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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: October 23, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

A weak cold front located over the central Florida Panhandle this morning should move into north-central Florida by this evening and push through the northern half of the District during the early morning hours on Wednesday. Well ahead of the front, a pool of greater moisture/instability off the east coast of Florida is expected to move onshore throughout the day, with the axis of greatest moisture likely extending from the southern interior of the District to the upper east coast by this afternoon. Some shower activity associated with the region of enhanced moisture could reach the east coast this morning while weakening, followed by a pause in rains. This afternoon after peak surface heating a good supply of moisture, enhanced instability, and increasing low-level convergence (southeasterly winds intersecting southwesterly winds in the middle of the District) should help to trigger widely scattered or scattered showers and a few thunderstorms from the south-central interior to the upper east coast, some of which could moderately strong or heavy. The short-range model guidance has depicted a concentration of rains over inland areas southeast of Lake Okeechobee late this afternoon, and today's quantitative precipitation forecast (QPF) reflects this as a likely scenario. The favorable large-scale factors coming together suggest basin-scale areal average rainfall at least as significant as yesterday's if not greater, with local maxima in the 2 to 3-inch range over inland areas. Overall, total District rainfall is predicted to be around or greater than yesterday's (~0.04 inches) but very likely less than a tenth of an inch, mainly from the rains south and east of Lake Okeechobee this afternoon. The cold front entering the northern half of the District early on Wednesday should gradually settle southward to around or south of Lake Okeechobee by late in the day and become diffuse or lose its identity on Thursday. Some light to moderate rains, widely scattered or scattered in nature, should precede the front over the central and southern part of the District on Wednesday. An increasing east-northeasterly wind flow, above normal moisture, and the presence of the dying frontal boundary favors an increase of rains District wide on Thursday, with a good or widespread coverage of light to moderate rainfall. The greatest areal average rainfall and local maxima are forecast along or near the east coast, and to a lesser extent over portions of the eastern interior of the District, in contrast to the lower amounts forecast over western areas. A similar spatial pattern of rainfall but with less total rainfall is predicted on Friday after the front dissipates, with the heavier activity still generally over the eastern half of the District and mainly along/near the east coast. A surge of moisture associated with the northern end of a tropical wave could overspread the southeastern half of the District on Saturday, possibly resulting in a round of moderate/heavy rainfall over a part of this area. The enhanced moisture associated with the wave could take another day or two to exit the area, which means that Sunday could still be on the wet side and Monday could still wet but less so. For the week ending next Tuesday morning, the deterministic total QPF is a little above eight tenths of an inch or slightly above the long-term mean for the fourth week of October and shows a maximum of rainfall over the east, particularly along the east coast. The model probabilistic output indicates a good chance for normal or above normal total weekly District rainfall (65% chance), with near to above normal rains in the east and below to near normal rainfall north and west of Lake Okeechobee.

Kissimmee

Tuesday morning stages were 56.5 feet NGVD (1.2 feet below schedule) in East Lake Toho, 54.4 feet NGVD (0.3 feet below schedule) in Toho, and 50.2 feet NGVD (2.0 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.6 feet NGVD at S-65D. Tuesday morning discharges were 332 cfs at S-65, 267 cfs at S-65A, 378 cfs at S-65D and 444 cfs S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 7.4 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.28 feet. This week's recommendation is to continue 250 cfs discharge at S65-A.

Lake Okeechobee

Lake Okeechobee stage is 13.50 feet NGVD, increasing 0.03 feet from the previous week, but still 0.26 feet lower than last month. The Lake stage 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. After spending about 215 days below the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) the Lake stage moved back into the envelope at the start of August. However, the Lake stage is now 0.19 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 14.0 feet NGVD have now been dry for nearly a year. The latest estimate of cyanobacteria bloom potential (October 16, 2019) shows that bloom potential is low in the Lake, as the season for large-scale blooms has ended.

Estuaries

Total inflow to the St. Lucie Estuary averaged 494 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinity decreased slightly in the estuary. Salinity at the US1 Bridge is in the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 870 cfs over the past week with 105 cfs coming from the Lake. Salinity changed little over the past week. The 30-day moving average surface salinity is 6.0 at Val I-75 and 11.9 at Ft. Myers. Salinity conditions at Ft. Myers are outside the preferred range for tape grass but remain in the good range at Val I-75. Salinities are in the good range for adult eastern oysters at Cape Coral, and fair range at Shell Point and Sanibel.

Lake stage is in the Base Flow sub-band of 2008 LORS. Tributary hydrological conditions are normal. The forecast of 30-day moving average of surface salinity at Val I-75 would exceed 5 over the next two weeks if there are no releases. 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, approximately 700 acre-feet 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 65,000 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 768,000 acre-feet. Most STA cells are at or near target depths. 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, in STA-5/6 Flow-way 1 to facilitate the Restoration Strategies grading project in Flow-way 2, and in STA-1E Central Flow-way and STA-2 Flow-way 3 for vegetation management activities. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to A-1 FEB/STA-3/4.

Everglades

As the climatological dry season begins, there is concern for the ecology of the Everglades and Florida Bay. Current stages in the WCAs 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 (WCA-3A North) and allowing it to flow south has important ecological benefit. Generally, rates of stage change should remain below 0.25 feet per week or 0.5 feet per 2 weeks to protect Apple Snail reproduction within the WCAs. However, given that the window for snail egg laying is ending, a rate of ascension that exceeds that rate where depths are low (WCA-3A North) would be ecologically beneficial. Very little rain fell in Taylor Slough and Florida Bay this past week. Stages in Taylor Slough remain above average. Average salinities rose in Florida Bay and the nearshore over the last week and both remain above average for this time of year. Salinity conditions are much higher than desirable for the start of the dry season.

Supporting Information

KESSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 2.61 inches of rainfall in the past week and the Lower Basin received 1.51 inches (SFWMD Daily Rainfall Report 10/21/2019).

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: 10/22/2019

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)						
							10/20/19	10/13/19	10/6/19	9/29/19	9/22/19	9/15/19	9/8/19
Lakes Hart and Mary Jane	S-62	0	LKMJ	60.1	R	60.6	-0.5	-0.5	-0.4	-0.1	-0.1	0.0	0.0
Lakes Myrtle, Preston, and Joel	S-57	0	S-57	61.0	R	61.6	-0.6	-0.5	-0.4	-0.1	0.0	0.0	0.0
Alligator Chain	S-60	0	ALLI	62.9	R	63.7	-0.8	-0.7	-0.4	-0.2	-0.1	-0.1	0.0
Lake Gentry	S-63	0	LKGT	60.8	R	61.3	-0.5	-0.5	-0.4	-0.2	-0.1	-0.1	0.0
East Lake Toho	S-59	21	TOHOE	56.5	R	57.6	-1.1	-1.1	-0.8	-0.6	-0.4	-0.2	-0.2
Lake Toho	S-61	0	TOHOW, S-61	54.2	R	54.6	-0.4	-0.6	-0.4	-0.2	-0.1	0.1	0.0
Lakes Kissimmee, Cypress, and Hatchineha	S-65	354	KUB011, LKIS5B	50.2	R	52.1	-1.9	-1.8	-1.5	-1.2	-0.9	-0.4	-0.1

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: 10/22/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days ¹							
		10/20/2019	10/20/19	10/13/19	10/6/19	9/29/19	9/22/19	9/15/19	9/8/19	9/1/19	8/25/19
Discharge (cfs)	S-65	335	354	408	411	507	1,337	1,443	2,135	5,414	5,640
Discharge (cfs)	S-65A ²	264	286	327	327	423	1,248	1,412	2,676	5,795	6,547
Discharge (cfs)	S-65D ²	405	379	441	483	1,189	1,780	2,976	5,734	6,983	8,207
Headwater Stage (feet NGVD)	S-65D ²	25.83	25.78	25.81	25.84	26.64	26.78	27.00	27.56	27.48	27.42
Discharge (cfs)	S-65E ²	412	367	425	453	1,070	1,766	2,988	5,615	6,932	8,155
Discharge (cfs)	S-67	0	0	0	0	0	0	28	17	31	24
DO (mg/L) ³	Phases I & II/III river channel	6.8	7.4	6.7	7.1	6.0	4.2	2.1	2.2	0.9	0.5
Mean depth (feet) ⁴	Phase I floodplain	0.28	0.20	0.24	0.26	0.45	0.74	1.07	2.18	2.82	3.25

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

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

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

⁴1-day spatial average from South Florida Water Depth Assessment Tool (SFWDAT).

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

KCOL Hydrographs (through Sunday midnight)

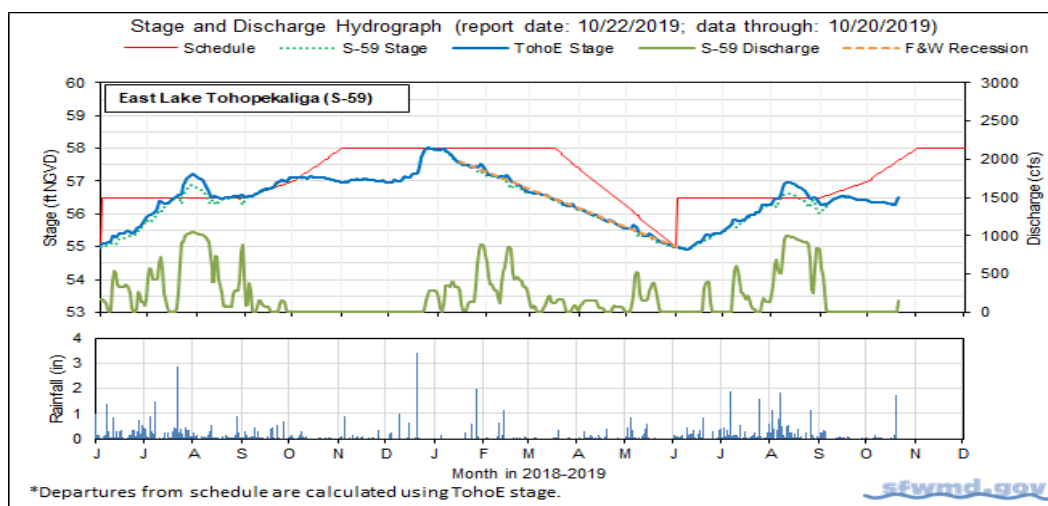


Figure 1.

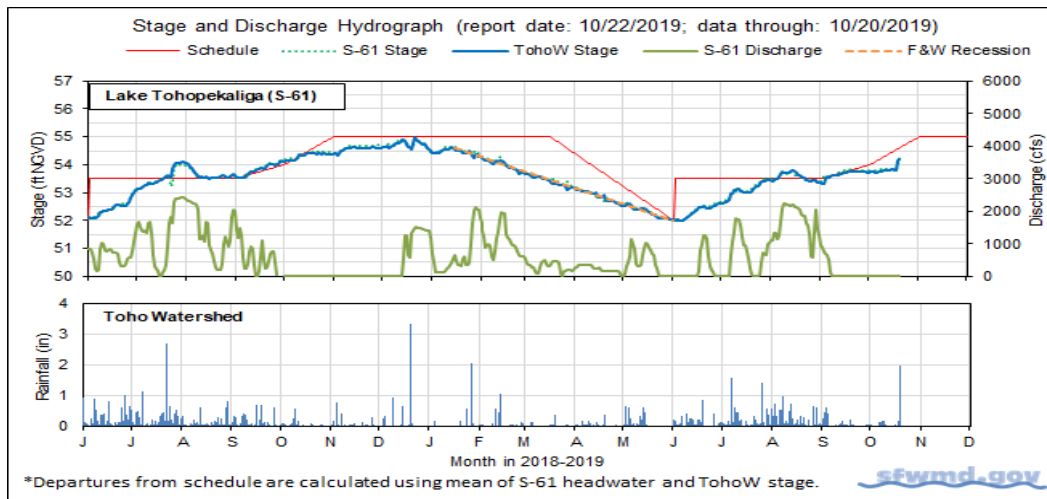


Figure 2.

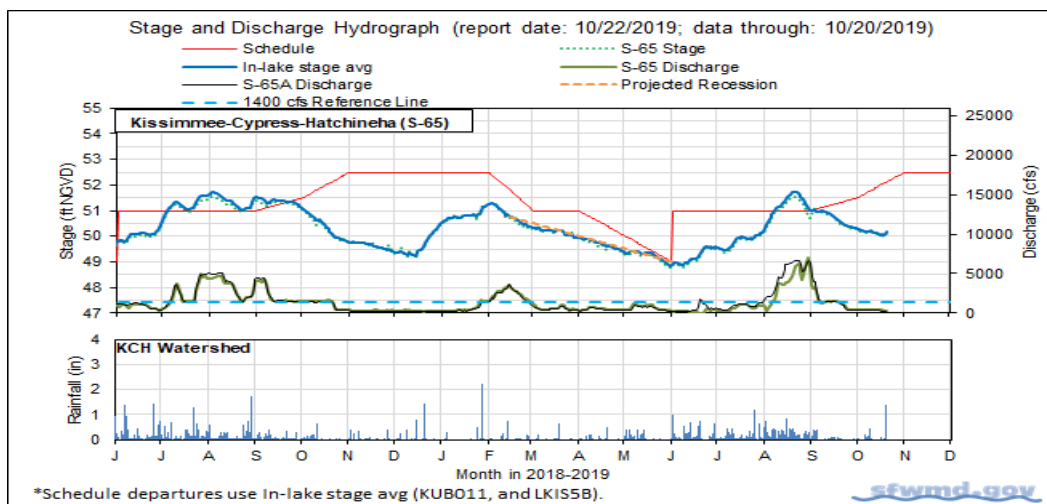


Figure 3.

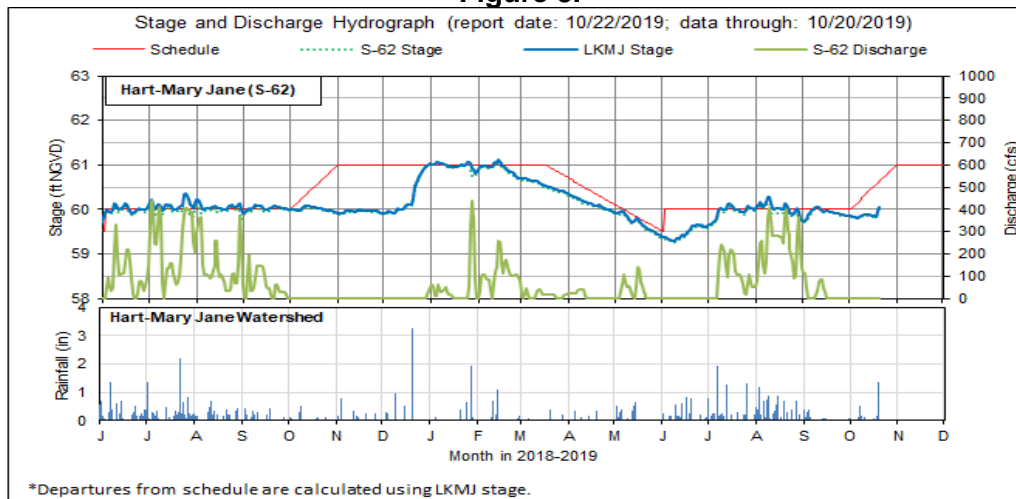


Figure 4.

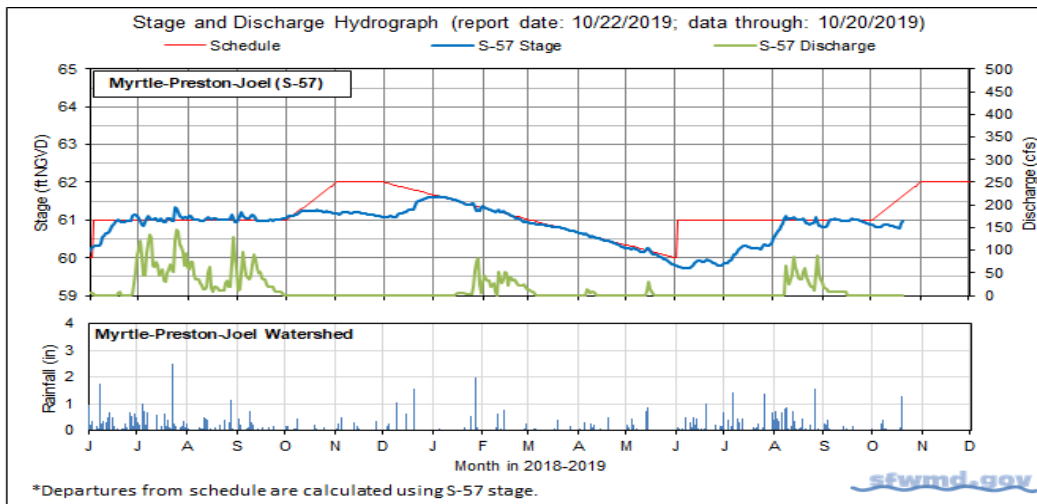


Figure 5.

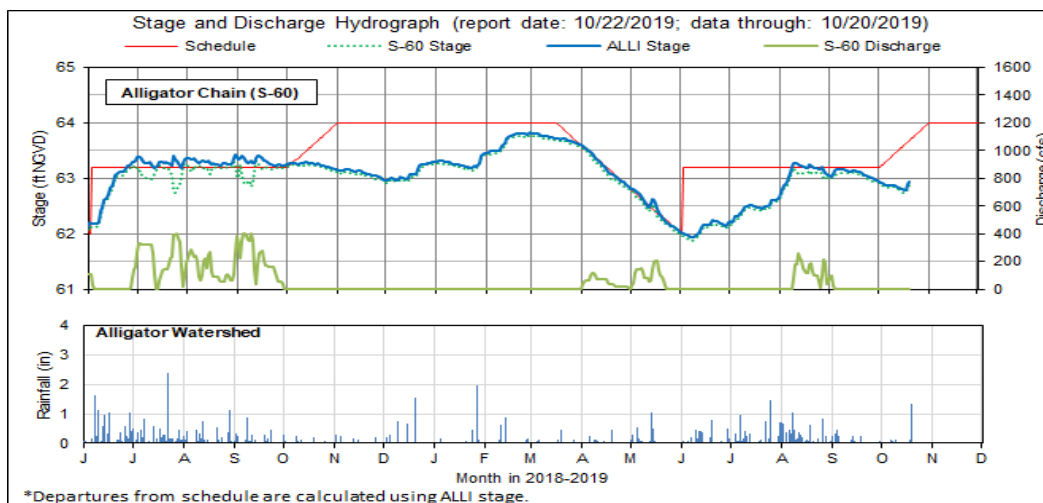


Figure 6.

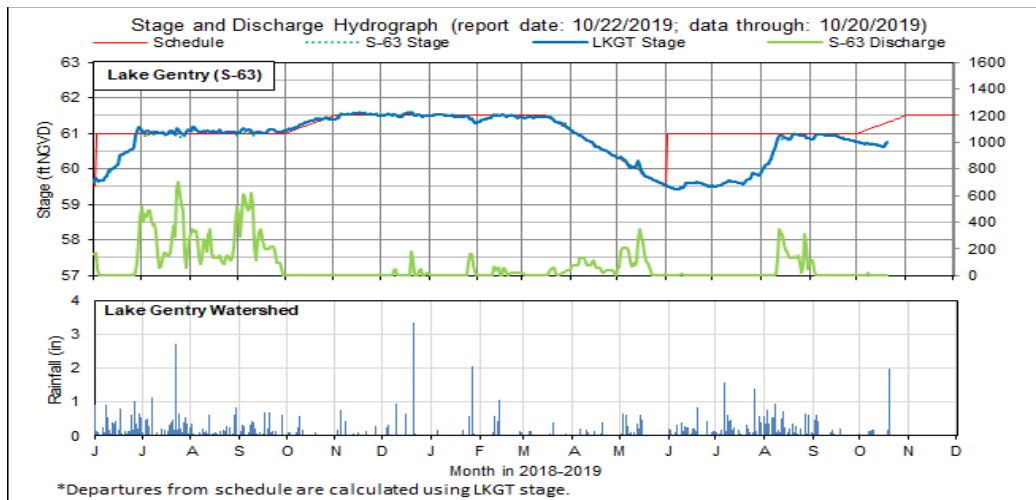


Figure 7.

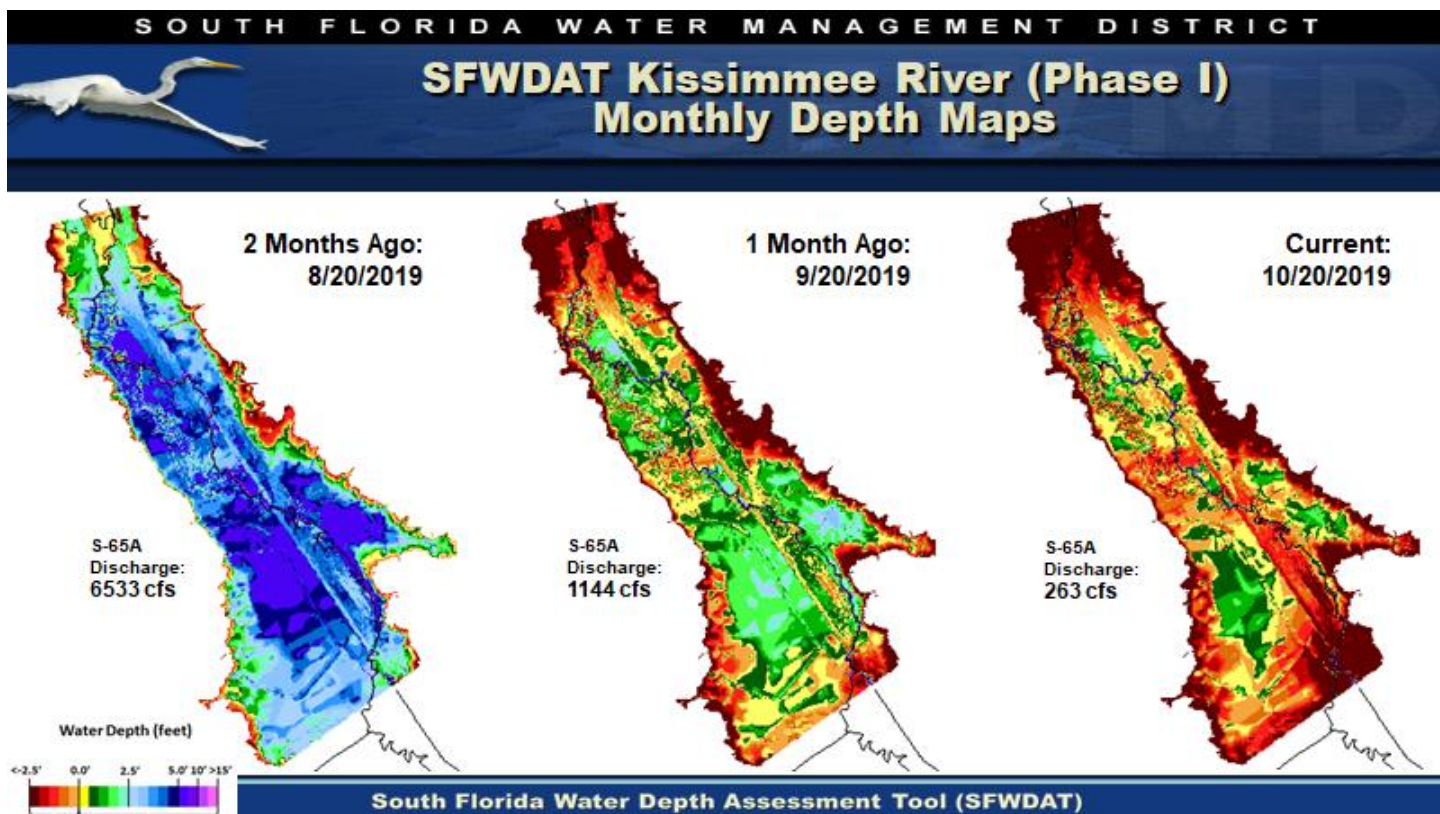


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

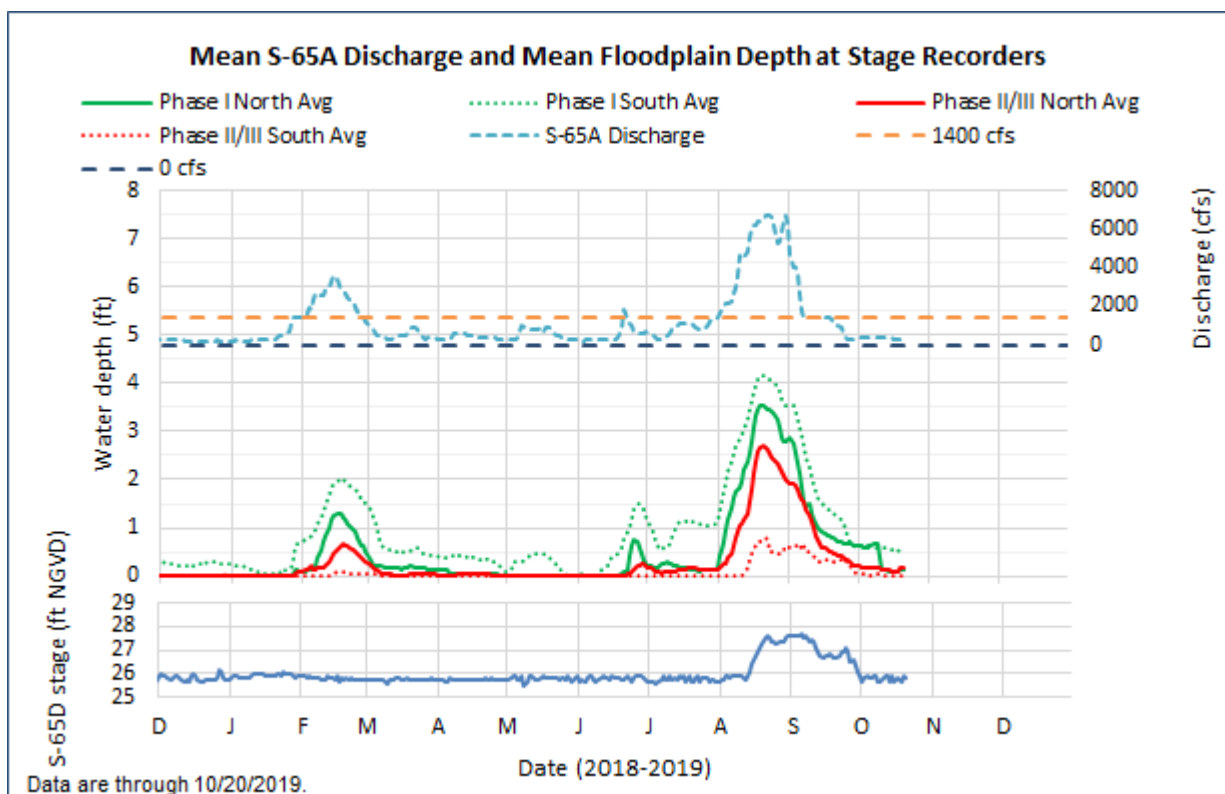
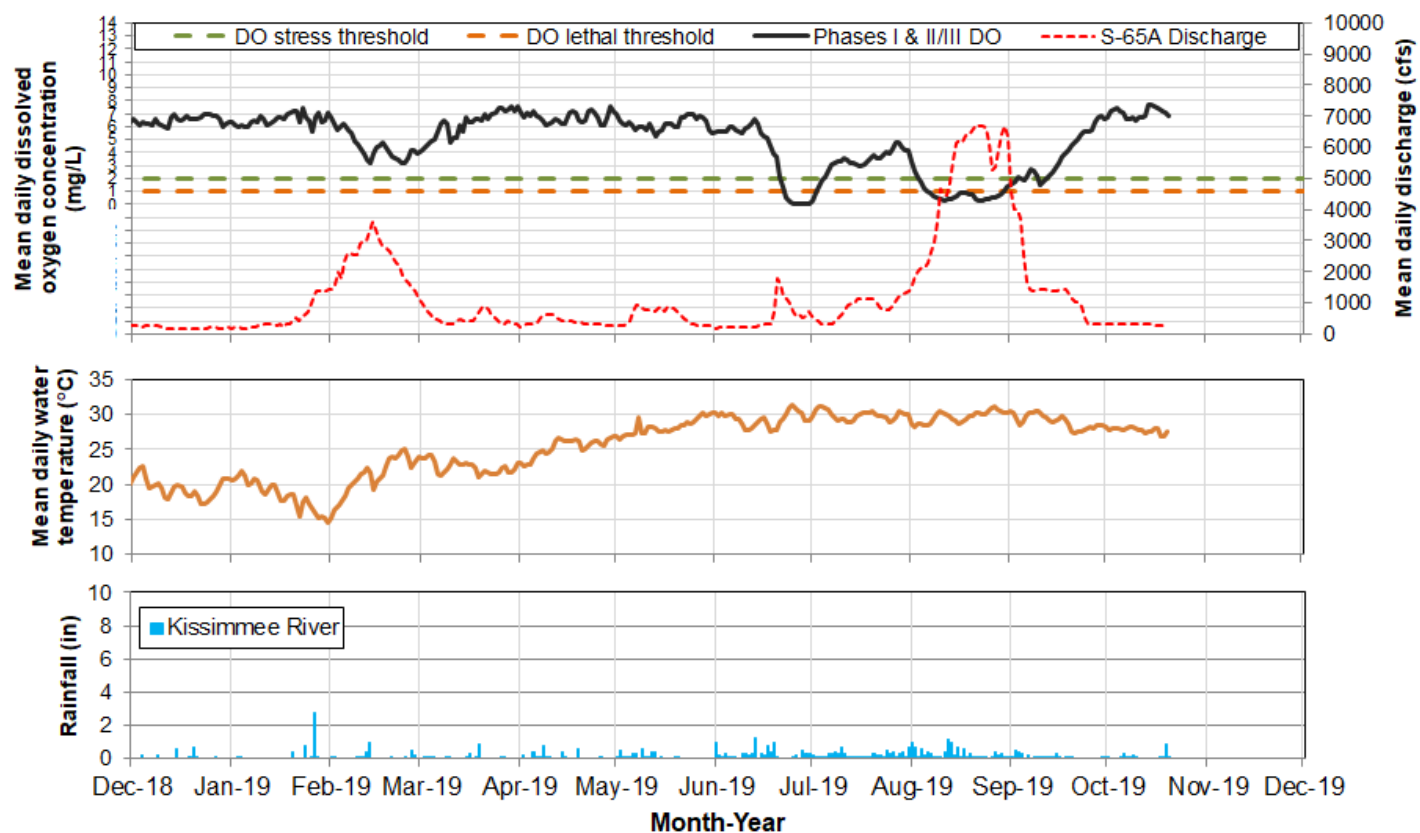


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.



Report Date: 10/22/2019; data are through: 10/20/2019.

Figure 10. Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phases I/II/III river channel.

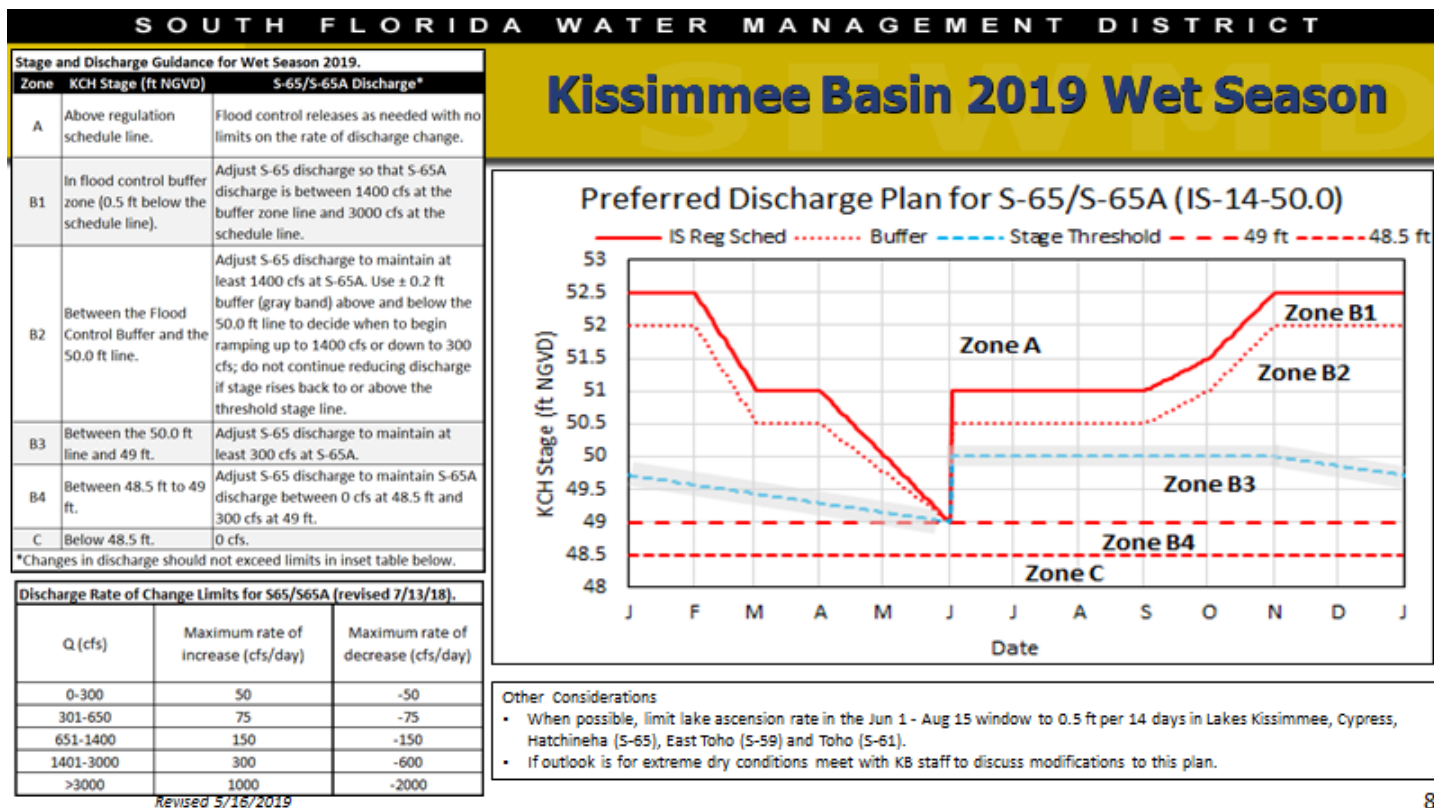


Figure 11. The 2019 Wet Season Discharge Plan for S-65/S-65A.

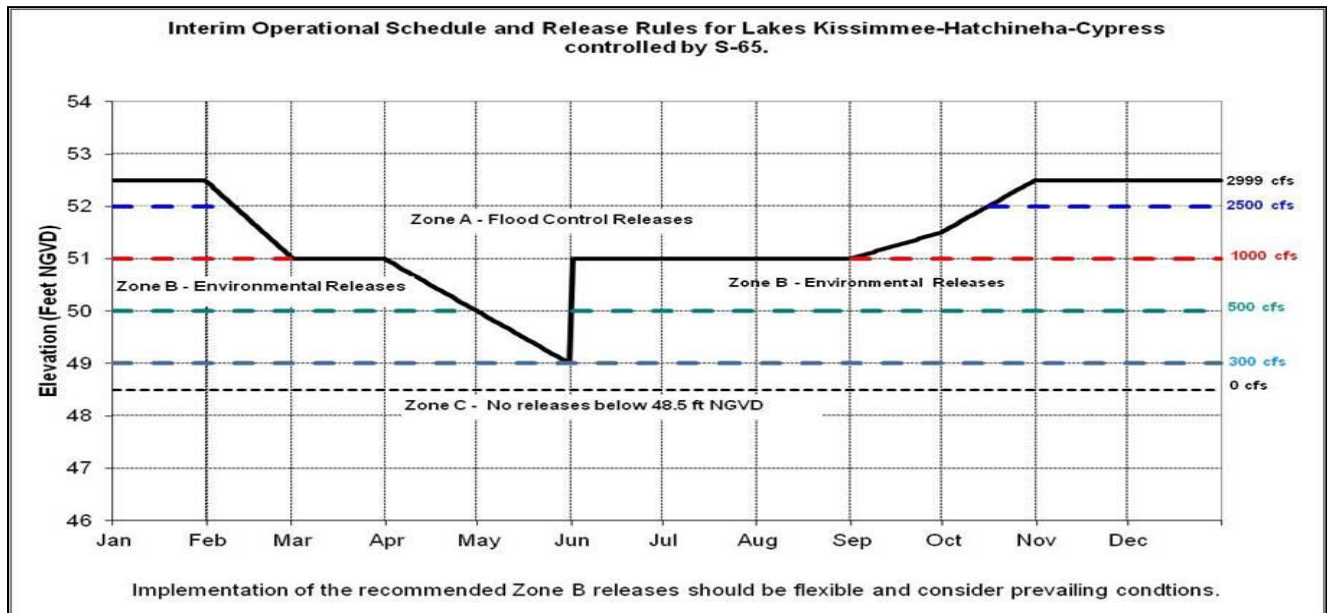


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

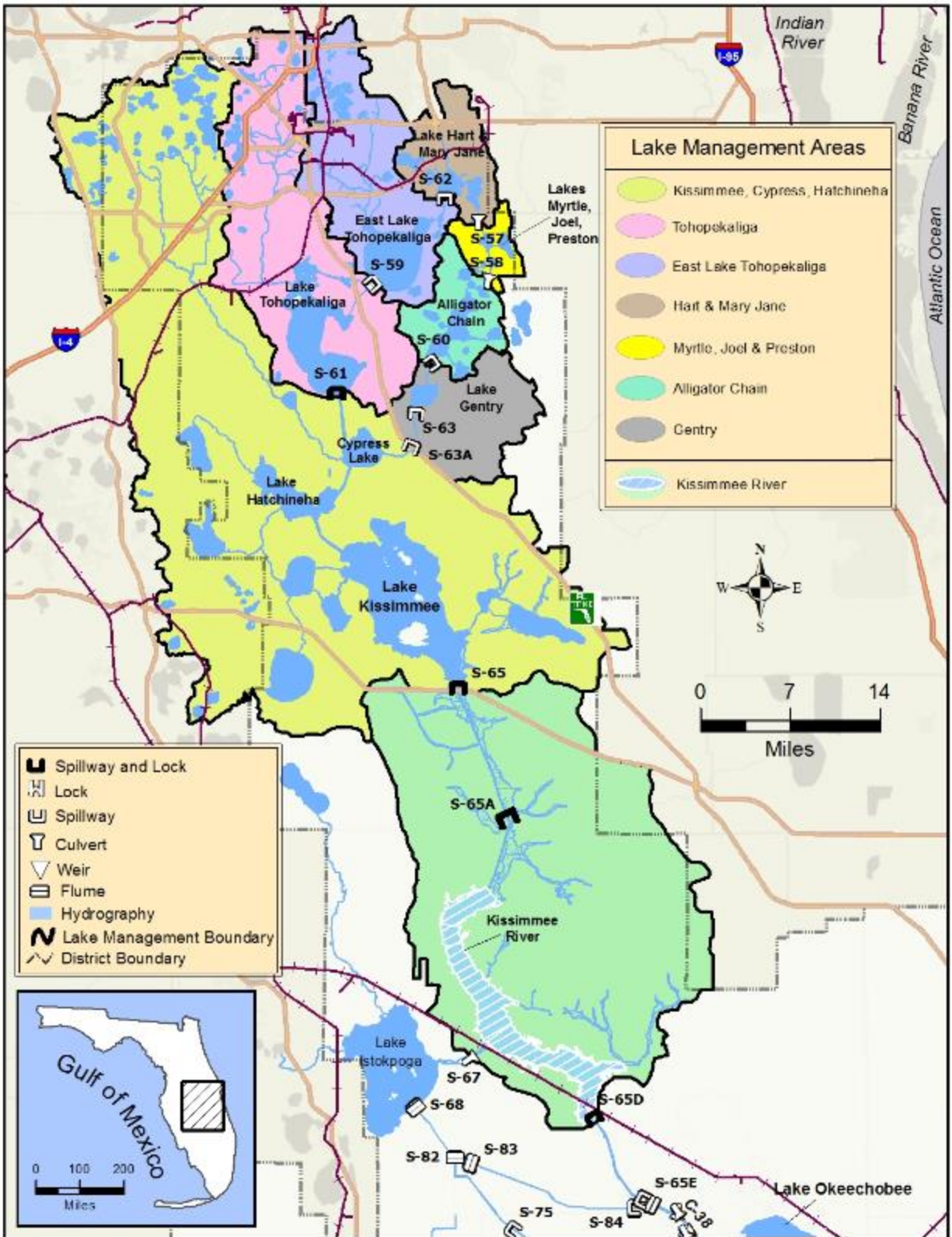


Figure 13. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 13.50 feet NGVD for October 21, 2019 increasing 0.03 feet from the previous week. 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 0.26 feet lower than a month ago and 0.53 feet lower than a year ago (Figure 1) when stages were near the bottom of the preferred ecological envelope (Figure 2). The Lake is currently 0.19 feet below the preferred ecological envelope. 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 (Figure 3). With the slight decline over the past month, lake stage remains the lowest it has been for this time of year since 2011 (Figure 4). According to RAINДАР, during the week of October 15 to October 21, 2019, 1.13 inches of rain fell directly over the Lake, compared to 1.43 inches the previous week. Rainfall across the watershed was highly variable again, but this week northern regions received the highest rainfall (1.5 to 3.5 inches), while many southern basins received less than half an inch (Figure 5).

The average daily inflows (minus rainfall) to the Lake increased slightly, from 467 cfs to 525 cfs. Over two thirds of the inflow came from the Kissimmee River (S-65E & S-65EX1) which decreased from 416 cfs to 375 cfs. No passive backflow from the L-8 Canal at Canal Point (via CLV10A) occurred this week (Table 1).

Outflow (minus evapotranspiration) increased from 232 cfs to 681 cfs. Flows through the L-8 Canal at Canal Point (via CLV10A) dropped from 67 cfs to 62 cfs, releases west through S-77 increased from 165 cfs to 278 cfs, and 341 cfs were discharged through S-354. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation were lower than the previous week, dropping from 0.90 inches to 0.70 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 6 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 October 1st – 2nd found values of Chlorophyll a (Chla) which were indicative of bloom conditions (District considers greater than 40 µg/L as bloom density) in the western portion of the lake at L005 (61 µg/L) and Palmout (49 µg/L)(Figure 7). Two additional nearshore zone stations had Chla values of over 20 µg/L, as did two pelagic stations, L001 and L008. Only one station had microcystin levels above the detection limit of 0.20 µg/L; LZ30, a southern site had a microcystin value of 3.68 µg/L, and a Chla value of 18 µg/L.

The recent satellite imagery has been obscured by cloud cover, however the October 16, 2019 image using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel 3 OLCI sensor data showed that bloom potential remains low in the lake, as the season for potential wide-spread algal blooms has likely ended (Figure 8).

Water Management Recommendations

Lake Okeechobee stage is 13.50 feet NGVD, increasing 0.03 feet from the previous week, but still 0.26 feet lower than last 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. After spending about 215 days below the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) the Lake moved back into it at the start of August. However, the Lake stage is now 0.19 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 for nearly a year. The latest estimate of cyanobacteria bloom potential (October 16, 2019) shows that bloom potential is low in the Lake, as the season for large-scale blooms has ended.

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)	OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-65E & S-65EX1	416	375	0.2	S-77	165	278	0.1
S-71 & S-72	19	114	0.0	S-308	0	0	0.0
S-84 & S-84X	11	15	0.0	S-351	0	0	0.0
Fisheating Creek	21	20	0.0	S-352	0	0	0.0
S-154	0	0	0.0	S-354	0	341	0.1
S-191	0	0	0.0	L-8 Outflow	67	62	0.0
S-133 P	0	0	0.0	ET	2067	1628	0.7
S-127 P	0	0	0.0	Total	2300	2309	1.0
S-129 P	0	0	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							
Rainfall	3289	2631	1.1				
Total	3756	3155	1.4				

Provisional Data

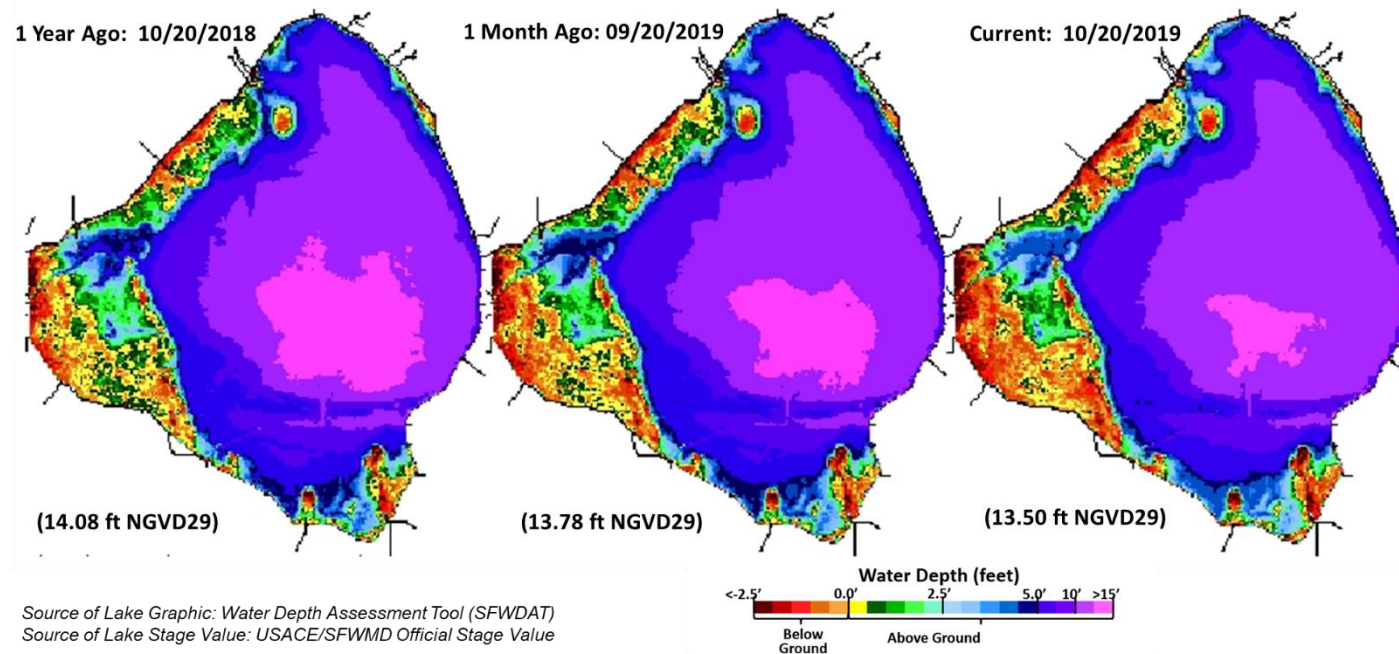


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

Lake Okeechobee Stage vs Ecological Envelope

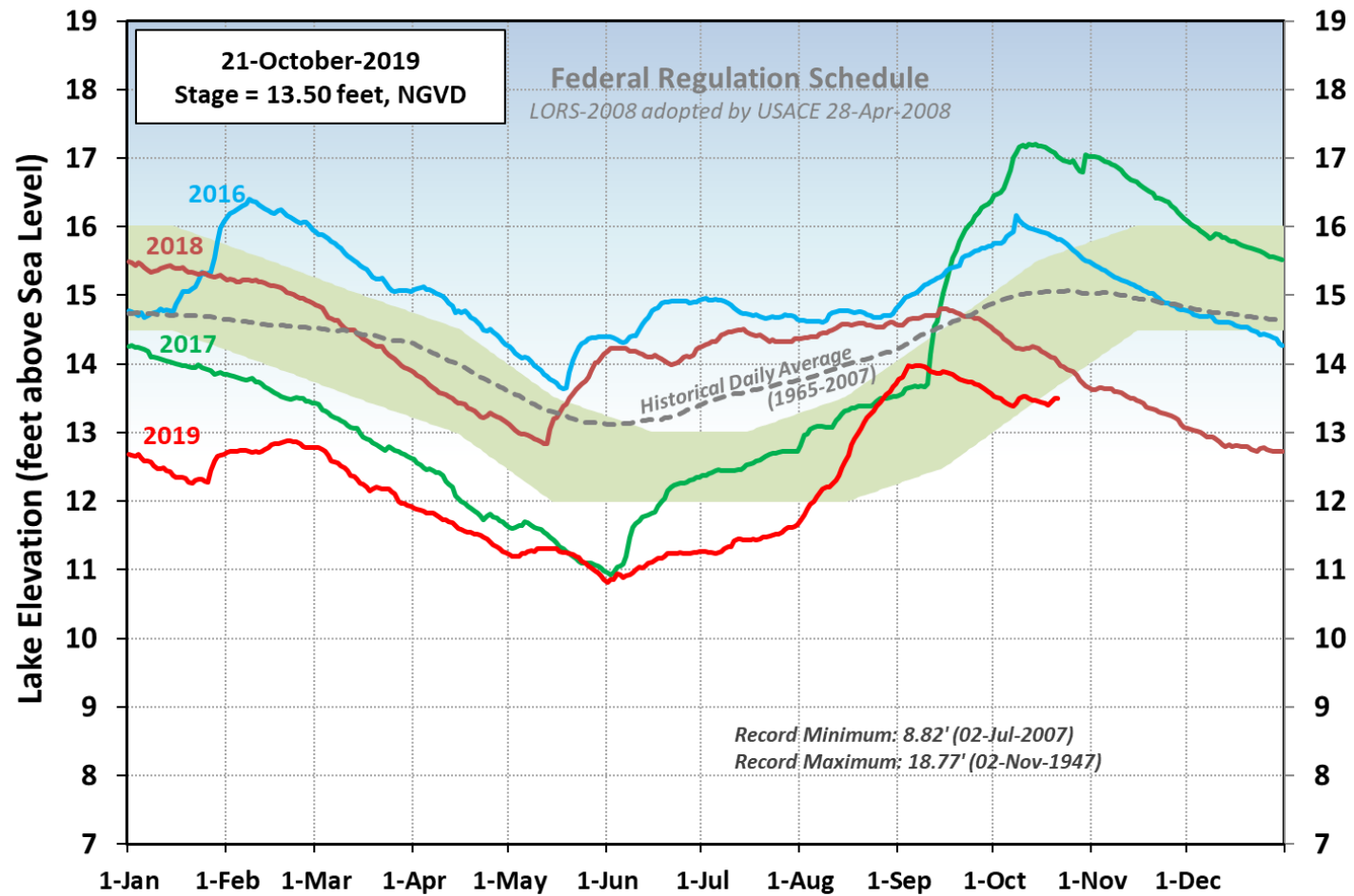


Figure 2. Select annual stage hydrographs for Lake Okeechobee in comparison to the Ecological Envelope.

Lake Okeechobee Water Level History and Projected Stages

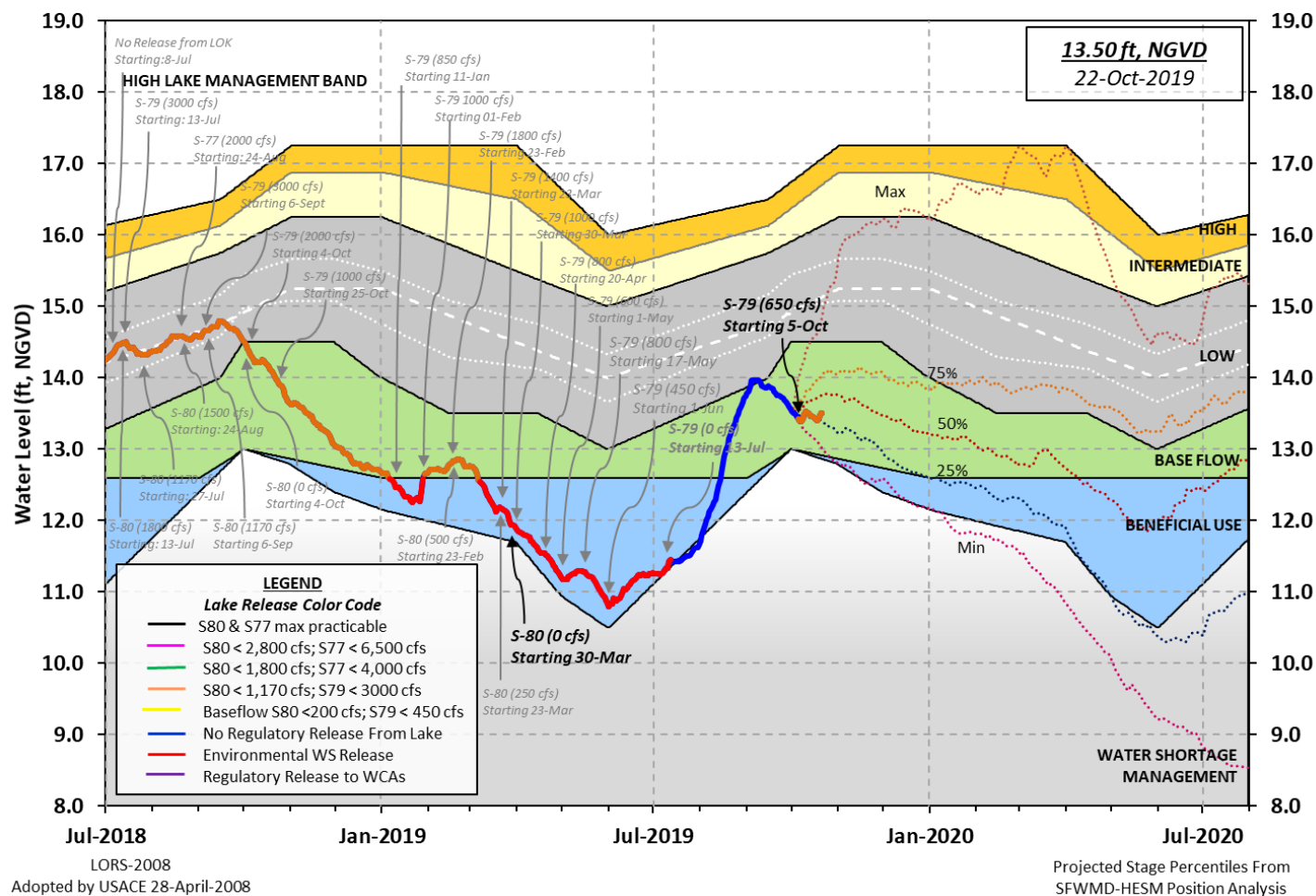


Figure 3. Recent Lake Okeechobee stage and releases, with projected stages based on a dynamic position analysis.

Lake Okeechobee Water Level Comparison

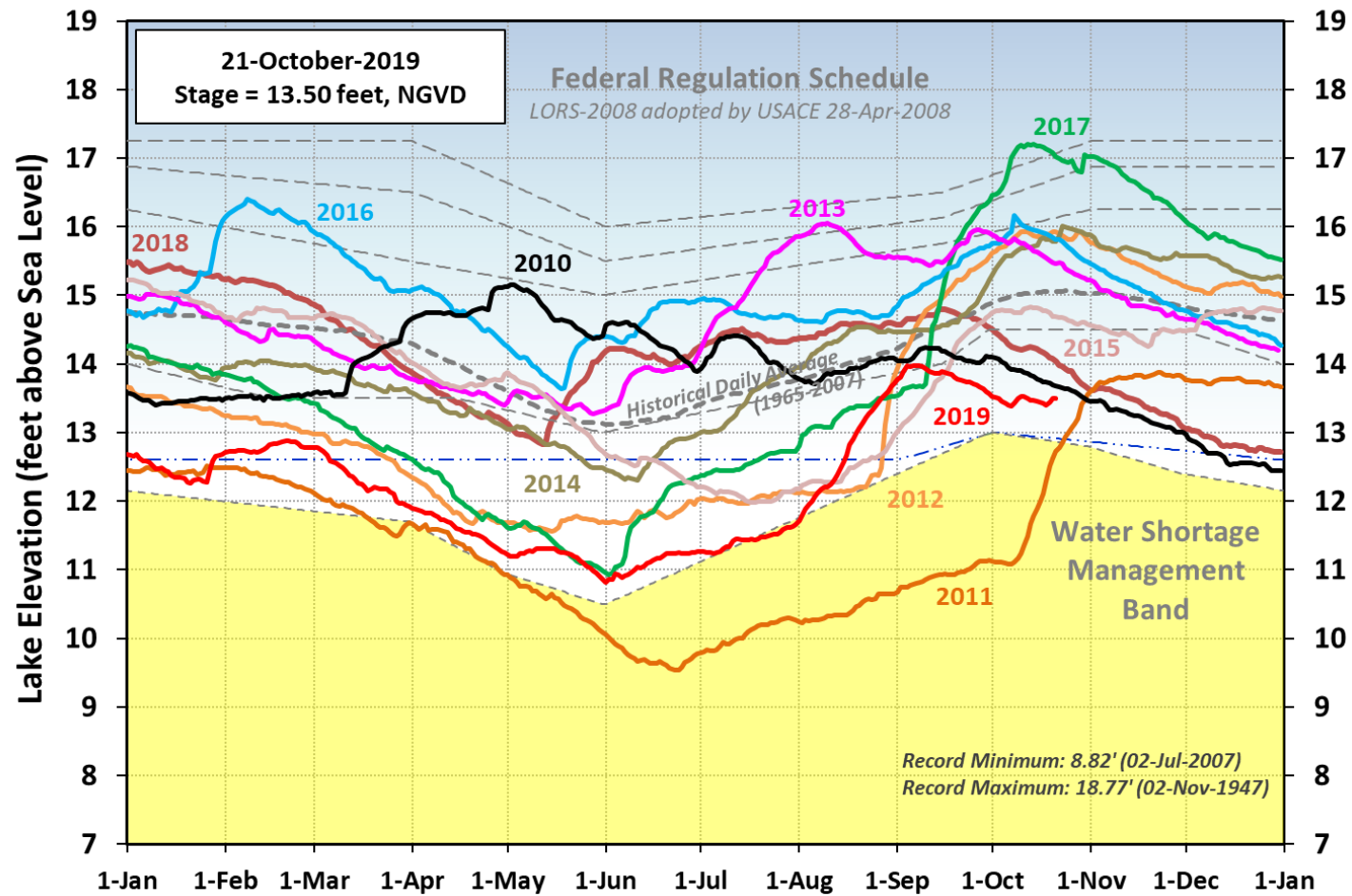


Figure 4. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES
FROM: 0515 EST, 10/15/2019 THROUGH: 0515 EST, 10/22/2019

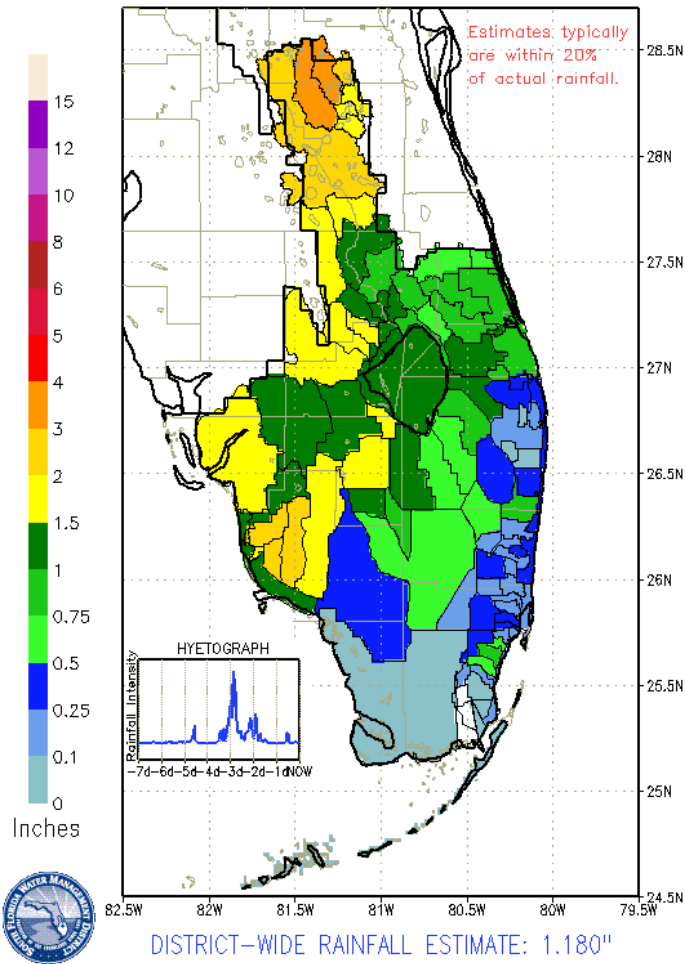


Figure 5. Rainfall estimates by basin.

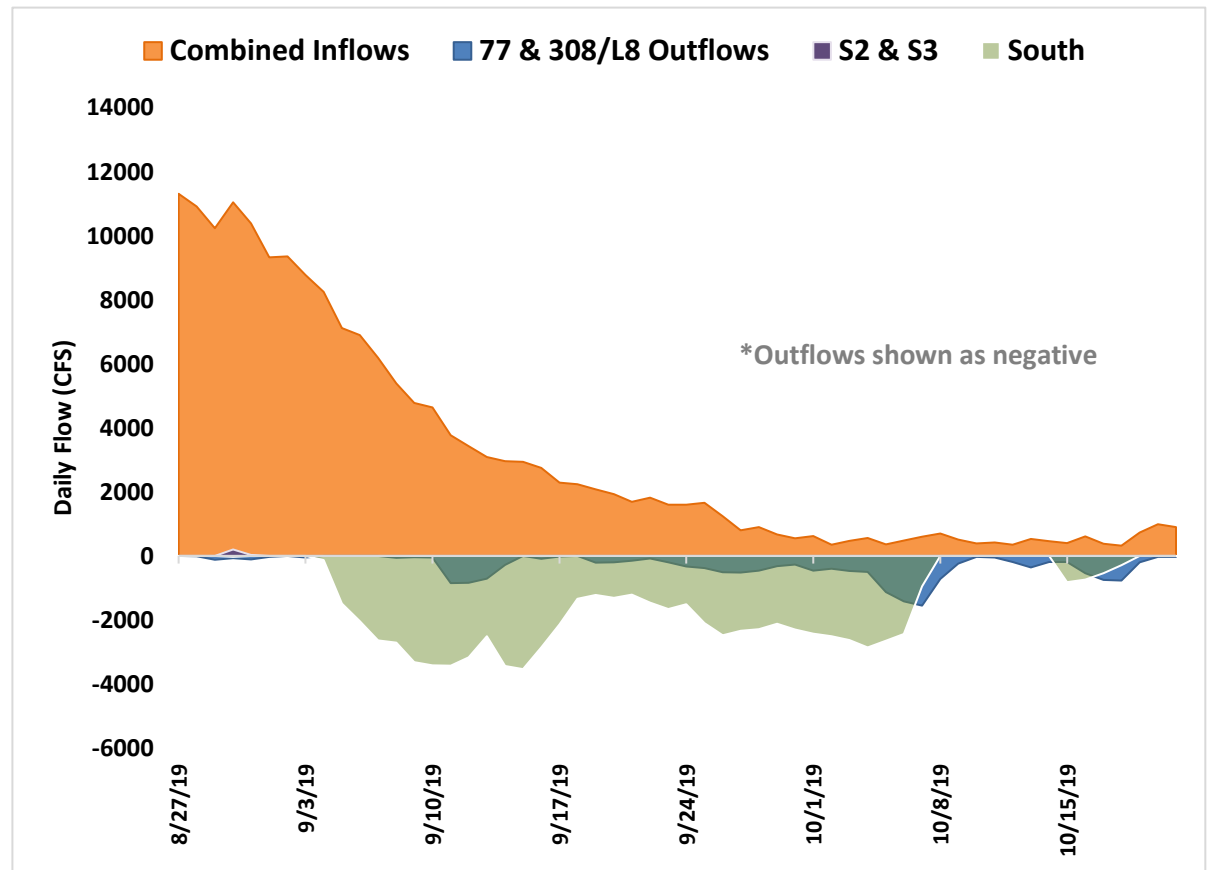
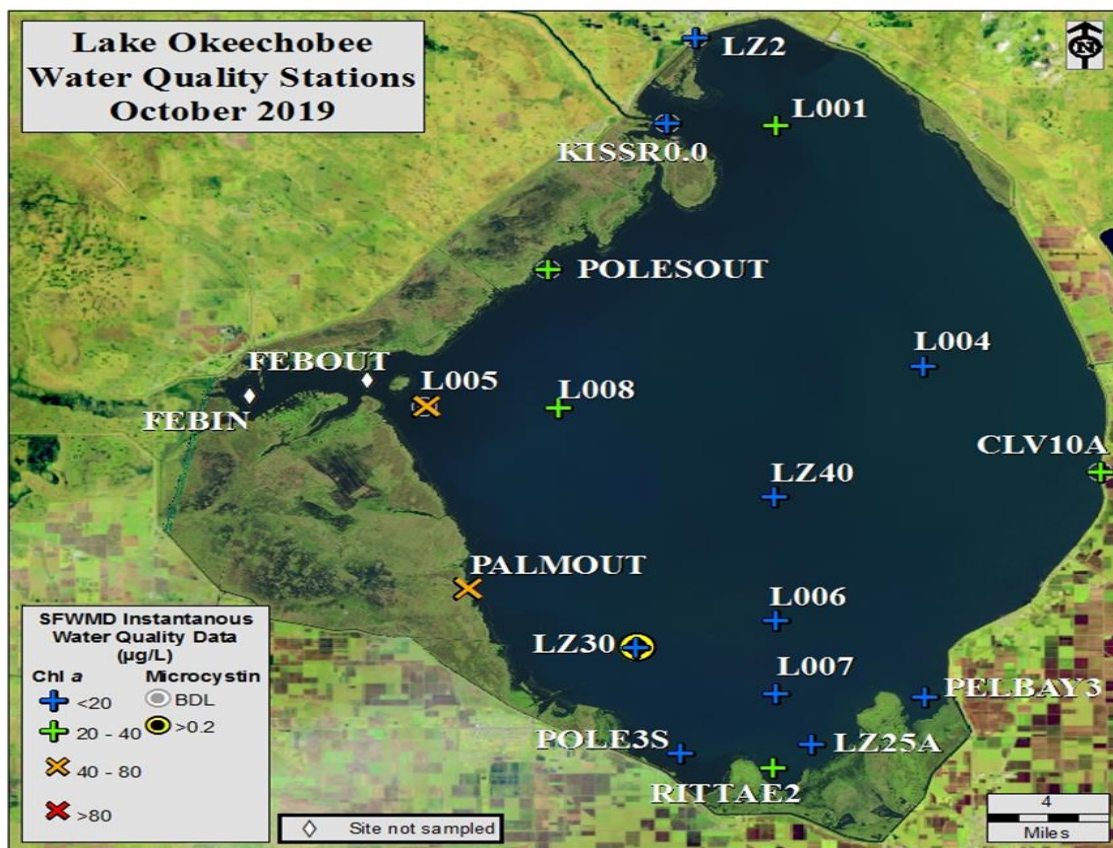


Figure 6. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive 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.



Site	October, 2019	
	Chlorophyll <i>a</i> (µg/L)	Microcystin (µg/L)
Nearshore Stations		
KISSR0.0	16.2	BDL
L005	61.2	BDL
LZ2	17.2	BDL
LZ25A	7.4	
PALMOUT	48.5	
PELBAY3	10.4	
POLE3S	9.4	
POLESOUT	28.9	BDL
RITTAE2	22.8	
Pelagic Stations		
L001	31.4	
L004	10.8	
L006	7.8	
L007	7.7	
L008	27.7	
LZ30	17.6	3.68
LZ40	10.3	
CLV10A	10.3	BDL

Figure 7. Chlorophyll *a* (µg/L) and microcystin (µg/L) values for nearshore and pelagic stations for October 2019. SFWMD classifies an algal bloom as having Chl *a* values >40 µg/L. Microcystin values <0.20 µg/L are below the detection limit (BDL).

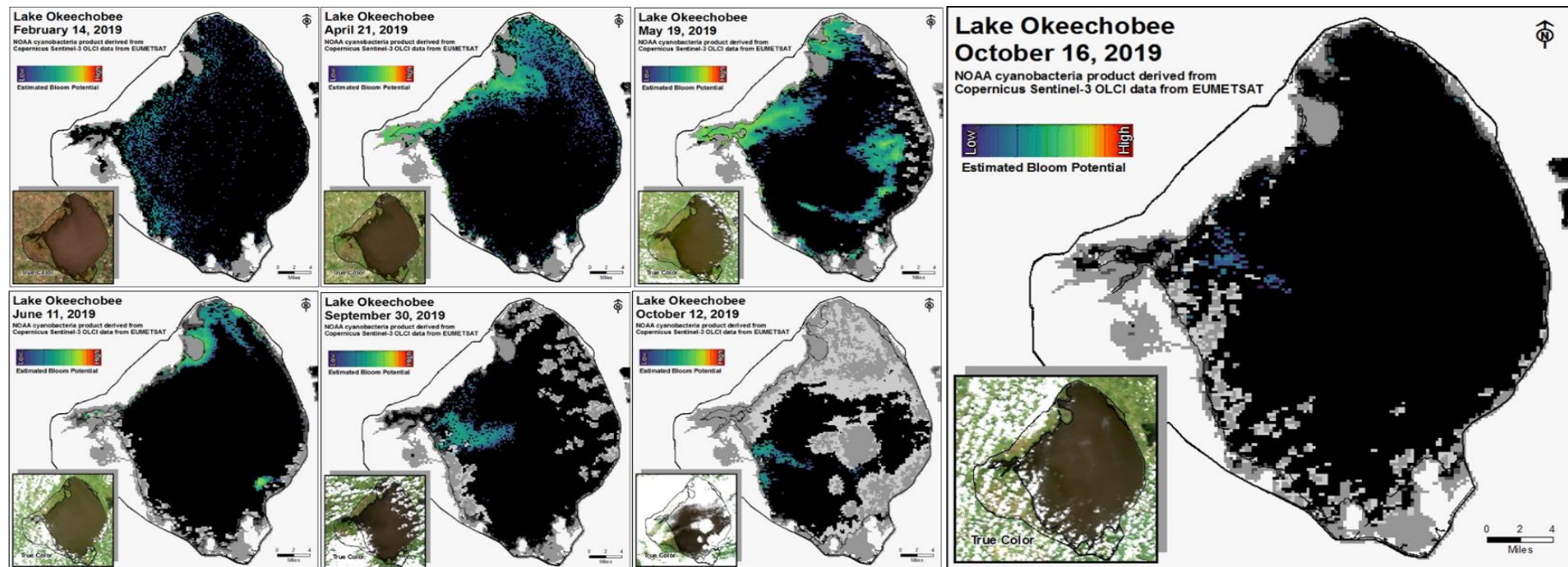


Figure 8. Potential for cyanobacterial blooms on Lake Okeechobee in 2019, based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 494 cfs (Figures 1 and 2) and last month inflow averaged about 420 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	301
S-80	0
S-308	0
S-49 on C-24	50
S-97 on C-23	29
Gordy Rd. structure on Ten Mile Creek	114

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 unavailable. 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.

Sampling Site	Surface	Bottom	Envelope
HR1 (North Fork)	11.5 (12.8)	16.7 (18.2)	NA ¹
US1 Bridge	16.7 (EM ²)	18.2 (19.8)	10.0-26.0
A1A Bridge	23.8 (26.5)	27.1 (EM)	NA ¹

¹Envelope not applicable and ²Equipment Malfunction.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 870 cfs (Figures 5 and 6) and last month inflow averaged about 632 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	278
S-78	396
S-79	737
Tidal Basin Inflow	133

Over the past week in the estuary, surface salinity decreased to Val I-75 and increased downstream (Table 4, Figures 7 & 8). The seven-day average salinity values within the good range for adult eastern oysters at Cape Coral and in the fair range at Shell Point and Sanibel (Figure 9). The 30-day moving average surface salinity is 6.0 at Val I-75 and 11.9 at Ft. Myers. Salinity conditions at Ft. Myers are outside the preferred range for tape grass but remain in the good range at Val I-75.

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)	5.0 (EM ³)	5.5 (6.4)	NA ¹
Val I75	7.4 (7.7)	9.3 (9.2)	0.0-5.0 ²
Ft. Myers Yacht Basin	14.1 (13.5)	14.7 (14.0)	NA
Cape Coral	20.7 (19.3)	22.0 (21.0)	10.0-30.0
Shell Point	30.4 (28.7)	30.5 (29.1)	10.0-30.0
Sanibel	32.7 (32.3)	32.8 (32.3)	10.0-30.0

¹Envelope not applicable, ²Envelope is based on a 30-day average, and ³Equipment Malfunction.

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 4.5 to 8.0 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 125 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	125	8.0	7.2
B	300	125	7.1	6.8
C	450	125	6.0	6.4
D	650	125	4.6	6.0
E	800	125	4.5	5.9

Red tide

The Florida Fish and Wildlife Research Institute reported on October 18, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background to medium concentrations in 11 samples collected from Lee County. *Karenia brevis* was not observed in samples collected from Palm Beach County (no samples were analyzed this week from St. Lucie, Martin, Broward or Miami-Dade counties). Respiratory irritation and several reports of fish kills were received in Lee County.

Water Management Recommendations

Lake stage is in the Base Flow sub-band. Tributary conditions are normal. 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.

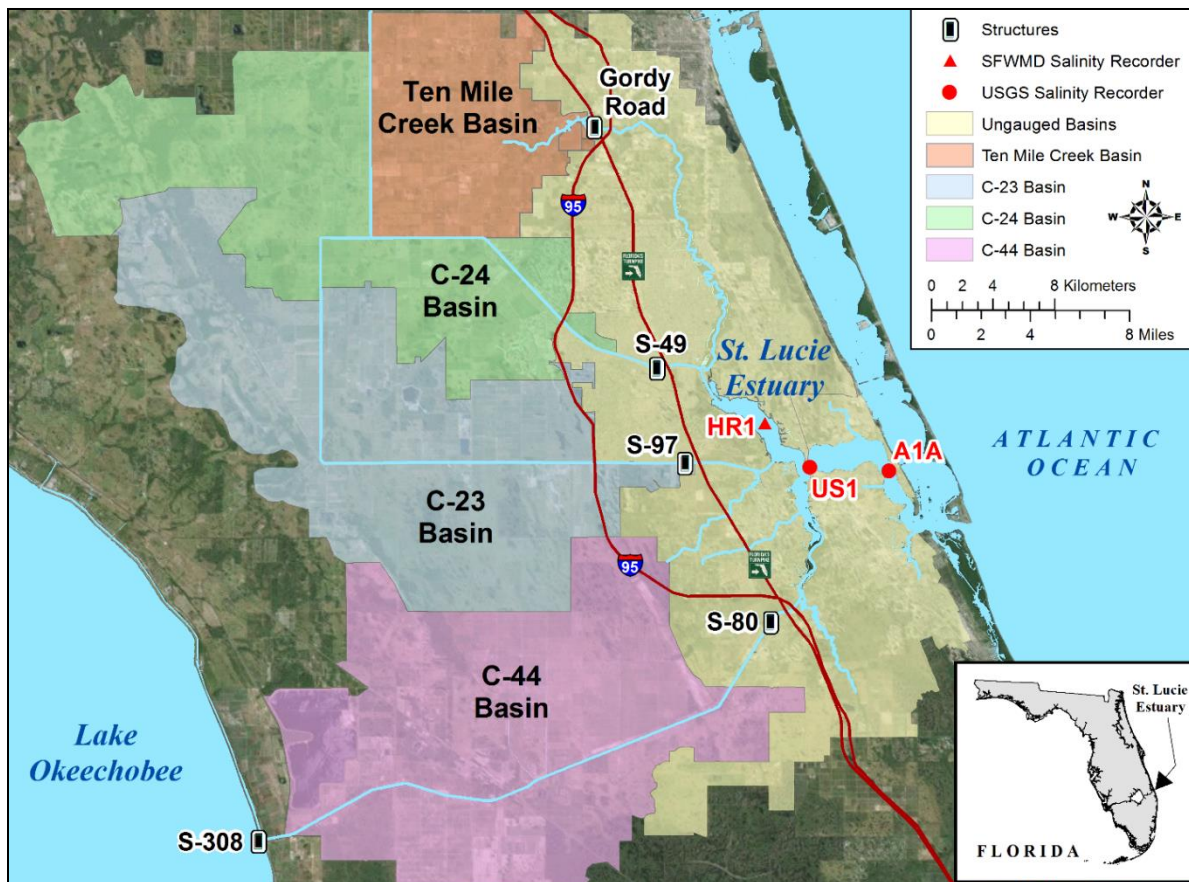


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

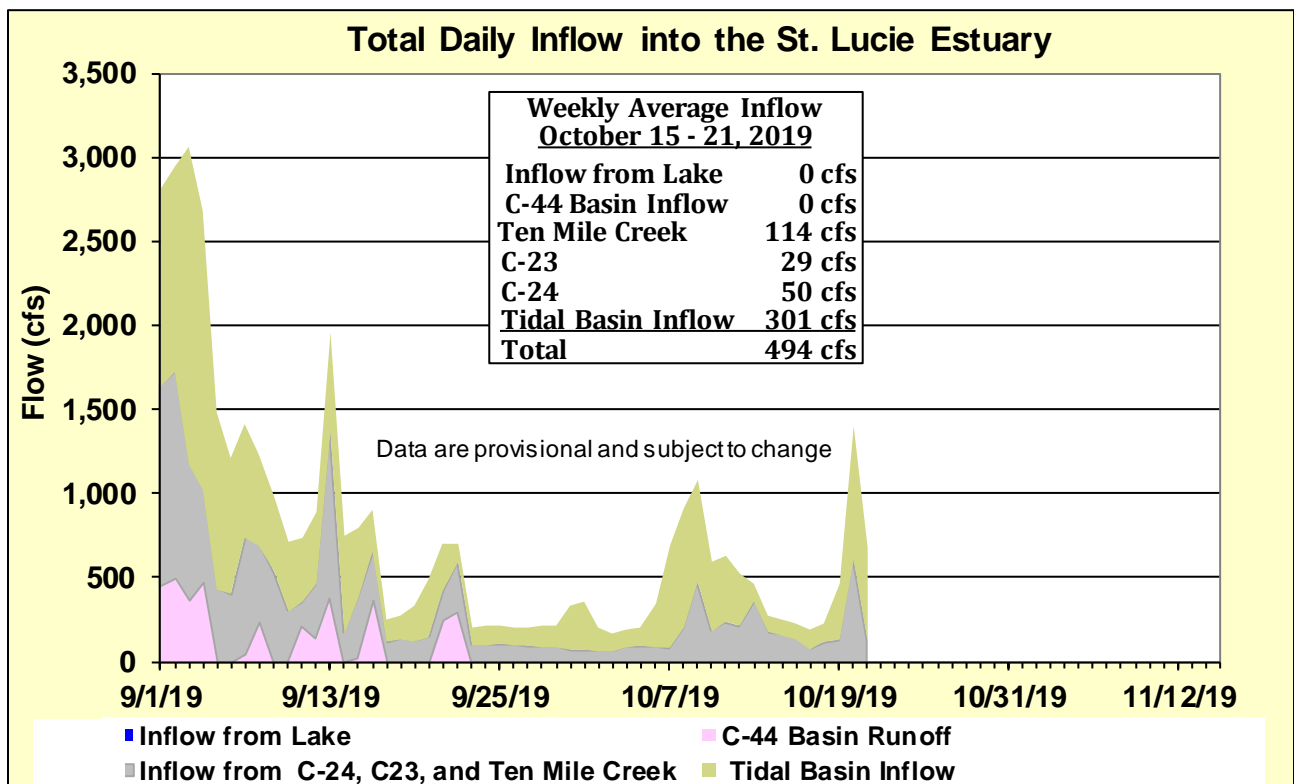


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

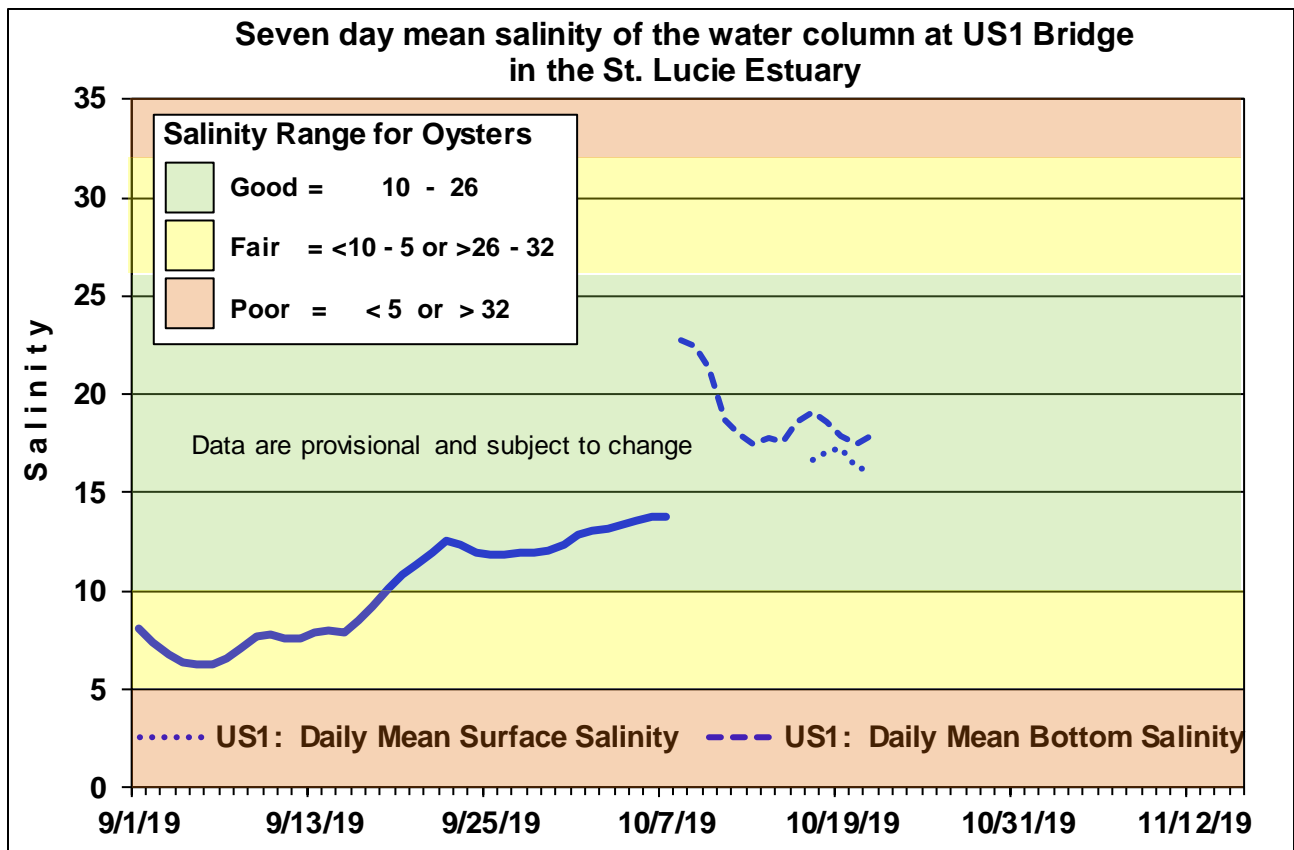


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

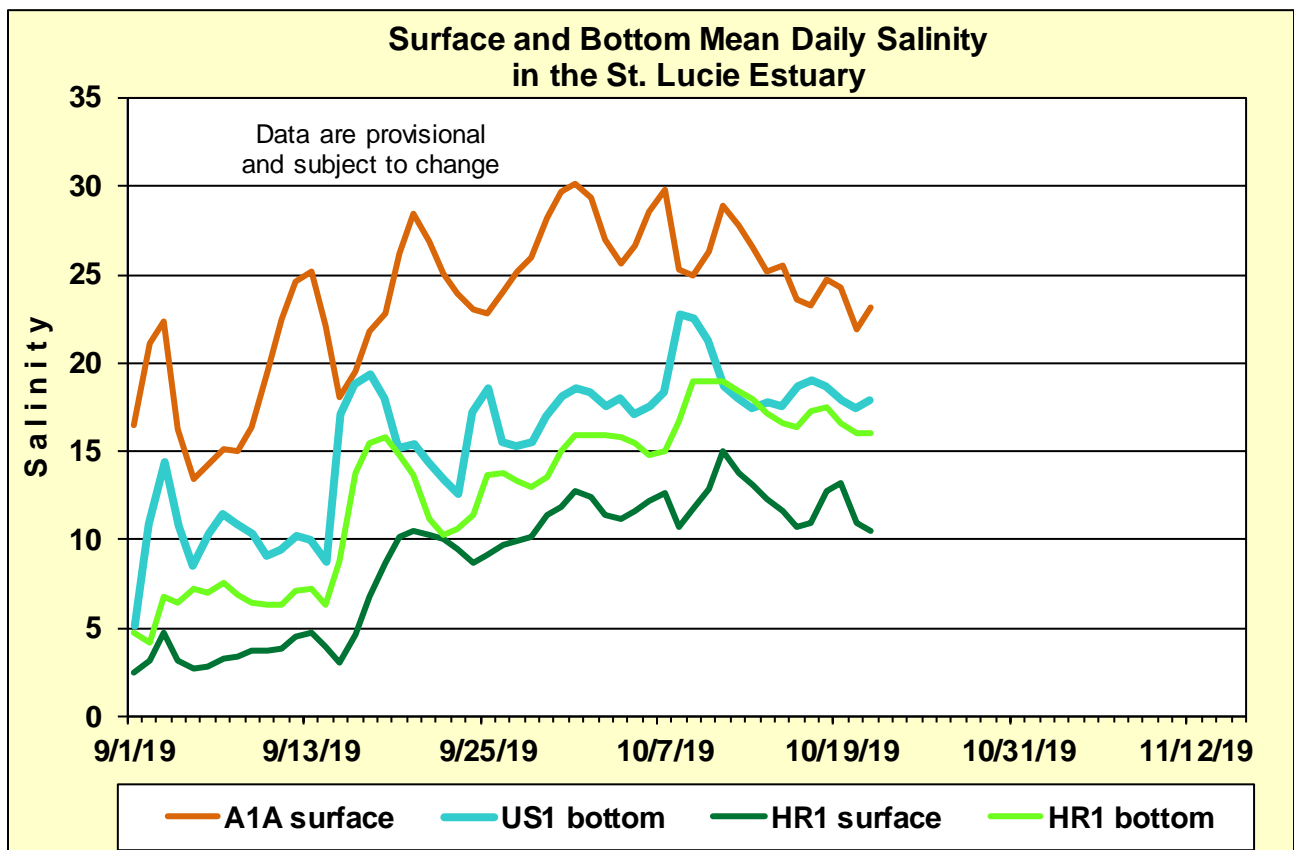


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

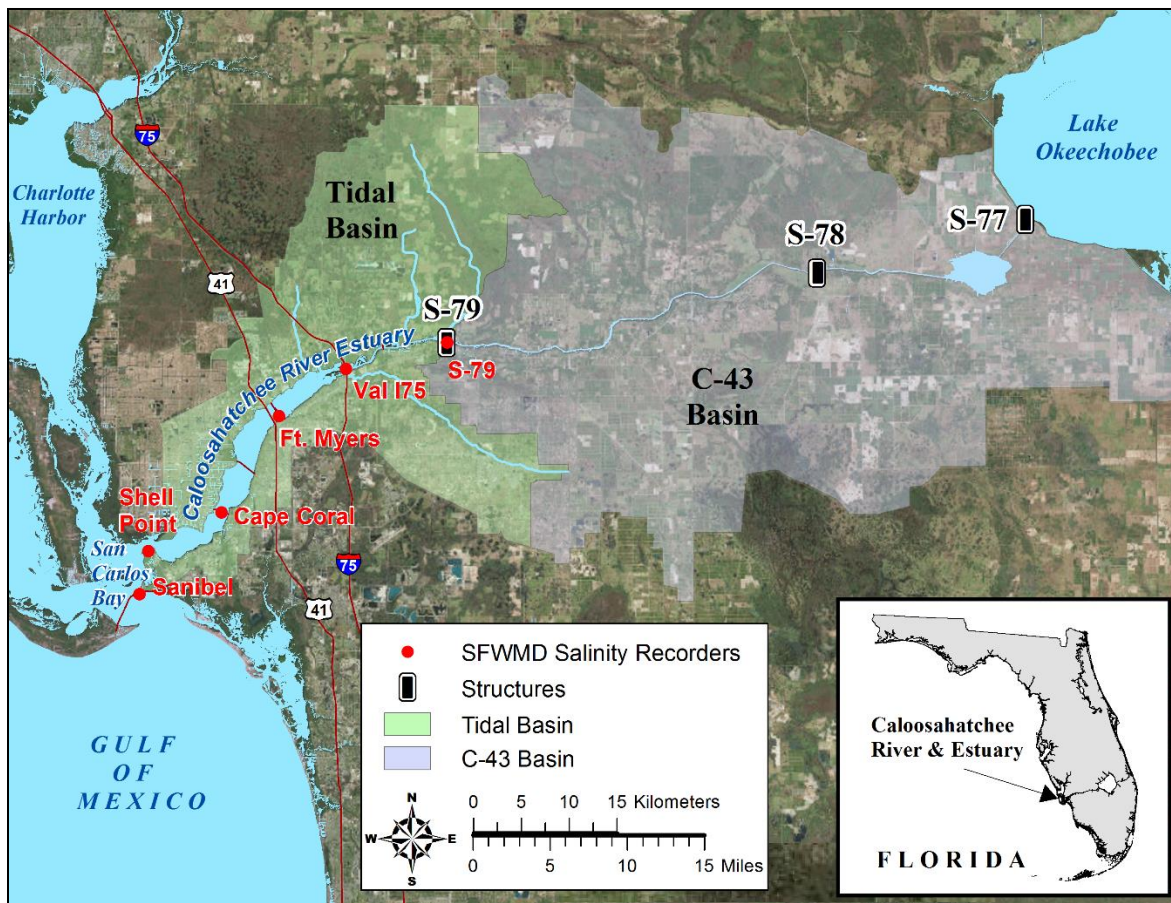


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

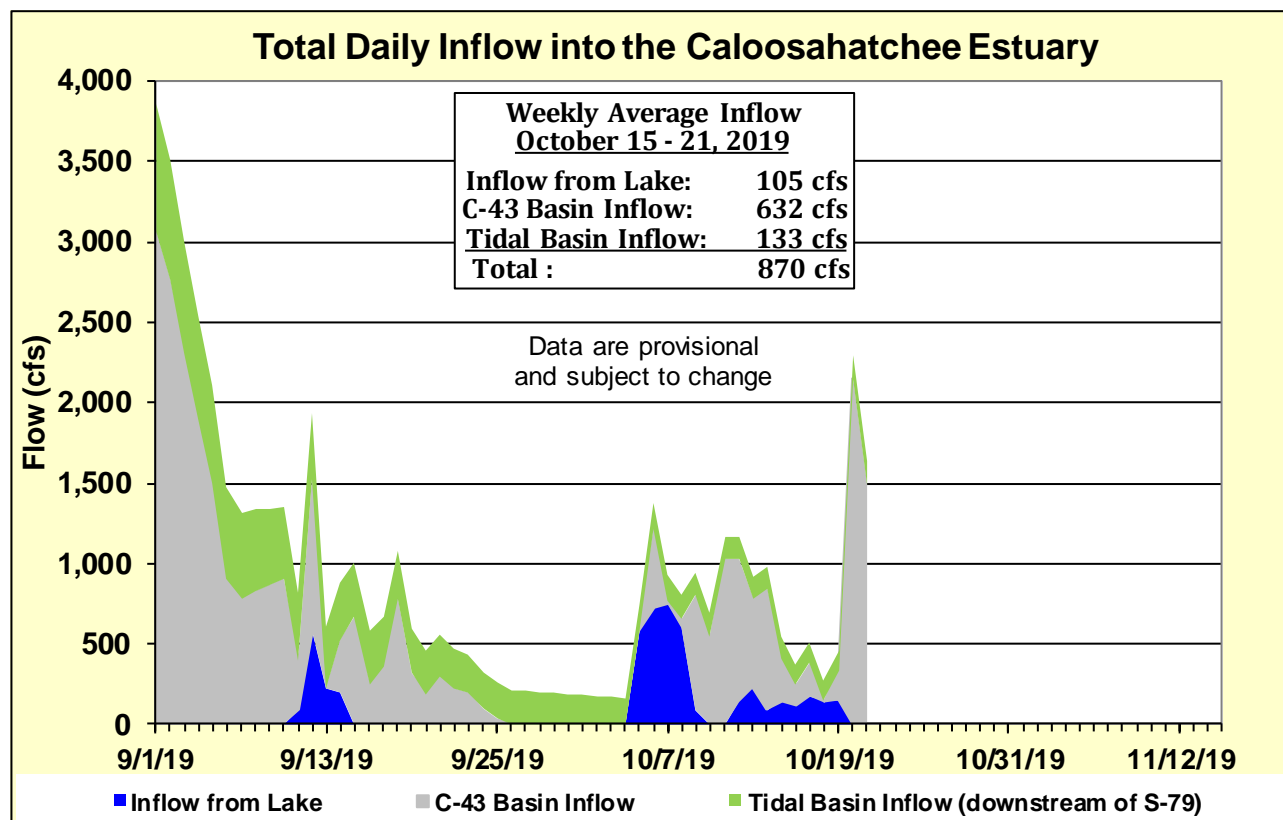


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

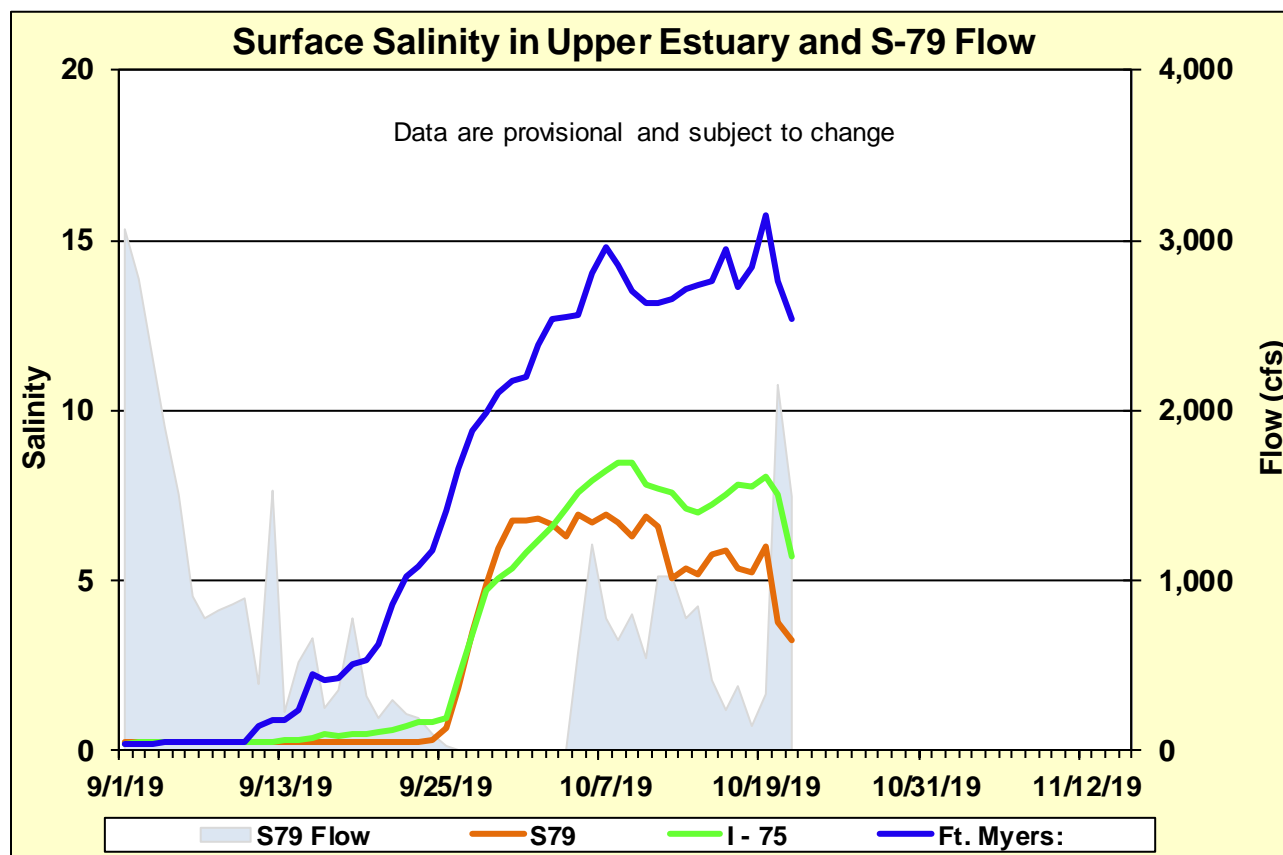


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

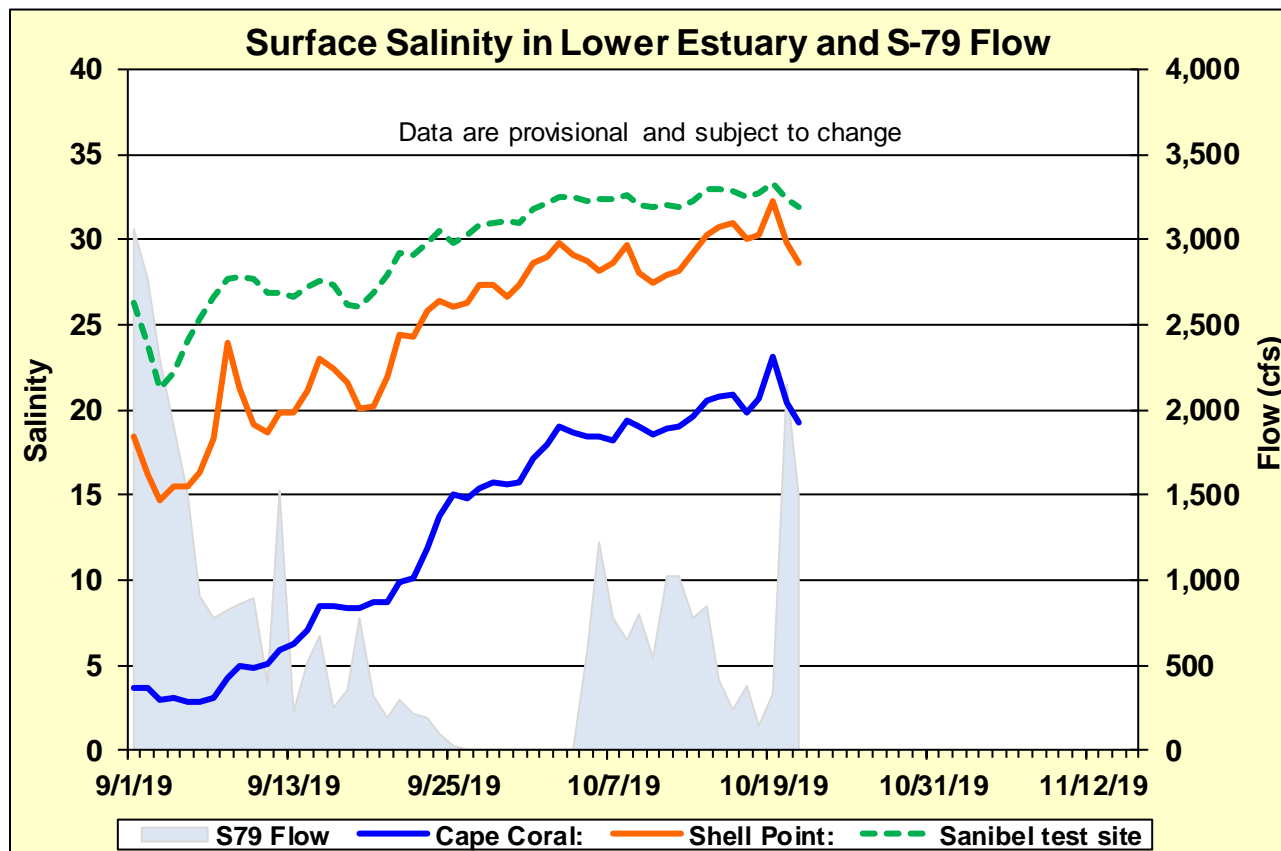


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

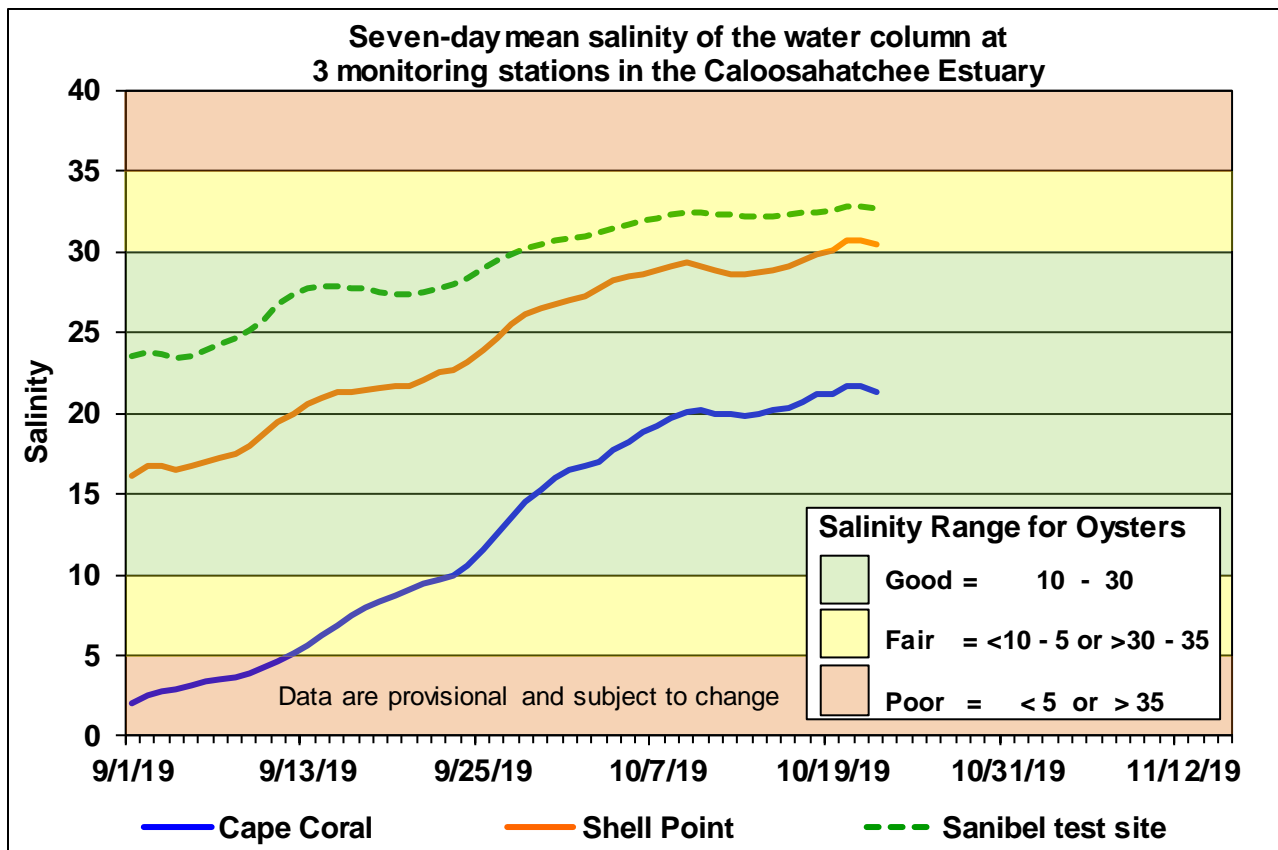


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

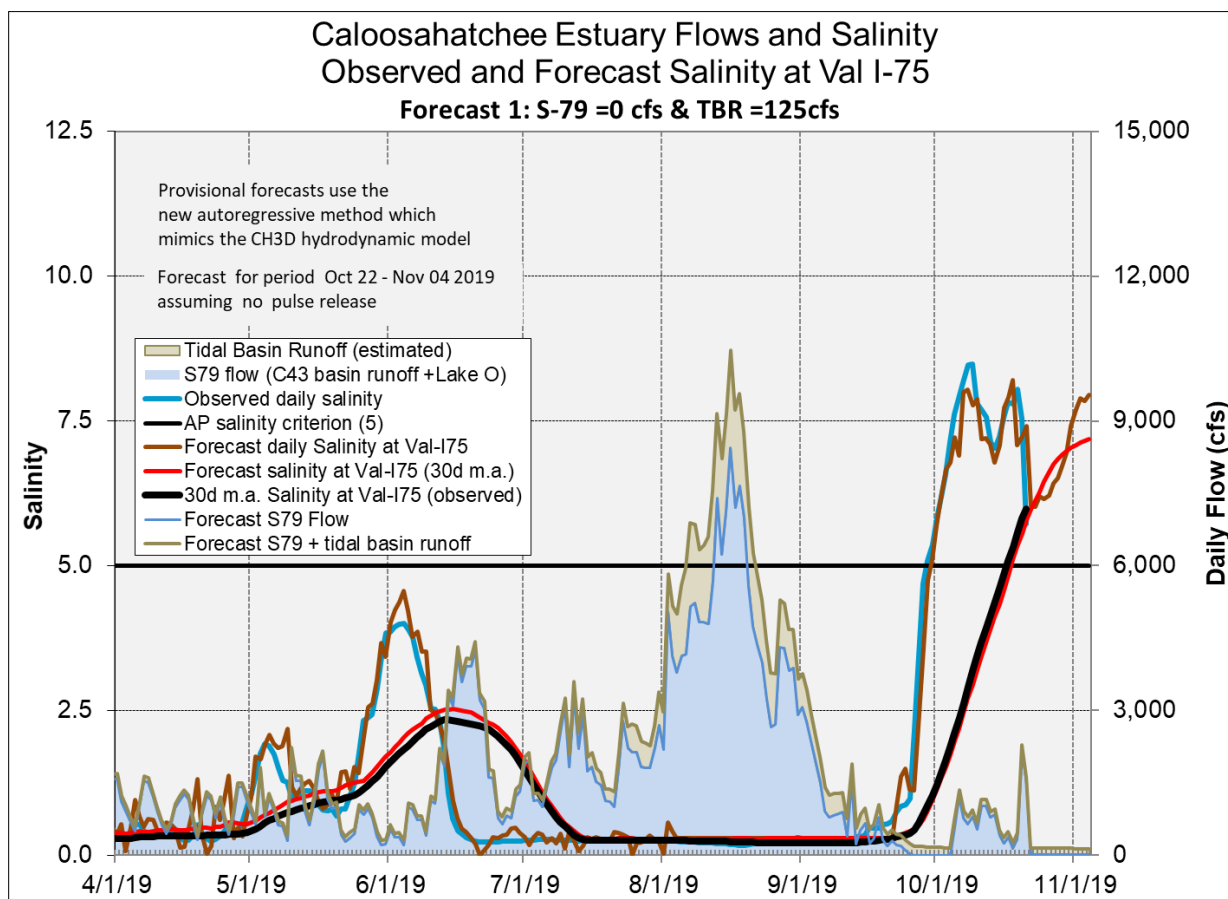
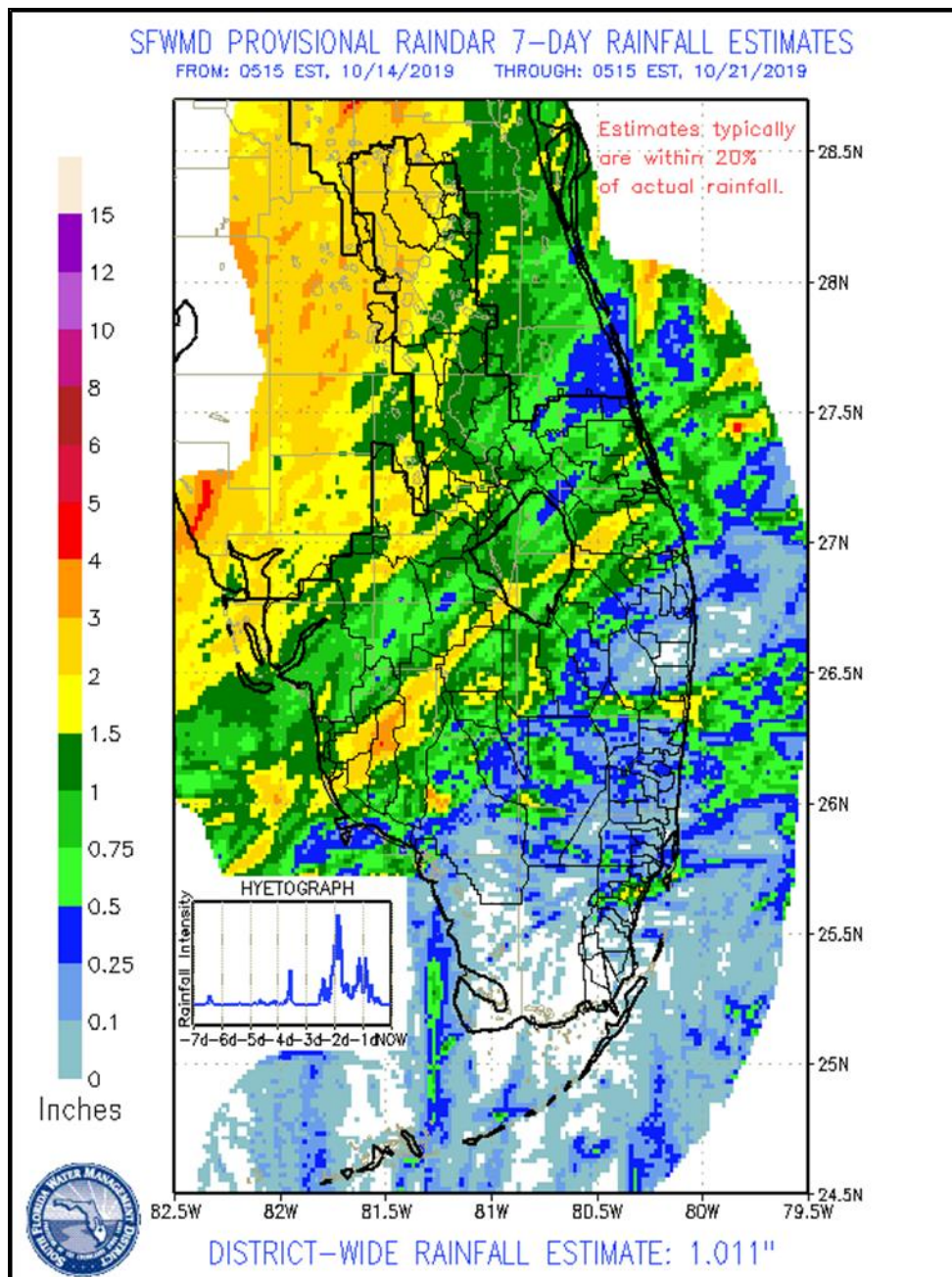


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

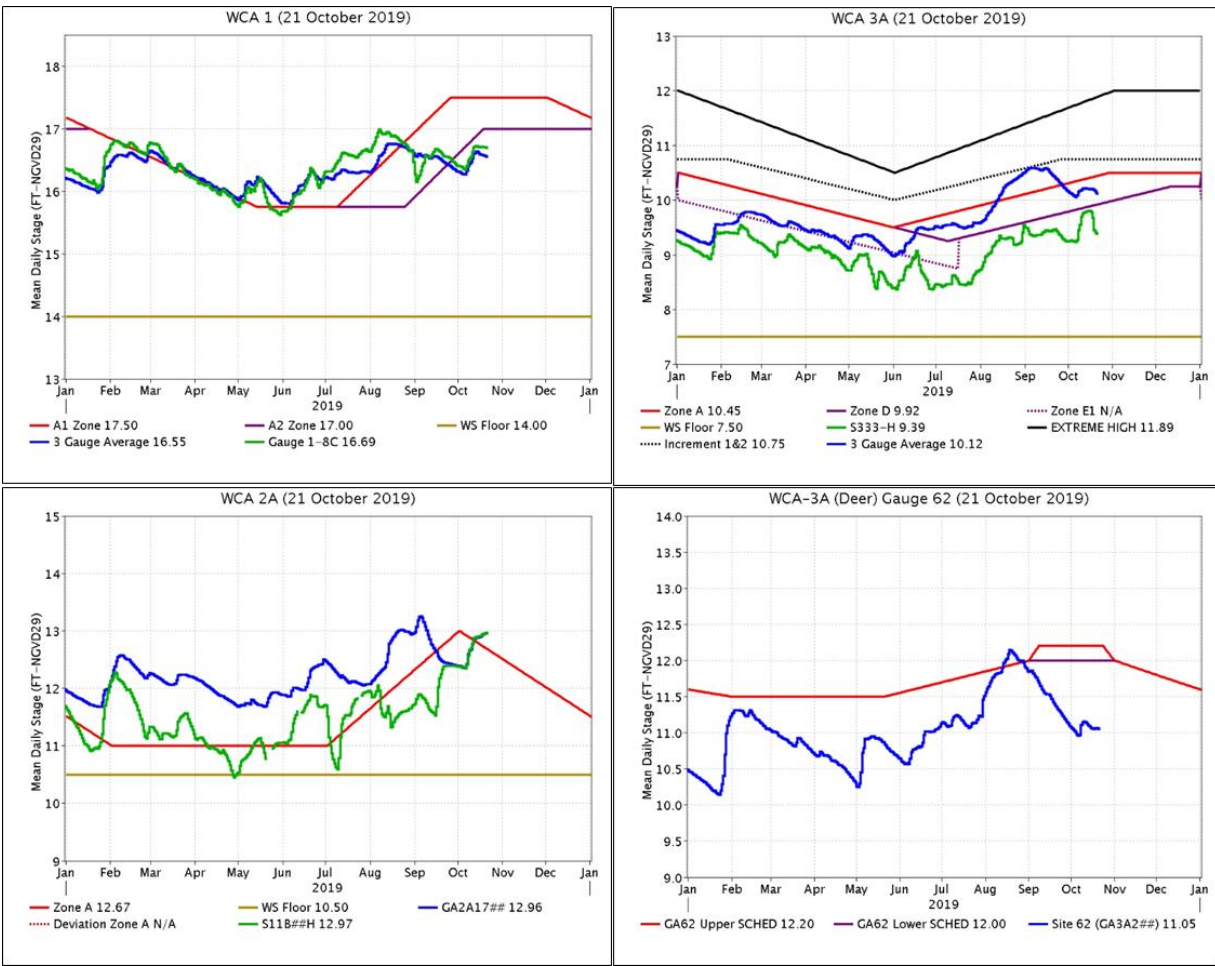
EVERGLADES

WCA-2 was the only basin where the stage increased last week. The stage change at the gauges monitored in this report averaged a 0.07-foot decrease last week. Pan evaporation was estimated at 1.28 inches and the Rainfall Plan calls for a release of 1,580 cfs from WCA-3A (a 150 cfs decrease from last week).

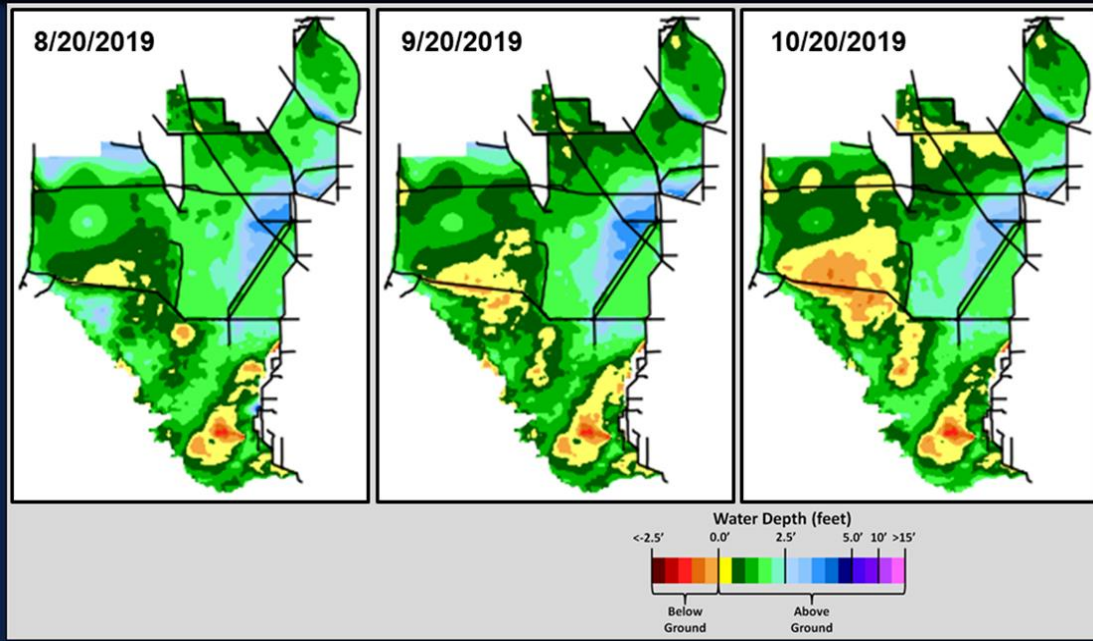
Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.31	-0.10
WCA-2A	0.58	+0.09
WCA-2B	0.20	-0.10
WCA-3A	0.48	-0.07
WCA-3B	0.16	-0.06
ENP	0.06	-0.10



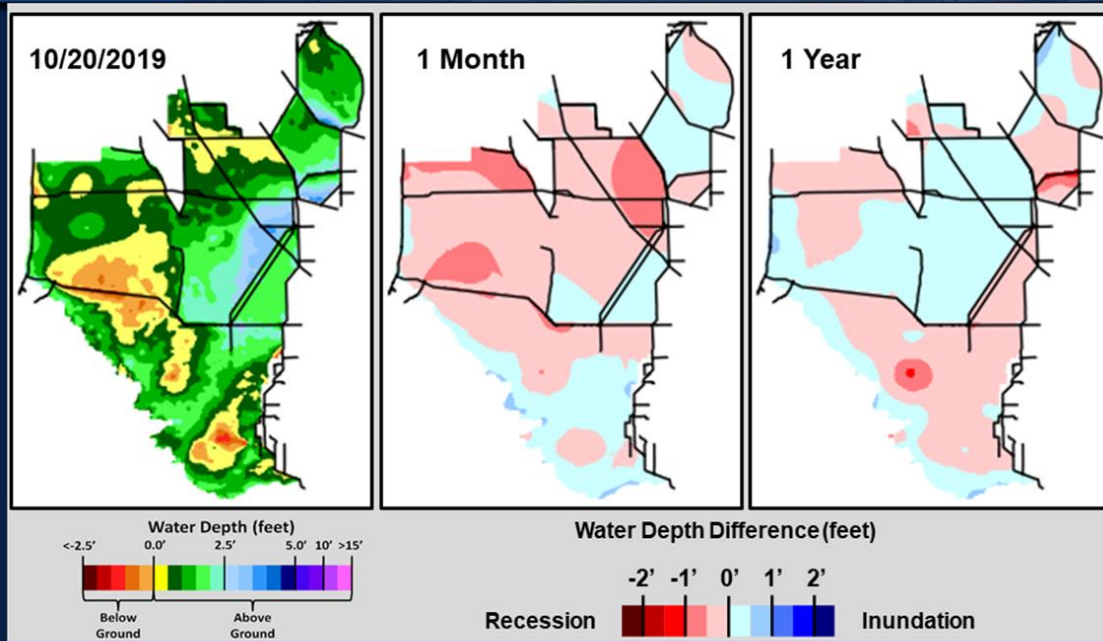
Regulation Schedules: WCA-1: The three-gauge average stage is paralleling the Zone A2 line, currently at 0.45 feet below. WCA-2A: Gauge 2A-17 stage continues to rise away from the Zone A regulation line now 0.29 above the falling line. WCA-3A: The three-gauge average stage remains in Zone D, currently 0.20 feet above that line. WCA-3A stage at gauge 62 (northwest corner) dropped 0.05 last week and remains well below the lower schedule, currently 0.95 feet below



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicates depths are at ground surface along the northern half of WCA-3A North and in the extreme north of WCA-1. The spatial extent of the deepest ponding along the L-67 canal in WCA-3A has diminished, but the regions with depths in the 2.0 to 2.5 foot range have expanded to the west. Hydrologic connectivity has diminished in Lostman's but remains in Shark River and Taylor Slough. WDAT difference maps indicate that in general depths are significantly shallower within the north eastern portion of WCA-3A compared to a month ago. Compared to one year ago, the only significant difference in depth is in WCA-2B, where in the northern half of which depths are up to 1.0 foot less than they were a year ago.

**SFWDAT Water Depth Monthly Snapshots**

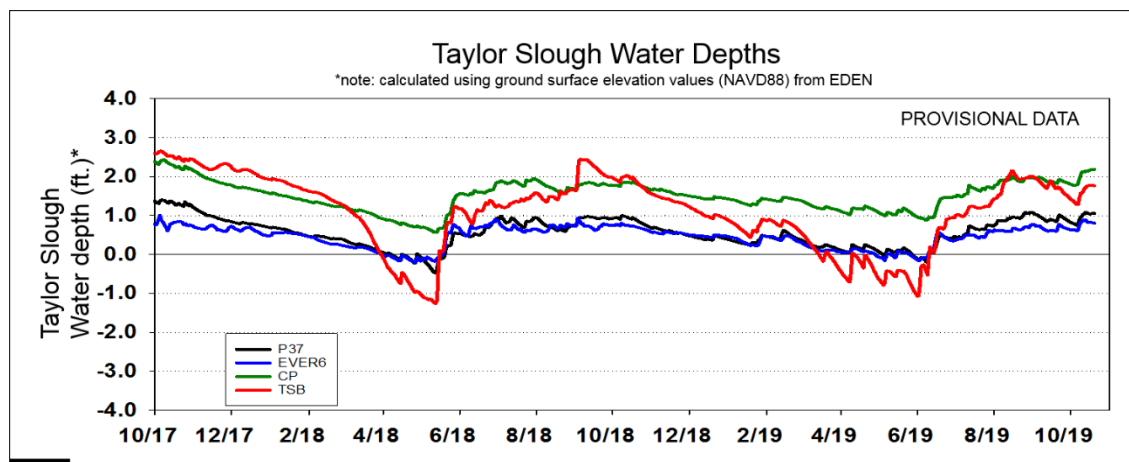
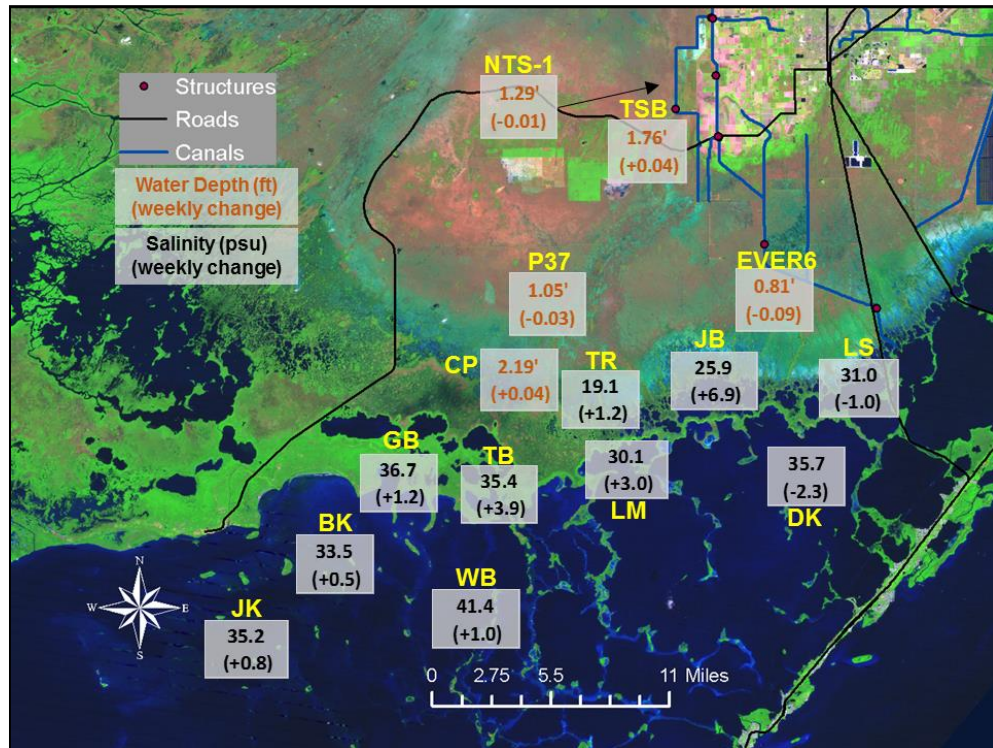
South Florida Water Depth Assessment Tool (SFWDAT)

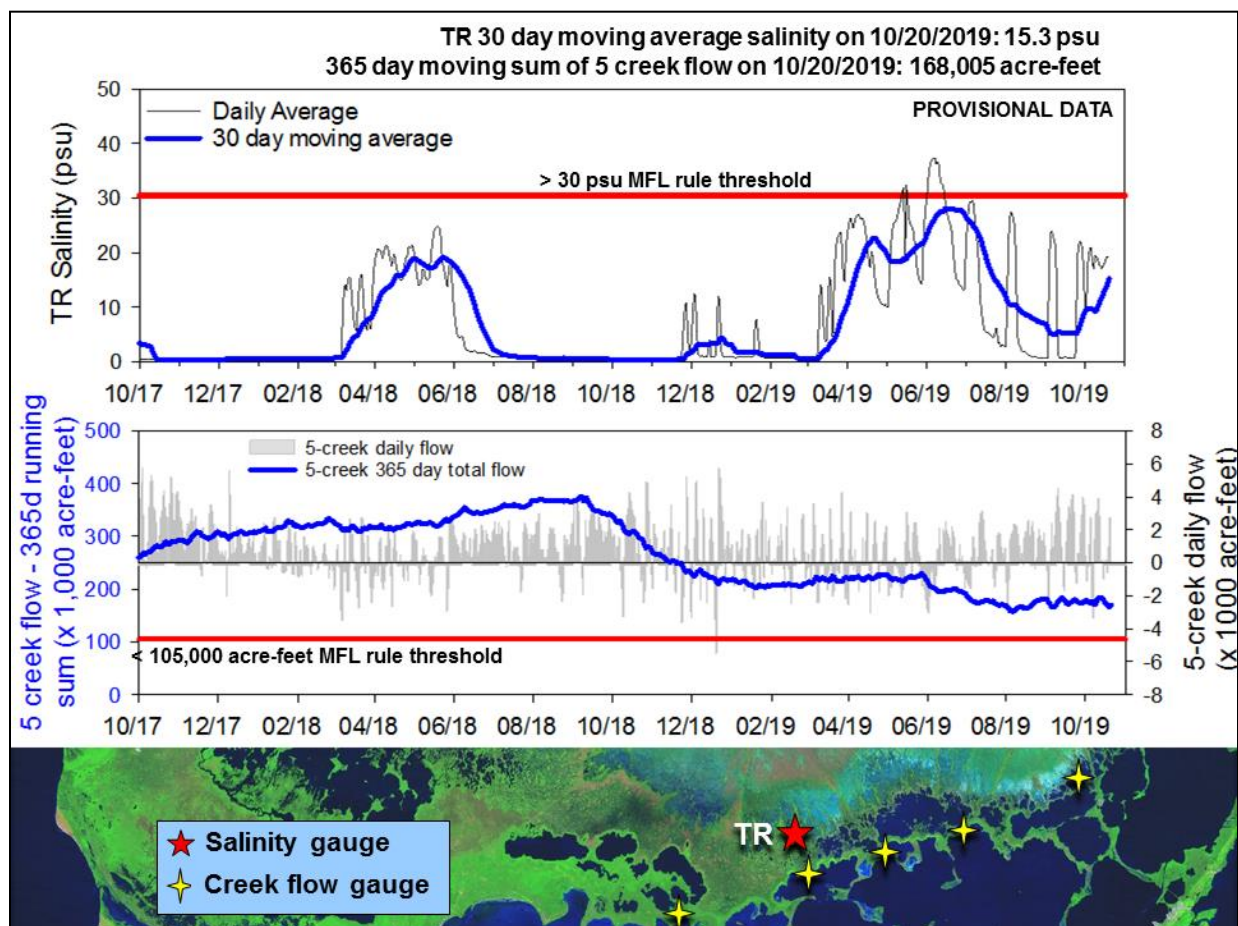
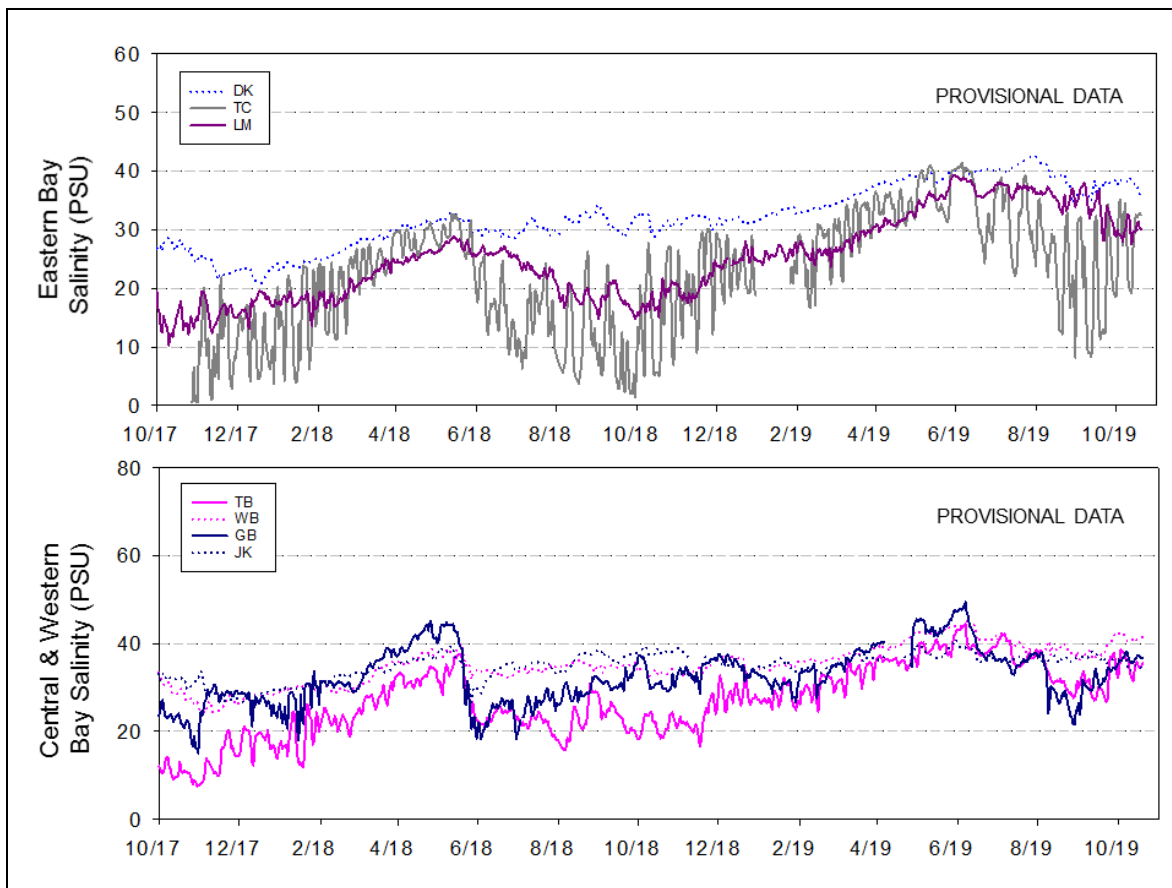
**SFWDAT Everglades Difference Maps
(Present – Past)**

South Florida Water Depth Assessment Tool (SFWDAT)

Taylor Slough Water Levels: Next to no rain fell over Taylor Slough and Florida Bay this past week. Stages decreased an average of 0.01 feet throughout the area with individual stations changing -0.09 feet to +0.04 feet over the week. Stages remain 3 inches above the historical averages for this time of year due to last week's rain and associated water movement.

Florida Bay Salinities: Average salinity in Florida Bay was 34 psu, 2 psu higher than last week. The average for the northern shoreline increased 3 psu to end at 34 psu which is 13 psu higher than average. Elsewhere in the bay, conditions are 9 psu above average for this time of year which is undesirable.





Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) rose 1 psu over the last week to end at 19 psu. The 30-day moving average increased 4.1 psu to end at 15.3 psu. Weekly flow from the 5 creeks identified by yellow stars on the map totaled about -517 acre-feet with half of the week experiencing negative flows. The 365-day moving sum of flow from the 5 creeks (tracked as part of the Florida Bay MFL criteria) decreased roughly 14,000 acre-feet to 168,005 acre-feet and continues to hover under the 25th percentile (190,165 acre-feet). Creek flow are provisional USGS data.

Water Management Recommendations

As the climatological dry season begins, the ecology of the Everglades is eliciting concern as current stages in the WCAs are low for this time of year and salinities are high in Florida Bay. Deeper water during the wet season allows the prey base to build to optimal densities prior to the dry season and wading bird nesting season. Deeper early dry season depths also mean that the seasonal drawdown that concentrates prey for easier foraging can extend throughout the nesting season. WCA-3A North has a high potential for good wading bird foraging this year as a fire in that basin, near the Alley North colony, may have opened the sloughs making it easier for wading birds to forage for prey in that critical region but it is drying down early and rapidly. As WCA-2A is above schedule and WCA-3A North is dry, it may be an appropriate time to route water from WCA-2A to WCA-3A through the S-7/S-150 route that was utilized in the past. Overall conserving water within the WCAs and moving low nutrient water south has many ecological benefits. 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. A potential indicator of stress in the Taylor Slough mangrove zone is the minimum that the 30-day moving average salinity reaches during the peak of the wet season; compared to salinities of one and two years ago, current conditions are elevated. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, October 22nd, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage decreased by 0.10'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2A	Stage increased by 0.09'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2B	Stage decreased by 0.10'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-3A NE	Stage decreased by 0.14'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-3A NW	Stage decreased by 0.05'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths.	
Central WCA-3A S	Stage decreased by 0.04'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths.	Protect tree islands, upstream/downstream habitat and wildlife.
Southern WCA-3A S	Stage decreased by 0.04'		
WCA-3B	Stage decreased by 0.06'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths.	Protect tree islands, upstream/downstream habitat and wildlife.
ENP-SRS	Stage decreased by 0.10'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from -0.09 to +0.04'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions.
FB- Salinity	Salinity changes ranged -2.3 to -6.9 psu.	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.