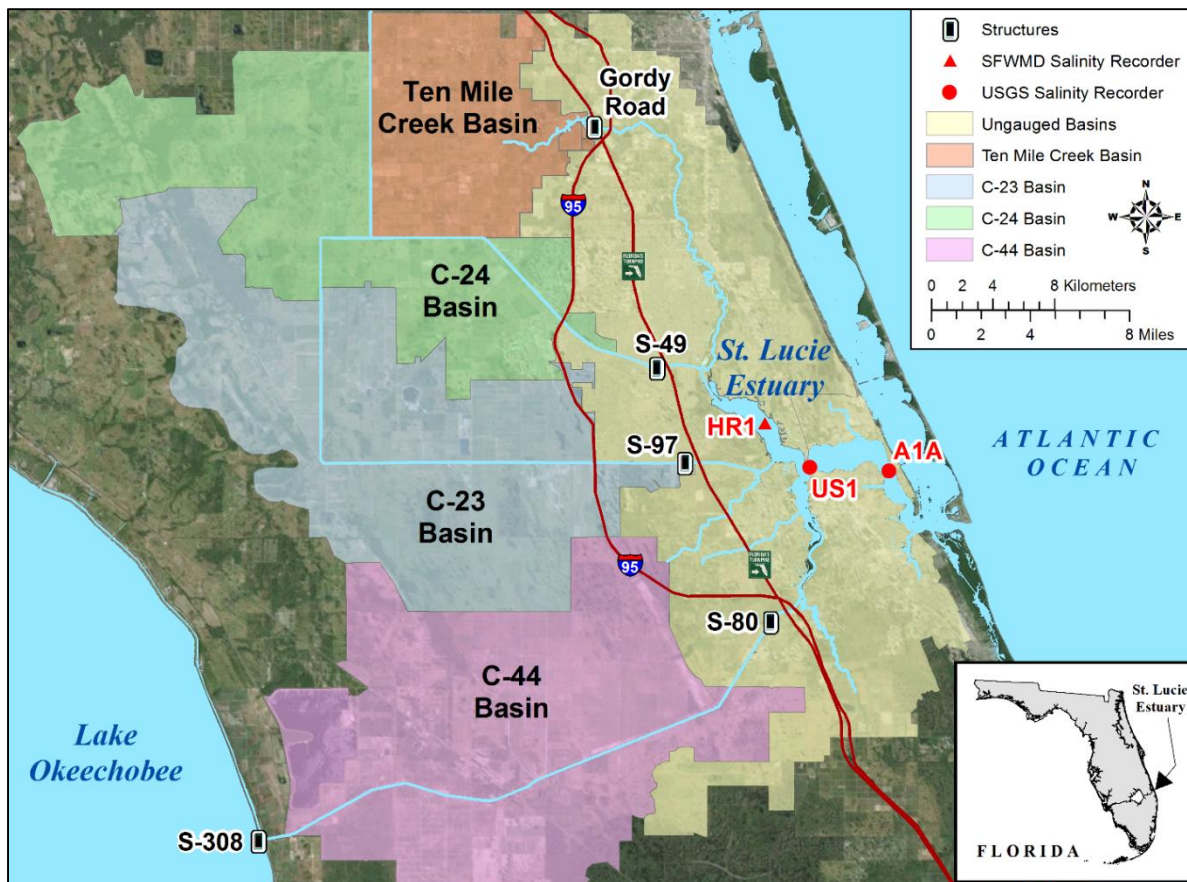
### Red tide

The Florida Fish and Wildlife Research Institute reported on May 29, 2020, that *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from or offshore of Lee or Palm Beach counties (no samples were analyzed this week from St. Lucie, Martin, Broward, or Miami-Dade counties).

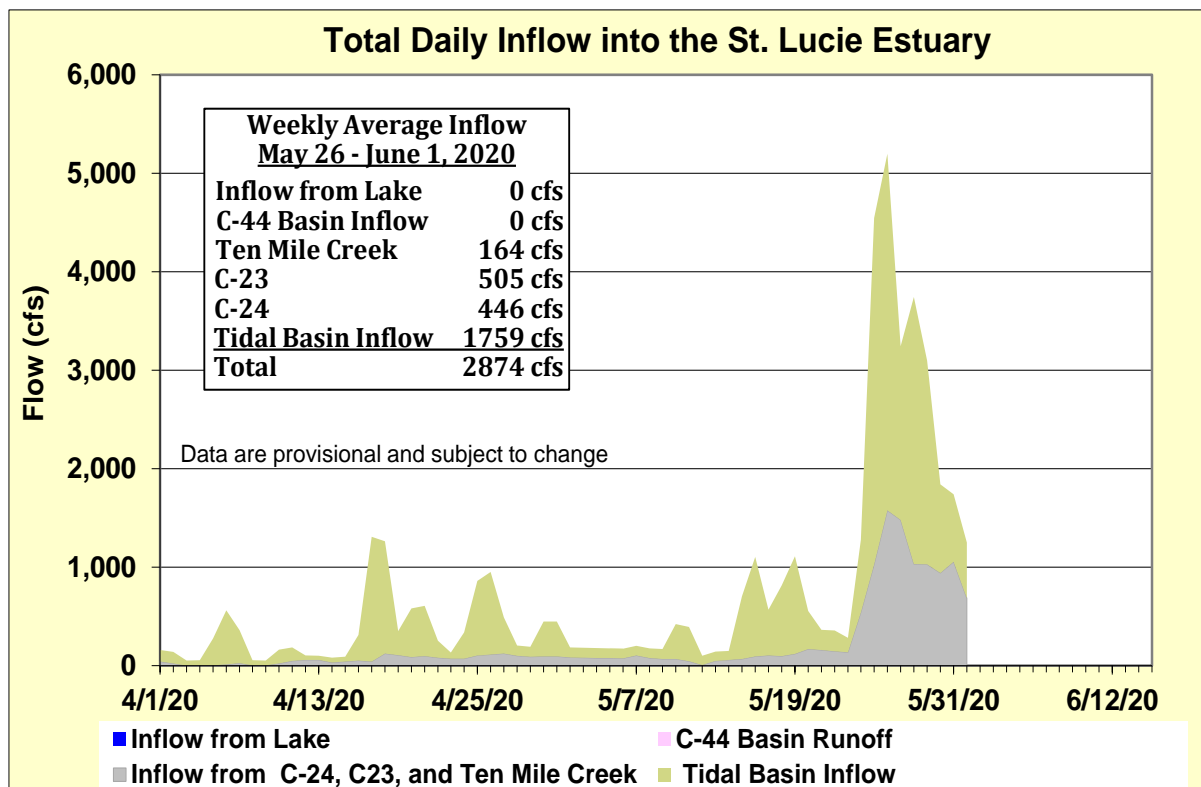
### Water Management Recommendations

Lake stage is in the Beneficial Use Flow sub-band. Tributary conditions are normal. The South Florida Water Management District's Lake Okeechobee Adaptive Protocol's Release Guidance suggests up to 300 cfs release at S-79 to the Caloosahatchee Estuary with supplemental release at S-77 as needed.

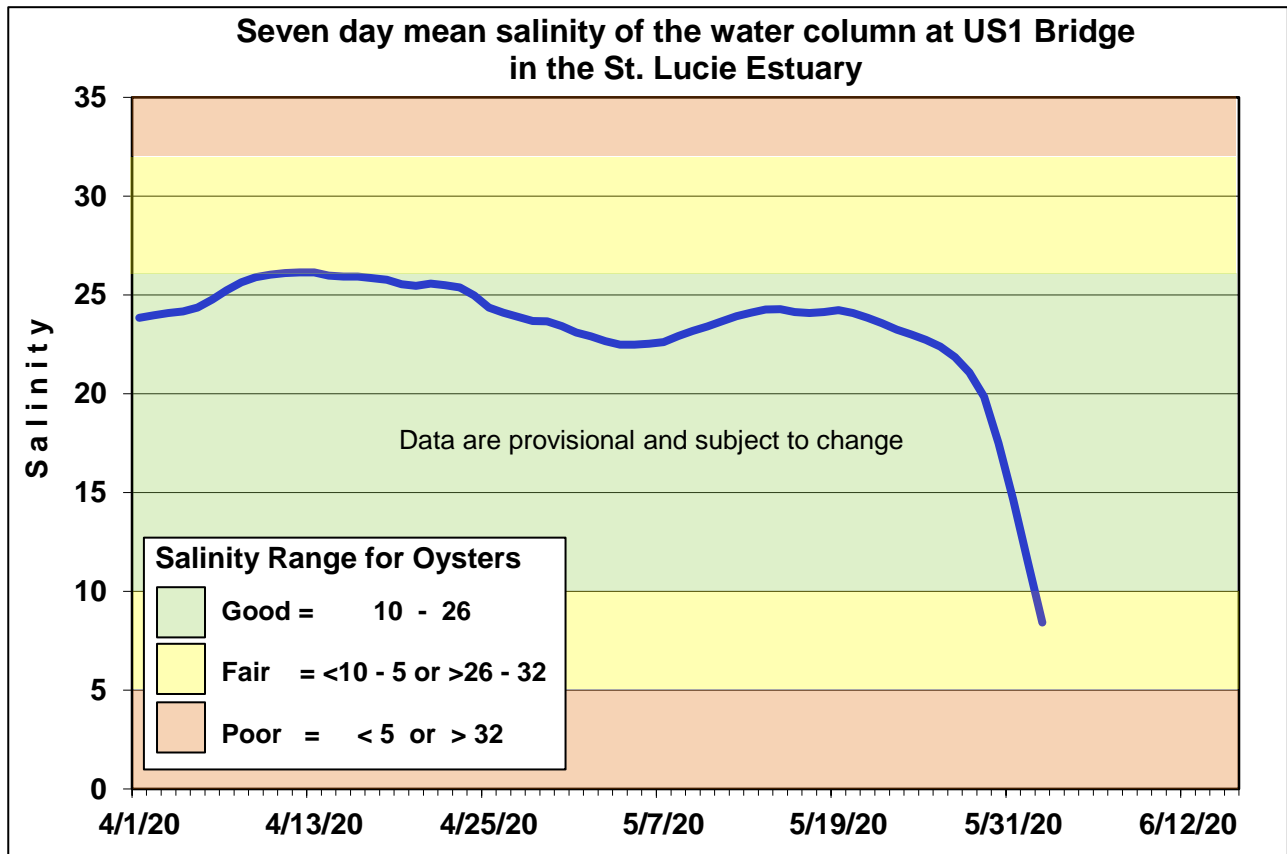




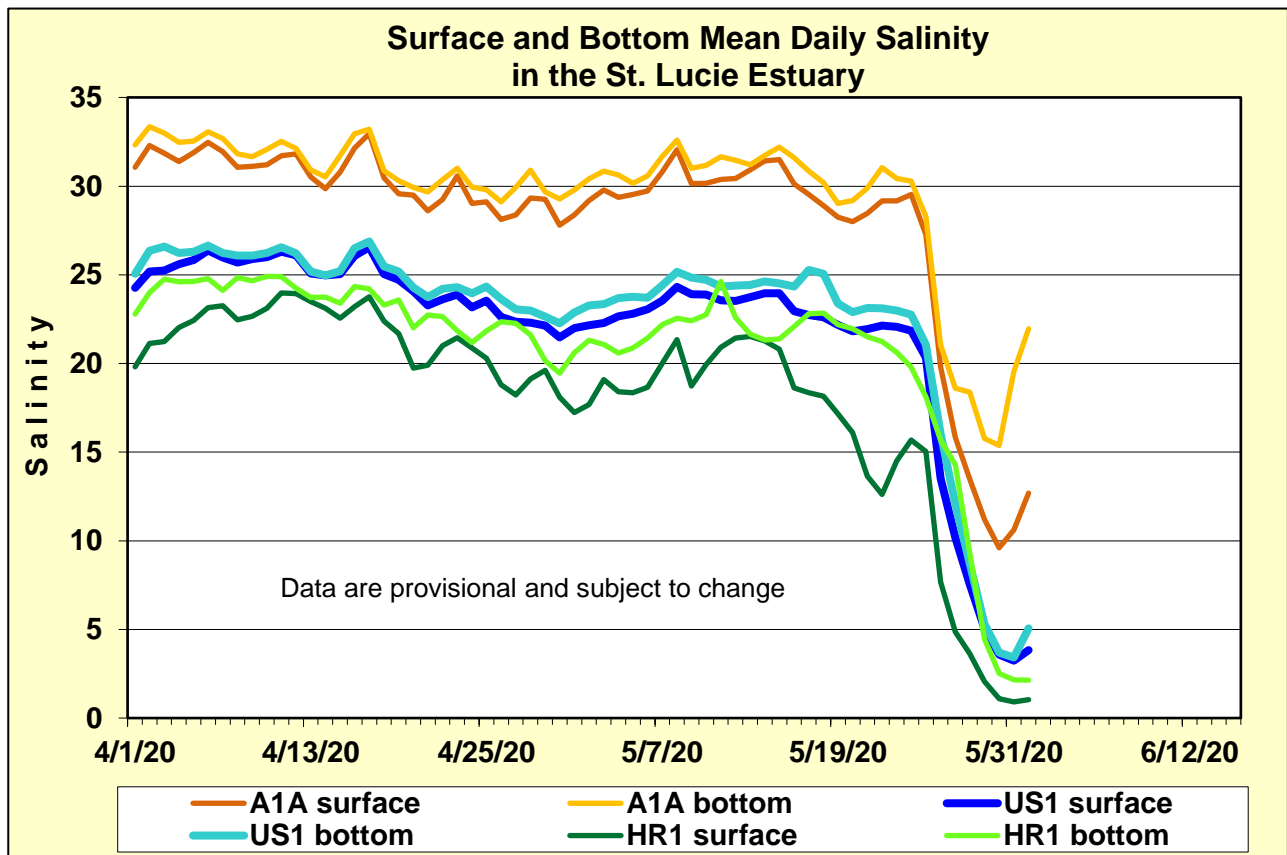
**Figure 1.** Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.



**Figure 2.** Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basin 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 HR1 stations.

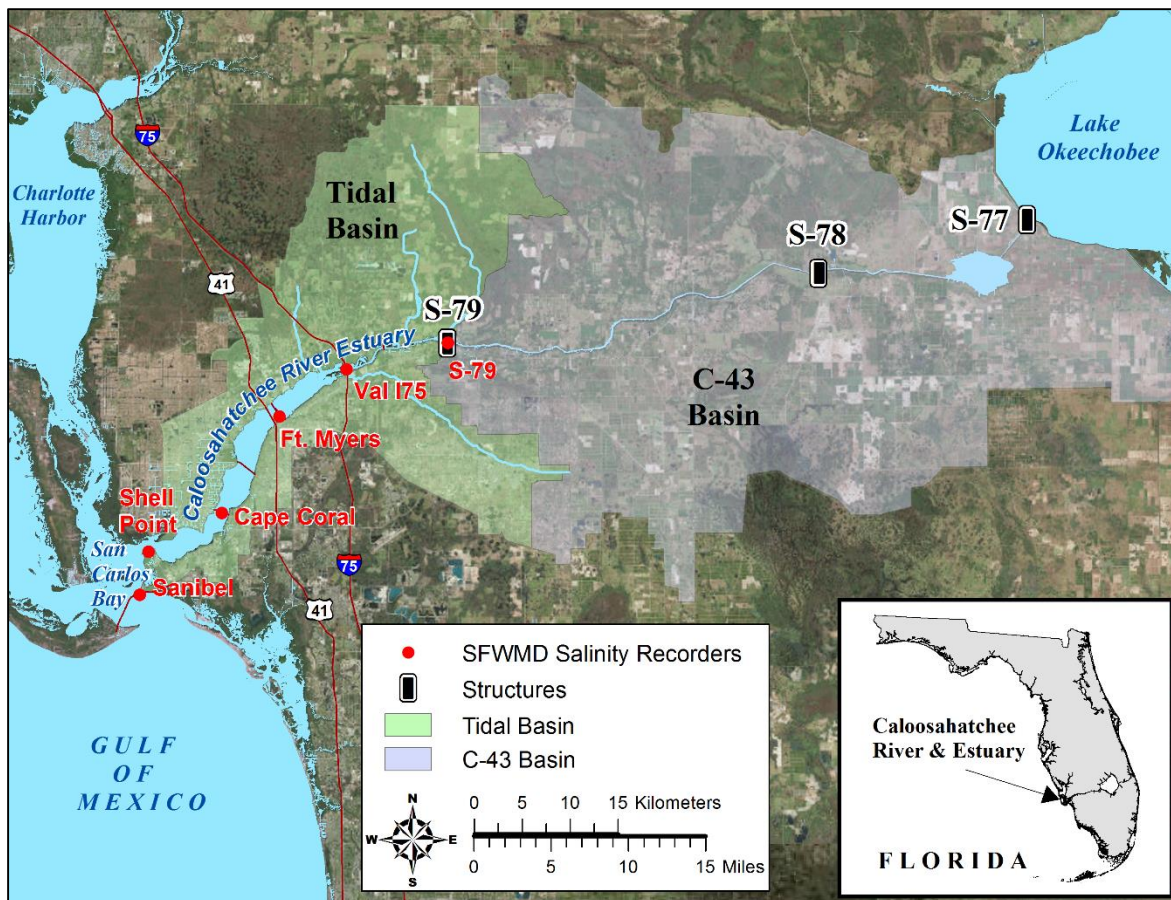


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

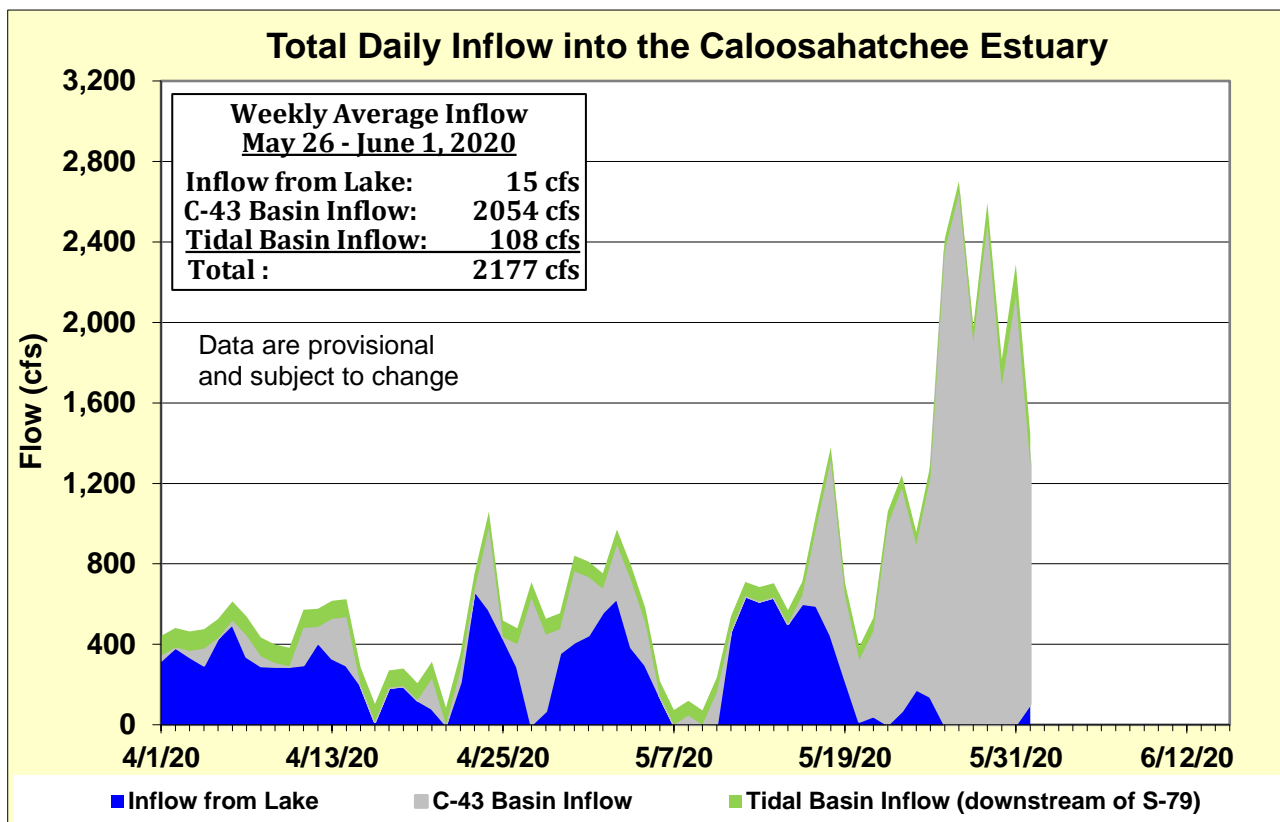
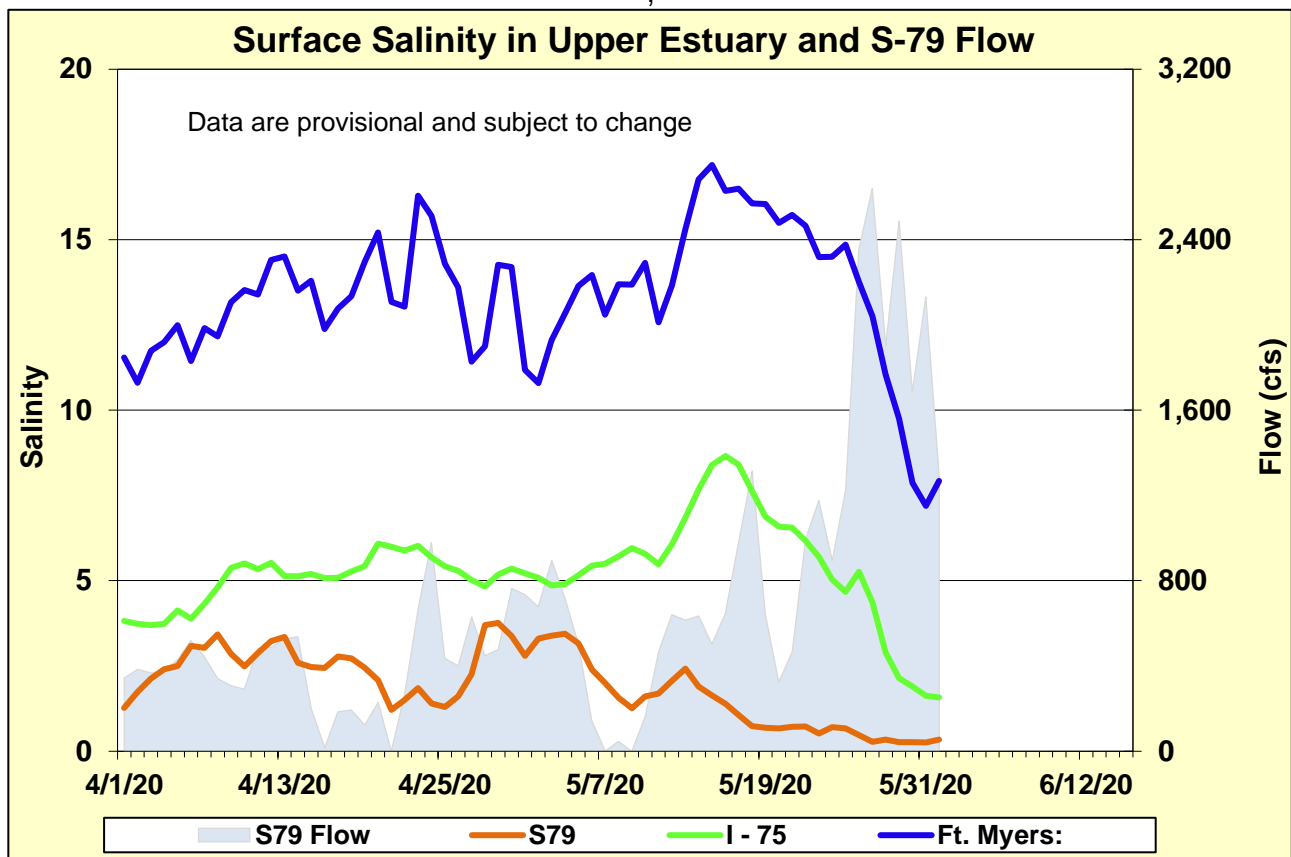
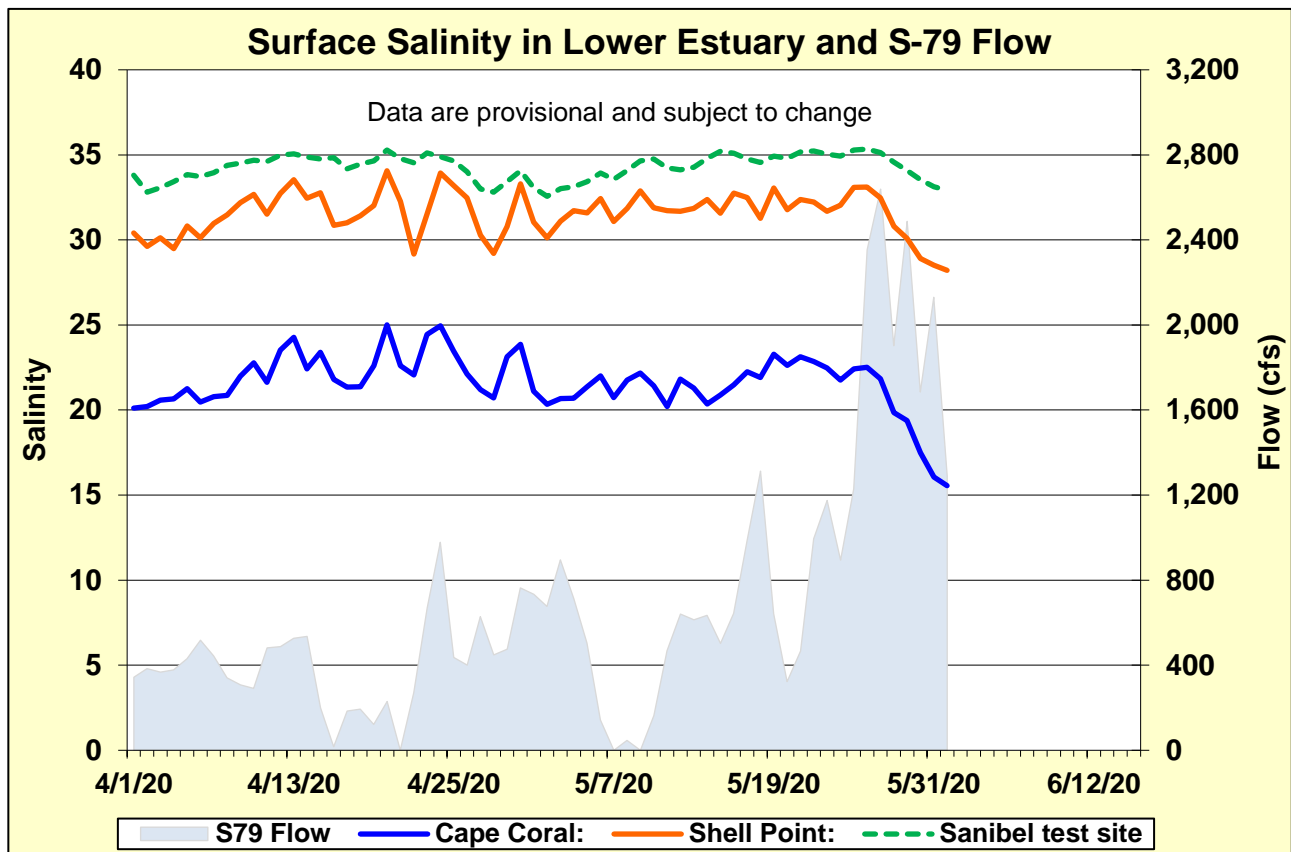


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin

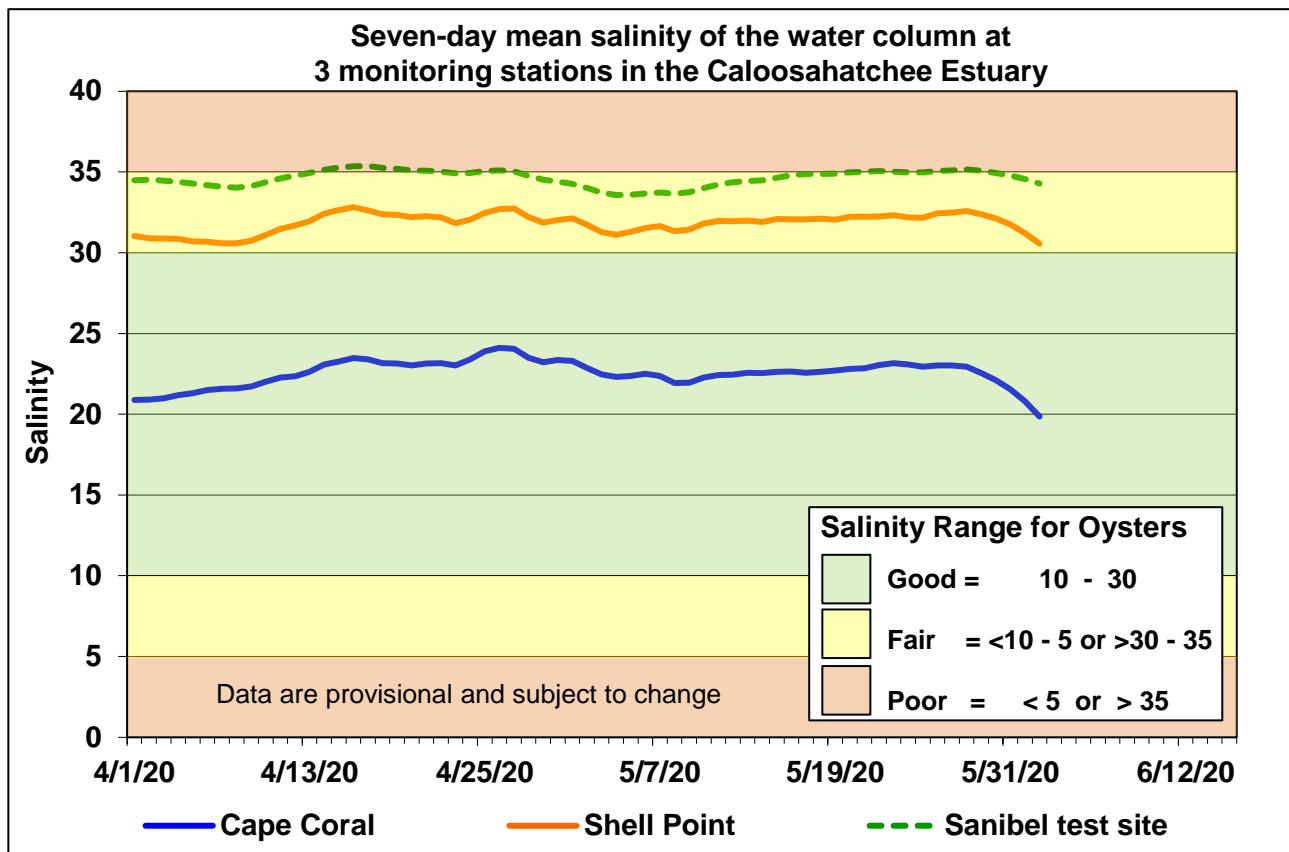


**Figure 7.** Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

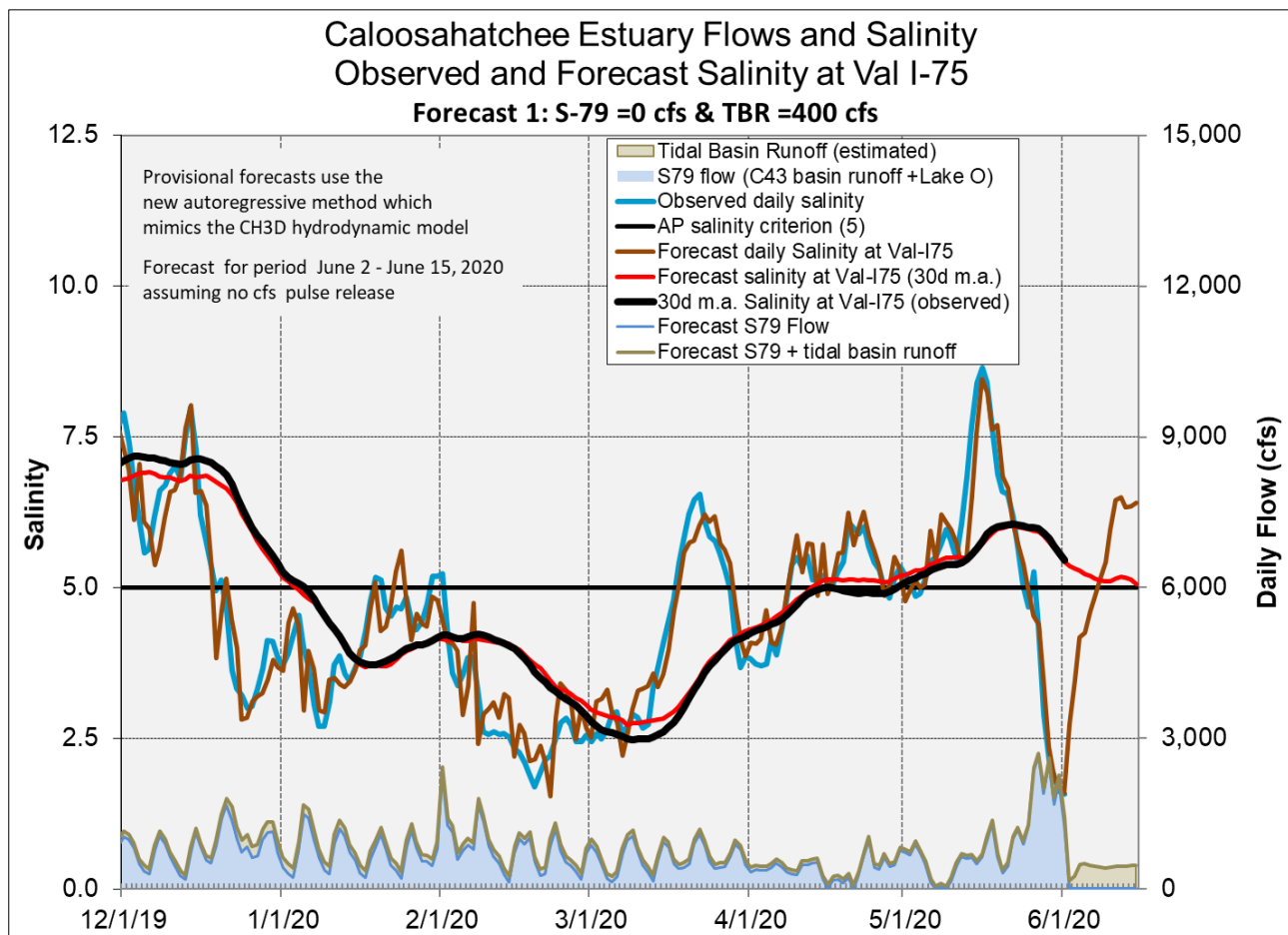


**Figure 8.** Daily mean flows at S-79 and salinity at lower estuary stations.





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



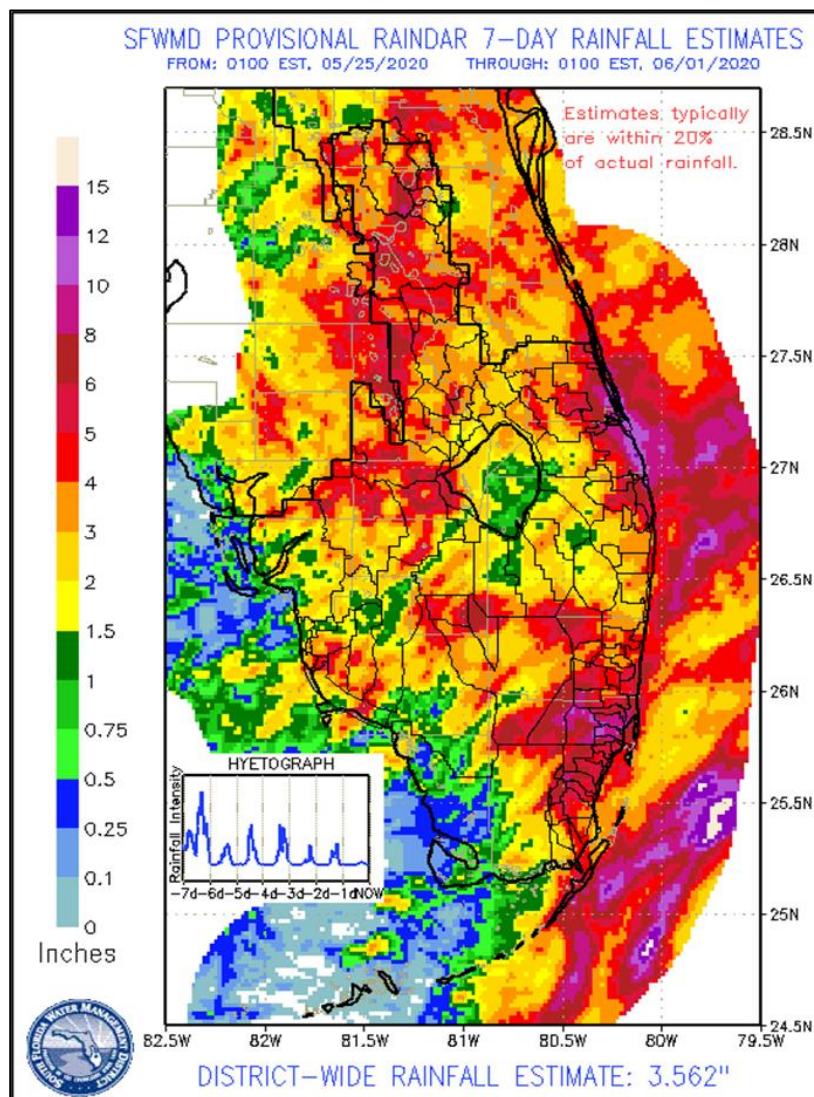
**Figure 10.** Forecasted Val I-75 surface salinity assuming no pulse release at S79.



## EVERGLADES

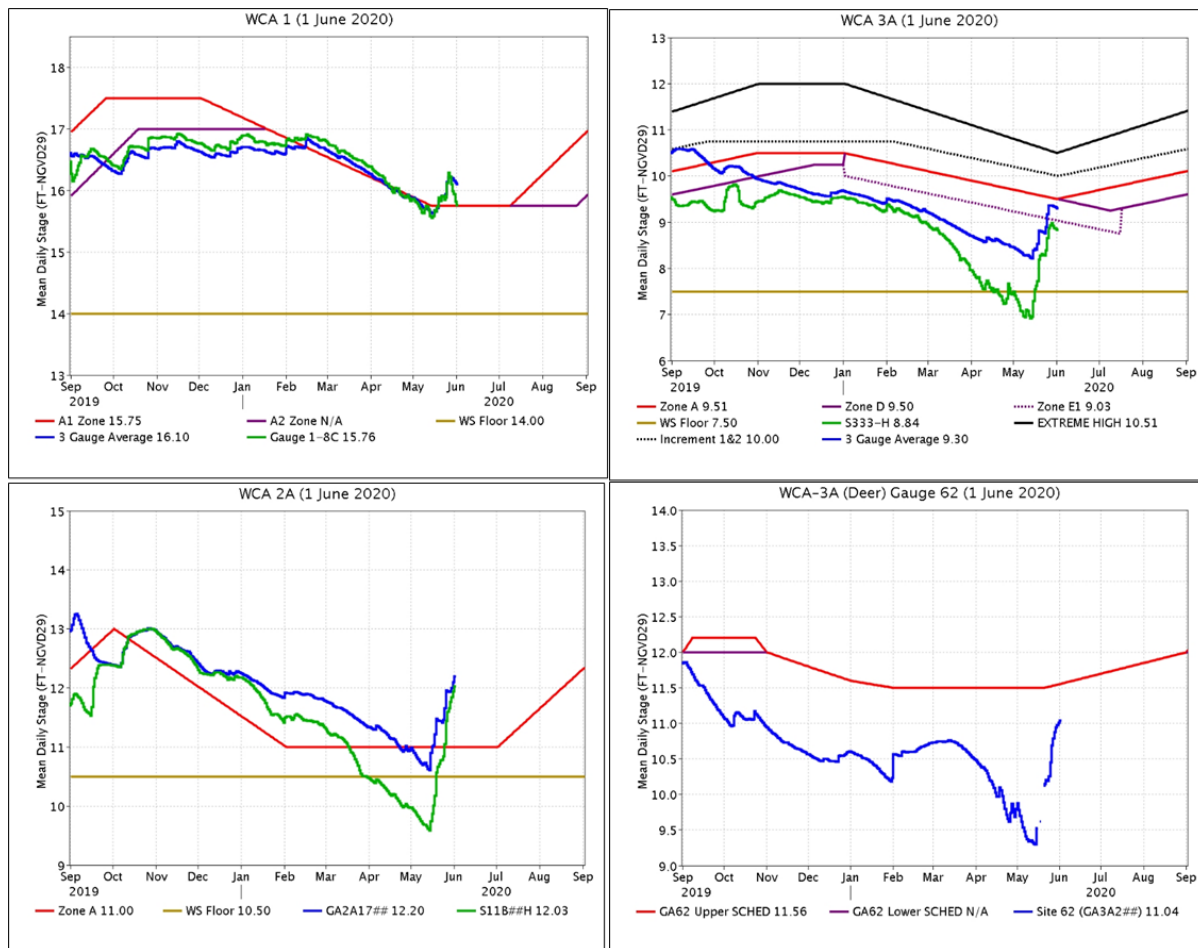
Well above average rainfall was recorded across the WCAs last week, with WCA-3B receiving the most. At the gauges monitored for this report stages rose on average 0.33 feet last week (down 0.24 from the week prior) with a maximum rate of change of +0.67 feet in WCA-3A NW. Evaporation was estimated at 1.84 inches last week an increase from the week prior.

Everglades Region	Rainfall (Inches)	Stage Change (feet)	
WCA-1	2.25	+0.04	<div><div></div> Good</div> <div><div></div> Fair</div> <div><div></div> Poor</div>
WCA-2A	5.04	+0.61	
WCA-2B	3.95	+0.32	
WCA-3A	3.67	+0.39	
WCA-3B	6.75	+0.39	
ENP	1.55	+0.54	



Regulation Schedules: WCA-1: Stage at the 1-8C Gauge fell towards the stable regulation line, currently 0.01 feet above the Zone A1 line and below the 3 Gauge average. WCA-2A: Stage at Gauge

S11-B continued its rapid ascent, below the WS floor two weeks ago now 1.03 feet above the Zone A regulation line. WCA-3A: The Three Gauge Average stage leveled off and followed just below the Zone A regulation line last week, presently 0.21 feet below that regulation line. WCA-3A at gauge 62 (Northwest corner): Stage continued to rise quickly last week but remains well below the Upper Schedule at 0.52 feet below the rising target line.

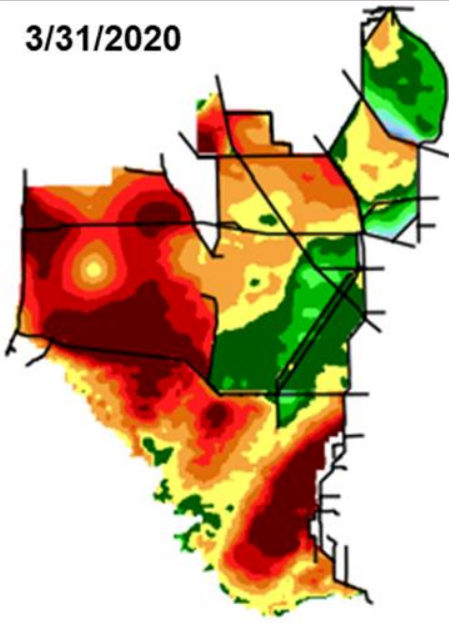


Water Depths: The WDAT tool for spatial interpolation of depth monthly snapshots indicate depths remain below ground in northeastern WCA-3A, with the western side now showing water up to a foot above the soil surface. Depths are approaching 2.5 feet in the upper reaches of the L-67s in WCA-3A South. WCA-2A is now inundated in the north has with the potential for water at the soil surface upstream of the S-11s in that basin. WCA-1 depths remain relatively stable and depths came up in the north. Shark River Slough and Lostman's Slough in ENP are showing signs of stages ascending to ground surface or near and hydrologic connectivity has returned to Taylor River. Comparing WDAT water levels from present, over the last month stages rose significantly across the WCAs most prominent in northwestern WCA-3A and northeastern WCA-2A. Looking back one year the stage difference patterns are less striking. The entirety of the WCA-1 and WCA-3A are slightly above or similar in stage. In WCA-2A the difference is mixed, deeper in the north and shallower in the south. The WDAT model indicates a drier condition in the far west and the panhandle of ENP compared to a year ago but not a month ago.

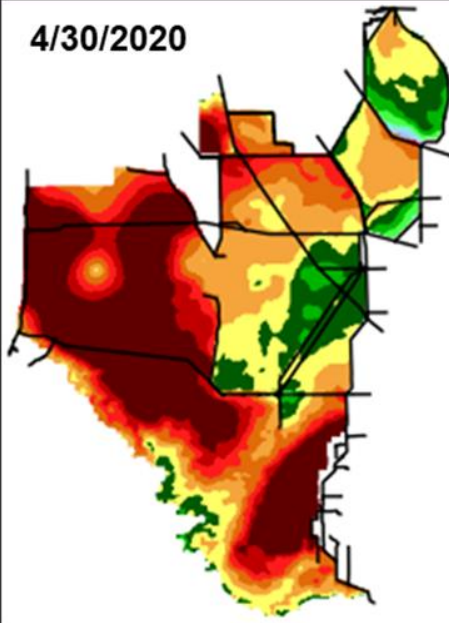


## SFWDAT Water Depth Monthly Snapshots

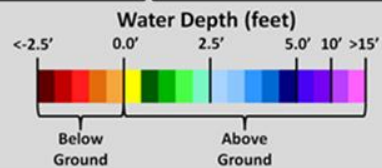
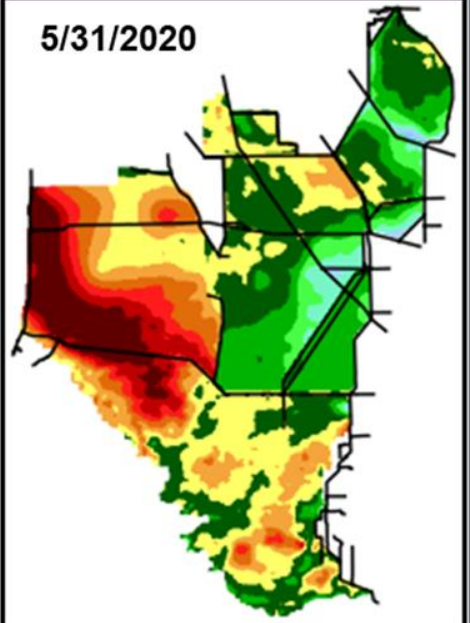
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4/30/2020



5/31/2020

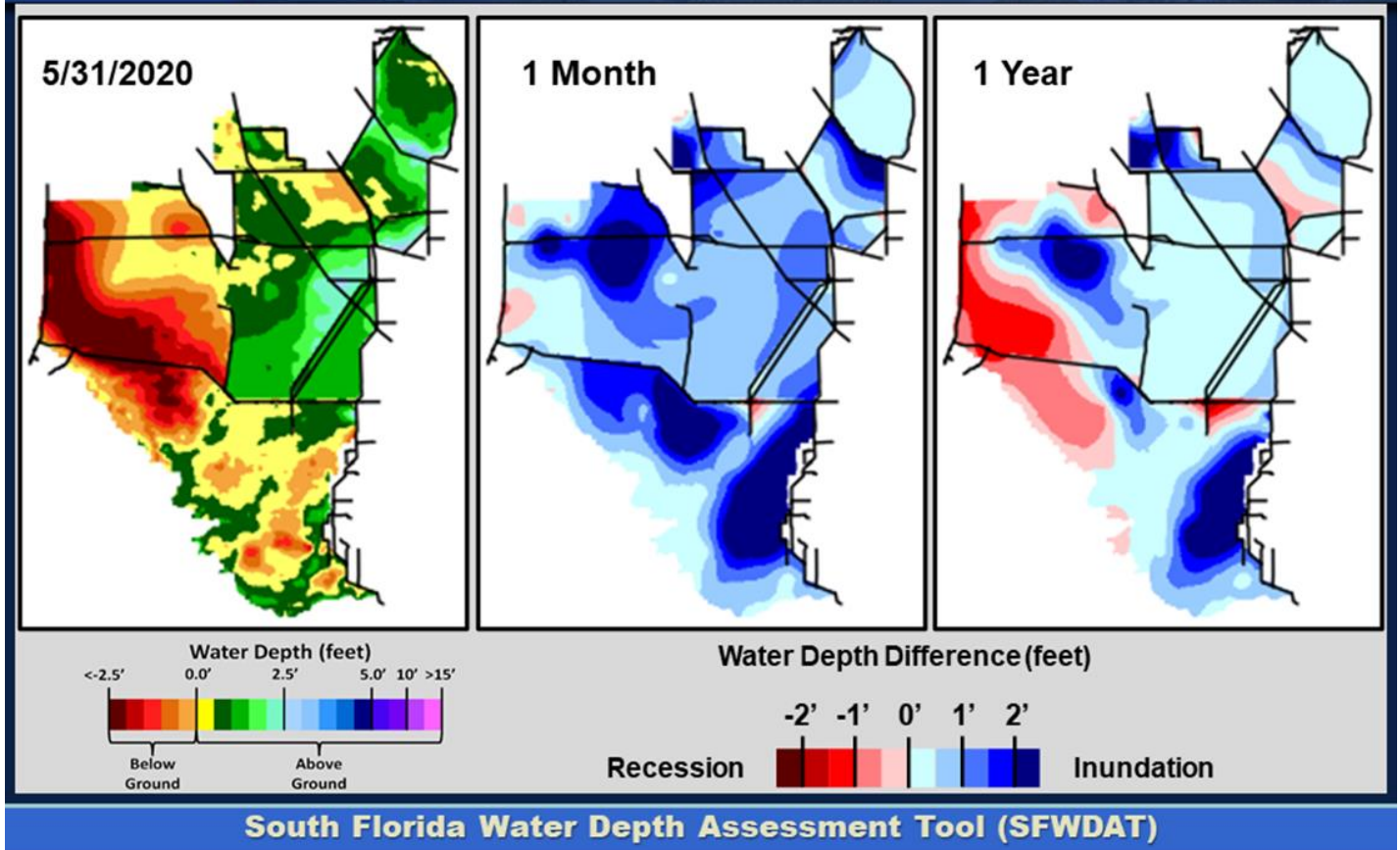


South Florida Water Depth Assessment Tool (SFWDAT)

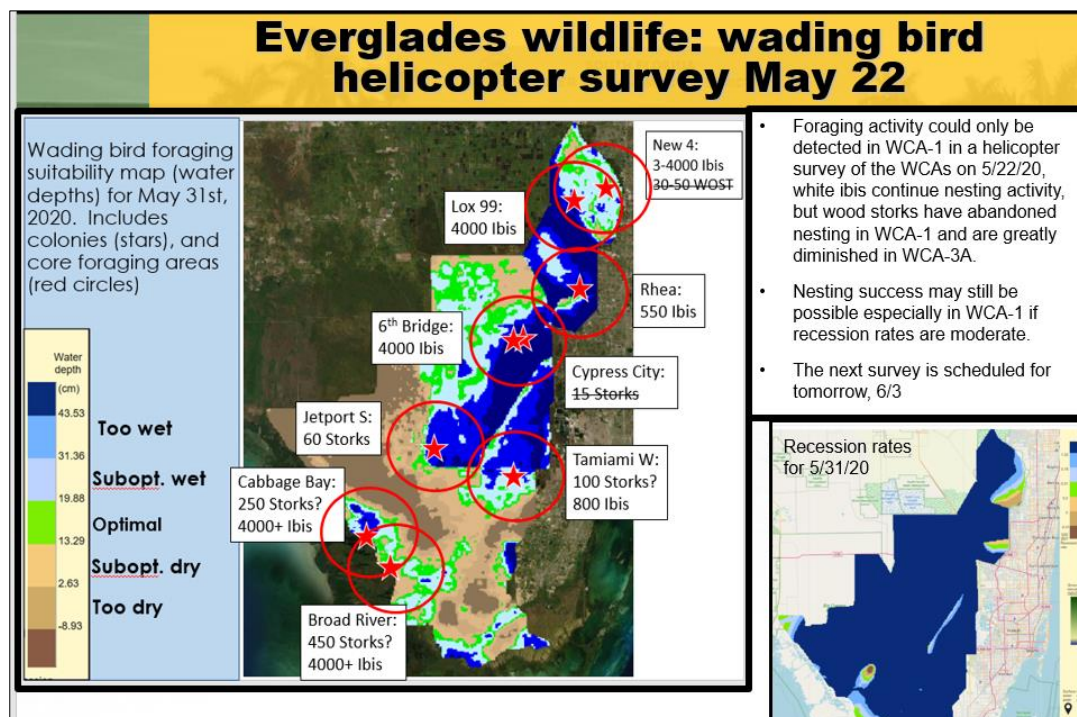




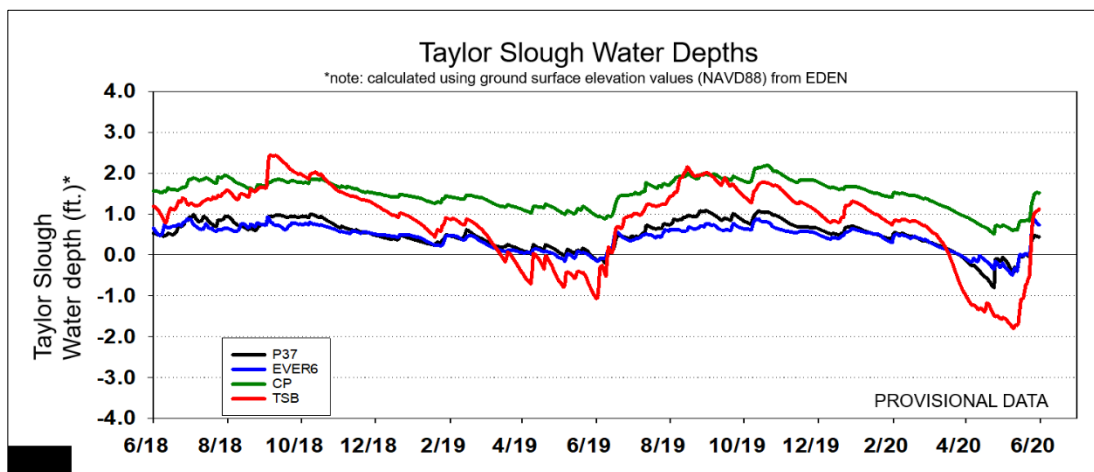
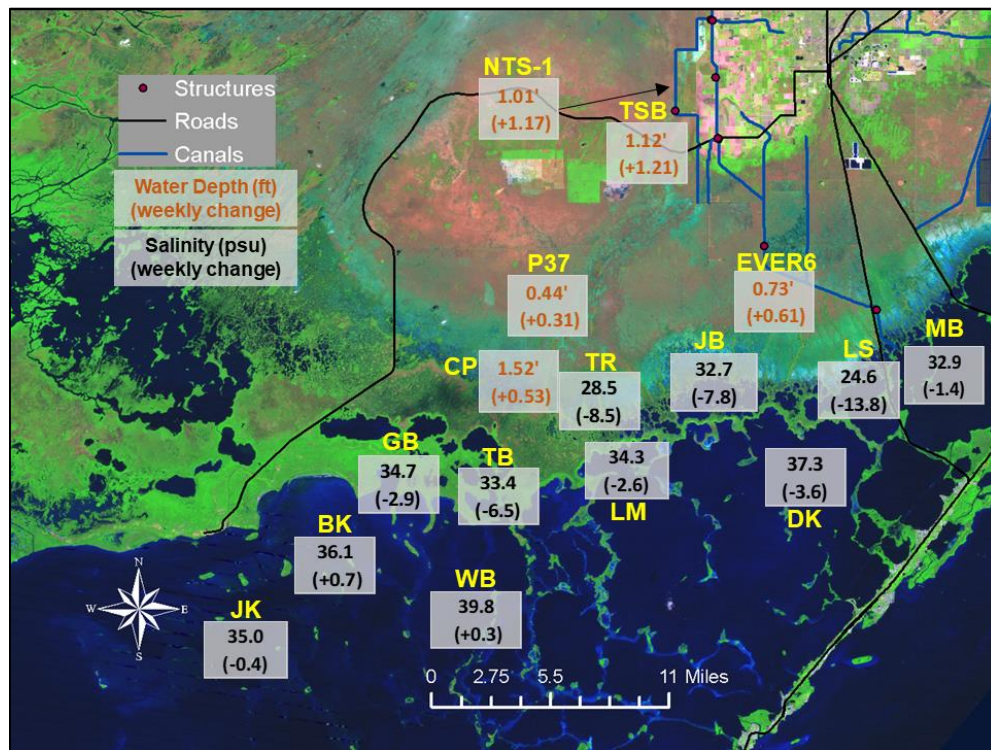
## SFWDAT Everglades Difference Maps (Present – Past)



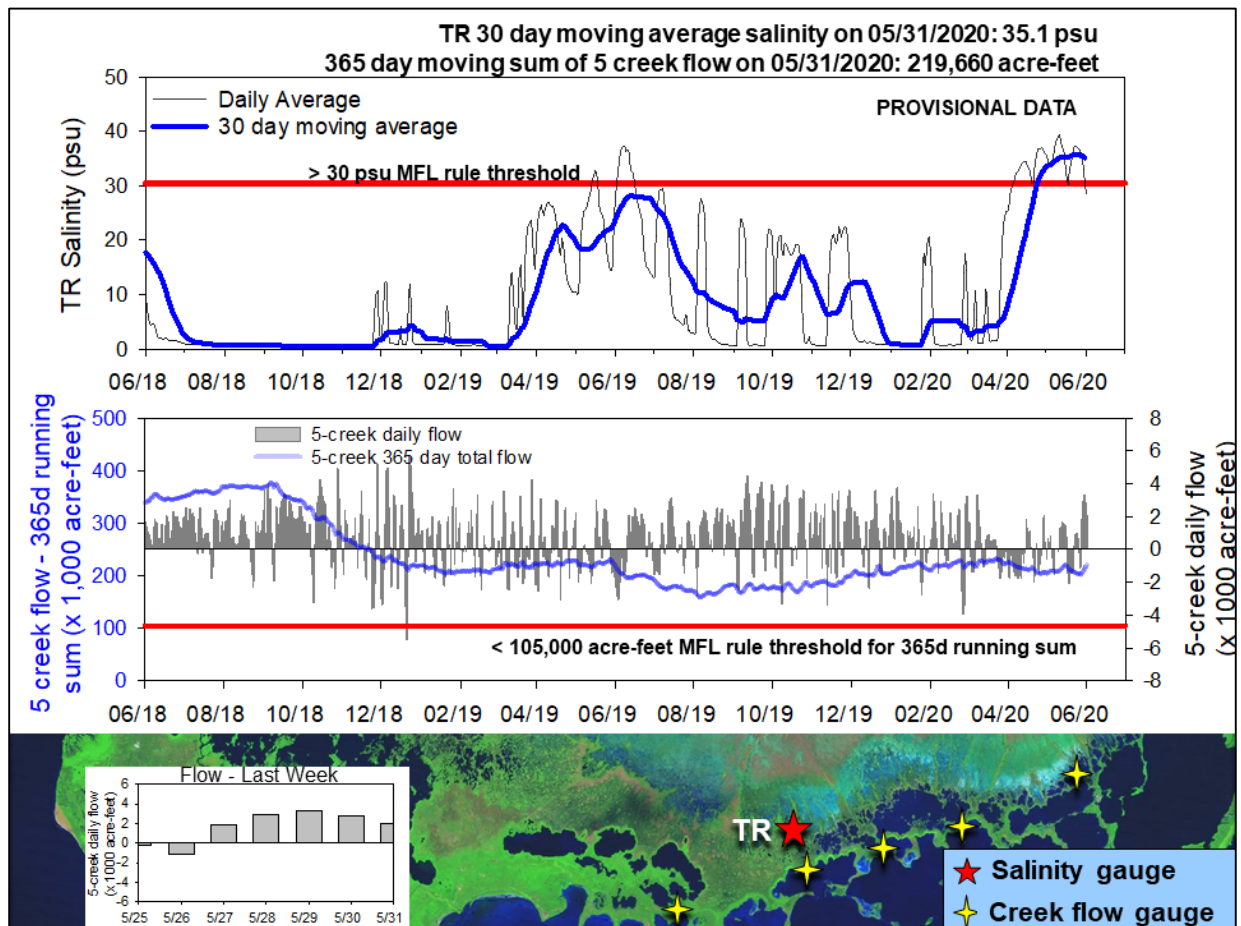
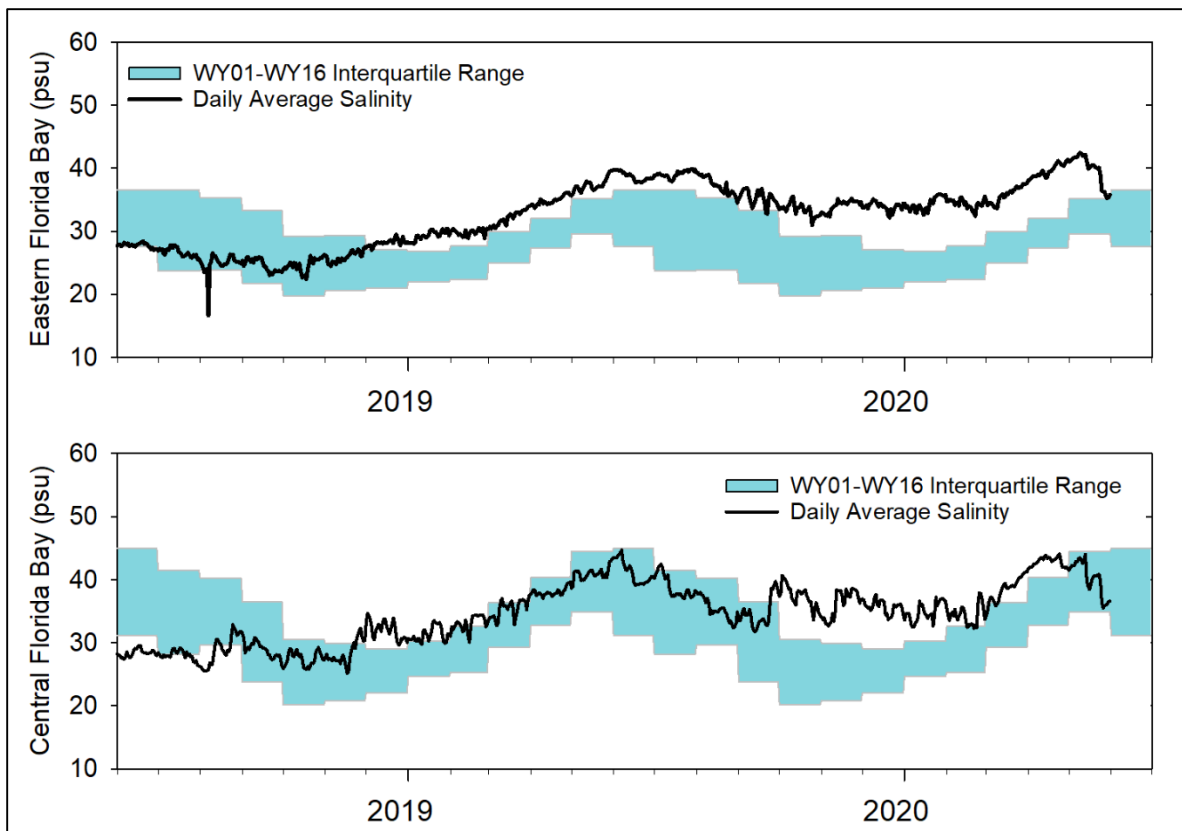
Wildlife: Wading birds



Taylor Slough Water Levels: An average of 2.62 inches of rain fell over Taylor Slough and Florida Bay this past week and stages increased an average of 0.76 feet and all the stations have above ground water depths. Phosphorus levels at the western structures (S-328 and G-737) near the Taylor Slough headwaters were 19 µg/L last week, so we are requesting that these structures remain closed this week.







Florida Bay Salinities: Average salinity in Florida Bay decreased 4.1 psu with the largest change occurring in the eastern Bay and the nearshore areas. The freshwater flush of the Taylor Slough marsh and mangrove zone is starting (a rapid decrease in nearshore salinities is expected in the upcoming weeks as a result), and the salinities in the Bay are within the middle 50% of historical values for this time of year.

Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) decreased from 37 psu to 28 over the last week. The 30-day moving average decreased 0.6 psu to end at 35.1 psu. Weekly flow from the 5 creeks identified by yellow stars on the map totaled about 11,500 acre-feet last week with positive flows resuming on Wednesday (5/27). Salinity is decreasing slowly, but the freshwater from westward deliveries and local rainfall should soon start the rapid freshening typical of the wet season. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) increased 17,000 acre-feet this week to end at 219,660 acre-feet, between the 25th percentile (192,885 acre-feet) and the median (249,091 acre-feet). Creek flow are provisional USGS data.

### **Water Management Recommendations**

Water management undertaken to minimize a reversal (trying to keep the rise in stage less than .25 feet per week) that would negatively impact the core wading bird foraging area in WCA-1 would have ecological benefit.

Discharges into historically over drained northern WCA-3A have the potential to maintain saturated soils and protect these over-drained portions of the Everglades. While the moderation of recession rates in any part of WCA-3A North are beneficial, available water sent through the S-150 into Northeastern WCA-3A would have greater ecological value than the same amount of water discharged in Northwestern 3A.

Phosphorus levels at the western structures (S-328 and G-737) near the Taylor Slough headwaters were 19 µg/L last week, so we are requesting that these structures remain closed this week.

Flows towards Taylor Slough and Florida Bay freshen salinity conditions within the nearshore areas of Florida Bay and decrease the currently stressful conditions for seagrasses and fauna as nearshore salinities remain elevated, decreasing the estuarine gradient within the bay.

More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

## SFWMD Everglades Ecological Recommendations, June 2nd, 2020 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage increased by 0.04'	Moderating the ascension rate to less than 0.25 feet per week or 0.50 feet per two weeks is ecologically beneficial. A recession rate in this basin has ecological benefit.	Protect downstream habitat and wildlife. Provide in basin wading bird foraging opportunities as wading bird nesting continues in this basin.
WCA-2A	Stage increased by 0.61'	Moderating the ascension rate to less than 0.25 feet per week or 0.50 feet per two weeks and conserving water in this basin has ecological benefit.	Protect upstream/downstream habitat and wildlife. Apple snail reproduction is hindered by rapidly increasing stage.
WCA-2B	Stage increased by 0.32'	Moderating the ascension rate to less than 0.25 feet per week or 0.50 feet per two weeks and conserving water in this basin has ecological benefit.	Protect upstream/downstream habitat and wildlife. Apple snail reproduction is hindered by rapidly increasing stage.
WCA-3A NE	Stage increased by 0.34'	Moderating the ascension rate to less than 0.25 feet per week or 0.50 feet per two weeks and conserving water in this basin has ecological benefit.	Protect upstream/downstream habitat and wildlife. Apple snail reproduction is hindered by rapidly increasing stage.
WCA-3A NW	Stage increased by 0.67'	Moderating the ascension rate to less than 0.25 feet per week or 0.50 feet per two weeks and conserving water in this basin has ecological benefit.	
Central WCA-3A S	Stage remained unchanged	Moderating the ascension rate to less than 0.25 feet per week or 0.50 feet per two weeks and conserving water in this basin has ecological benefit. A recession rate in this basin has ecological benefit	Protect upstream/downstream habitat and wildlife. Protect wading bird foraging as nesting continues.
Southern WCA-3A S	Stage increased by 0.54'		
WCA-3B	Stage increased by 0.39'	Moderating the ascension rate to less than 0.25 feet per week or 0.50 feet per two weeks and conserving water in this basin has ecological benefit.	Protect upstream/downstream habitat and wildlife. Apple snail reproduction is hindered by rapidly increasing stage.
ENP-SRS	Stage increased by 0.54'	Make discharges to the Park according to the 2012 WCP rainfall plan	Protect upstream/downstream habitat and wildlife. Apple snail reproduction is hindered by rapidly increasing stage.
Taylor Slough	Stage changes ranged from +0.31' to +1.21'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions.
FB- Salinity	Salinity changes ranged -13.8 to +0.7 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.