

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, Assistant Executive Director, Executive Office Staff

**FROM:** SFWMD Staff Environmental Advisory Team

**DATE:** December 18, 2019

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

### **Summary**

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

A cold front will bring showers and thunderstorms tonight and Wednesday; a very wet scenario with the potential for excessive rainfall is setting up for Saturday/Sunday/Monday. A cold front currently in Florida's panhandle will move through the District tonight and during the day Wednesday before stalling across the Florida Straits Wednesday night. Daytime heating will generate some scattered showers and a few thunderstorms ahead of the front this afternoon before more favorable moisture and upper level energy associated with the front move in from the northwest this evening and then shift southeastward to near Lake Okeechobee by Wednesday morning and then offshore of the east coast by sunset Wednesday. Dry conditions will spread over the northern portion of the District behind the front Wednesday and Thursday but a weak upper level trough moving across the area will flare up some shower activity near the old frontal boundary and some of this activity is forecast to affect the southern and eastern portions of the District Thursday and Friday. The forecast becomes much more complex and wet beginning Saturday. An upper level low is forecast to develop in a trough over Texas Saturday and then slowly move eastward across the northern Gulf of Mexico Sunday and Monday. This trough is forecast to develop a surface low along the stalled frontal boundary over the Gulf of Mexico which would initially lift the frontal boundary back north over the District bringing widespread rains with embedded heavy showers and thunderstorms over the District Saturday and Sunday. The upper level trough is forecast to eventually move eastward across the Florida peninsula Sunday night or Monday and then bring the front back south through the District. Not surprisingly, uncertainty remains with the details of the exact timing and motion of the developing low but a stalled frontal boundary with a developing surface low to our west is a classic heavy rain producer for the District. Confidence in the specifics of this developing system should increase as the week progresses. District-wide rainfall of 2" with the potential for localized rainfall amounts to 6-10" are forecast for the 3-day period of Saturday, Sunday, and Monday. Building high pressure behind this system is currently forecast to bring drier for Christmas and the following weekend before the next frontal system affects the District early the following week. Therefore, below-average rainfall is forecast for Week 2.

#### **Kissimmee**

Tuesday morning stages were 55.0 feet NGVD (3.0 feet below schedule) in East Lake Toho, 54.5 feet NGVD (0.5 feet below schedule) in Toho, and 50.9 feet NGVD (1.6 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.3 feet NGVD at S-65A and 25.9 feet NGVD at S-65D. Tuesday morning discharges were 368 cfs at S-65, 317 cfs at S-65A, 355 cfs at S-65D and 303 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 9.7 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.12 feet. Recommendations: 12/13/2019- Lower stage in Lake Toho to 54.5 feet as soon as possible. The purpose is to create additional difference at S-59. 12/17/2019- Continue S65-A discharge of at least 250 cfs. The purpose is to maintain minimum flow to the Kissimmee River.

## **Lake Okeechobee**

Lake Okeechobee stage was 13.01 feet NGVD on December 16, 2019, up 0.10 feet from the previous week but down 0.25 feet from the previous month. The Lake moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it has remained since. Water levels moved below the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) on October 15, 2019 and are currently 1.49 feet below the bottom of the envelope. Low Lake stages continue to benefit recovering SAV communities, but also stress higher elevation marshes; areas with elevations greater than approximately 14 feet NGVD have now been dry since late October of last year. Low stages throughout 2019 also likely limited prey production in the marsh and is likely to impact wading bird use of the lake in the 2020 breeding season. The latest estimate of cyanobacteria bloom potential (December 16, 2019) shows that estimated bloom potential is at low- to no-risk.

## **Estuaries**

Total inflow to the St. Lucie Estuary averaged 1690 cfs over the past week with no flow coming from Lake Okeechobee. Salinities decreased throughout the estuary. Salinity at the US1 Bridge is in the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 661 cfs over the past week with 259 cfs coming from the Lake. Salinity increased slightly in the estuary over the past week. Salinities are in the good range at Val I-75 for Tape Grass and in the fair range at Ft. Myers. Salinities are in the good range for adult eastern oysters at Cape Coral and Shell Point and in the fair range at Sanibel.

Lake stage is in the Base Flow sub-band of 2008 LORS. Tributary hydrological conditions are dry. The forecast of 30-day moving average of surface salinity at Val I-75 would exceed 5 over the next two weeks if there is no release. SFWMD's Lake Okeechobee Adaptive Protocol's Release Guidance suggests up to 450 cfs @ S-79 and S-77 baseflow release to supplement as needed.

## **Stormwater Treatment Areas**

Over the past week, 800 ac-ft of Lake Okeechobee water was delivered to the FEBs/STAs. The total amount of Lake releases sent to the FEBs/STAs in WY2020 (since May 1, 2019) is approximately 70,000 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 806,000 acre-feet. Most STA cells are at or near target depths except STA-5/6 cells which are below target. STA-5/6 Flow-ways 2 and 3 are offline for the Restoration Strategies project to grade non-effective treatment areas, and STA-1E Western Flow-way is offline for West Distribution Cell levee repairs and 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, and in STA-1E Central Flow-way, STA-2 Flow-way 3, and STA-2 Flow-way 4 for vegetation management activities. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to STA-2 or A-1 FEB/STA-3/4.

## **Everglades**

Current stages in the WCAs, particularly in WCA-3A North, are low for this time of year and salinities are high in Florida Bay. Conserving fresh water in the Everglades, distributing it to where depths are low and allowing it to flow south has important ecological benefit. As wading bird foraging begins in the Everglades, ecological recommendations move towards moderating recession rates where and when possible. Generally, this time of year rates from -0.05 to -0.09 feet per week are desirable to optimize conditions for prey concentration and capture. However, given the uniquely low stages at the start of this season it remains ecologically desirable to conserve as much water as possible. Florida Bay and Taylor Slough received a significant amount of rainfall last week and recent stages declines slowed. On average salinity conditions remained stable last week yet still are well above average for this time of year.

## Supporting Information

### KISSIMMEE BASIN

#### Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 1.13 inches of rainfall in the past week and the Lower Basin received 1.03 inches (SFWMD Daily Rainfall Report 12/15/2019).

#### 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: 12/17/2019

Water Body	Structure	7-day Average Discharge (cfs) <sup>1</sup>	Stage Monitoring Site <sup>2</sup>	Lake Stage (feet)	Schedule Type <sup>3</sup>	Schedule Stage (feet)	Daily Departure (feet)						
							12/15/19	12/8/19	12/1/19	11/24/19	11/17/19	11/10/19	11/3/19
Lakes Hart and Mary Jane	S-62	0	LKMJ	60.8	R	61.0	-0.2	-0.4	-0.4	-0.4	-0.5	-0.5	-0.6
Lakes Myrtle, Preston, and Joel	S-57	0	S-57	61.6	R	61.9	-0.3	-0.5	-0.5	-0.5	-0.6	-0.5	-0.6
Alligator Chain	S-60	0	ALLI	63.0	R	64.0	-1.0	-1.1	-1.1	-1.0	-1.0	-1.0	-1.0
Lake Gentry	S-63	3	LKGT	60.8	R	61.5	-0.7	-0.7	-0.7	-0.7	-0.6	-0.6	-0.7
East Lake Toho	S-59	219	TOHOE	55.0	R	58.0	-3.0	-3.0	-2.8	-2.5	-2.4	-2.2	-2.0
Lake Toho	S-61	727	TOHOW, S-61	54.6	R	55.0	-0.4	-0.3	-0.2	-0.1	-0.1	0.0	0.0
Lakes Kissimmee, Cypress, and Hatchineha	S-65	347	KUB011, LKIS5B	50.9	R	52.5	-1.6	-1.8	-1.9	-1.9	-1.9	-2.0	-2.1

<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 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: 12/17/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days <sup>1</sup>							
		12/15/2019	12/15/19	12/8/19	12/1/19	11/24/19	11/17/19	11/10/19	11/3/19	10/27/19	10/20/19
Discharge (cfs)	S-65	369	347	359	358	356	323	335	332	318	354
Discharge (cfs)	S-65A <sup>2</sup>	318	302	318	315	319	276	281	279	263	286
Discharge (cfs)	S-65D <sup>2</sup>	345	344	346	347	330	290	338	382	368	379
Headwater Stage (feet NGVD)	S-65D <sup>2</sup>	25.84	25.81	25.88	25.90	25.84	25.76	25.77	25.74	25.83	25.78
Discharge (cfs)	S-65E <sup>2</sup>	276	342	307	330	345	244	208	365	405	367
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	10.1	9.7	9.3	8.4	8.1	7.2	7.2	6.4	6.4	6.6
Mean depth (feet) <sup>4</sup>	Phase I floodplain	0.12	0.11	0.11	0.14	0.13	0.15	0.17	0.22	0.24	0.20

<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)

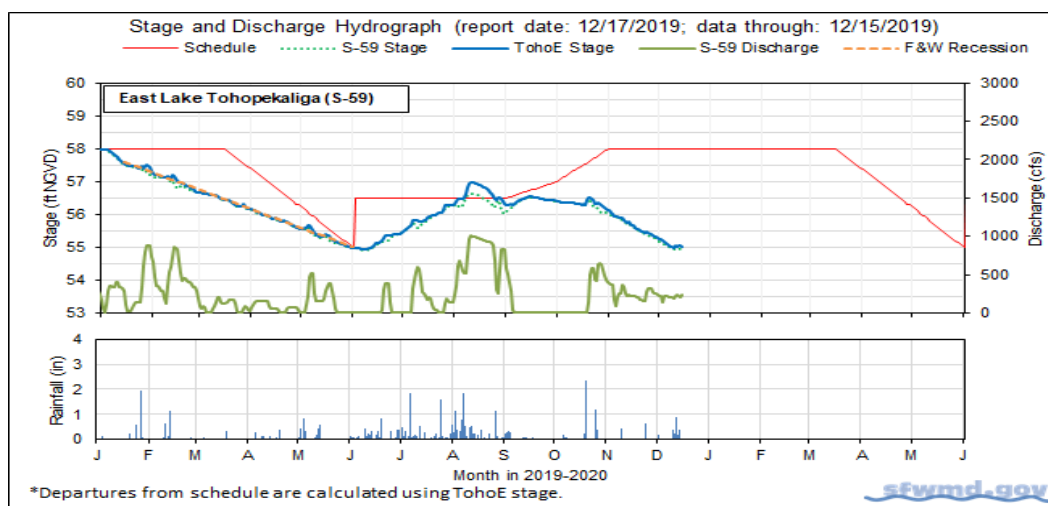


Figure 1.

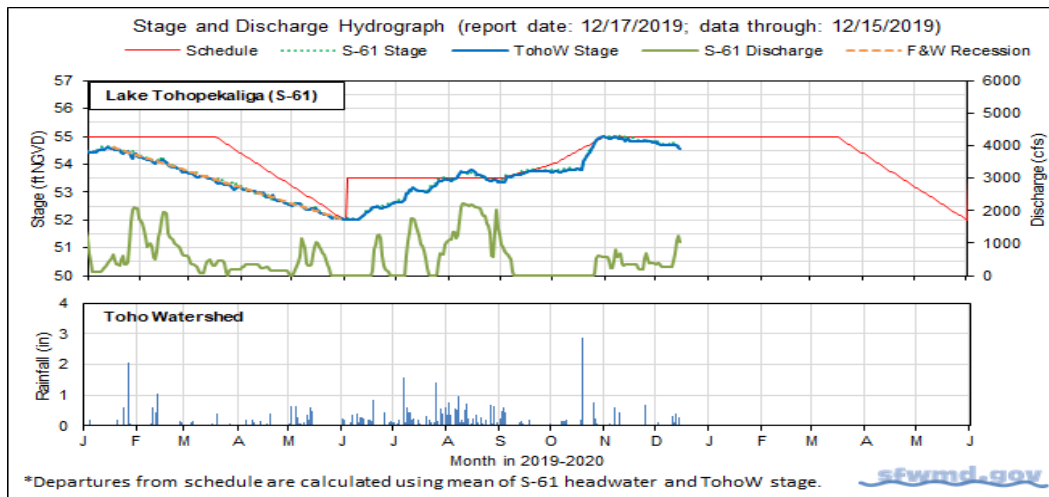


Figure 2.

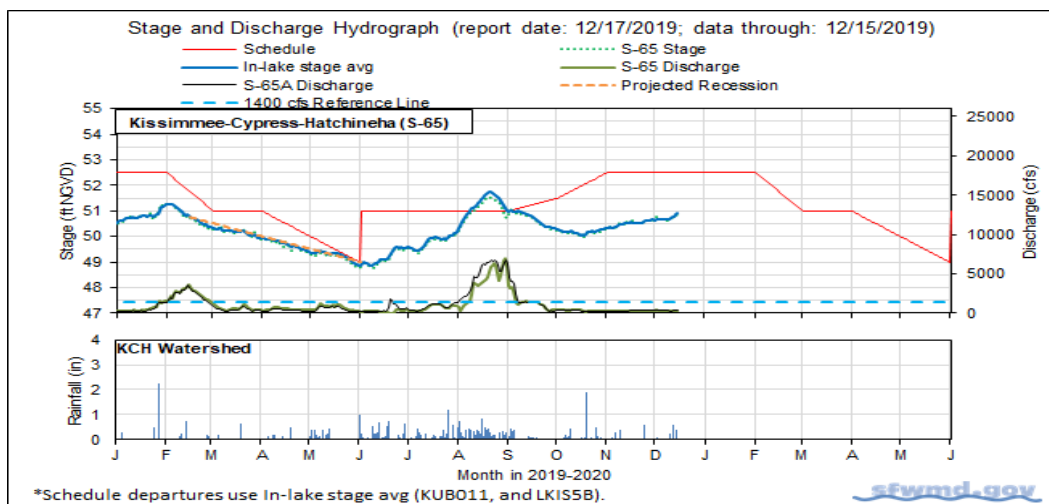
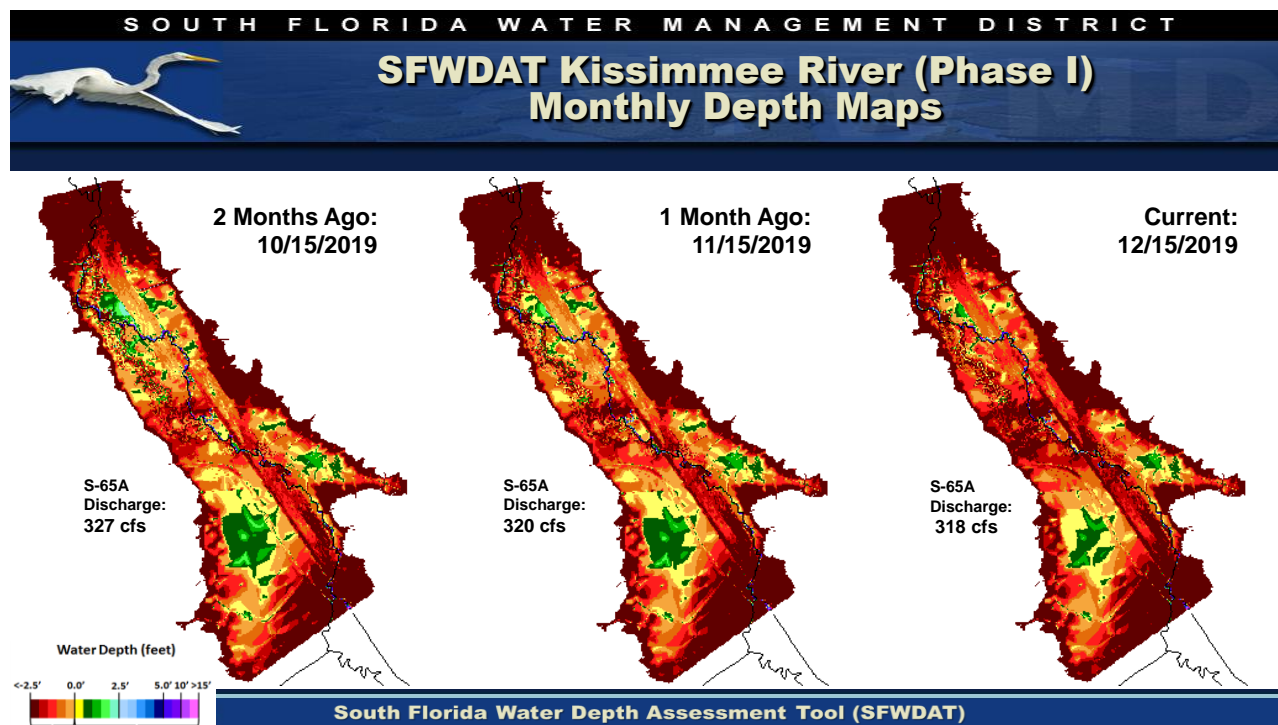
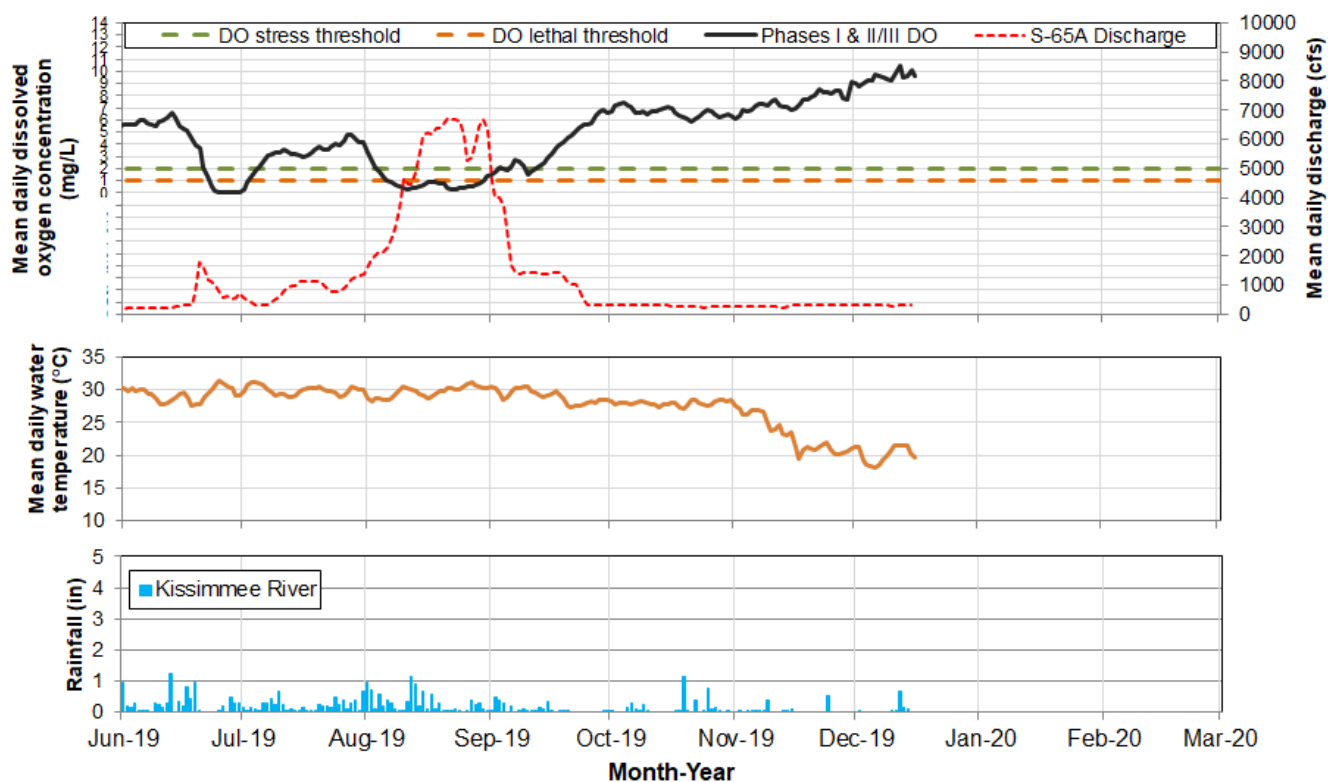


Figure 3.



**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.



Report Date: 12/17/2019; data are through: 12/15/2019.

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

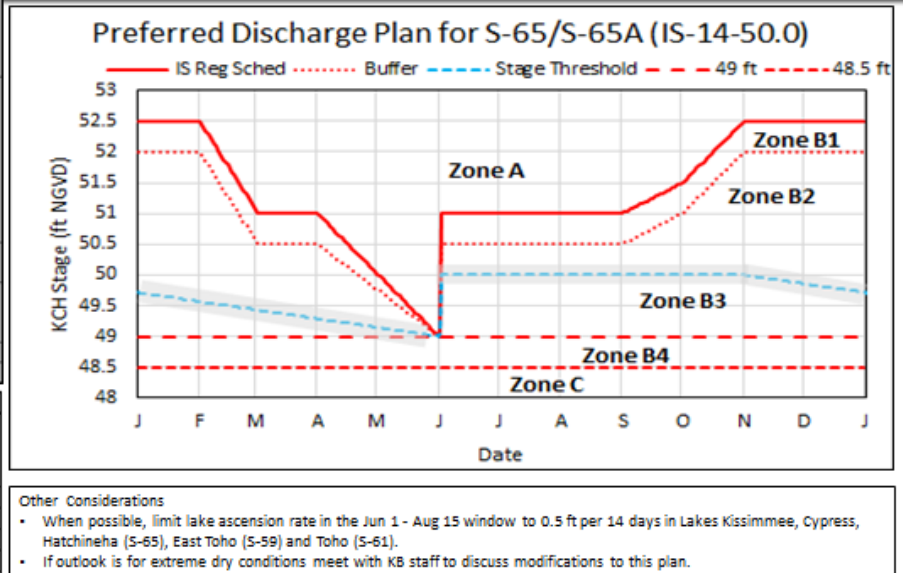
Stage and Discharge Guidance for Wet Season 2019.		
Zone	KCH Stage (ft NGVD)	S-65/S-65A Discharge*
A	Above regulation schedule line.	Flood control releases as needed with no limits on the rate of discharge change.
B1	In flood control buffer zone (0.5 ft below the schedule line).	Adjust S-65 discharge so that S-65A discharge is between 1400 cfs at the buffer zone line and 3000 cfs at the schedule line.
B2	Between the Flood Control Buffer and the 50.0 ft line.	Adjust S-65 discharge to maintain at least 1400 cfs at S-65A. Use $\pm 0.2$ ft buffer (gray band) above and below the 50.0 ft line to decide when to begin ramping up to 1400 cfs or down to 300 cfs; do not continue reducing discharge if stage rises back to or above the threshold stage line.
B3	Between the 50.0 ft line and 49 ft.	Adjust S-65 discharge to maintain at least 300 cfs at S-65A.
B4	Between 48.5 ft to 49 ft.	Adjust S-65 discharge to maintain S-65A discharge between 0 cfs at 48.5 ft and 300 cfs at 49 ft.
C	Below 48.5 ft.	0 cfs.

\*Changes in discharge should not exceed limits in inset table below.

Discharge Rate of Change Limits for S65/S65A (revised 7/13/18).		
Q (cfs)	Maximum rate of increase (cfs/day)	Maximum rate of decrease (cfs/day)
0-300	50	-50
301-650	75	-75
651-1400	150	-150
1401-3000	300	-600
>3000	1000	-2000

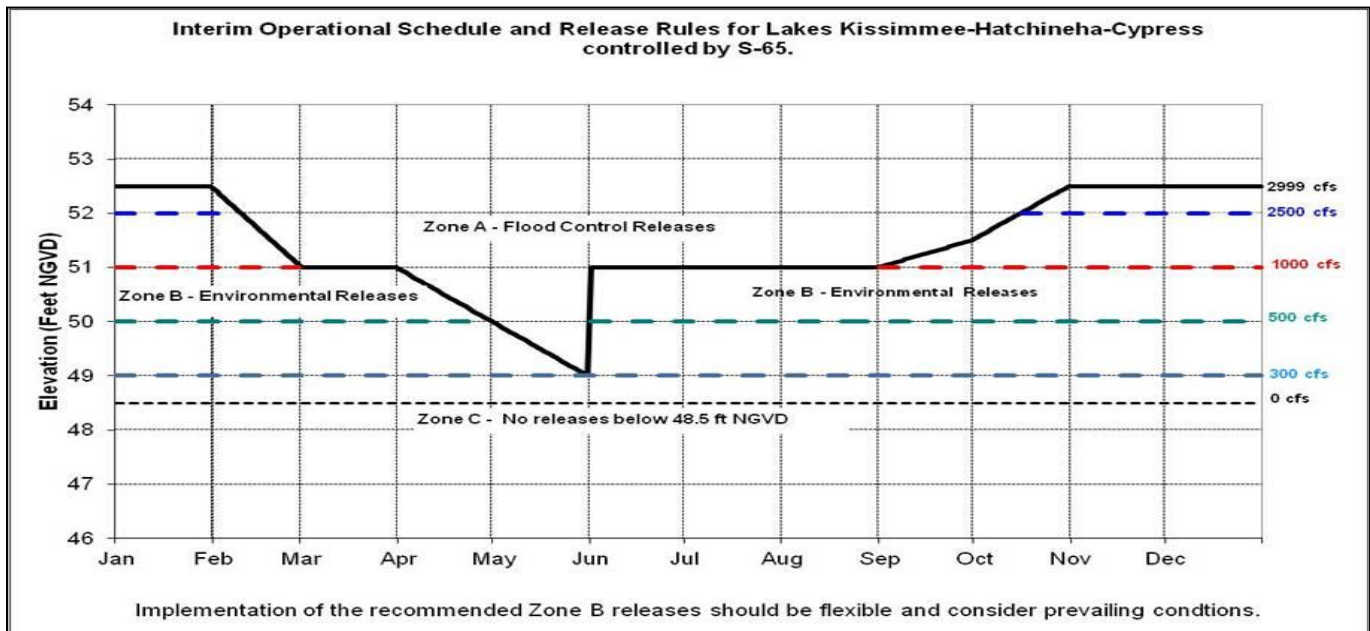
Revised 5/16/2019

## Kissimmee Basin 2019 Wet Season



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

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



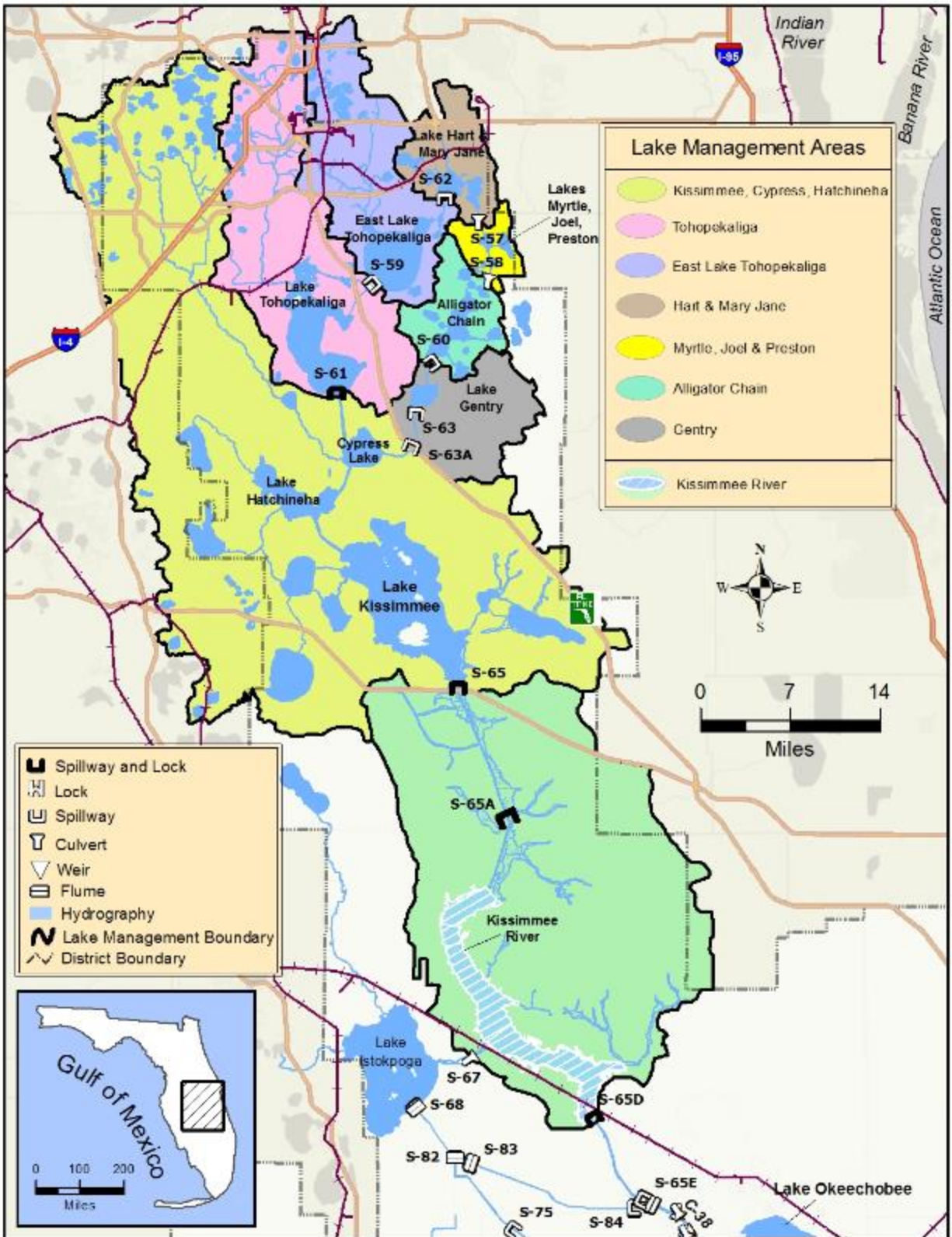


Figure 8. The Kissimmee Basin.



## **LAKE OKEECHOBEE**

According to the USACE web site, Lake Okeechobee average daily lake stage was 13.01 feet NGVD on December 16, 2019, up 0.10 feet from the previous week but down 0.25 feet from the previous month. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and four perimeter stations (S-308, S-352, S-4 and S-133). The lake is now 0.22 feet higher than a year ago (Figure 1). The Lake is currently 1.49 feet below the preferred ecological envelope (Figure 2). Lake stages moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it has remained since (Figure 3). According to RAINДАР, during the week of December 10 to December 16, 2019, 1.17 inches of rain fell directly over the lake while the upper east coast received up to 5 inches of rain. Most of the southern interior received less than 1-inch last week (Figure 4).

The average daily inflows (minus rainfall) to the Lake were higher than the previous week, going from 320 cfs last week to 755 cfs this week. Most of the inflow came from the Kissimmee River (S-65E & S-65EX1) and passive inflow from the S-308, 333 cfs and 325 cfs, respectively. Passive inflow of 80 cfs also occurred at the L-8 structure. Fisheating Creek flows were similar to last week (Table 1).

Outflow (minus evapotranspiration) decreased from the previous week, going from 2,702 cfs to 914 cfs. Flows west through the S-77 decreased from 840 cfs to 404 cfs and flows south through the S-350 structures decreased from 1,590 cfs the previous week to 510 cfs this past week. Outflows to the L-8 Canal via Culvert 10A also decreased from the previous week going from 160 cfs to 0 cfs. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation decreased by 0.15 inches from the previous week to 0.32 inches.

Total lake inflows and outflows for the past week are detailed in Table 1, as well as the approximate change in lake stage from each major structure's total flows over the period. Figure 5 shows the combined average daily cfs for inflows and outflows for the Lake over the past eight weeks. These data are provisional and are subject to change.

The most recent available satellite imagery (December 16, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel 3 OLCI sensor data showed that bloom potential is low lake-wide having decreased in potential in the southwestern portion (Figure 6).

## **Water Management Recommendations**

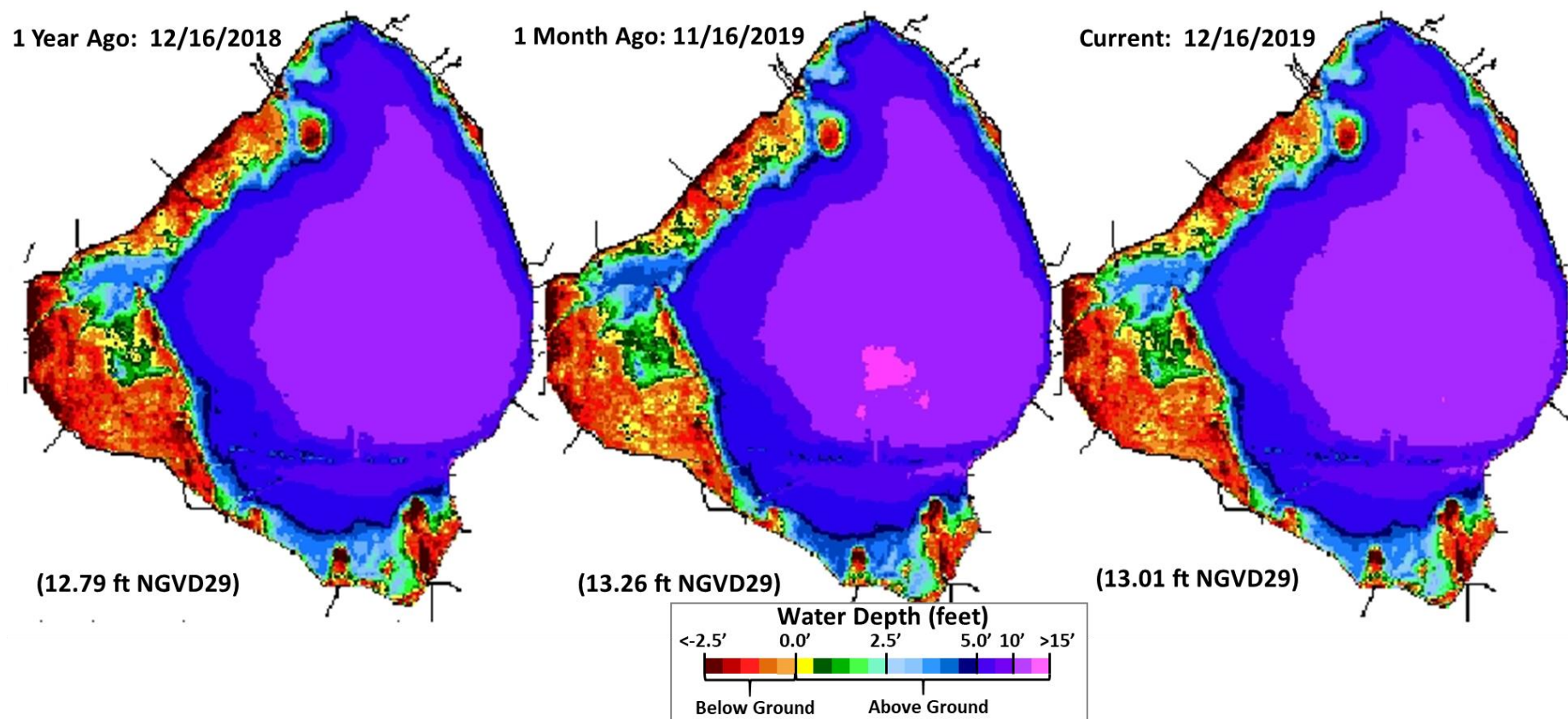
Lake Okeechobee stage was 13.01 feet NGVD on December 16, 2019, up 0.10 feet from the previous week and down 0.25 feet from the previous month. The Lake moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it has remained since. Water levels moved below the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) on October 15, 2019 and are currently 1.49 ft below the bottom of the envelope. Low Lake stages continue to benefit recovering SAV communities, but also stress higher elevation marshes; areas with elevations greater than approximately 14 feet NGVD have now been dry since late October of last year. Low stages throughout 2019 also likely limited prey production in the marsh and is likely to impact wading bird use of the Lake in the 2020 breeding season. The latest estimate of cyanobacteria bloom potential (December 16, 2019) shows that estimated bloom potential is at low- to no-risk.

**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	306	333	0.1
S-71 & S-72	0	0	0.0
S-84 & S-84X	0	0	0.0
Fisheating Creek	15	13	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	0	4	0.0
S-131 P	0	0	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		80	0.0
Rainfall	0	2616	1.2
<b>Total</b>	<b>320</b>	<b>3046</b>	<b>1.4</b>

OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-77	840	404	0.2
S-308	122	-325	-0.1
S-351	798	186	0.1
S-352	360	99	0.0
S-354	428	225	0.1
L-8 Outflow	160		
ET	1050	707	0.3
<b>Total</b>	<b>3759</b>	<b>1296</b>	<b>0.6</b>

Provisional Data



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

## Lake Okeechobee Stage vs Ecological Envelope

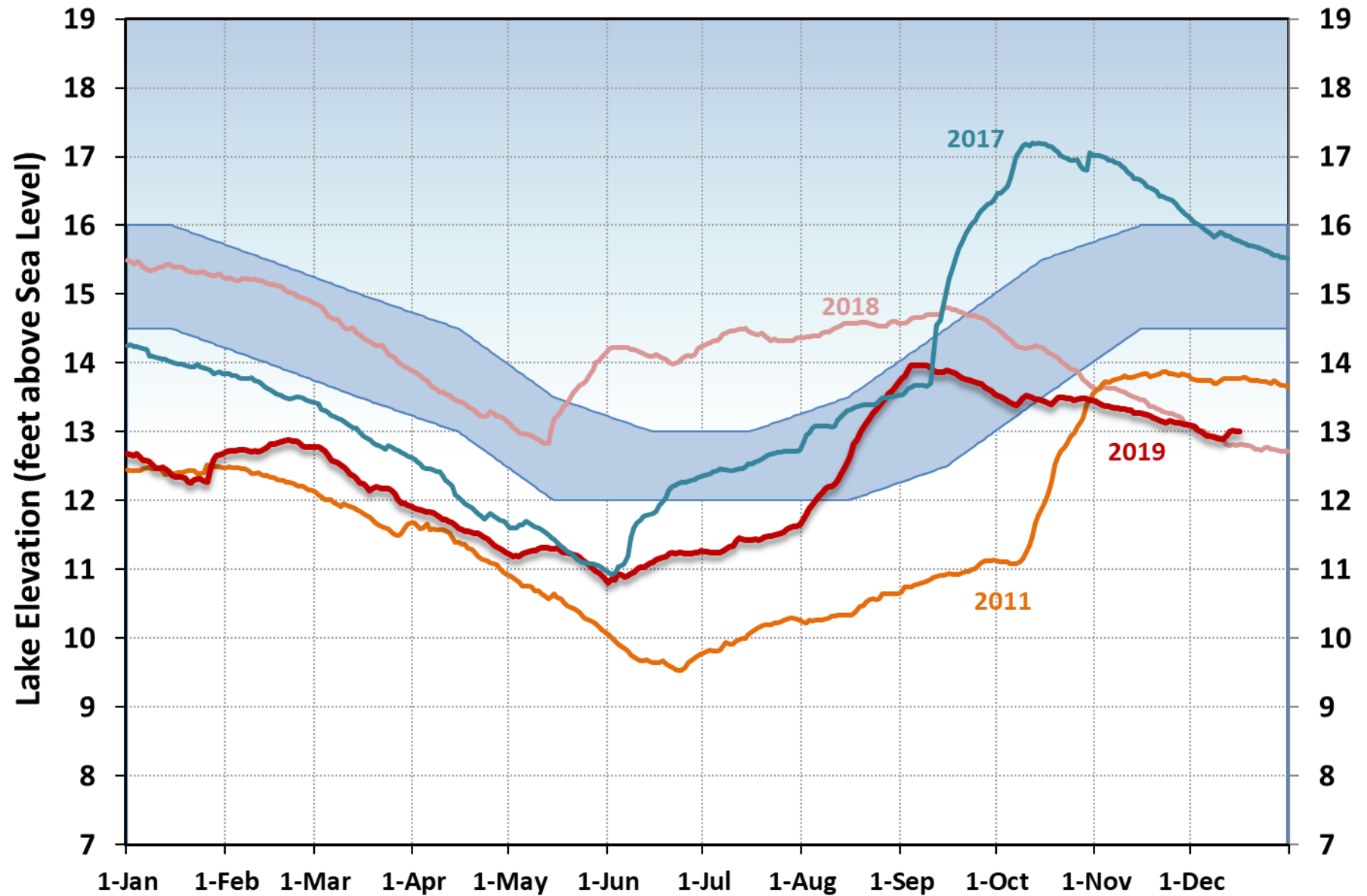
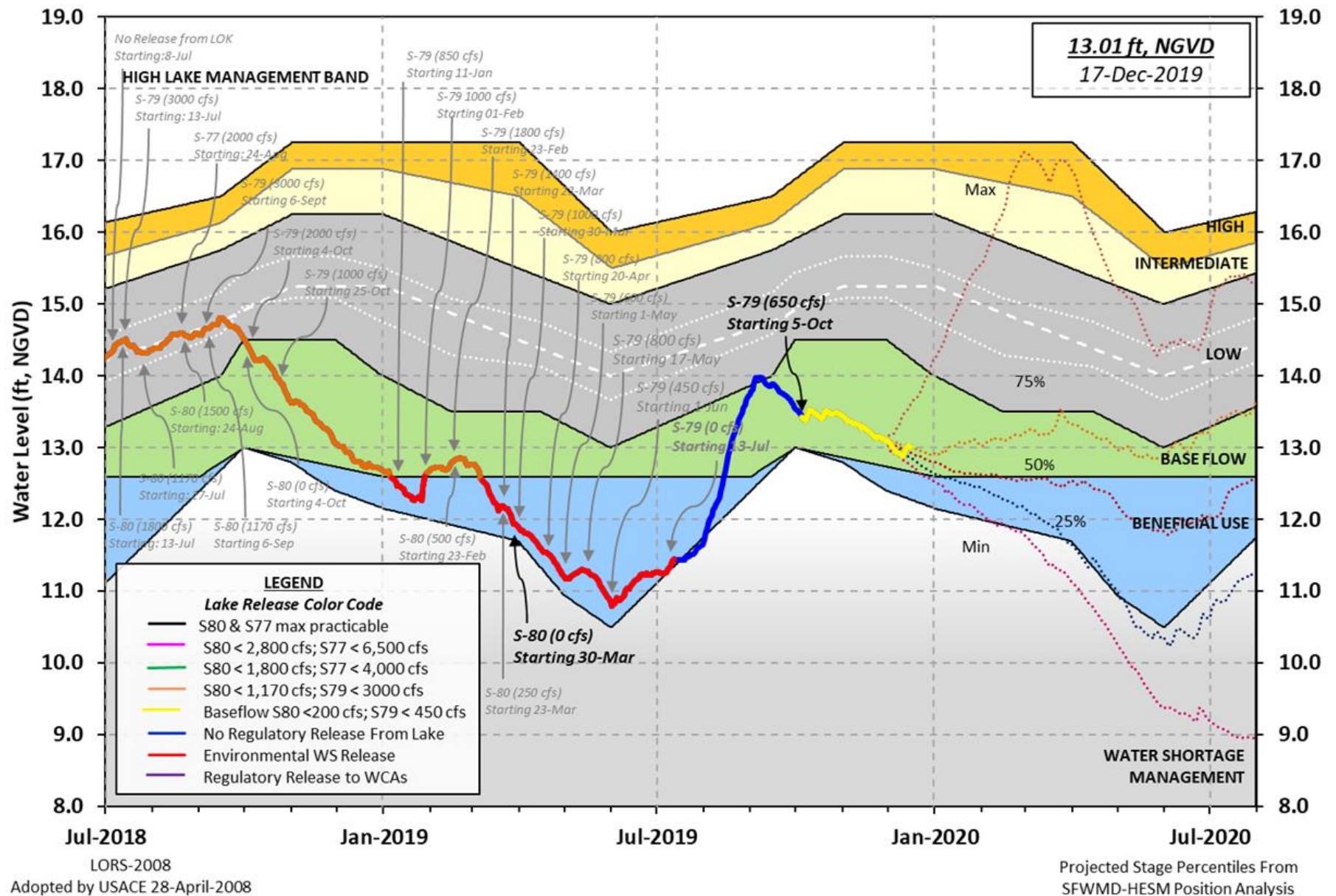


Figure 2. Select annual stage hydrographs for Lake Okeechobee in comparison to the Ecological Envelope.

# Lake Okeechobee Water Level History and Projected Stages



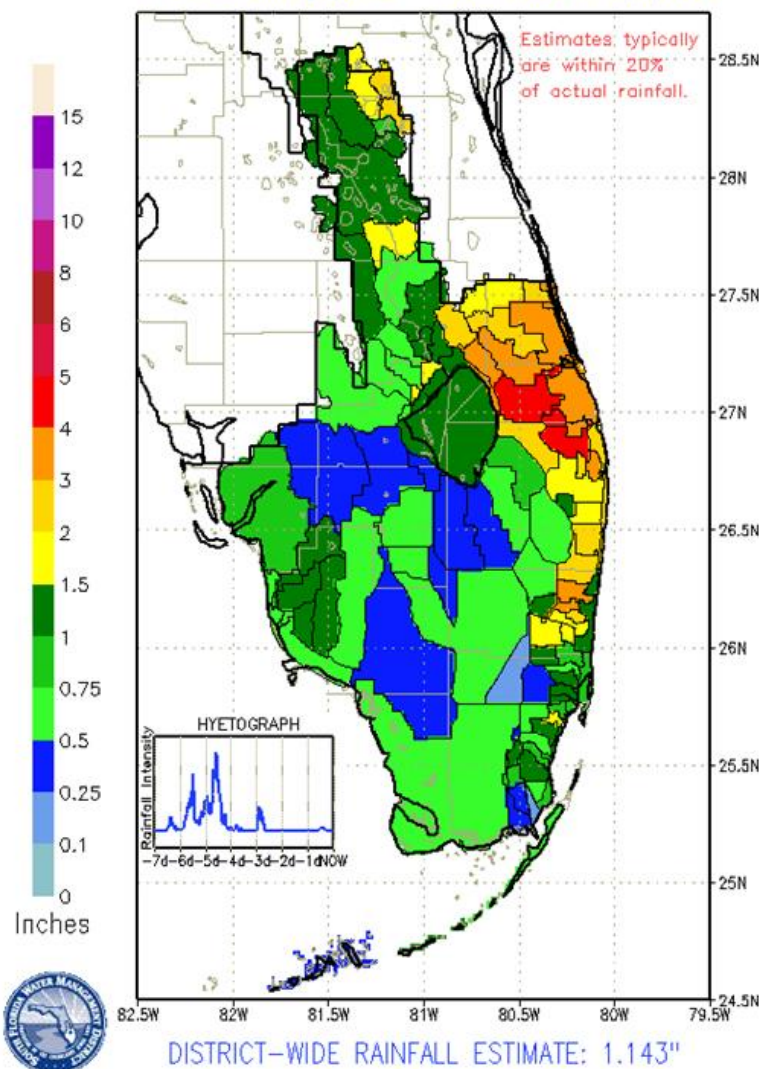
**Figure 3.** Recent Lake Okeechobee stage and releases, with projected stages based on a dynamic position analysis.



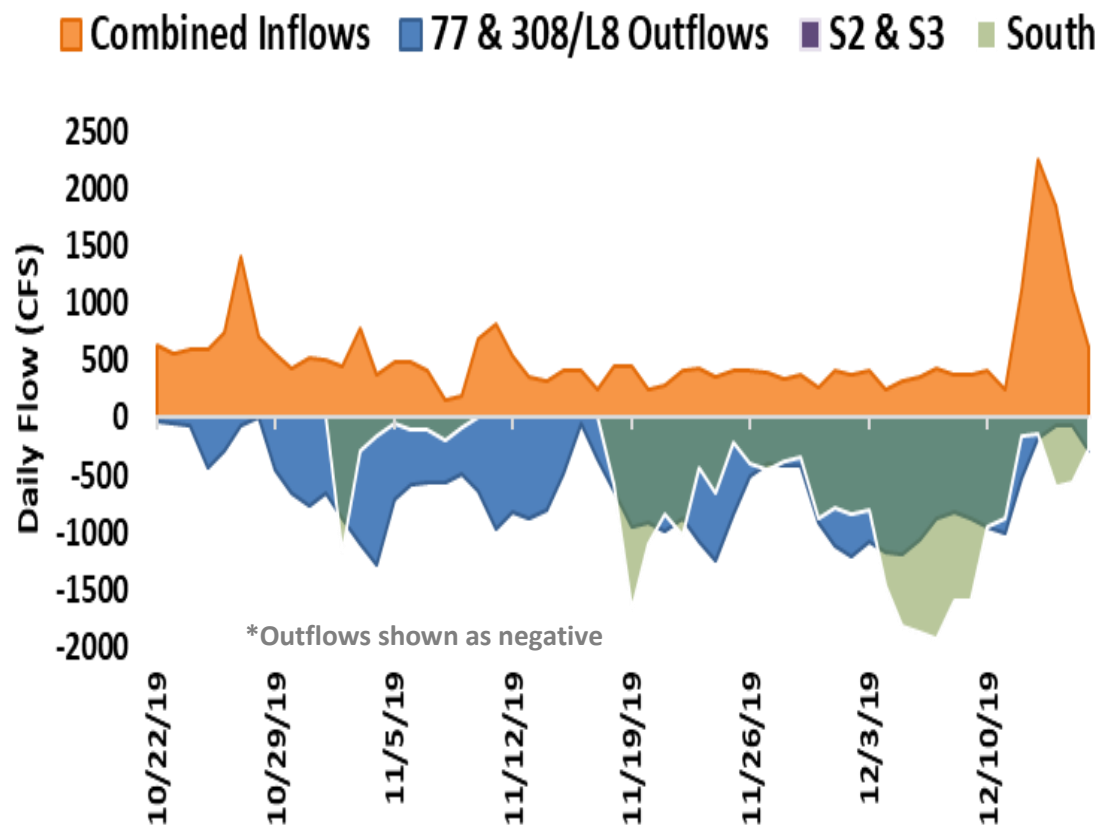
# SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES

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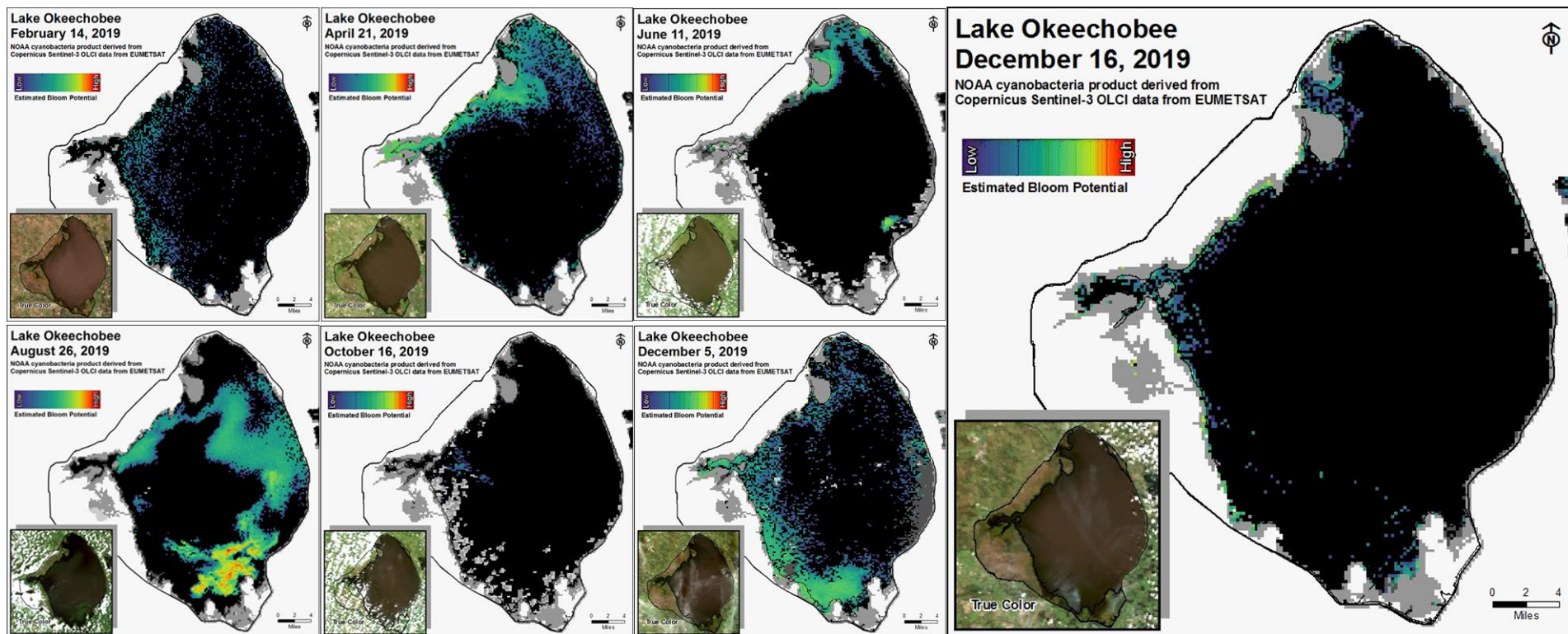
THROUGH: 0630 EST, 12/17/2019



**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. Outflows through the S-77 and S-308 structures are shown based on their downstream gauges to account for lock openings for navigation.



**Figure 6.** Potential for cyanobacterial blooms on Lake Okeechobee in 2019, based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover.

## **ESTUARIES**

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

Last week total inflow to the St. Lucie Estuary averaged approximately 1690 cfs (Figures 1 and 2) and last month inflow averaged about 541 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	1256
S-80	0
S-308	-405
S-49 on C-24	92.
S-97 on C-23	323
Gordy Rd. structure on Ten Mile Creek	119

Over the past week, salinity increased 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 23.2. Salinity conditions in the middle estuary are estimated to be within the good range for adult eastern oysters (Figure 3).

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

<b>Sampling Site</b>	<b>Surface</b>	<b>Bottom</b>	<b>Envelope</b>
HR1 (North Fork)	<b>15.4</b> (18.8)	<b>20.4</b> (22.2)	NA <sup>1</sup>
US1 Bridge	<b>19.4</b> (22.7)	<b>20.2</b> (23.9)	10.0-26.0
A1A Bridge	<b>25.5</b> (28.2)	<b>27.6</b> (29.8)	NA <sup>1</sup>

<sup>1</sup>Envelope not applicable

### **Caloosahatchee Estuary:**

Last week total inflow to the Caloosahatchee Estuary averaged approximately 661 cfs (Figures 5 and 6) and last month inflow averaged about 769 cfs. Last week's provisional averaged inflows from the structures are shown in Table 3.

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

<b>Location</b>	<b>Flow (cfs)</b>
S-77	422
S-78	378
S-79	571
Tidal Basin Inflow	90

Over the past week, surface 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 at Shell Point and in the fair range at Sanibel (Figure 9). The seven-day average surface salinities (Table 4) are in the good range for Tape Grass at Val I-75 and in the fair range 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 reflects the preferred salinity range for associated sampling sites.

Sampling Site	Surface		Bottom	Envelope
S-79 (Franklin Lock)	<b>5.9</b> (5.7)		<b>6.0</b> (5.8)	NA <sup>1</sup>
Val I75	<b>7.2</b> (6.2)		<b>8.6</b> (8.6)	0.0-5.0 <sup>2</sup>
Ft. Myers Yacht Basin	<b>13.3</b> (12.2)		<b>13.9</b> (15.2)	NA
Cape Coral	<b>19.5</b> (18.8)		<b>20.9</b> (20.6)	10.0-30.0
Shell Point	<b>29.4</b> (27.9)		<b>29.6</b> (28.2)	10.0-30.0
Sanibel	<b>31.9</b> (31.1)		<b>32.5</b> (31.1)	10.0-30.0

<sup>1</sup>Envelope not applicable and <sup>2</sup>Envelope is based on a 2-week forecast 30-day average (see Table 5 below).

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 4.8 to 9.8 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 800 cfs and Tidal Basin inflows of 80 cfs. The 30-day moving average surface salinity at Val I-75 is forecast to be between 5.8 and 7.7 within two weeks (Table 5). This and the current salinity conditions at Val I-75 outside the envelope of salinity 0.0-5.0 for this site (Table 4) indicate that the estuary would benefit from additional water.

**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	80	9.8	7.7
B	300	80	8.0	7.0
C	450	80	6.6	6.3
D	650	80	5.0	5.8
E	800	80	4.8	5.8

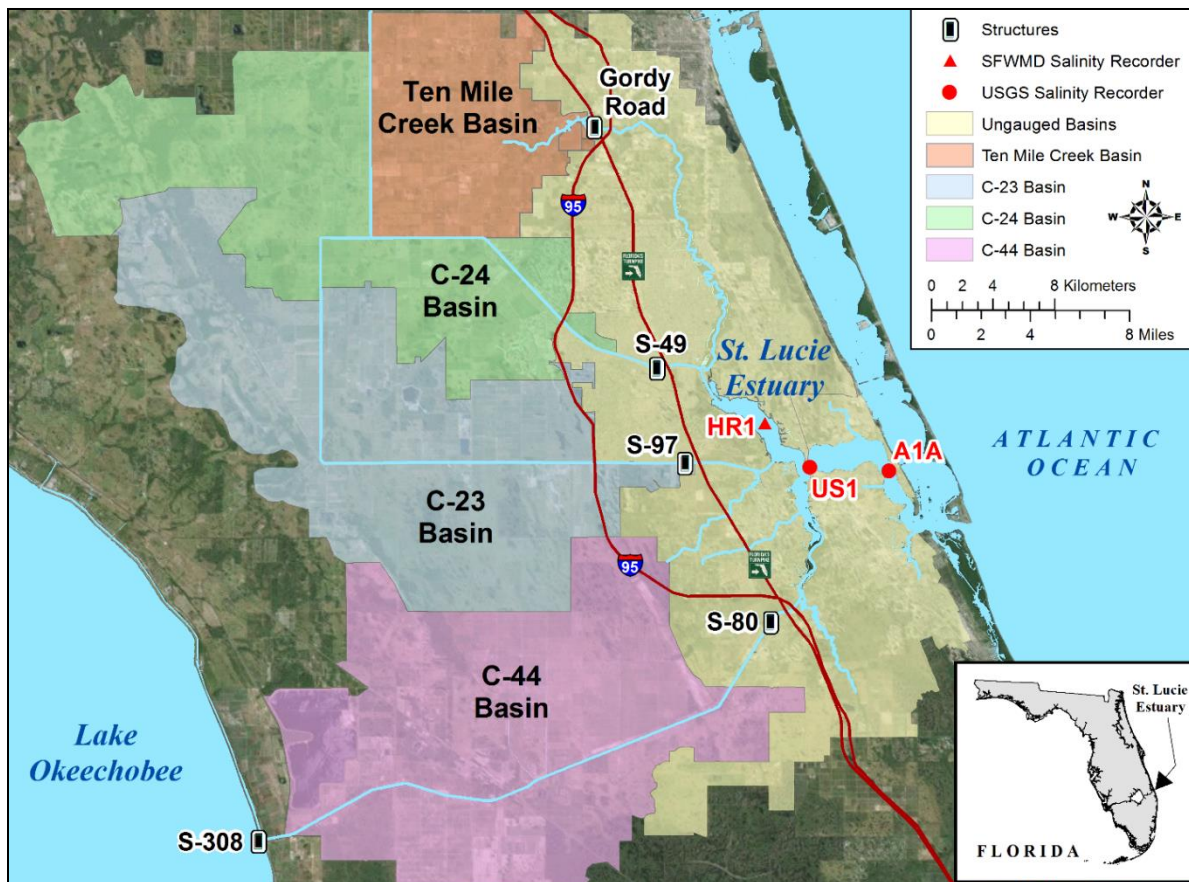
### Red tide

The Florida Fish and Wildlife Research Institute reported on December 13, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background to medium concentrations in 17 samples collected from and/or offshore of Lee County. *Karenia brevis* was not observed in samples collected from St. Lucie, Martin, Palm Beach Broward or Miami-Dade counties. Respiratory irritation was received in Lee County.

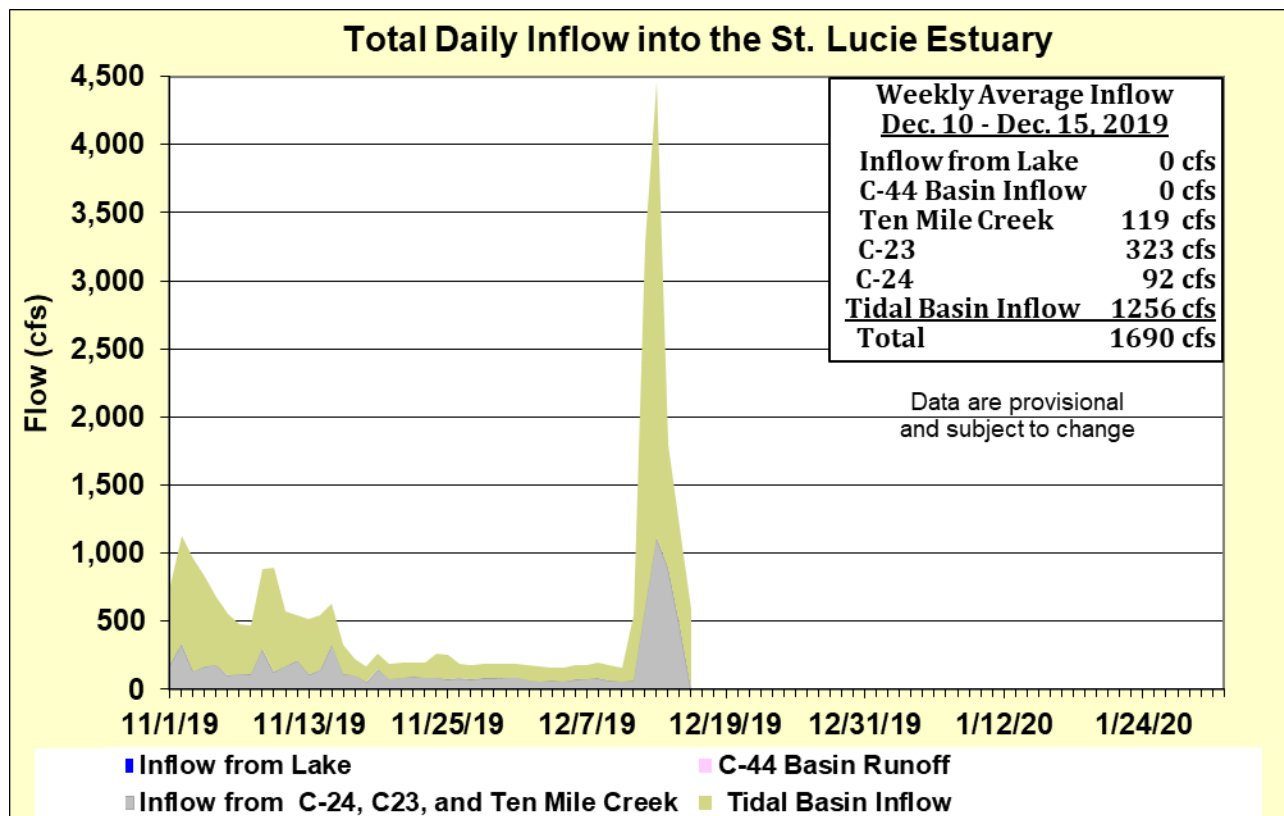
### Water Management Recommendations

Lake stage is in the Base Flow sub-band. Tributary conditions are dry. The 30-day moving average of surface salinity at Val I-75 is predicted to exceed 5 over the next two weeks. SFWMD's Lake Okeechobee Adaptive Protocol's Release Guidance suggests up to 450 cfs @ S-79 and S-77 baseflow release to supplement as needed.



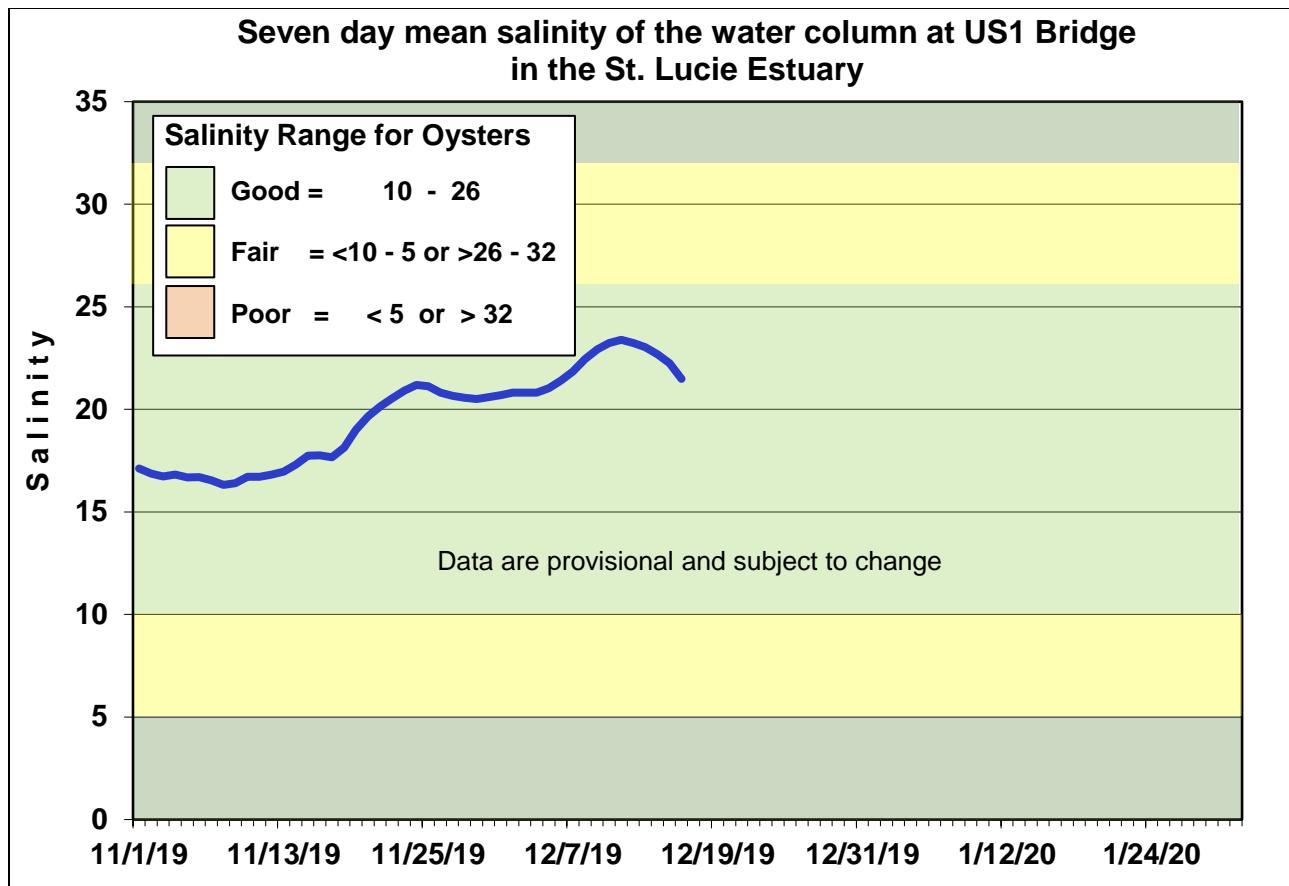


**Figure 1.** Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

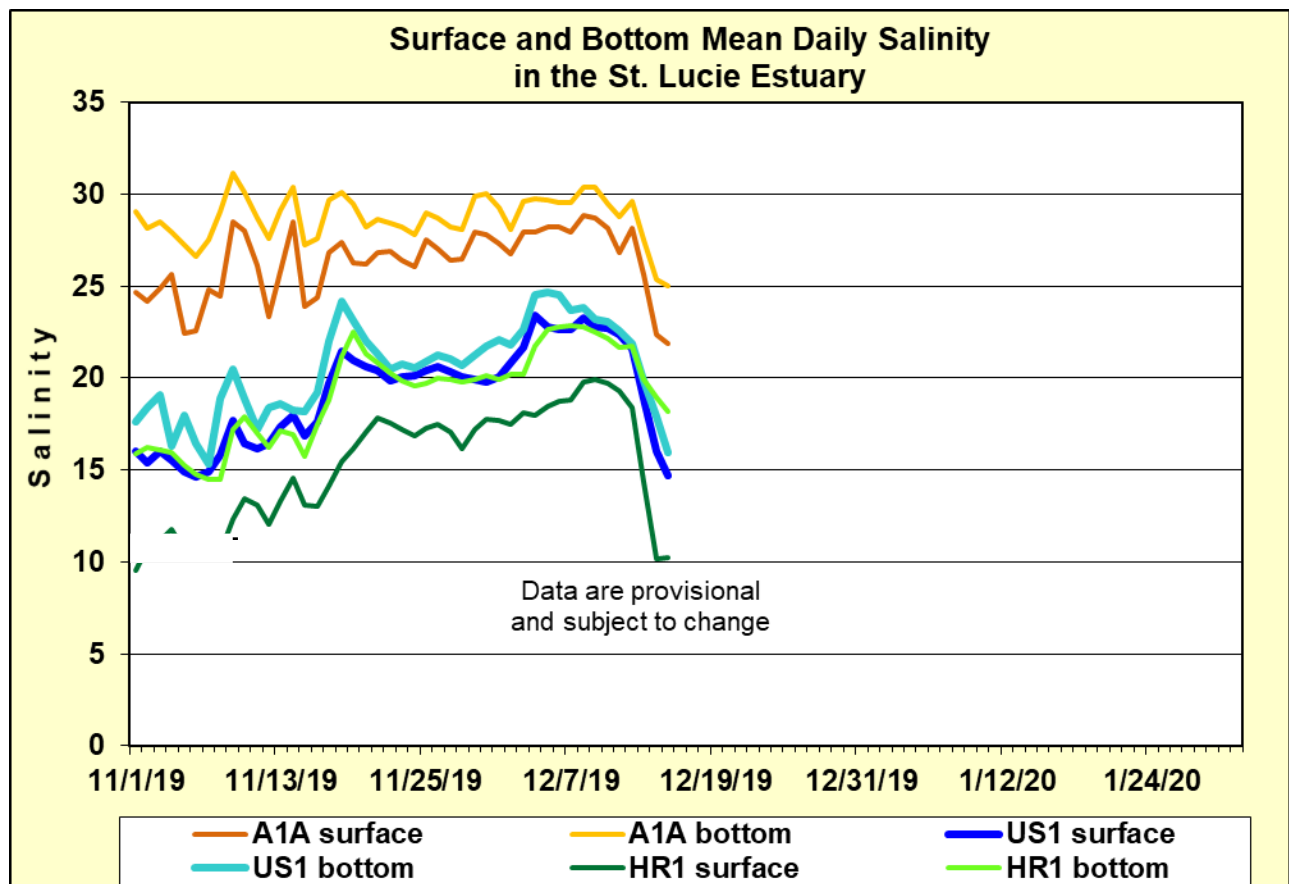


**Figure 2.** Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basin into the St. Lucie Estuary.





**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.

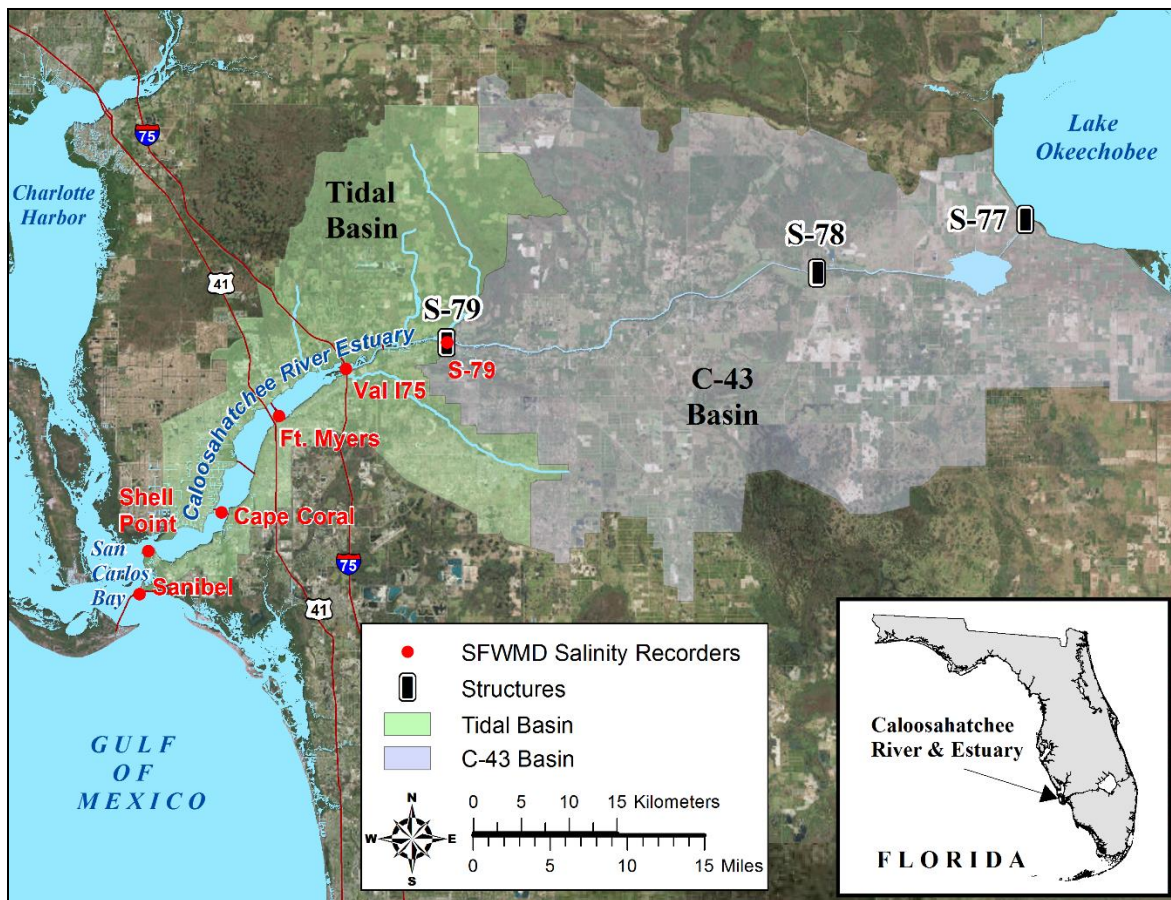


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

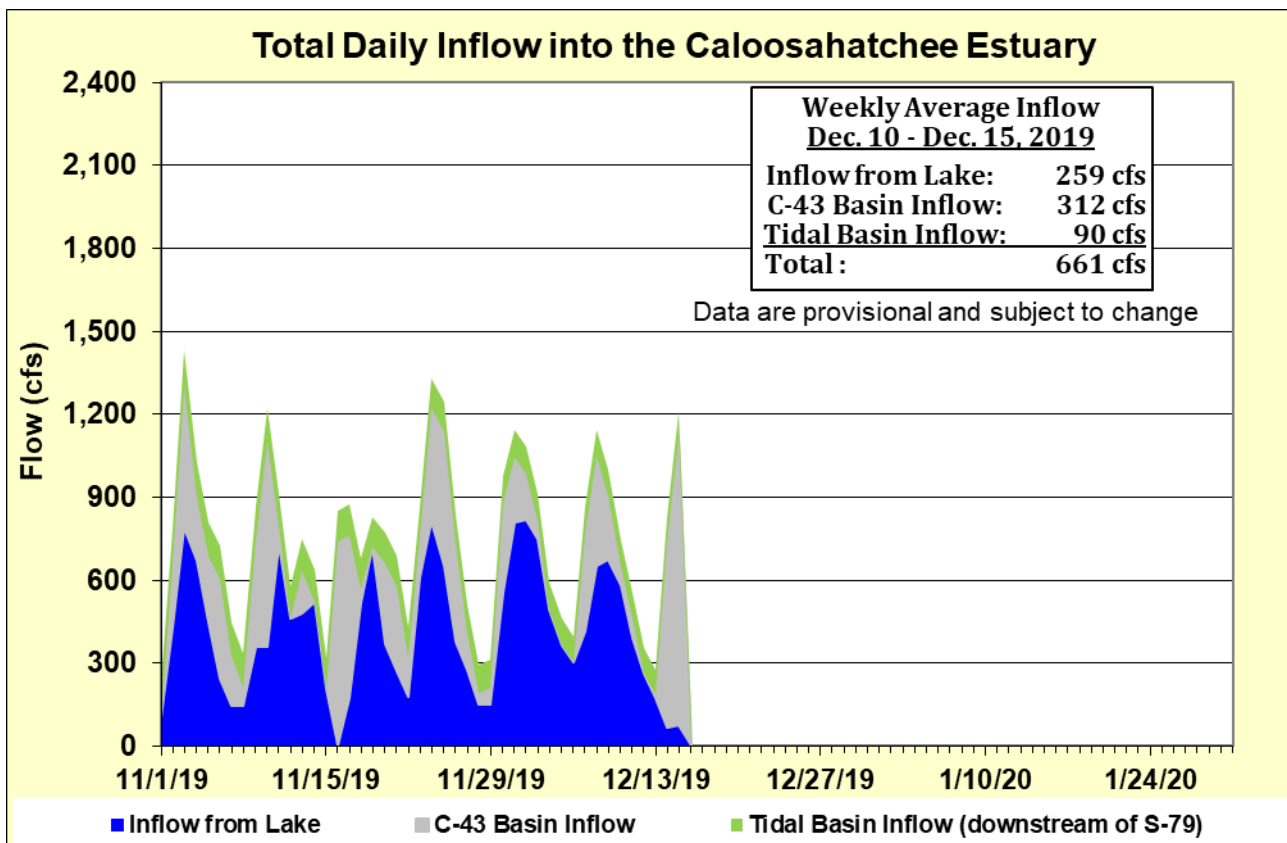
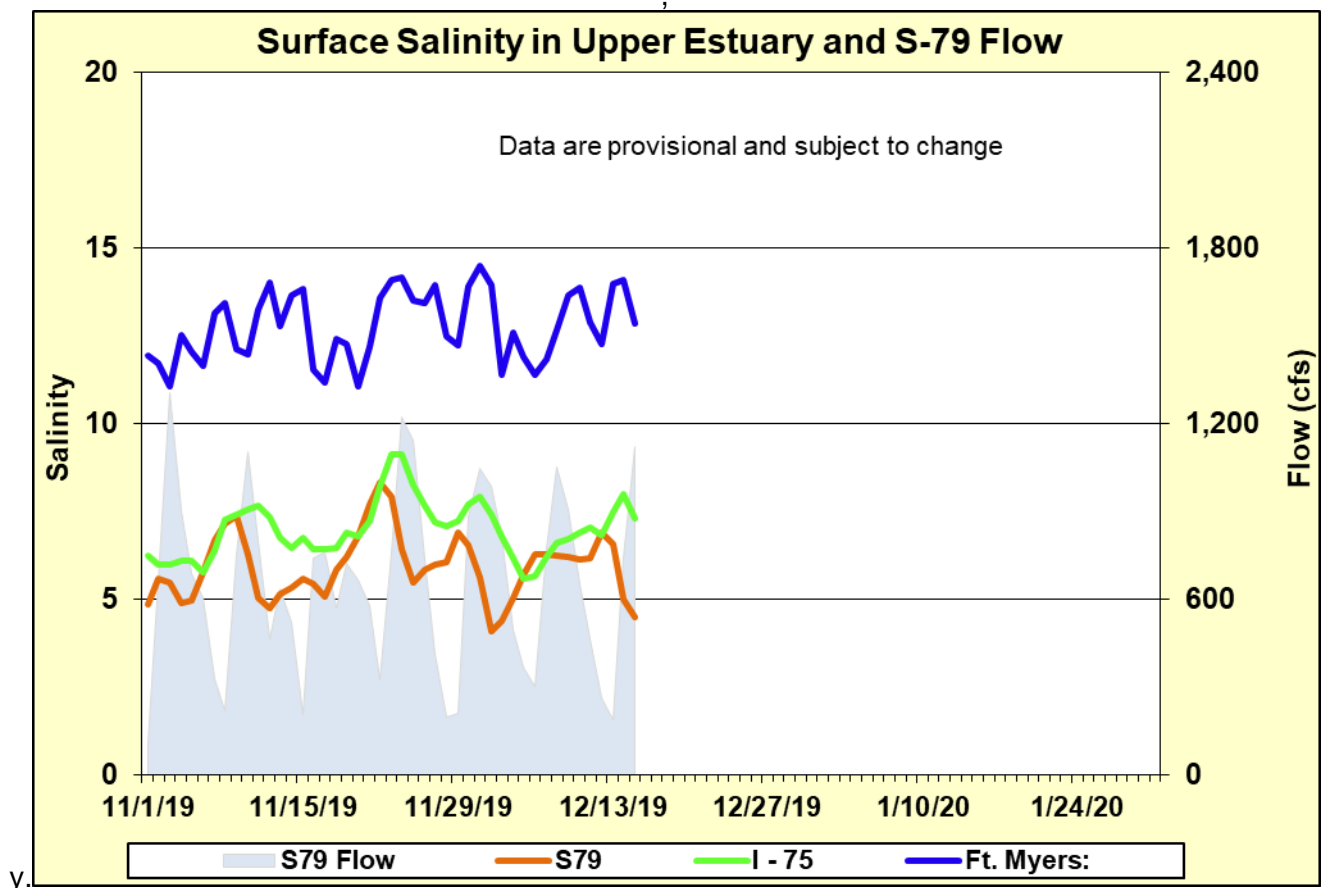
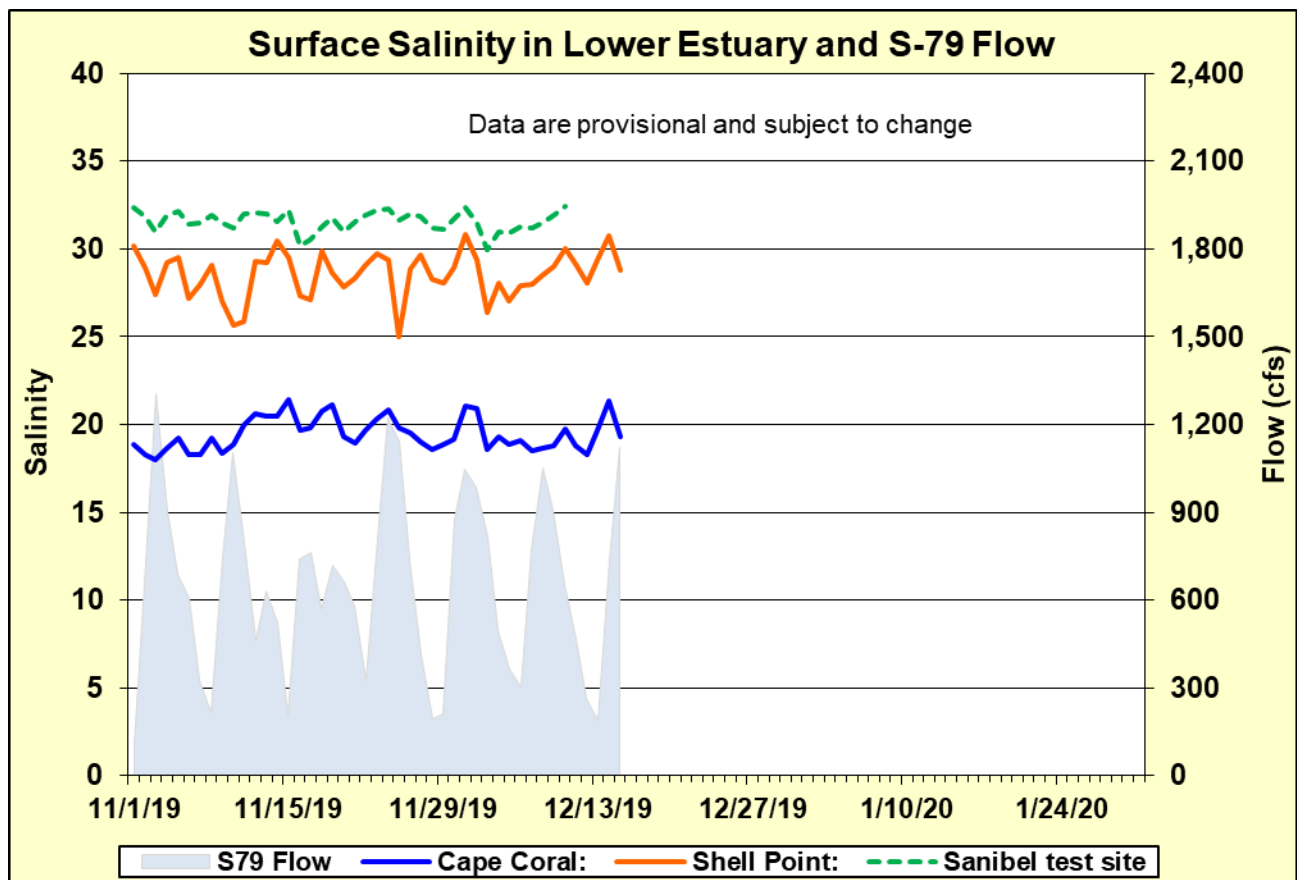


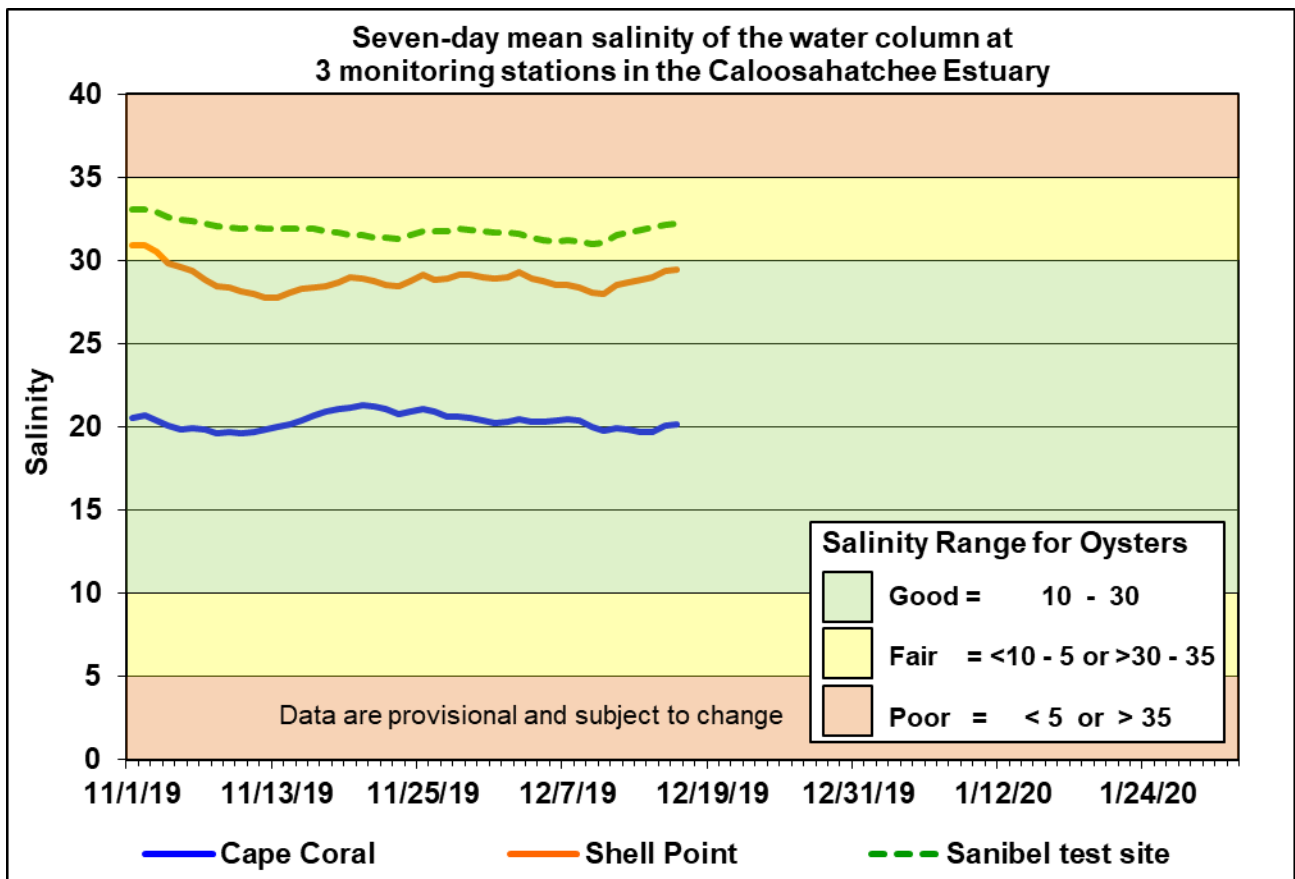
Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin



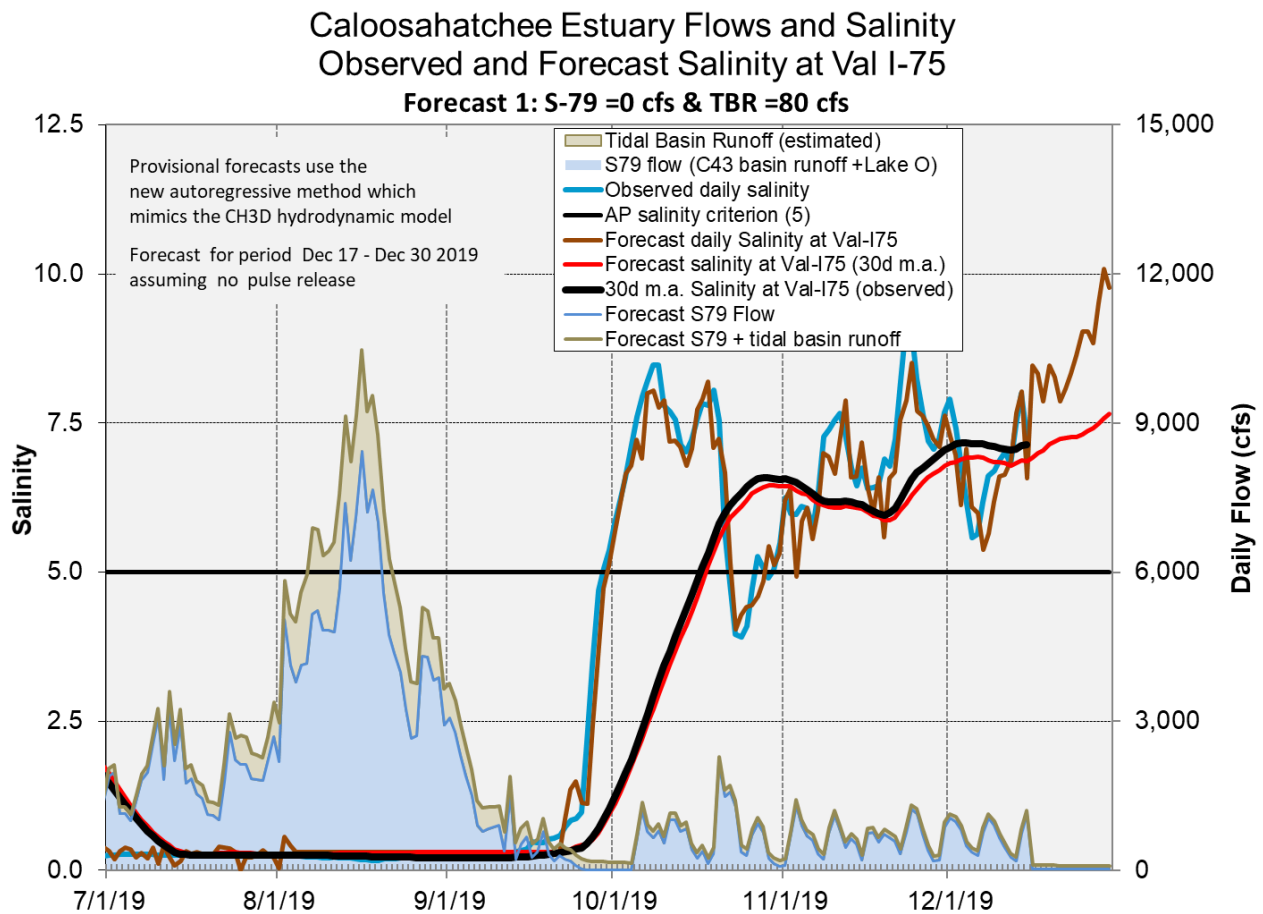
**Figure 7.** Daily mean flows at S-79 and salinity at upper estuary monitoring stations.



**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.



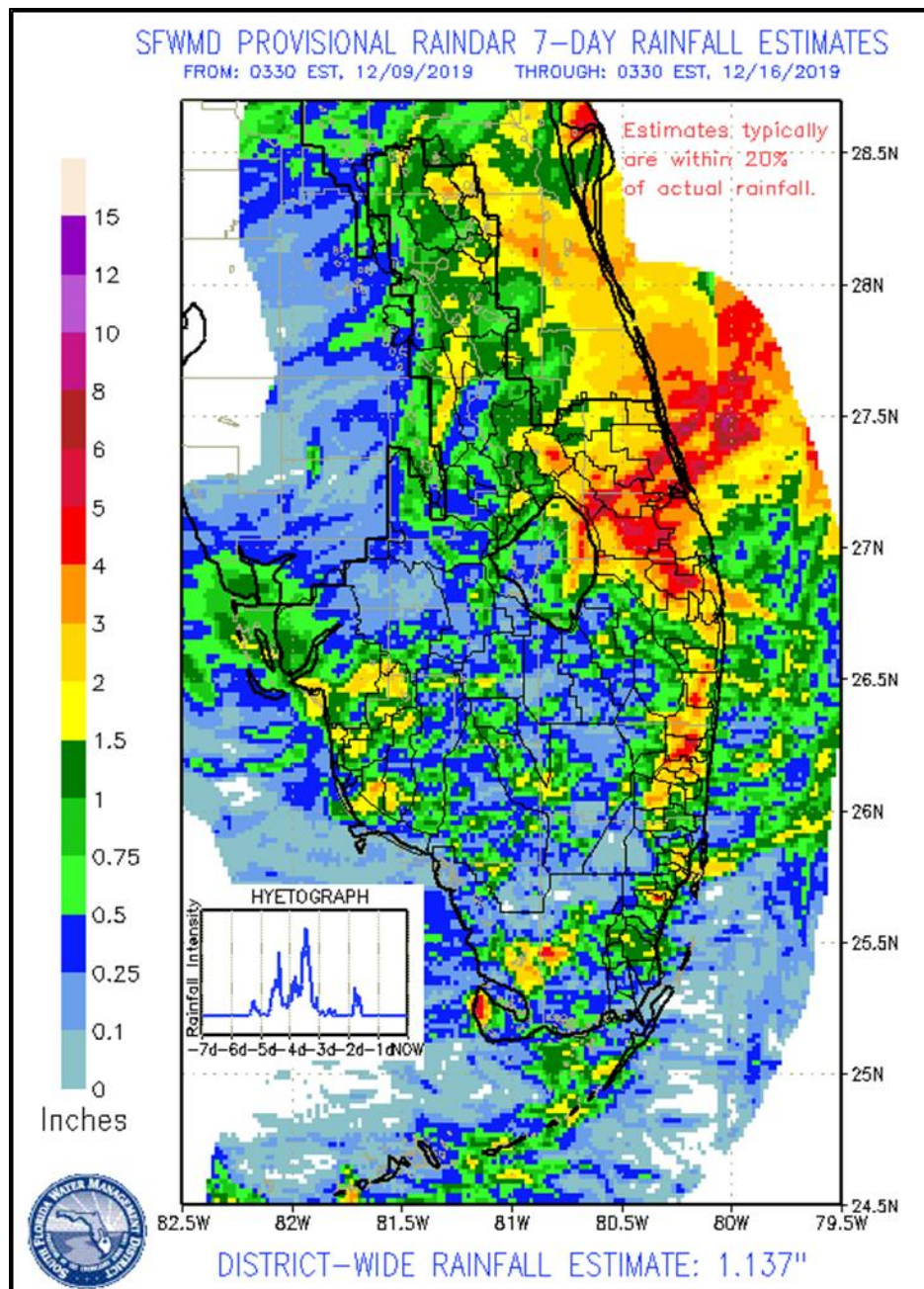
**Figure 10.** Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

## **EVERGLADES**

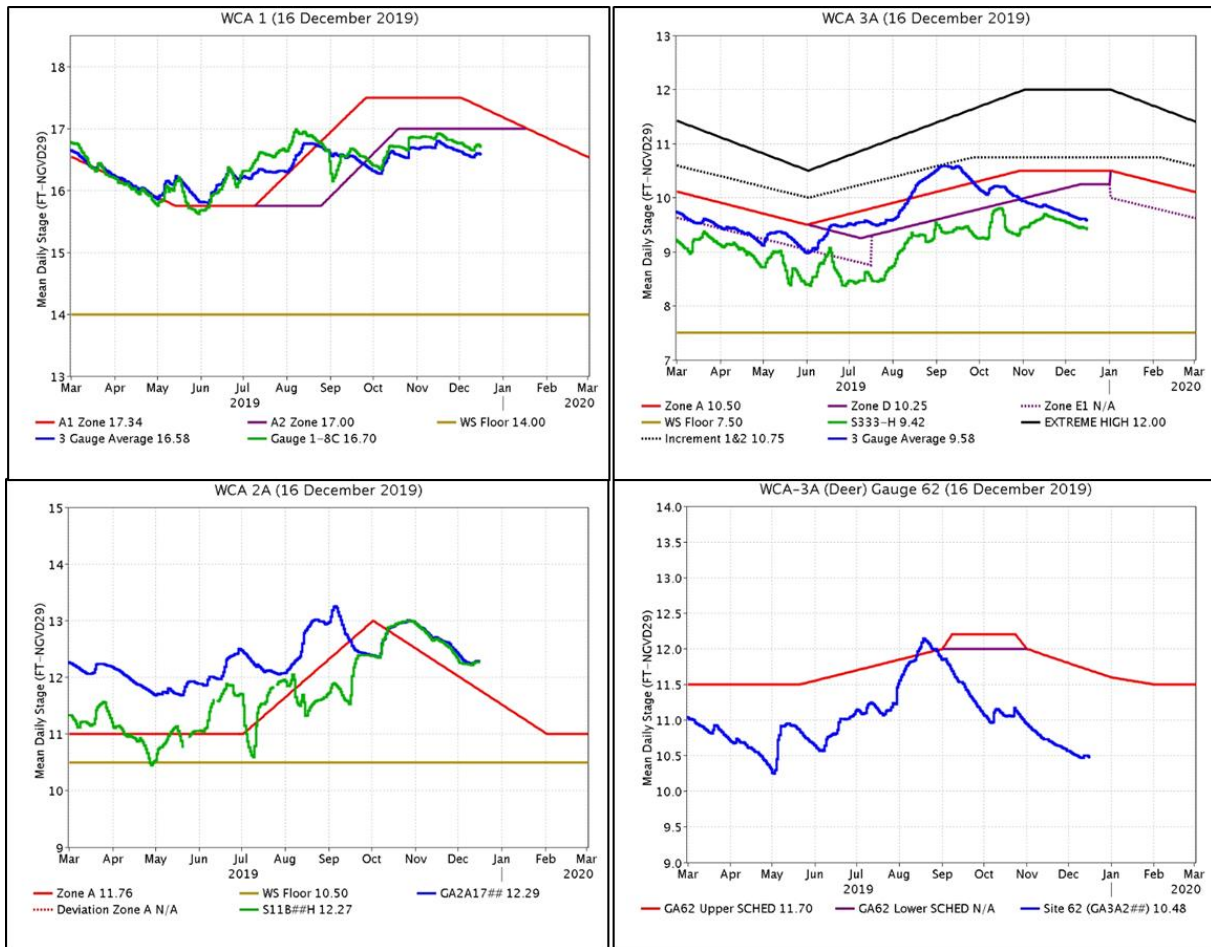
A much needed, above average amount of rainfall occurred within the Everglades last week. The average weekly change at the gauges monitored for this report was a -0.02 feet. Pan evaporation was estimated at 0.92 inches.

<b>Everglades Region</b>	<b>Rainfall (Inches)</b>	<b>Stage Change (feet)</b>
WCA-1	0.75	+0.03
WCA-2A	0.72	+0.03
WCA-2B	1.09	-0.02
WCA-3A	0.55	-0.03
WCA-3B	0.17	-0.06
ENP	0.67	-0.11





Regulation Schedules: WCA-1: The three-gauge average stage trends upwards towards the flat Zone A2 regulation line last week, currently 0.42 feet. WCA-2A: Over the last week the marsh stage at gauge GA2A17 ascended away from falling Zone A regulation line, now 0.53 feet above. WCA-3A: The three-gauge average stage continues to trend downward away from schedule over last week, currently 0.67 feet below the flat Zone D regulation line. WCA-3A: At gauge 62 (northwest corner) remained steady over the last week, though well under the falling upper schedule at 1.22 feet below.

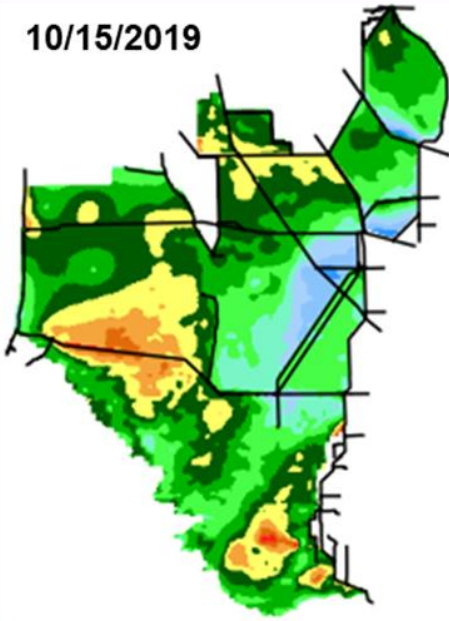


Water Depths: The WDAT tool for spatial interpolation of depth monthly snapshots indicate depths at or below ground across most of WCA-3A North, and new over the last three weeks in that basin depths have reached more than 0.5' below ground across the northern boundary of that basin. Depths range from 2.5 to 4.0 feet across most of WCA-2B. Hydrologic connectivity remains in SRS and Taylor slough, and diminished but still present in Lostman's. Comparing WDAT water levels from present, water depths over the last month are lower across the Everglades. Significant recessions nearing -1.0 feet occurred in northern WCA-3A and southern WCA-2A. Looking back one year the stage differences are mixed in WCA-3A with the northwest corner significantly drier and the rest of the basin slightly wetter. WCA-1 is significantly wetter especially in the northern region and WCA-2A is mixed. December of 2018 was a relatively dry time with below average stages and rainfall.

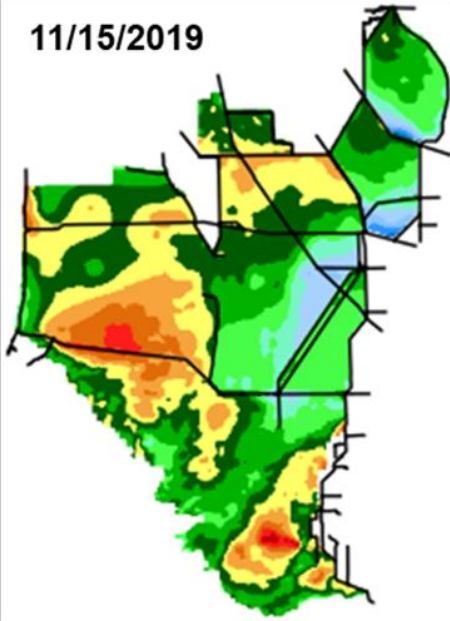


## SFWDAT Water Depth Monthly Snapshots

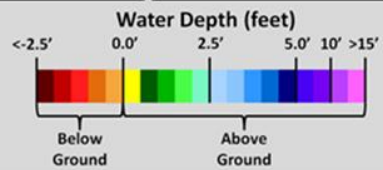
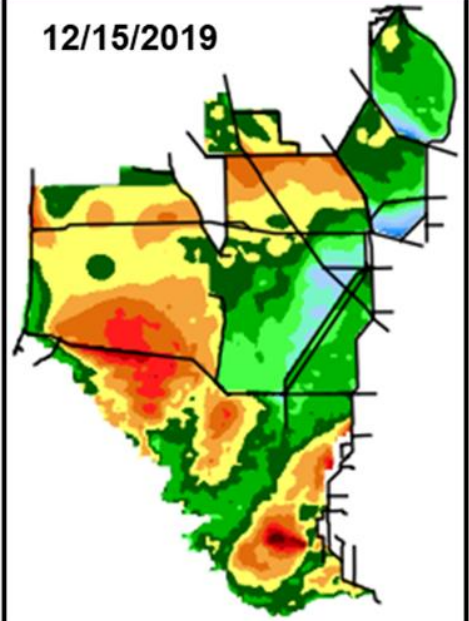
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12/15/2019

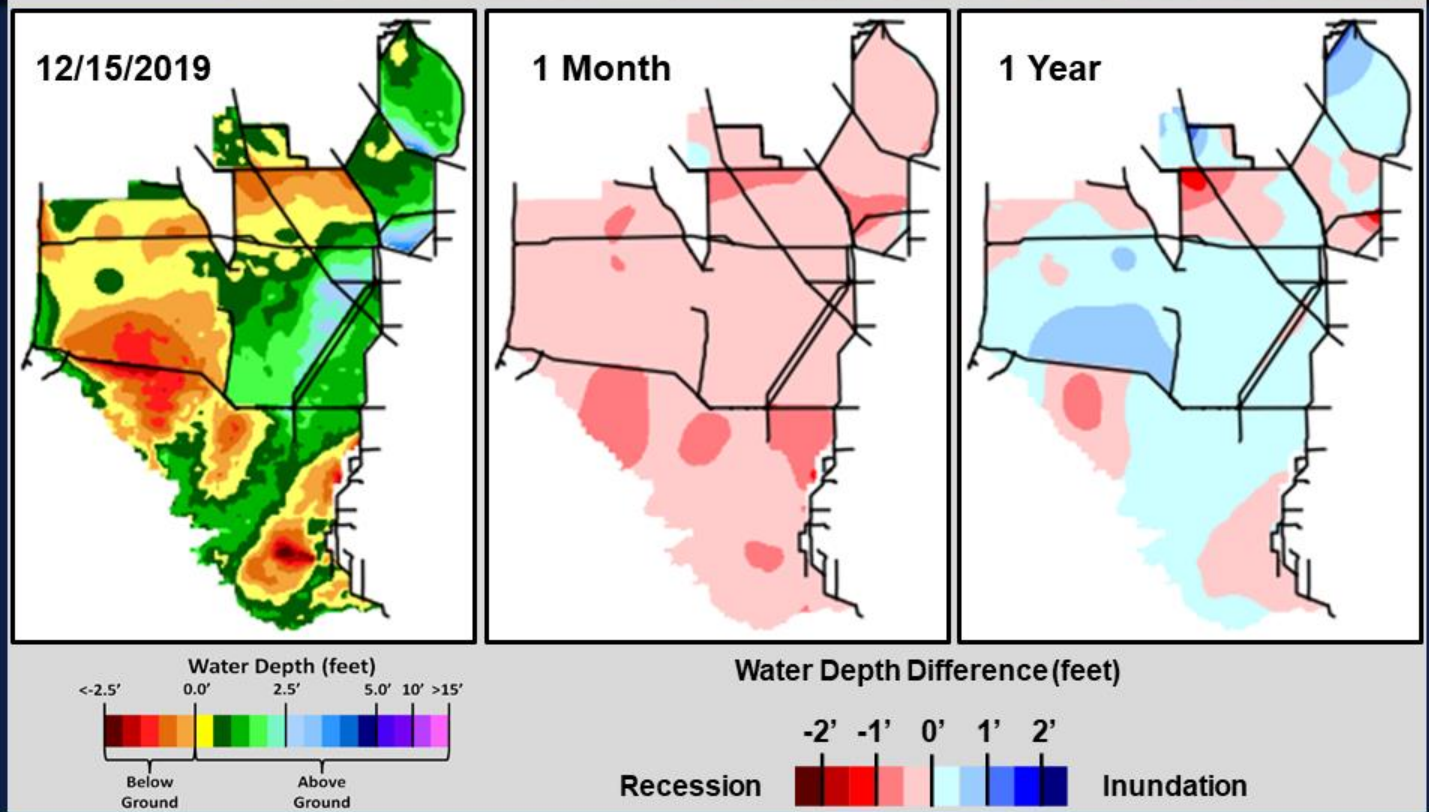


South Florida Water Depth Assessment Tool (SFWDAT)





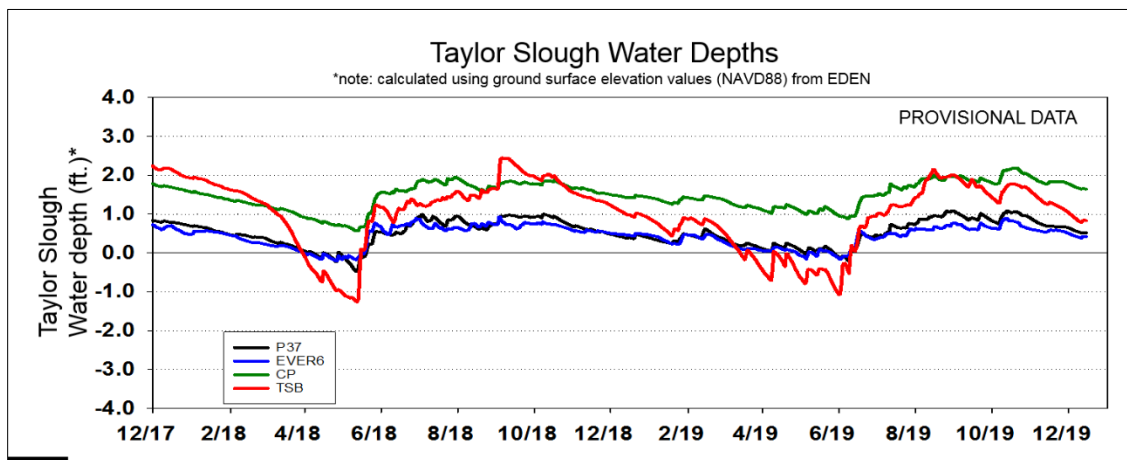
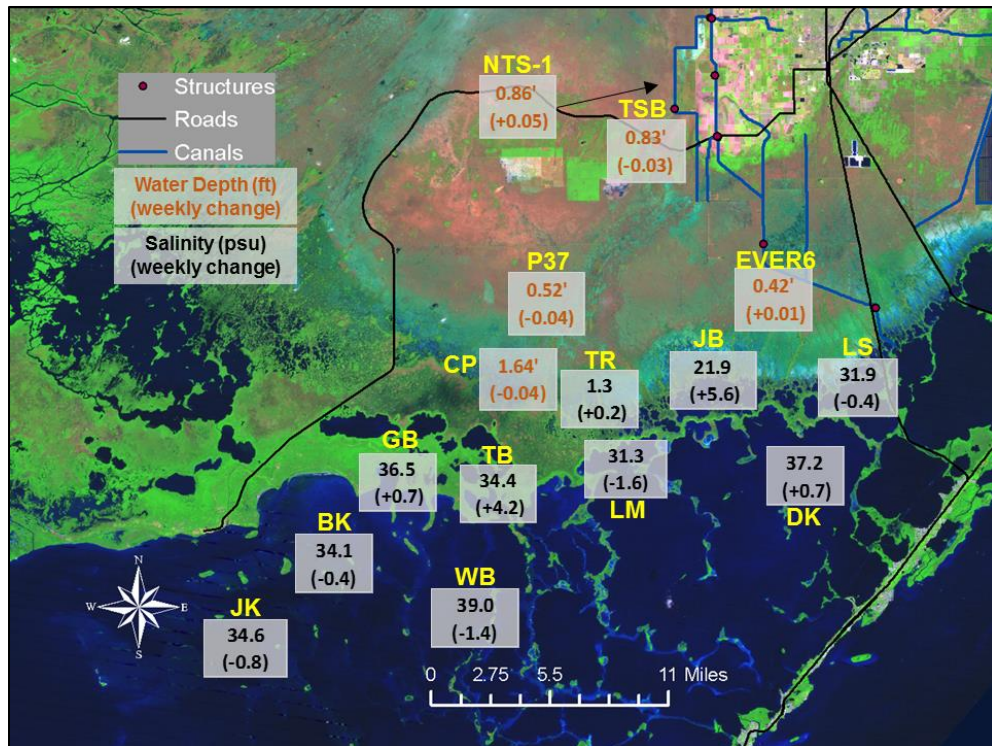
## SFWDAT Everglades Difference Maps (Present – Past)



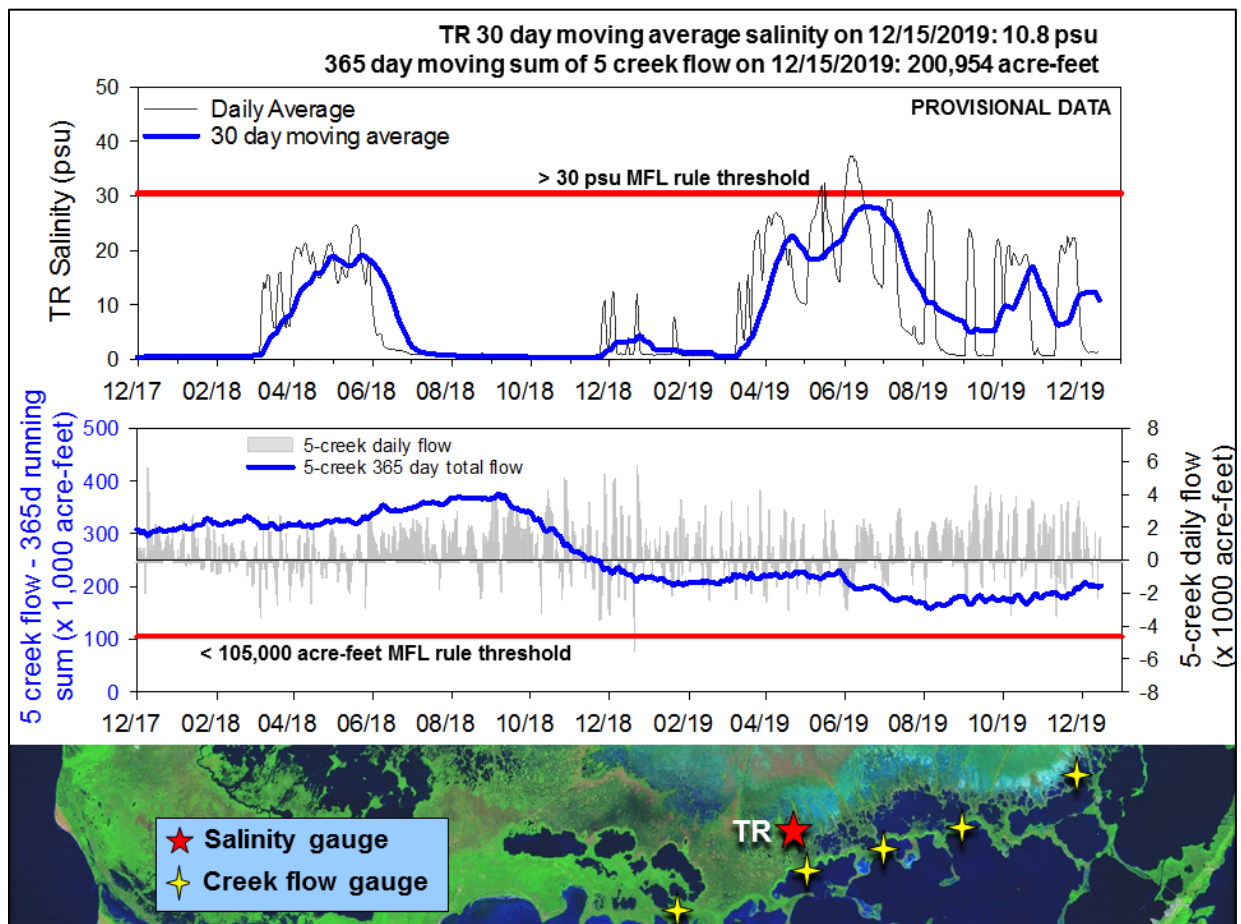
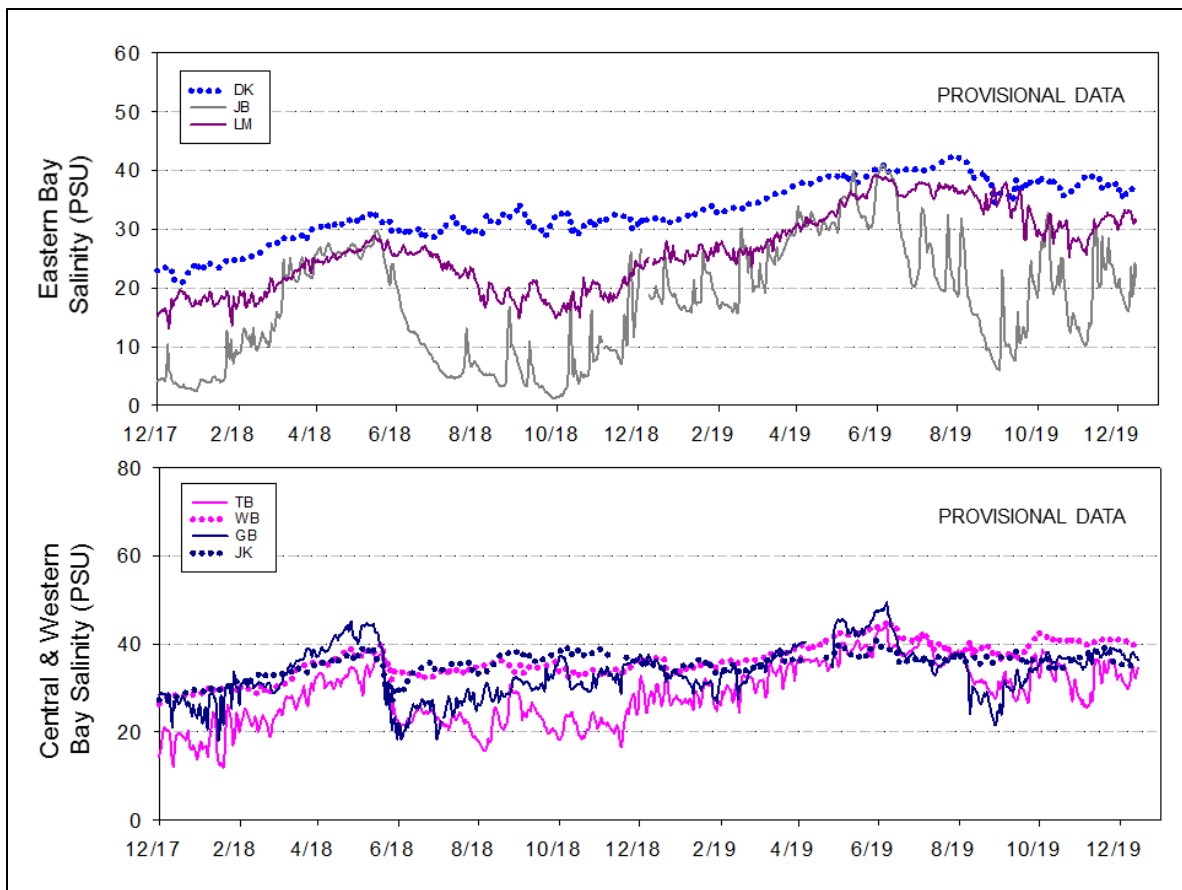
**South Florida Water Depth Assessment Tool (SFWDAT)**

**Taylor Slough Water Levels:** An average of 0.49 inches of rain fell over Taylor Slough and Florida Bay this last week, which slowed the decrease in stage to 0.01 feet for the week in this region. Northern Taylor Slough (TSB) is an inch below its historical average, but the area just to the north (west of S-332D impoundment) is about 5 inches higher than its historical average.

**Florida Bay Salinities:** Average salinity in Florida Bay held steady at 33 psu this past week which is 9 psu above average. It is very concerning that there is little estuarine gradient (spatial variability) within the bay this early in the dry season and that there is little ability to increase freshwater delivery through the slough before it dries out this year.







Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) stayed between 1.0 and 1.4 psu over the past week. The 30-day moving average ended at 10.8 psu (1.5 psu lower than last week). Weekly flow from the 5 creeks identified by yellow stars on the map totaled about -1,000 acre-feet last week with alternating positive and negative flows every other day. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) decreased about 400 acre-feet this week to end at 200,954 acre-feet, still just above the 25th percentile (190,165 acre-feet). Creek flow are provisional USGS data.

### **Water Management Recommendations**

Current stages in the WCAs are low for this time of year and salinities are high in Florida Bay. Conserving water within the WCAs and moving low nutrient water south has many ecological benefits. Maintaining saturated soils in over-drained portions of the Everglades conserves peat and lowers the risk of muck fires. 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. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

<b>SFWMD Everglades Ecological Recommendations, December 17th, 2019 (red is new)</b>			
Area	Weekly change	Recommendation	Reasons
WCA-1	Stage increased by 0.03'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2A	Stage increased by 0.03'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2B	Stage decreased by 0.02'	Conserving water in this basin has benefit as current water depths are below seasonal averages.	Protect within basin habitat and wildlife.
WCA-3A NE	Stage decreased by 0.05'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect stage conditions conducive to wading bird foraging and peat soil conservation.
WCA-3A NW	Stage remained unchanged	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	
Central WCA-3A S	Stage decreased by 0.05'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect upstream/downstream habitat and wildlife.
Southern WCA-3A S	Stage decreased by 0.03'		
WCA-3B	Stage decreased by 0.06'	Conserving water in this basin has benefit as current water depths are below seasonal averages.	Protect tree islands, upstream/downstream habitat and wildlife.
ENP-SRS	Stage decreased by 0.11'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from -0.04 to +0.05'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions.
FB- Salinity	Salinity changes ranged -1.6 to +5.6 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.