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M E M O R A N D U M

TO: John Mitnik, Chief, Operations, Engineering and Construction Bureau
Paul Linton, Chief, Operations Section

FROM: SFWMD Staff Environmental Advisory Team

DATE: July 17, 2018

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

A deep-layered southwesterly to southerly wind flow ahead of a low- to mid-level trough over the Florida Panhandle is transporting moist and unstable air northward across the District today. Where the moisture is a little deeper vertically north of Lake Okeechobee scattered to locally numerous showers and thunderstorms are expected to develop during the afternoon and evening, with the greatest concentration around or possibly over portions of the Kissimmee valley. The southwesterly wind flow should favor a second 'hot spot' along the east coast sea breeze from the southeastern interior to near the coast. The complicating factor regarding the forecast over the southeast is the arrival of very dry mid-level air over the southern half of the District by this afternoon, which could act to suppress some of the activity. Farther southwest and especially near the west coast relatively dry weather should prevail, with many areas seeing little to no rain. The very dry mid-level air with origins from west Africa should dominate the District's weather through early this weekend, and its suppressing influence should result in below normal District-average rainfall through Saturday. In fact, for the next 5 days, the deterministic quantitative precipitation forecast (QPF) is about 0.5 inches (normal is ~1.05 inches). The low- to mid-level trough over north Florida today should hold sway into next week, and the anomalous southwesterly winds ahead of it favor a very dry pattern for the southwest and especially near the west coast; the greatest departures from normal are expected there. Downwind of Lake Okeechobee over a large part of Martin and St. Lucie counties, the persistent southwesterly winds also mean well below normal rainfall, thanks to a pronounced 'lake shadow' remaining in place throughout the week. Whereas all basins should see rainfall solidly below normal through the weekend, the region near or inland of the lower and middle east coast should be relatively wetter. It should also be relatively wetter over the Kissimmee valley, which should be closer to the trough axis over north Florida. The dry Saharan Air should loosen its grip sometime late in the week and early next week, and with the large-scale pattern favoring rain, a trend toward near or above normal District rainfall seems possible.

Kissimmee

Tuesday morning stages were 56.5 feet NGVD (at schedule) in East Lake Toho, 53.5 feet NGVD (at schedule) in Toho, and 51.1 feet NGVD (0.1 feet above schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.3 feet NGVD at S-65A and 26.6 feet NGVD at S-65D. Tuesday morning discharges were: 1,615 cfs at S-65, 1,488 cfs at S-65A, and 3,281 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 2.7 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 1.34 feet. Recommendations were made this past week to: 1) reduce S-65/S-65A discharge to 1,400 cfs using a faster rate of decrease (600 cfs per day) to stabilize Lake Kissimmee stage, and 2) maintain sufficient discharge to keep areas under snail kite nests in Pool D hydrated until nestlings fledge. See revised discharge plan in the supporting information below.

Lake Okeechobee

Lake Okeechobee stage is 14.44 feet NGVD having decreased 0.02 feet over the past week and increased 0.31 feet over the past month. The Lake was below 13.0 feet NGVD for just 10 days this past dry season and likely rose too quickly for many recovering submerged aquatic vegetation (SAV) communities to stay in optimal light conditions. The seasonal low stage for the 2018 SAV growing season of 12.83 feet NGVD was the third highest since 2011, and the third time in six years that stage did not reach the bottom of the preferred stage envelope (12.5 – 15.5 feet NGVD). Due to record rainfall in May, the SAV coverage on the Lake will likely remain at minimal levels throughout the growing season and well into next year, prolonging impacts from high stages in 2016 and Hurricane Irma in 2017. Cyanobacteria blooms increased rapidly since late June to early July, with NOAA's satellite monitoring system (see supporting information below) suggesting that most of the Lake potentially had a visible algal bloom on the surface. The mid July imagery suggests conditions have improved, with only areas in the nearshore regions showing high potential for cyanobacterial blooms. However, conditions will likely remain favorable for recurring blooms throughout the summer, particularly during stretches of fewer storms and low winds.

Estuaries

Total inflow to the St. Lucie Estuary averaged 2,224 cfs over the past week with 759 cfs coming from Lake Okeechobee. Surface salinity increased throughout the estuary compared to last week's salinity levels. The seven-day average salinity at the US1 Bridge is in the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 6,583 cfs over the past week with 2,145 cfs coming from the Lake. Salinity remained about the same as last week's salinity levels throughout the estuary. The 30-day moving average surface salinity is 0.2 at Val I-75 and 0.2 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass. Salinity conditions are in the poor range for adult eastern oysters at Cape Coral and in the good range at Shell Point.

Stormwater Treatment Areas

Over the past week, the STAs received approximately 36,000 acre-feet of inflows (which includes approximately 10,300 acre-feet of Lake releases). The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 561,440 acre-feet, which includes approximately 37,200 acre-feet of Lake releases. Most STA cells are at or above target depths. Operational restrictions are in place for vegetation rehabilitation in STA-1E and STA-2, and for construction related activities in STA-1W. STA-5/6 Flow-ways 2 and 3 are offline for initiation of a Restoration Strategies project to grade non-effective treatment areas. The nests of Migratory Bird Treaty Act and Endangered Species Act protected species have been observed in STA-1E. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to the STA-1E, A-1 FEB/STA-3/4 and STA-2.

Everglades

Marsh stages within the WCAs remain above the regulation schedule. Stage increases last week stayed within the recommended weekly ascension rate in all basins. Keeping depths below 2.5 feet at gauge 65 in WCA-3A is important to moderate the stress to tree islands caused by flooding when durations last longer than 60-90 days. Depths reached 2.5 feet on June 13 (5 days earlier than last year). The depth on Sunday at that location was 2.62 feet, a decrease of 0.10 feet over the last week. Stage ascension rates are now critical for apple snail reproduction in the Everglades. The current recommended ascension rate is less than 0.25 feet per week (or 0.5 feet per 2 weeks – less preferred rate). In Taylor Slough, the average water depth increased by 0.08 feet which is 5 to 6 inches above the historical average. Salinity increased 0.6 psu on average in Florida Bay, and is 4 psu below the historical average.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.57 inches of rainfall in the past week and the Lower Basin received 0.75 inches (SFWMD Daily Rainfall Report 7/16/2018).

Upper Kissimmee Basin

Stages and departures in the Kissimmee Chain of Lakes (KCOL) are shown in **Table 1**. KCOL stage hydrographs with respective regulation schedules and rainfall are shown in Figures 1-7.

Table 1. Average discharge (cfs) for the preceding seven days, one-day stage (feet NGVD), and departures from KCOL flood regulation (R) or temporary schedules (T, A, or S). Provisional, real-time data are from SFWMD.

Report Date: 7/17/2018

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)						
							7/15/18	7/8/18	7/1/18	6/24/18	6/17/18	6/10/18	6/3/18
Lakes Hart and Mary Jane	S-62	104	LKMJ	60.1	R	60.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0
Lakes Myrtle, Preston, and Joel	S-57	61	S-57	61.0	R	61.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.7
Alligator Chain	S-60	122	ALLI	63.3	R	63.2	0.1	0.1	0.2	0.0	-0.1	-0.6	-1.0
Lake Gentry	S-63	182	LKGT	61.0	R	61.0	0.0	0.0	0.1	-0.5	-0.6	-1.0	-1.3
East Lake Toho	S-59	256	TOHOE	56.4	R	56.5	-0.1	-0.1	-0.5	-0.9	-1.0	-1.2	-1.4
Lake Toho	S-61	621	TOHOW, S-61	53.5	R	53.5	0.0	-0.1	-0.4	-0.9	-0.9	-1.2	-1.4
Lakes Kissimmee, Cypress, and Hatchineha	S-65	2,561	KUB011, LKIS5B	51.1	R	51.0	0.1	0.3	-0.4	-0.9	-0.9	-0.9	-1.1

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 T = temporary schedule, R = USACE flood control schedule, S = temporary snail kite schedule, A = projected ascension line, N/A= not applicable or data not available.

DATA ARE PROVISIONAL

Lower Kissimmee Basin

Discharges at Lower Basin structures are shown in Table 2. SFWDAT depth maps for the Phase I restoration area are shown in Figure 8. Kissimmee River floodplain stages at selected stations are shown in Figure 9.

Table 2. One-day and seven-day averages of discharge at S-65x structures, of dissolved oxygen concentration in the Phase I area river channel, and water depth in the Phase I area floodplain. Data are provisional real-time data from SFWMD.

Report Date: 7/17/2018

Metric	Location	1-Day Average		Average for the Preceding 7-Days ¹									
		7/15/2018	7/15/18	7/8/18	7/1/18	6/24/18	6/17/18	6/10/18	6/3/18	5/27/18	5/20/18	5/13/18	
Discharge (cfs)	S-65	1,407	2,561	1,287	514	834	1,110	915	1,092	1,271	854	381	
Discharge (cfs)	S-65A ²	1,423	2,615	1,294	466	801	1,224	1,043	1,139	1,142	700	272	
Discharge (cfs)	S-65D ²	2,928	2,226	1,827	1,608	2,094	2,062	1,925	1,869	1,495	781	323	
Headwater Stage (feet NGVD)	S-65D ²	26.86	26.77	26.80	26.79	26.79	26.82	26.86	27.00	26.08	25.72	25.83	
Discharge (cfs)	S-65E ²	2,937	2,399	2,000	1,834	2,347	2,261	2,107	2,082	1,623	824	290	
Discharge (cfs)	S-67	173	217	292	298	277	273	278	282	298	332	71	
DO (mg/L) ³	Phase I river channel	2.1	2.7	2.9	3.4	2.0	1.4	1.7	3.4	4.8	5.7	7.5	
Mean depth (feet) ⁴	Phase I floodplain	1.34	1.14	0.60	0.46	0.75	0.84	0.76	0.66	0.47	0.17	0.06	

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

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

³DO is the average for sondes at PC62 and PC33.

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

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

KCOL Hydrographs (through Sunday midnight)

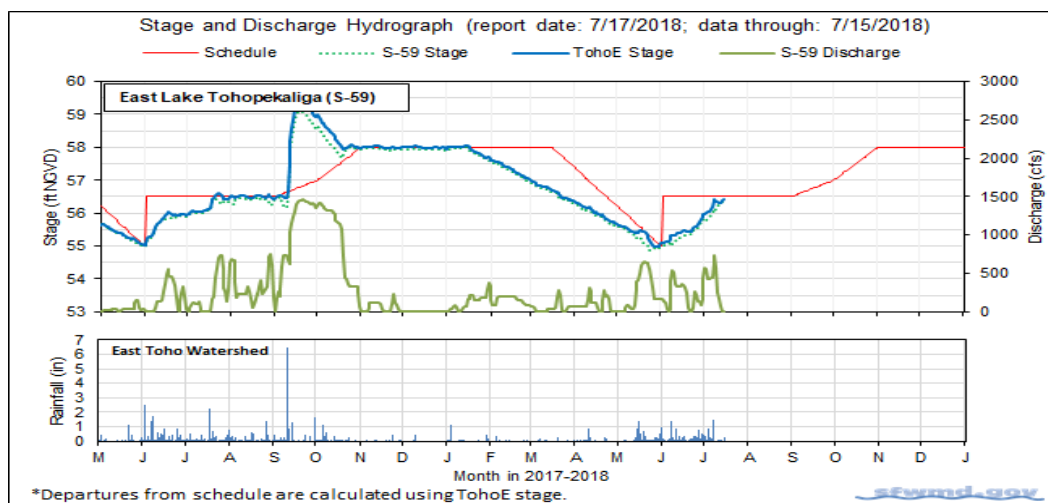


Figure 1.

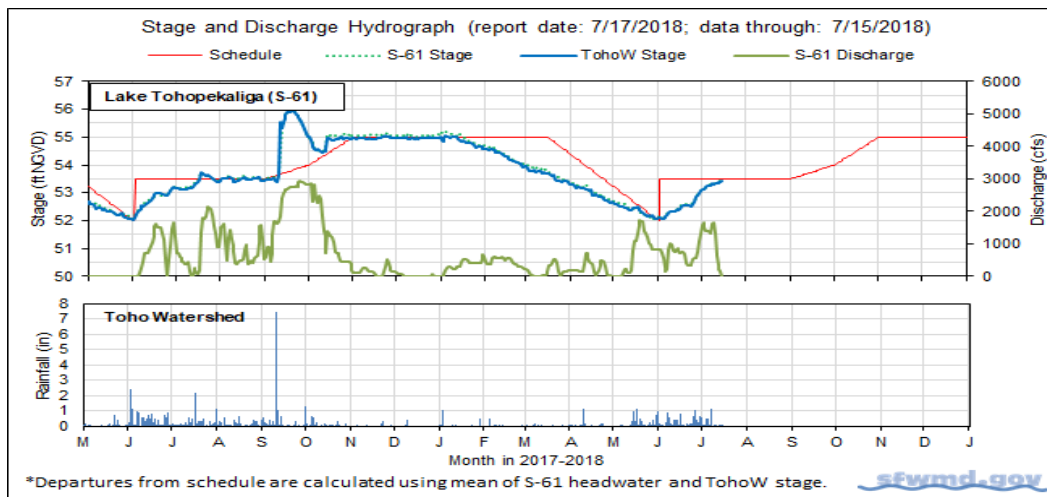


Figure 2.

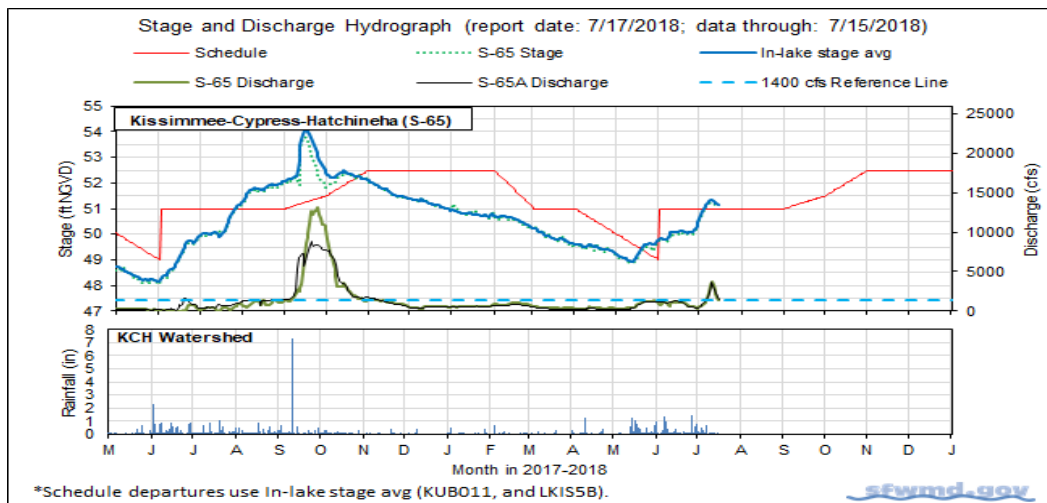


Figure 3.

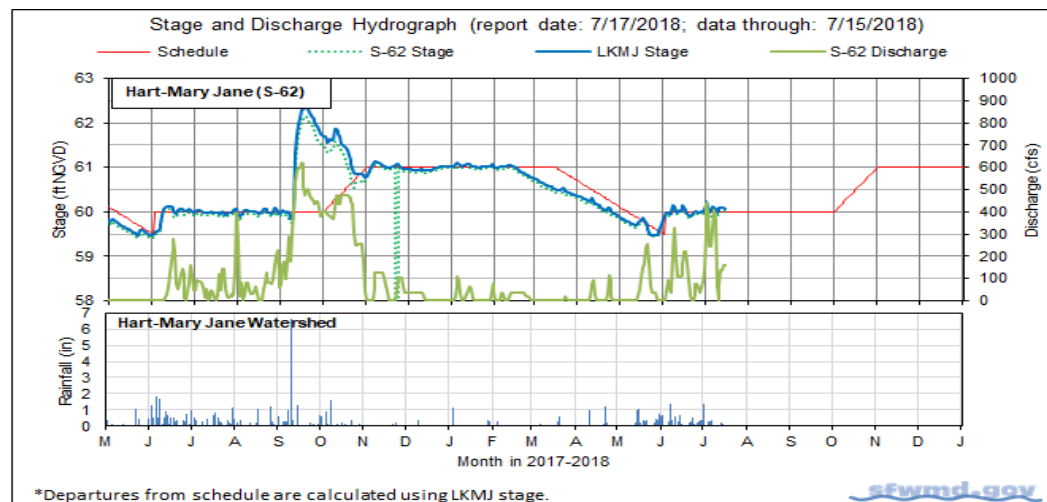


Figure 4.

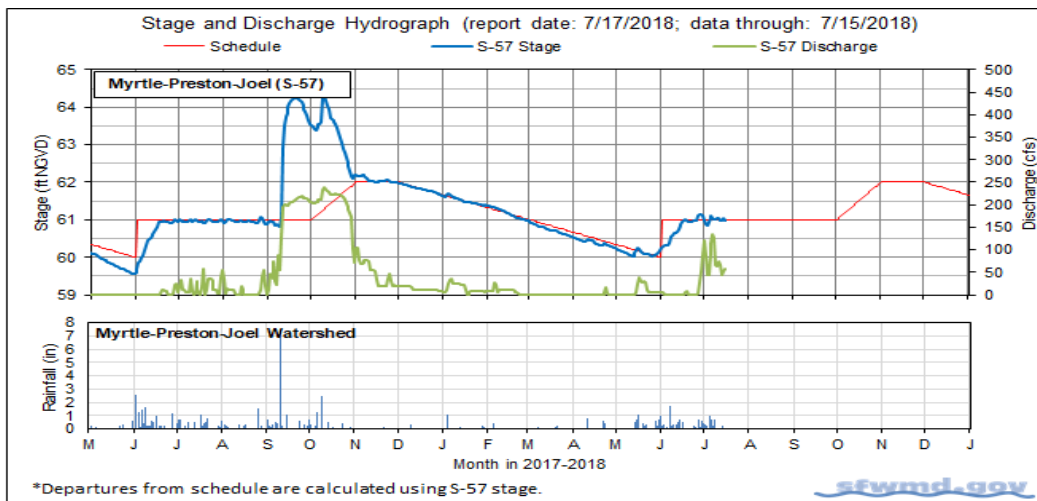


Figure 5.

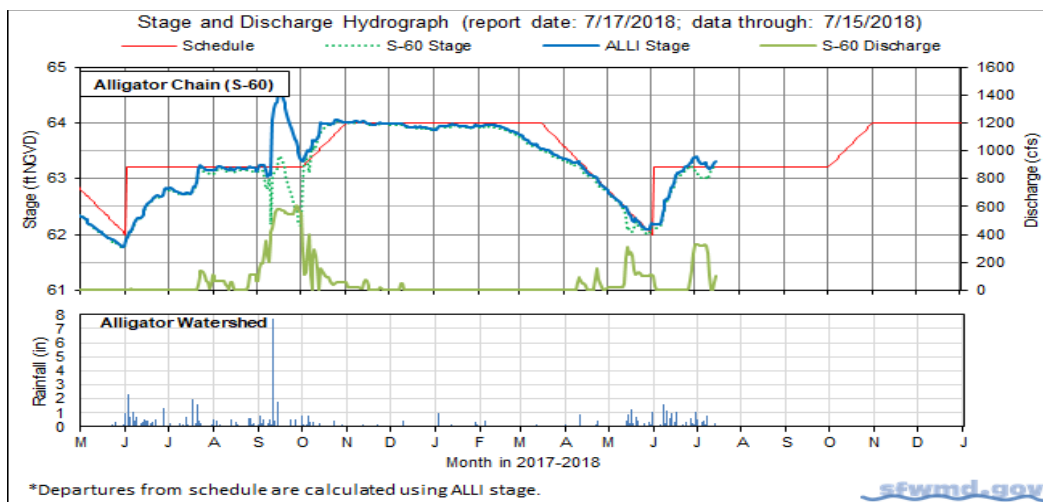


Figure 6.

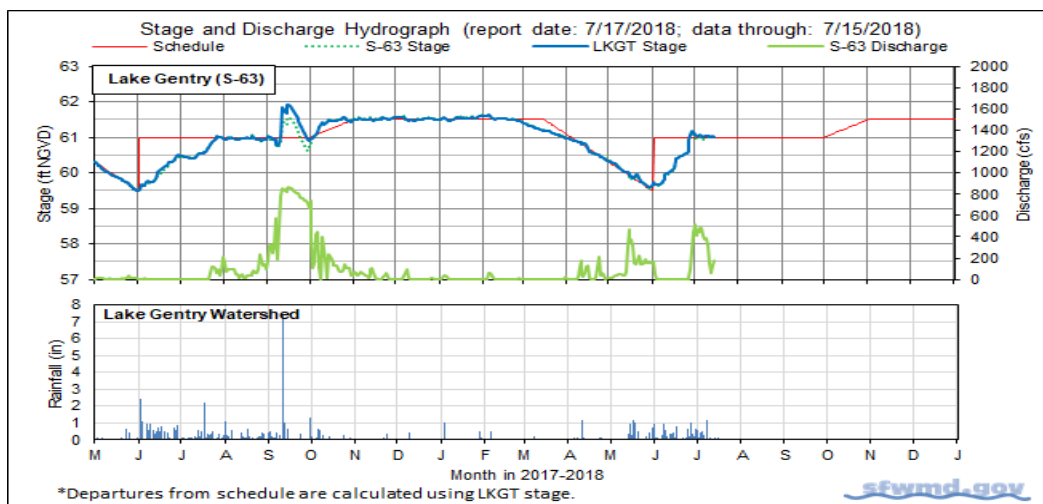


Figure 7.

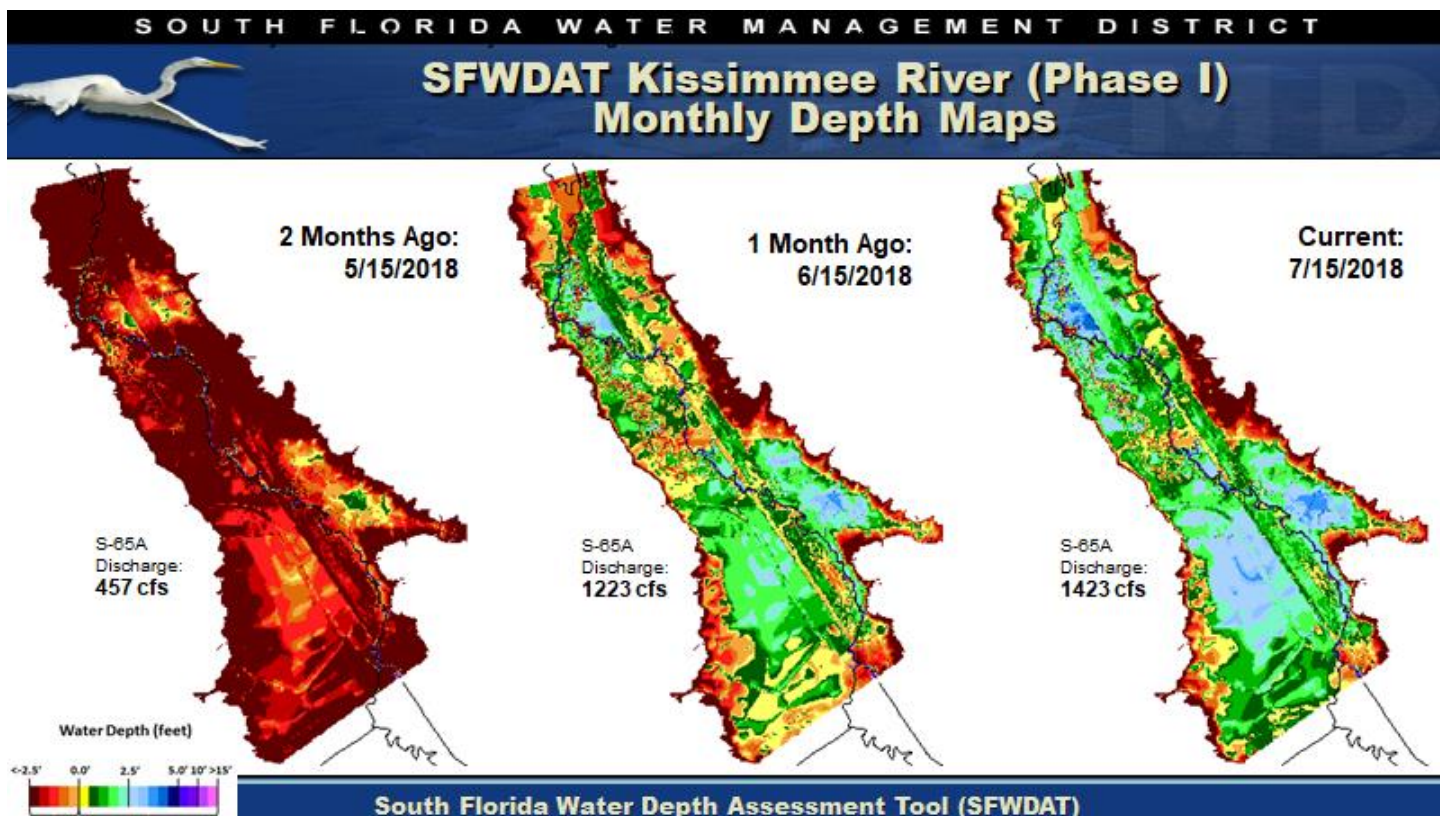


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

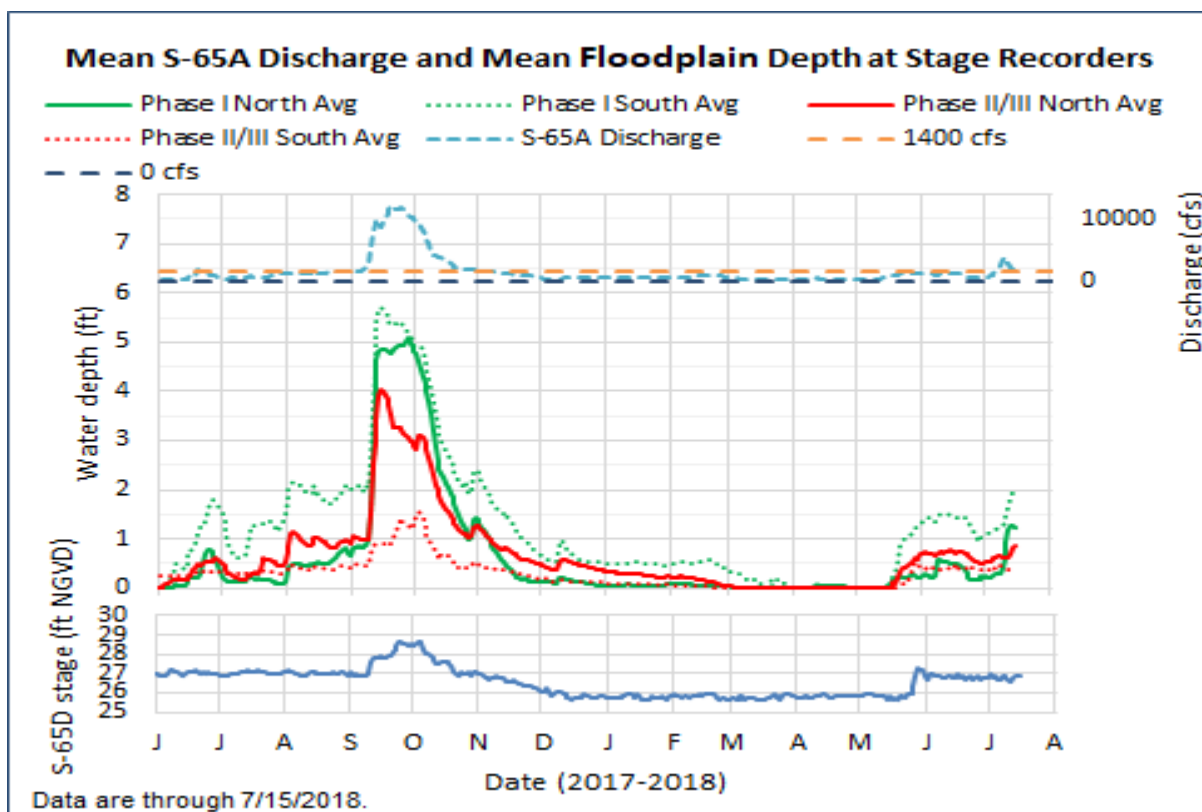


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.

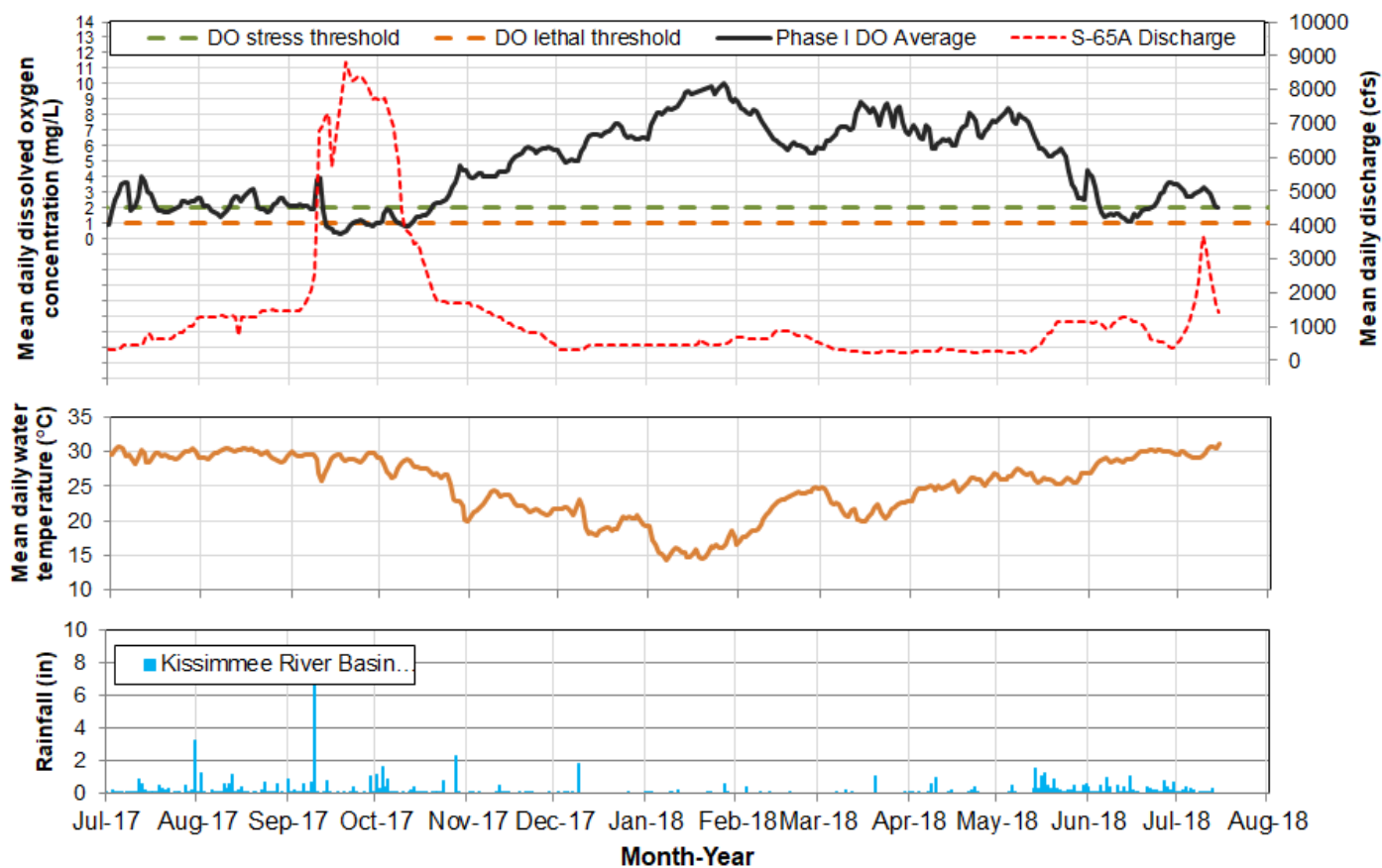


Figure 10. Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phase I river channel.

Water Management Recommendations

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
7/13/2018	Maintain approximately 1400 cfs at S-65A while Lake Kissimmee stage is above 50 feet. (See revised 2018 discharge plan, below).	To the extent possible, maintain sufficient discharge to keep areas under snail nest kites in Pool D hydrated until nests fledge.	N/A	KB Ops	7/17/2018
7/13/2018	Reduce S-65/S-65A discharge by 600 cfs/day until 1400 cfs is reached. (See revised 2018 discharge plan, below).	Reach 1400 cfs faster to help stabilize Lake Kissimmee stage.	Implemented	SFWMD Water Mgt/KB Ops	7/17/2018
7/9/2018	Increase S-65/S-65A discharge by 300 cfs if needed.	Stablize Lake Kissimmee stage.	N/A	SFWMD Water Mgt/KB Ops	7/10/2018
7/8/2018	Increase S-65/S-65A discharge by 900 cfs today in 3 increments of 300 cfs each.	Stablize Lake Kissimmee stage.	Implemented	KB Ops	7/10/2018
7/5/2018	Increase S-65/S-65A discharge by 300 cfs/day (double the prescribed rate of increase) Thursday through Sunday .	Stablize Lake Kissimmee stage.	Implemented	SFWMD Water Mgt	7/10/2018
7/2/2018	Increase S-65/S-65A discharge by 150 cfs/day (double the prescribed rate of increase).	Stablize Lake Kissimmee stage.	Implemented	SFWMD Water Mgt/KB Ops	7/10/2018
6/30/2018	Increase S-65/S-65A discharge as slowly as feasible	Slow stage ascension in Kissimmee-Cypress-Hatchineha	Implemented	KB Ops/SFWMD Water Mgt	7/3/2018
6/28/2018	Continue to reduce discharge at S-65/S-65A as slowly as feasible.	Prevent stage decline in Kissimmee-Cypress-Hatchineha.	Implemented	KB Ops/SFWMD Water Mgt	7/3/2018
6/21/2018	Reduce discharge at S-65/S-65A as slowly as feasible.	Prevent stage decline in Kissimmee-Cypress-Hatchineha.	Implemented	KB Ops/SFWMD Water Mgt	6/26/2018
6/15/2018	Reduce S-65A discharge by 150-300 cfs over the weekend.	Slow or stop DO decline in Kissimmee River.	Implemented	KB Ops	6/19/2018
6/12/2018	No new recommendations.		N/A		6/12/2018
6/5/2018	No new recommendations.		N/A		6/5/2018
5/29/2018	Begin implementation of the 2018 Wet Season Discharge Plan for S-65/S-65A on June 1 (see figure).	Provide variable flow from S-65/S-65A to balance Kissimmee River and Headwaters Lakes objectives including Kissimmee River floodplain inundation, moderated rates of change in discharge, and constrained rate of stage rise in the lakes.	Planned	KB Ops/SFWMD Water Mgt/FWC/FWS	5/29/2018
5/22/2018	Hold Kissimmee-Cypress-Hatchineha at current stage of approximately 49.5 ft until June 1.	(a) Reduce impacts of rising water on DO in the Kissimmee River; and (b) limit stage reversal in KCH to <1 foot to protect snail kite nests.	Implemented	KB Ops/SFWMD Water Mgt	5/29/2018
5/18/2018-5/20/2018	Increase discharge gradually in response to rainfall in consultation with KB staff.	(a) Reduce impacts of rising water on DO in the Kissimmee River; and (b) limit stage reversal in KCH to <1 foot to protect snail kite nests.	Implemented	KB Ops	5/22/2018
5/15/2018	Adjust S-65/S-65A discharge over the next few days to avoid additional stage rise in Kissimmee-Cypress-Hatchineha. Make any needed discharge changes gradually in consultation with Kissimmee Basin staff to reduce potential effects on Kissimmee River dissolved oxygen.	Protect Lake Kissimmee snail kite nests from rising water if there is additional rainfall.	N/A	KB Ops	5/22/2018
5/8/2018	No new recommendations.		N/A		5/8/2018
5/1/2018	No new recommendations.		N/A		5/1/2018
4/24/2018	No new recommendations.		N/A		4/24/2018
4/17/2018	No new recommendations.		N/A		4/17/2018
4/10/2018	No new recommendations.		N/A		4/10/2018
4/3/2018	No new recommendations.		N/A		4/3/2018
3/27/2018	No new recommendations.		N/A		3/27/2018
3/20/2018	No new recommendations.		N/A		3/20/2018
3/13/2018	No new recommendations.		N/A		3/13/2018
3/6/2018	No new recommendations.		N/A		3/6/2018
2/27/2018	No new recommendations.		N/A		2/27/2018
2/20/2018	No new recommendations.		N/A		2/20/2018
2/13/2018	No new recommendations.		N/A		2/13/2018

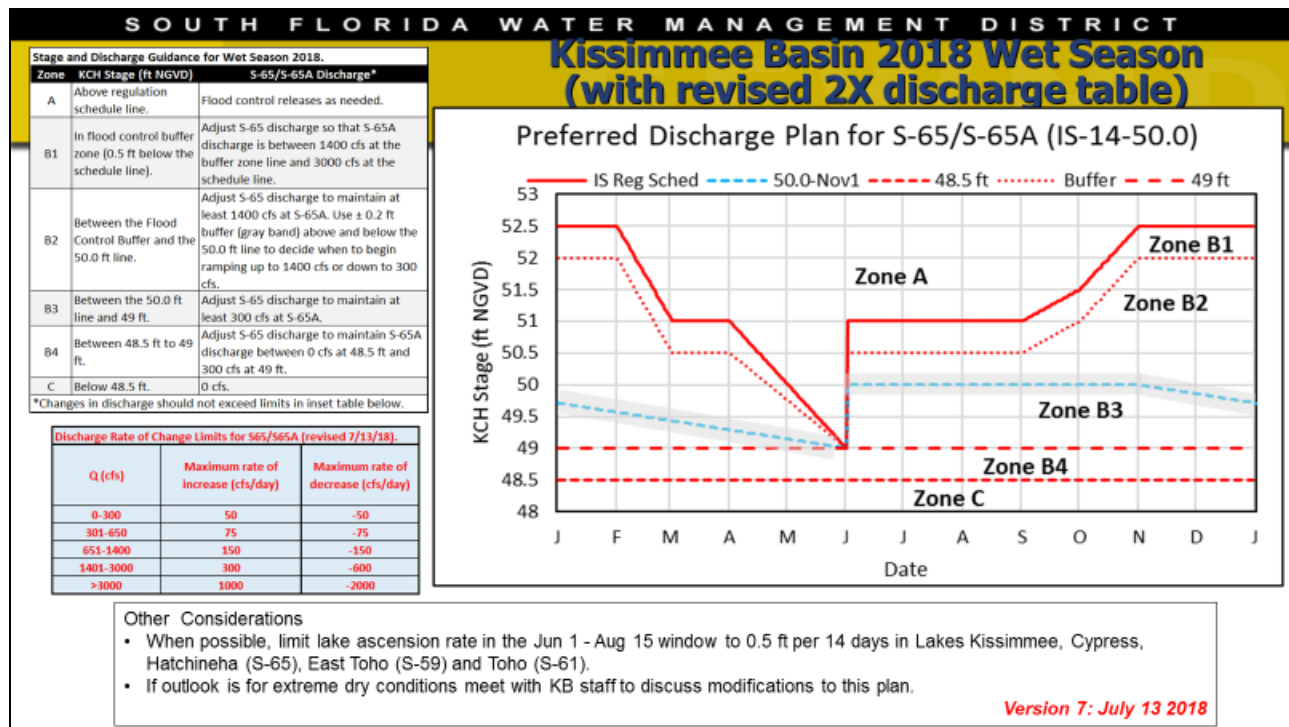


Figure 11. The 2018 Wet Season Discharge Plan for S-65/S-65A.

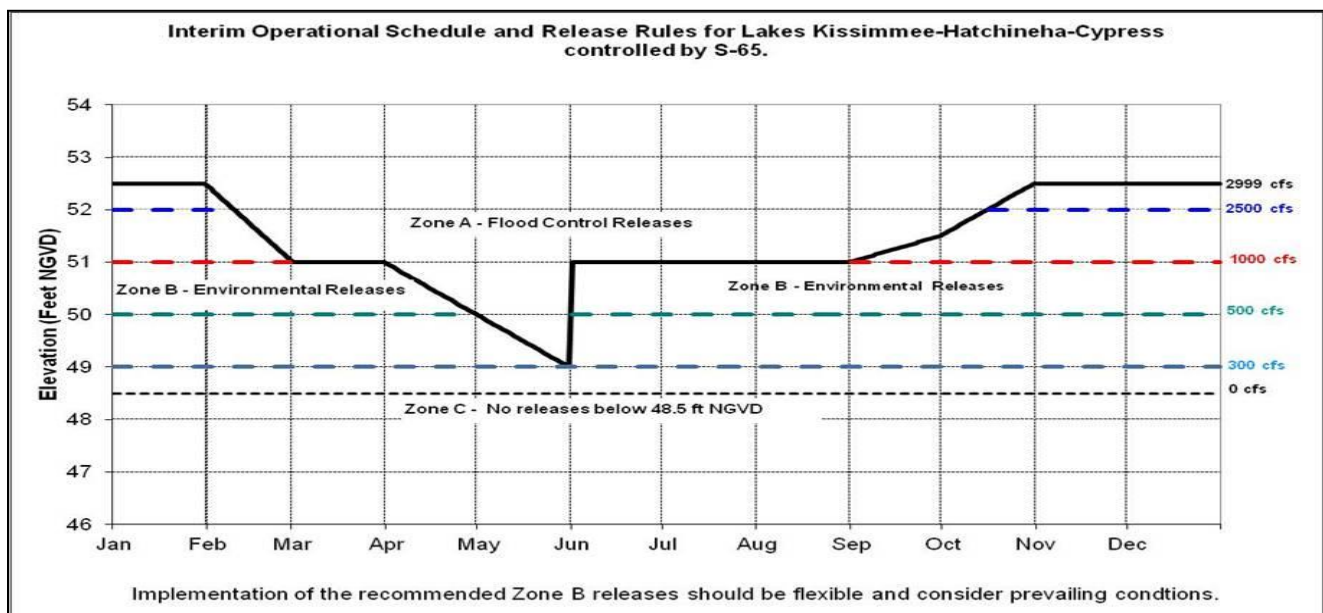


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

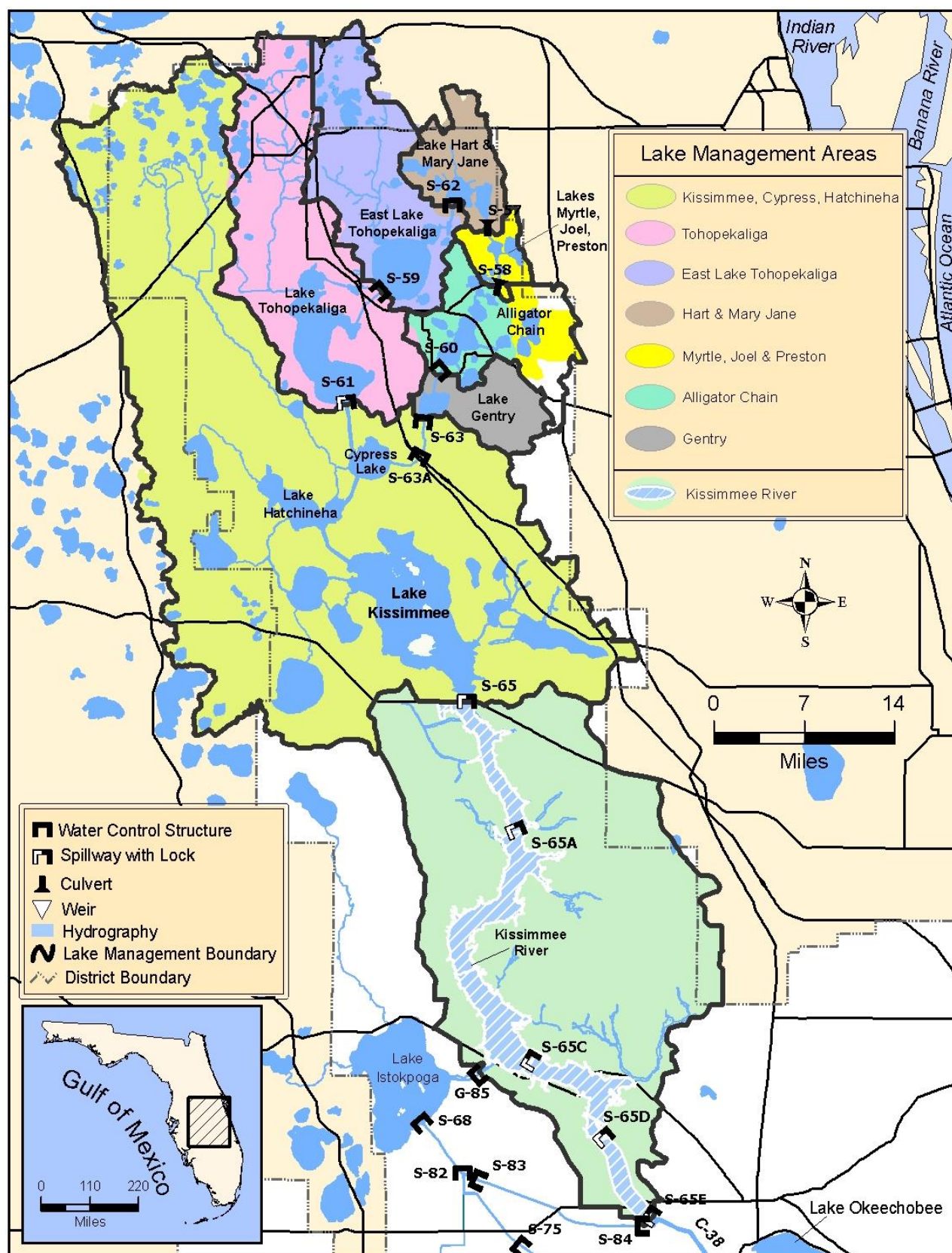


Figure 13. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee stage is at 14.44 feet NGVD for the period ending at midnight on July 16, 2018. 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 0.31 feet higher than it was a month ago and 1.88 feet higher than a year ago (Figure 1). The Lake is now in the Low sub-band (Figure 2). According to RAINДАР, 0.65 inches of rain fell over the Lake during the week July 10, 2018 – July 16, 2018. Rainfall varied throughout the watershed, with areas to the northwest receiving between 1.5 – 2.0 inches, the upper Kissimmee basin receiving between 0.5 – 1.0 inches, and the northeast watershed between 0 – 0.5 inches (Figure 3).

Average daily inflows to the Lake were similar to the previous week, going from 4,344 cfs to 4,273 cfs. Most of the inflows fell from the previous week, except for the Kissimmee River (S-65E structures) and Indian Prairie basins (S-71 & S-72 structures). Flows from the River increased from 2,054 cfs the previous week to 2,540 this past week, while flows from the Indian Prairie basin increased from 504 cfs the previous week to 827 this past week. The largest decrease in inflows was from Lake Istokpoga via the S-84 structures, going from 1,077 cfs the previous week to 531 cfs this past week. There was essentially no inflow or outflow through Culvert 10A from the L-8 canal this past week (Table 1). There have been no back-pumping operations from the S-2 or S-3 pumps during the wet season thus far.

Total outflows increased substantially from the previous week as discharges to the estuaries resumed and discharges south increased. Total outflows went from 450 cfs the previous week to approximately 4,043 this past week. Discharges via the S-77 and S-308 structures increased from 169 cfs and 0 cfs, respectively, the previous week to an average of 2,145 cfs and 829 cfs, respectively, this past week. Outflows to the south through the S-350 structures also increased, from 282 average daily cfs the previous week to 1,069 cfs this past week. The corrected average daily evapotranspiration value for the week based on the L006 weather platform solar radiation increased slightly to 0.19 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 4 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 satellite imagery (July 14) using the cyanobacteria monitoring product derived from NOAA's OLCI satellite sensor showed the potential for a cyanobacteria bloom decreased from the July 2 image over much of the Lake, with most areas of high potential for blooms occurring in the shallower, nearshore regions along the shore (Figure 5).

Table 1. Average daily inflows and outflows and the approximate depth equivalents on Lake Okeechobee for various structures.

INFLOWS	Previous Week Avg Daily cfs	Avg Daily Inflow cfs	Equivalent Depth Week Total (in)
S65E & S65EX1	2054	2540	1.0
S71 & 72	504	827	0.3
S84 & 84X	1077	531	0.2
Fisheating Creek	346	219	0.1
S154	18	17	0.0
S191	217	51	0.0
S133 P	48	40	0.0
S127 P	20	17	0.0
S129 P	22	12	0.0
S131 P	3	4	0.0
S135 P	23	13	0.0
S2 P	0	0	0.0
S3 P	0	0	0.0
S4 P	0	0	0.0
L8 Backflow	13	0	0.0
Rainfall	3858	3858	1.4
Total	8202	8131	3.1

OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S77	169	2145	0.9
S308	0	829	0.3
S351	0	385	0.2
S352	0	0	0.0
S354	282	684	0.4
L8 Outflow	0	1	0.0
ET	3417	3610	1.5
Total	3867	7653	3.3

PROVISIONAL DATA

Submerged Aquatic Vegetation (SAV) transects were established after Hurricane Irma within areas of sparse emergent vegetation at the edge of the marsh, essentially from the line of dense emergent plants out to open water. This area is generally where SAV is highest in coverage when conditions are right, and the communities extend slowly up or down slope depending on water levels. July sampling of the transects showed that SAV coverage remains extremely low on the Lake, with only 11/173 total samples (6%) having any occurrence of SAV (Figure 6). The majority of the samples (64%) with SAV present were in Fisheating Bay, which is more sheltered from wind and waves, and generally has higher turbidity than the nearshore zones; though tannin-stained water can still result in low light penetration. However, SAV beds were often dense and tall enough to reach the surface of the water in Fisheating Bay prior to Hurricane Irma, and were essentially non-existent in the July sample. Regrowth will likely take time as much of Fisheating Bay still had low light penetration (<30 cm Secchi disk depths) and nearly two meters in water depth.

Water Management Recommendations

Lake Okeechobee stage is 14.44 feet NGVD having decreased 0.02 feet over the past week and increased 0.31 feet over the past month. The Lake was below 13.0 feet NGVD for just 10 days this past dry season and likely rose too quickly for many recovering SAV communities to stay in optimal light conditions. The seasonal low for the 2018 SAV growing season of 12.83 feet NGVD was the third highest since 2011, and the third time in six years that stage did not reach the bottom of the preferred stage envelope (12.5 – 15.5 feet NGVD). Due to record rainfall in May, the SAV coverage on the Lake will likely remain at minimal levels throughout the growing season and well into next year, prolonging impacts from high stages in 2016 and Hurricane Irma in 2017. Recovery of SAV in the nearshore zone will require low lake stages in the summer of 2019, so efforts to prepare for such an event will help speed the rebound of this important community.

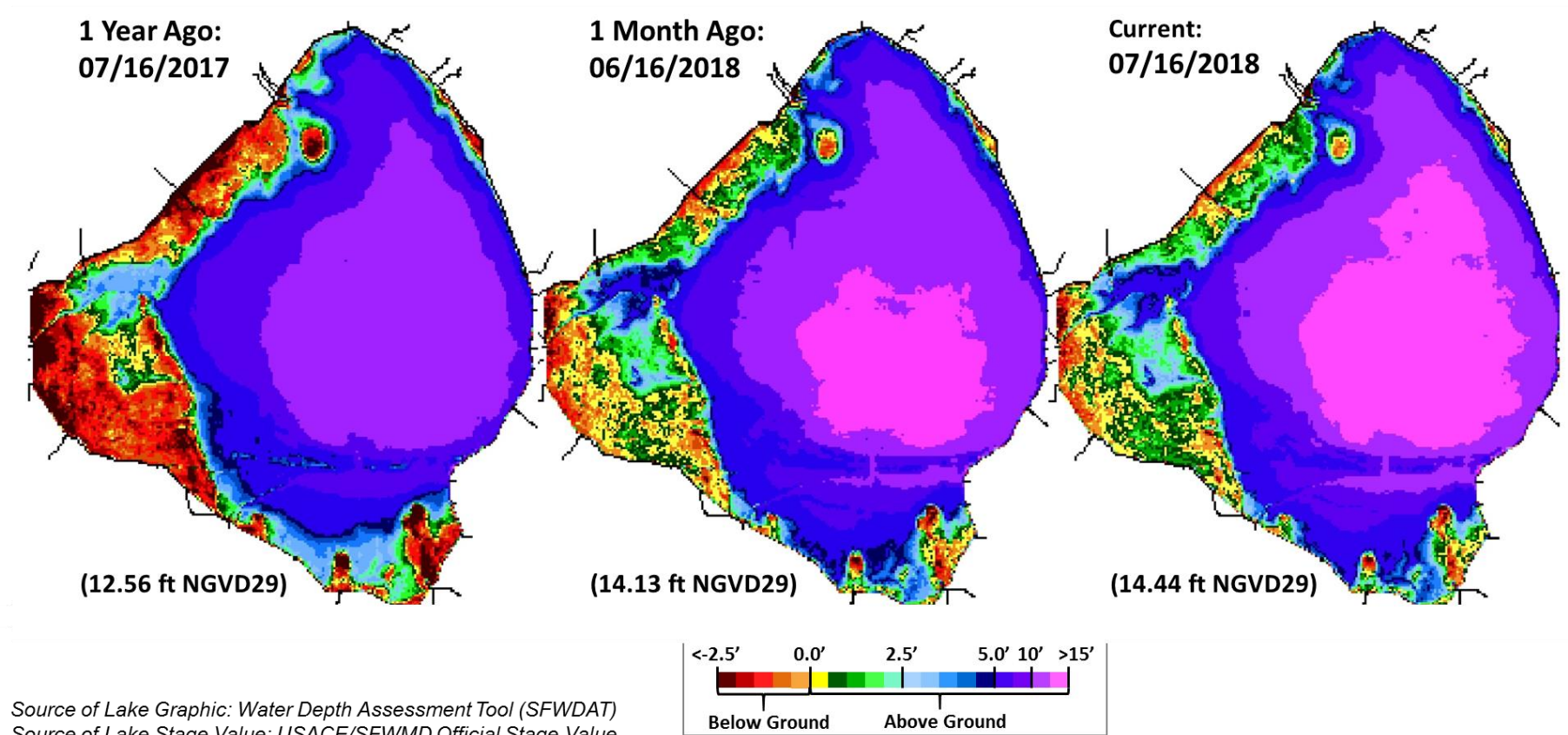


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

Lake Okeechobee Water Level History and Projected Stages

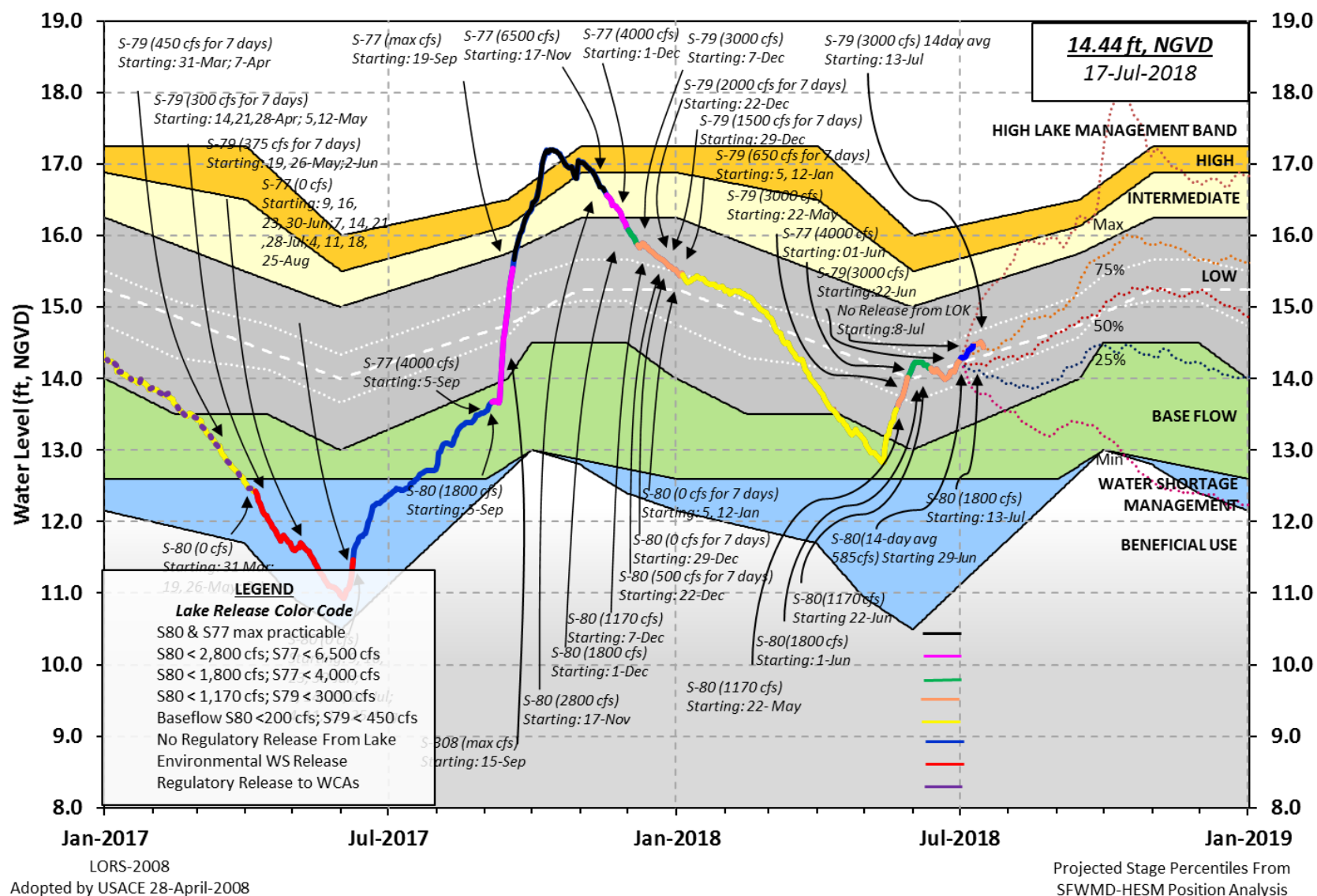


Figure 2. Recent Lake Okeechobee stage and releases, with projected stages based on a dynamic position analysis.

SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES
FROM: 0530 EST, 07/10/2018 THROUGH: 0530 EST, 07/17/2018

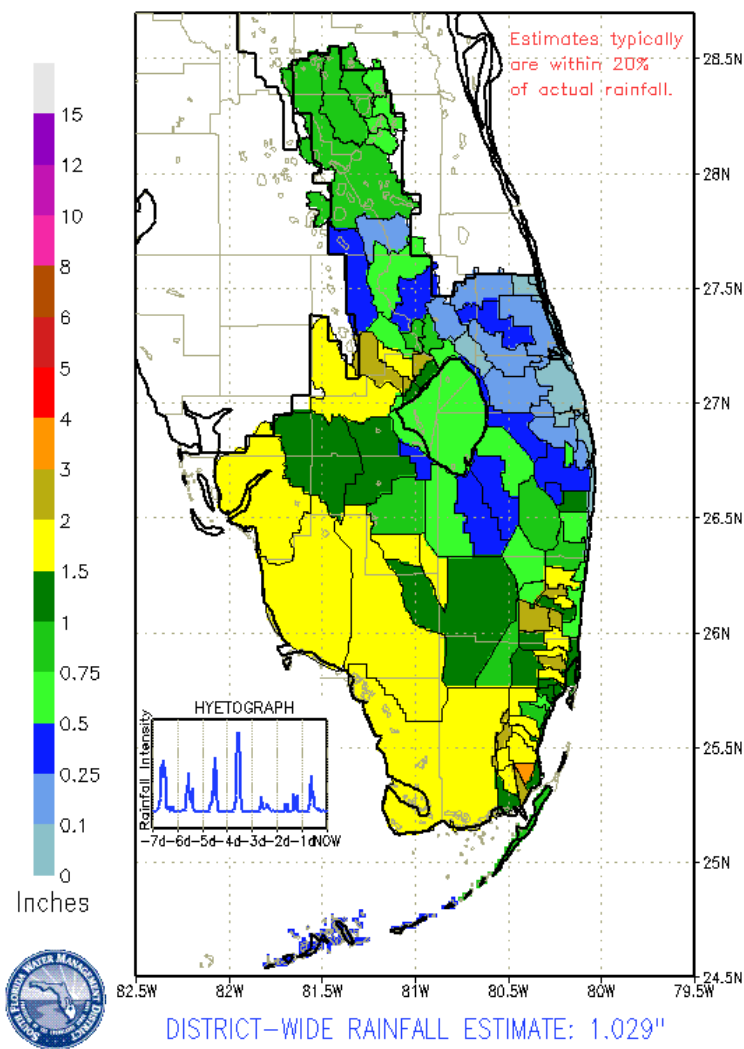


Figure 3. Rainfall estimates by basin.

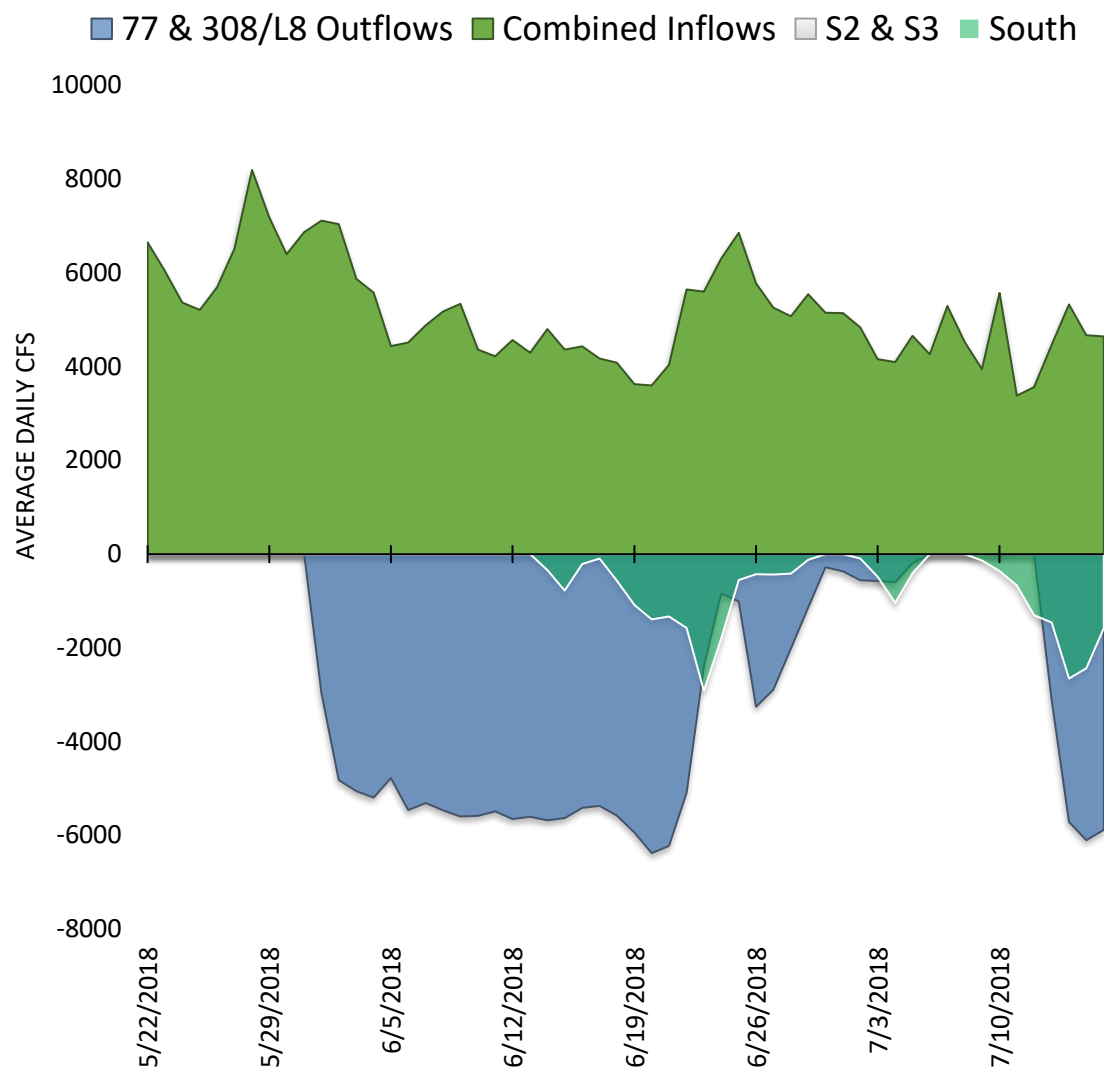
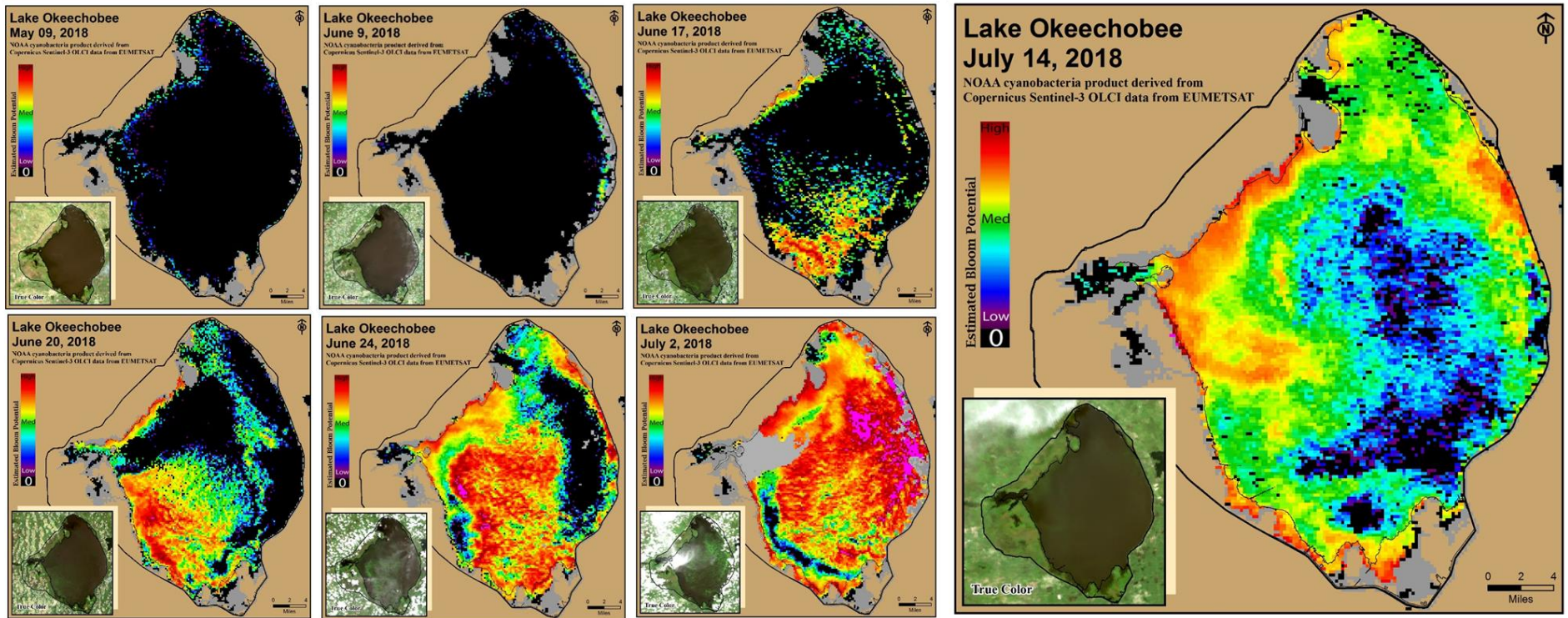


Figure 4. Major inflows and outflows of Lake Okeechobee, including the S-350 structures designated as South. The L-8 canal flows through culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. Inflows and outflows are shown as positive and negative, respectively, for visual purposes.



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

Unvalidated and Experimental Data

Figure 5. Potential for cyanobacterial blooms on Lake Okeechobee based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover. All data are experimental and unvalidated at this point in product development.

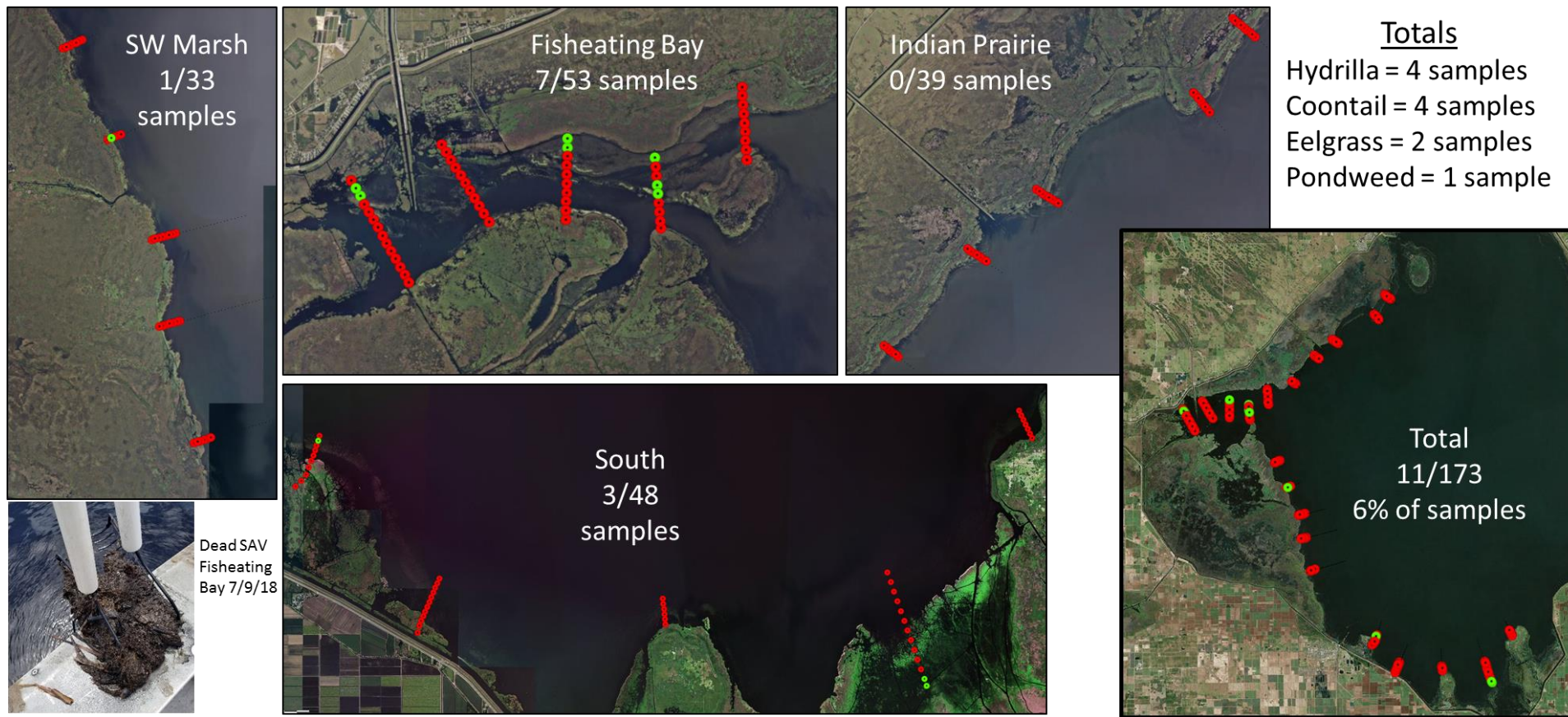


Figure 6. Submerged aquatic vegetation sampling results from 20 transects established in the nearshore zone of sparse emergent vegetation. Green circles indicate samples where SAV was present, while red indicates areas where it was not found.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged about 2,224 cfs (Figures 1 and 2) and last month inflow averaged about 2,785 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	211
S-80	963
S-308	829
S-49 on C-24	0
S-97 on C-23	164
Gordy Rd. structure on Ten Mile Creek	886

Over the past week, salinity increased throughout the estuary (Table 2, Figures 3 and 4). The seven-day moving average salinity of the water column (an average of the surface and bottom salinity) at the US1 Bridge is estimated to be 16.9. Salinity conditions in the middle estuary are within the good range for adult eastern oysters (Figure 3).

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

Sampling Site	Surface	Bottom	Envelope
HR1 (North Fork)	3.0 (1.0)	5.4 (3.9)	NA ¹
US1 Bridge	6.0 (4.5)	27.8 (23.7)	10.0-26.0
A1A Bridge	15.7 (12.7)	23.1 (22.1)	NA ¹

¹Envelope not applicable

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged about 6,583 cfs (Figures 5 and 6) and last month inflow averaged about 6,100 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	2,145
S-78	2,931
S-79	5,179
Tidal Basin Inflow	1,404

Over the past week, salinity remained about the same throughout the estuary (Table 4, Figures 7 & 8). The seven-day average salinity values are in the good range for adult eastern oysters at Shell Point, in the poor range at Cape Coral (Figure 9) and were not available at Sanibel. The 30-day moving average surface salinity is 0.2 at Val I-75 and 0.2 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass.

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

Sampling Site	Surface	Bottom	Envelope
S-79 (Franklin Lock)	0.2 (0.2)	0.2 (0.2)	NA ¹
Val I75	0.2 (0.2)	0.2 (0.2)	0.0-5.0 ²
Ft. Myers Yacht Basin	0.2 (0.2)	0.2 (0.2)	NA
Cape Coral	1.6 (1.4)	2.1 (2.1)	10.0-30.0
Shell Point	13.3 (11.7)	12.1 (11.6)	10.0-30.0
Sanibel	NR ³ (NR)	NR (NR)	10.0-30.0

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

The Florida Fish and Wildlife Research Institute reported on July 13, 2018, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background to high concentrations in 14 samples collected from or offshore of Lee County. Fish kills and respiratory irritation were reported in Lee County over the past week.

Water Management Recommendations

Lake stage is in the Low sub-band of 2008 LORS. Tributary hydrological conditions are wet. The 2008 LORS recommends up to 3,000 cfs at S-79 and up to 1,170 cfs at S-80. Given the current estuarine conditions, there are no ecological benefits associated with freshwater releases from Lake Okeechobee.

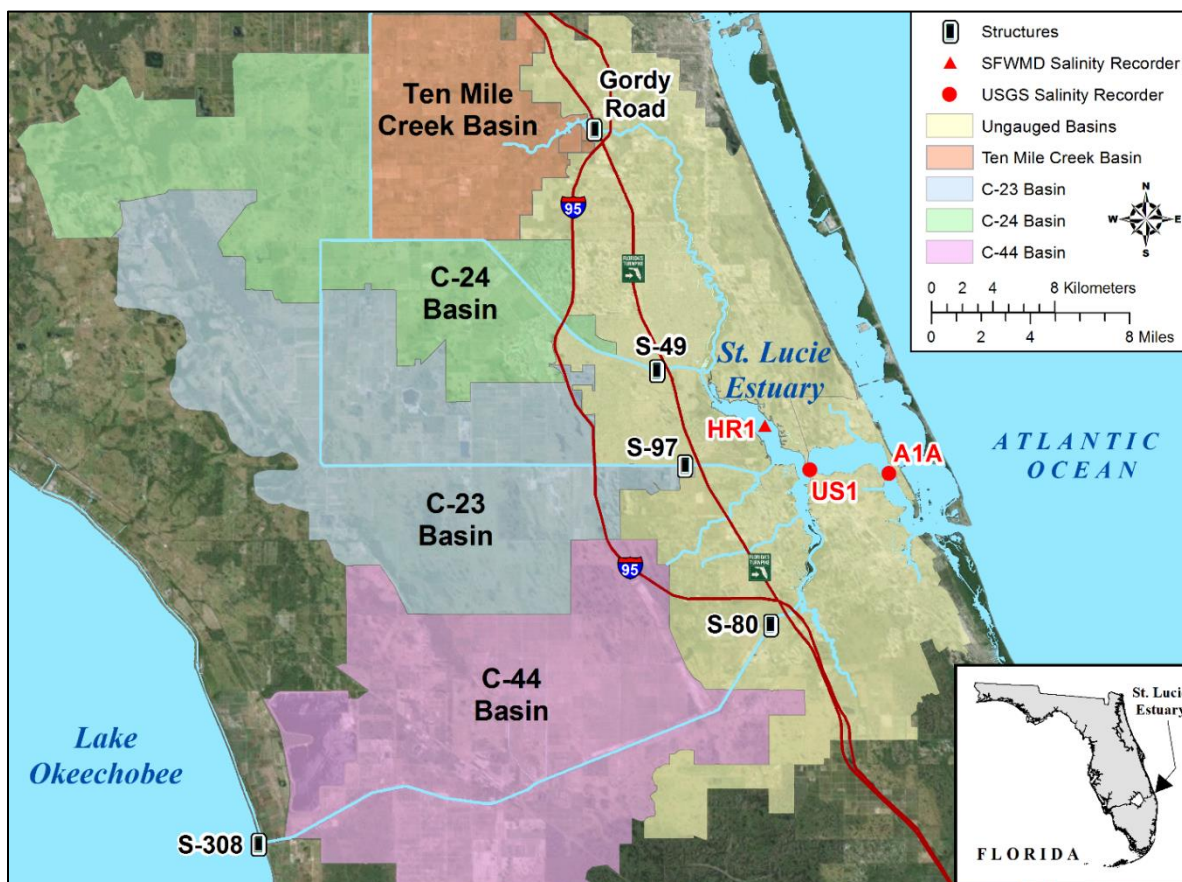


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

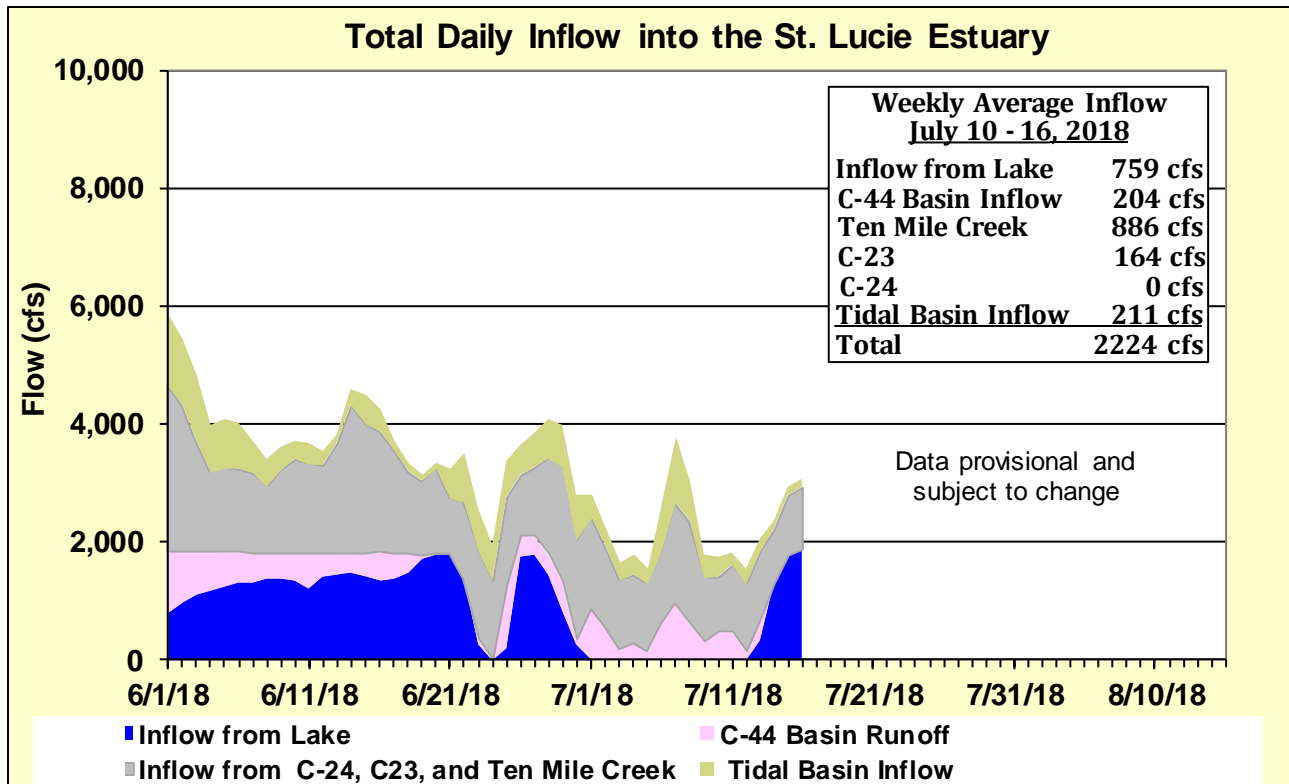


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

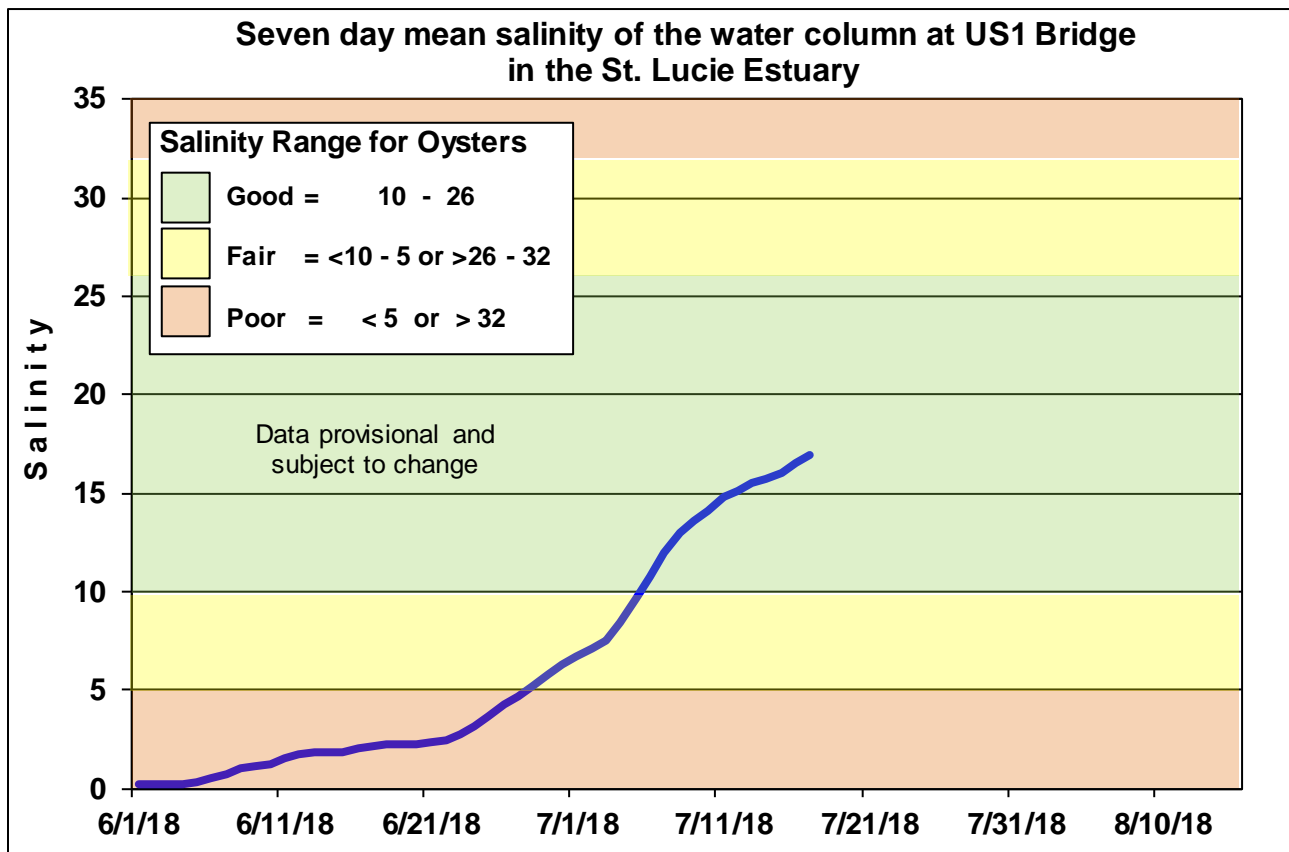


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

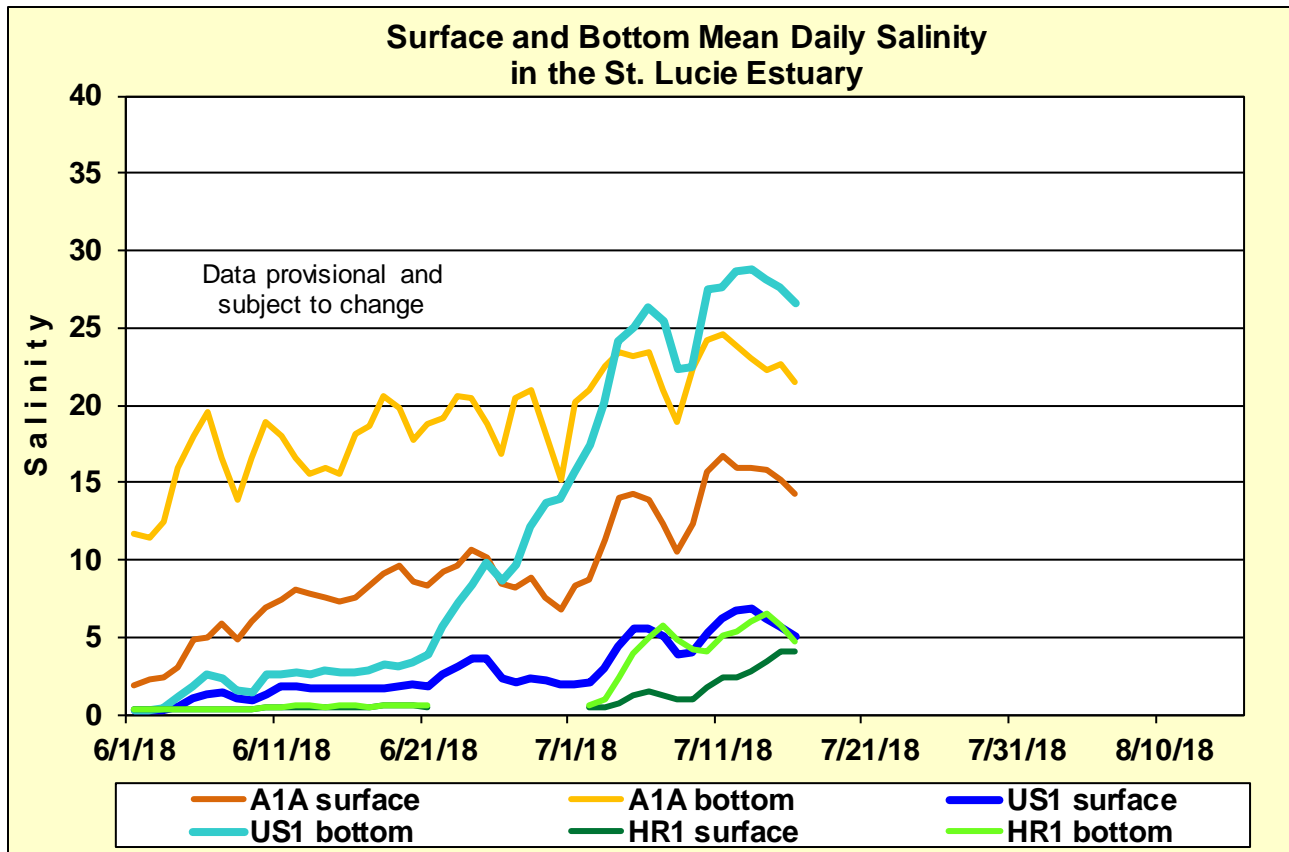


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

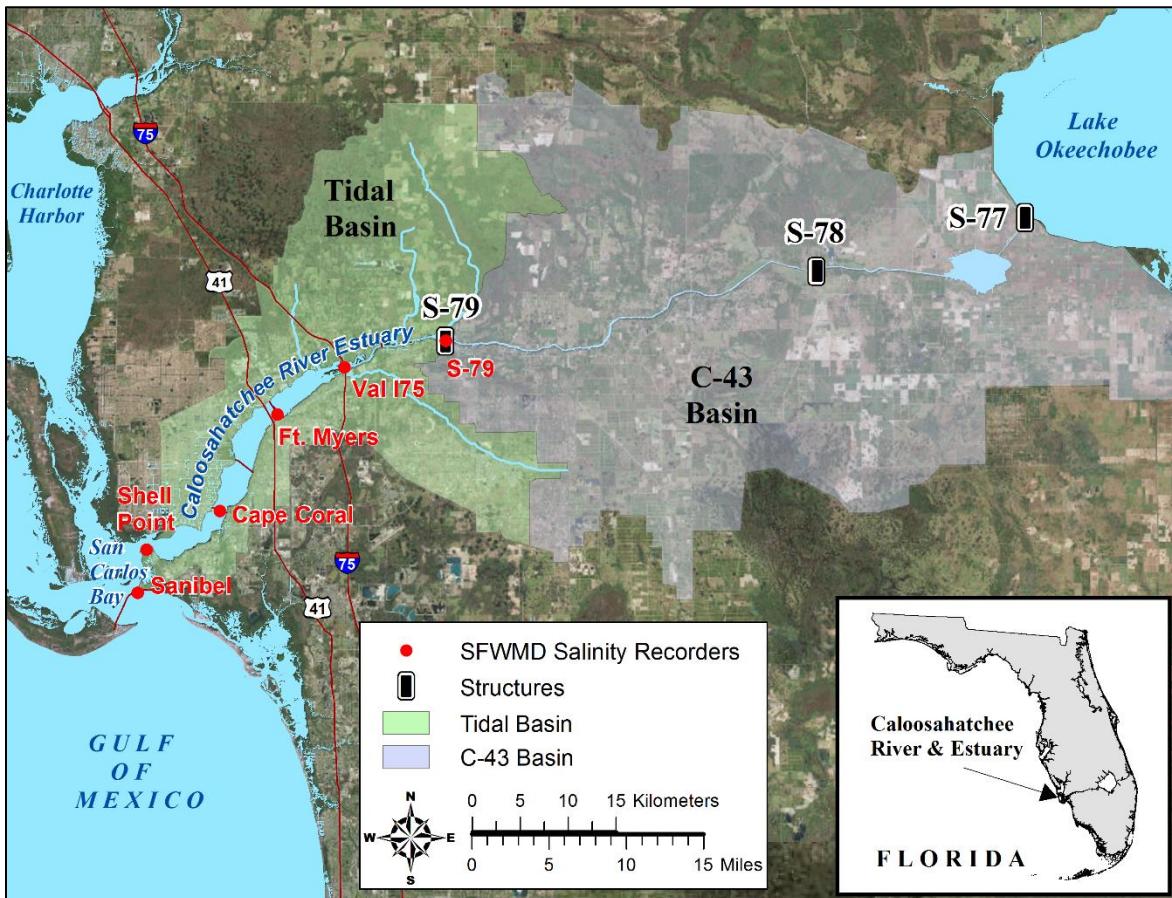


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

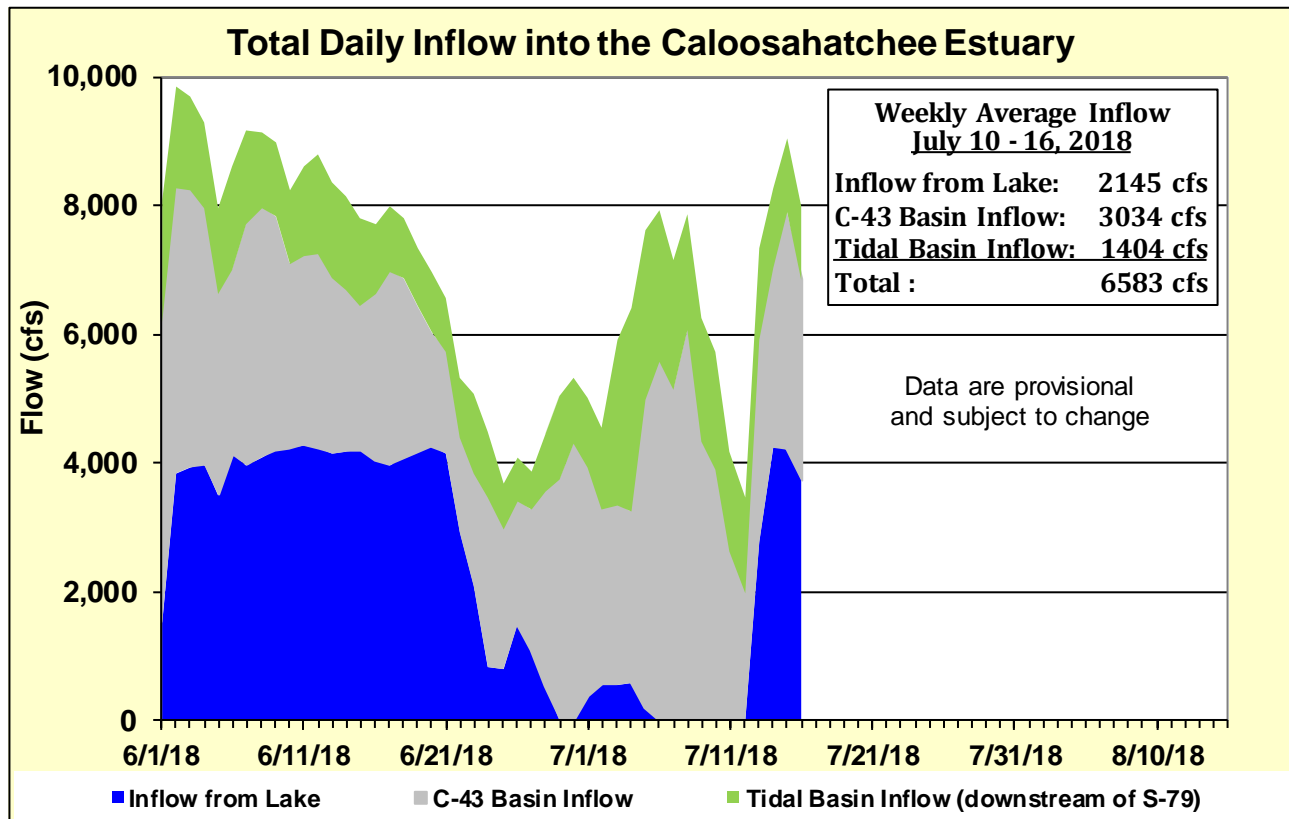


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

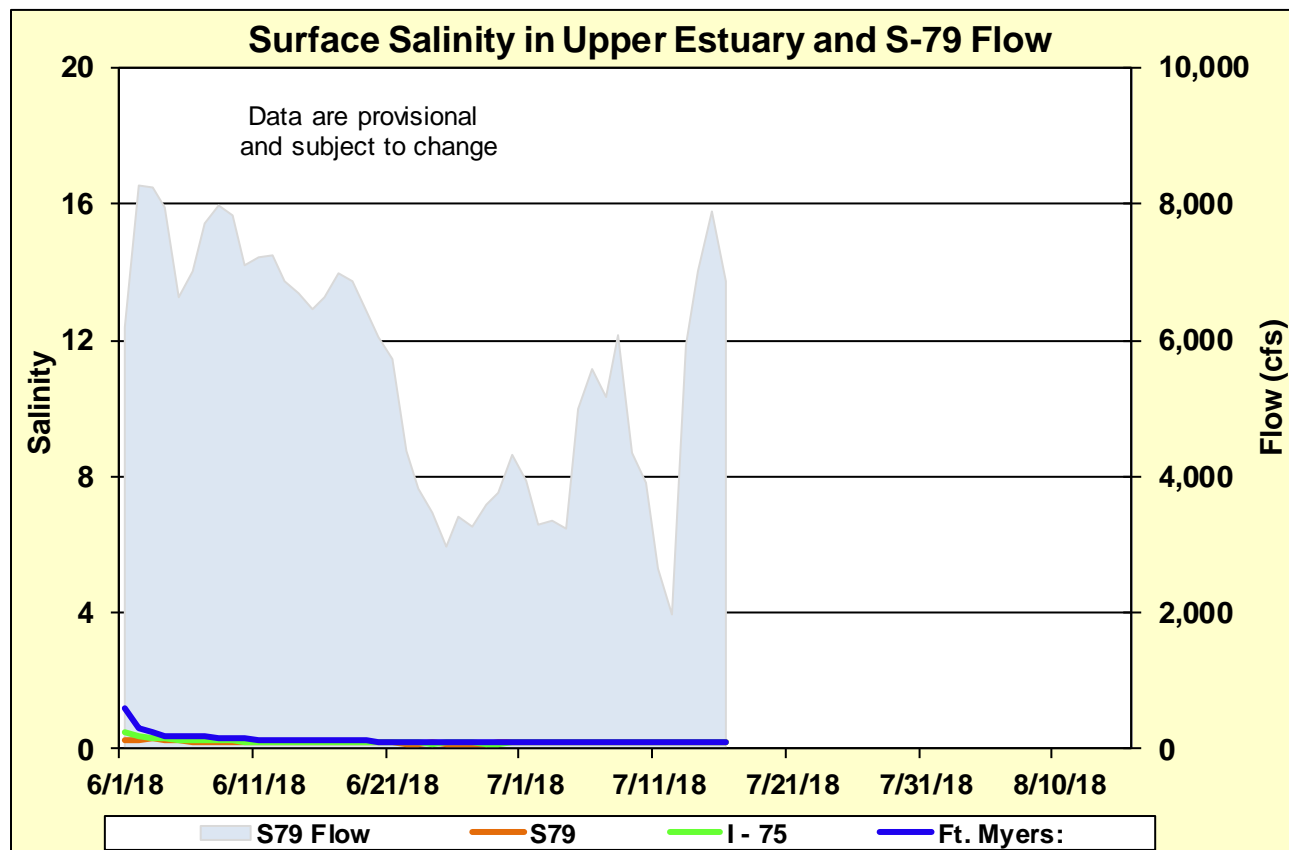


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

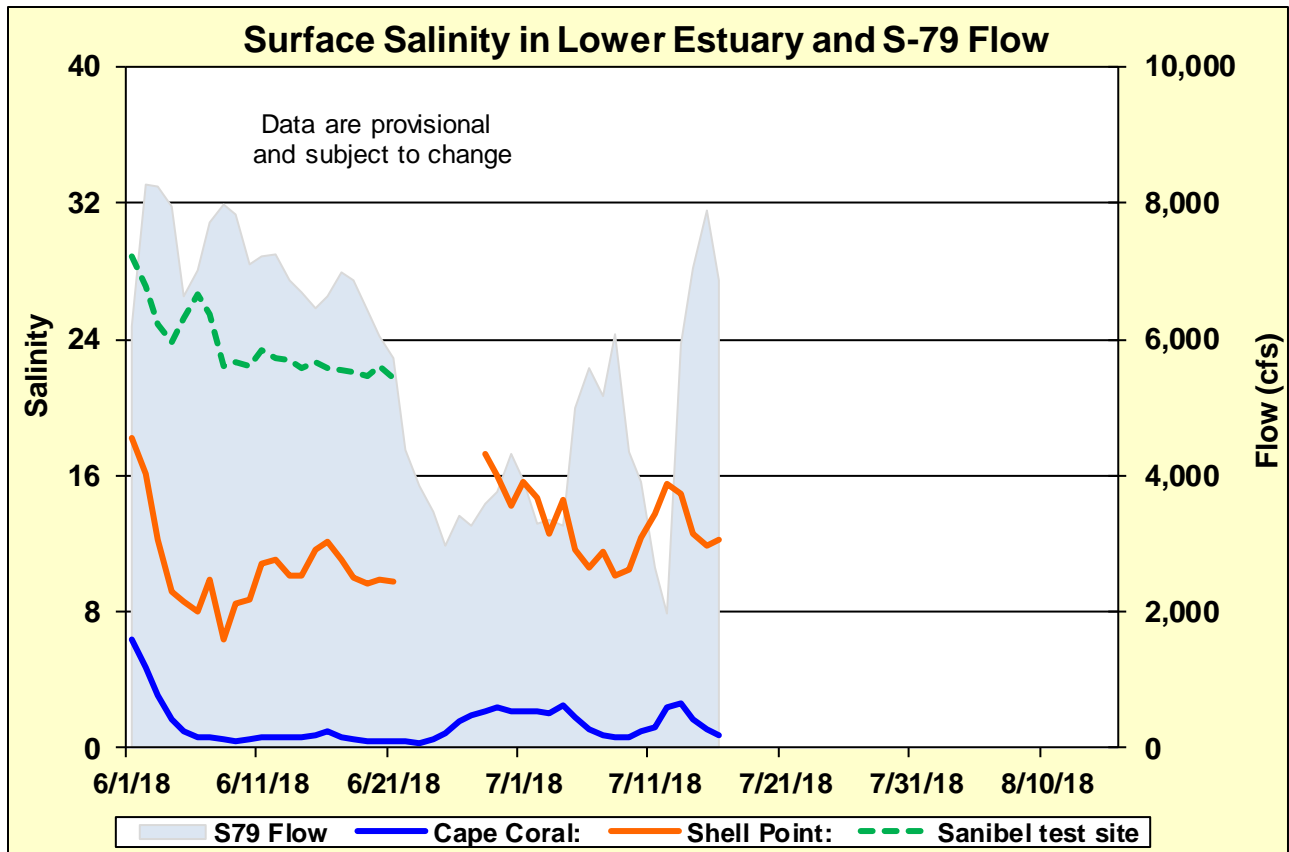


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

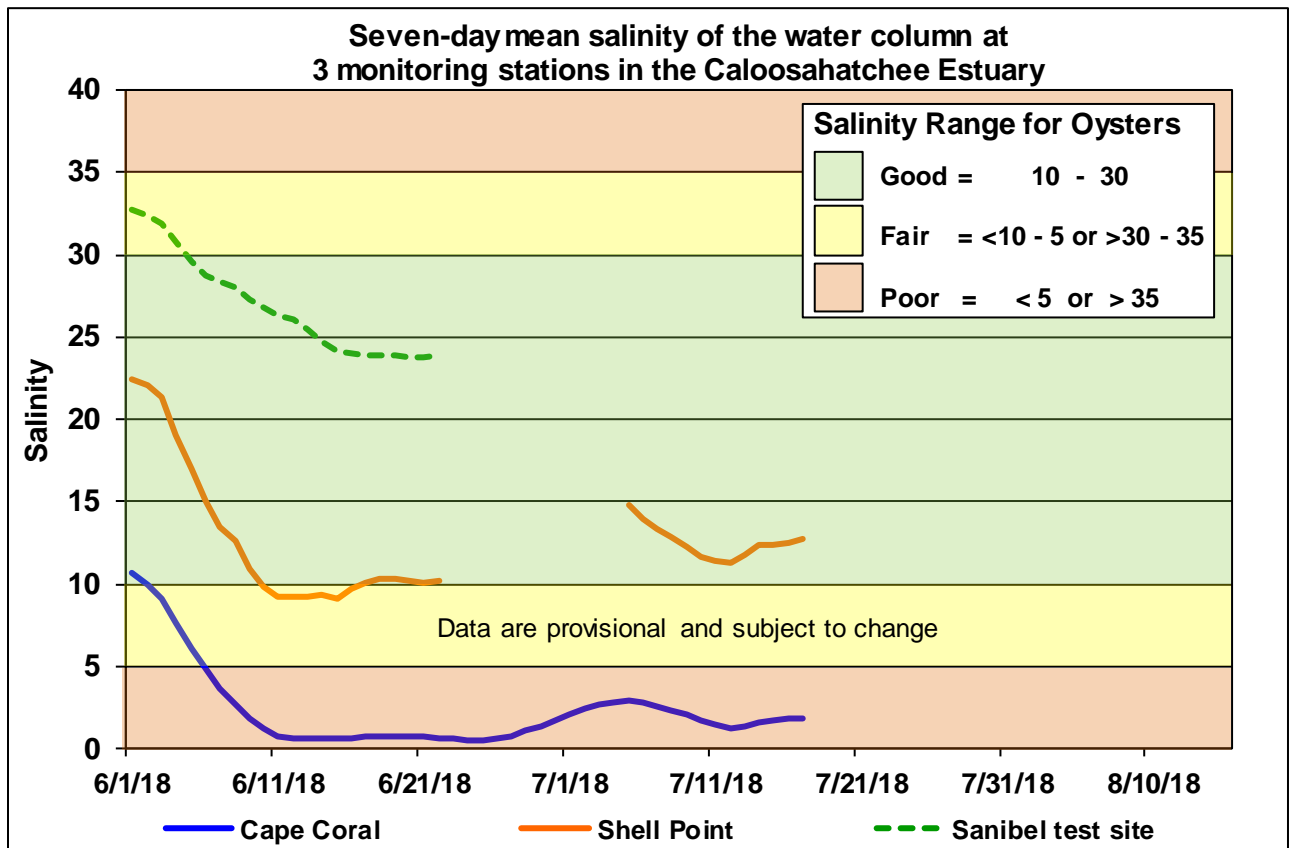
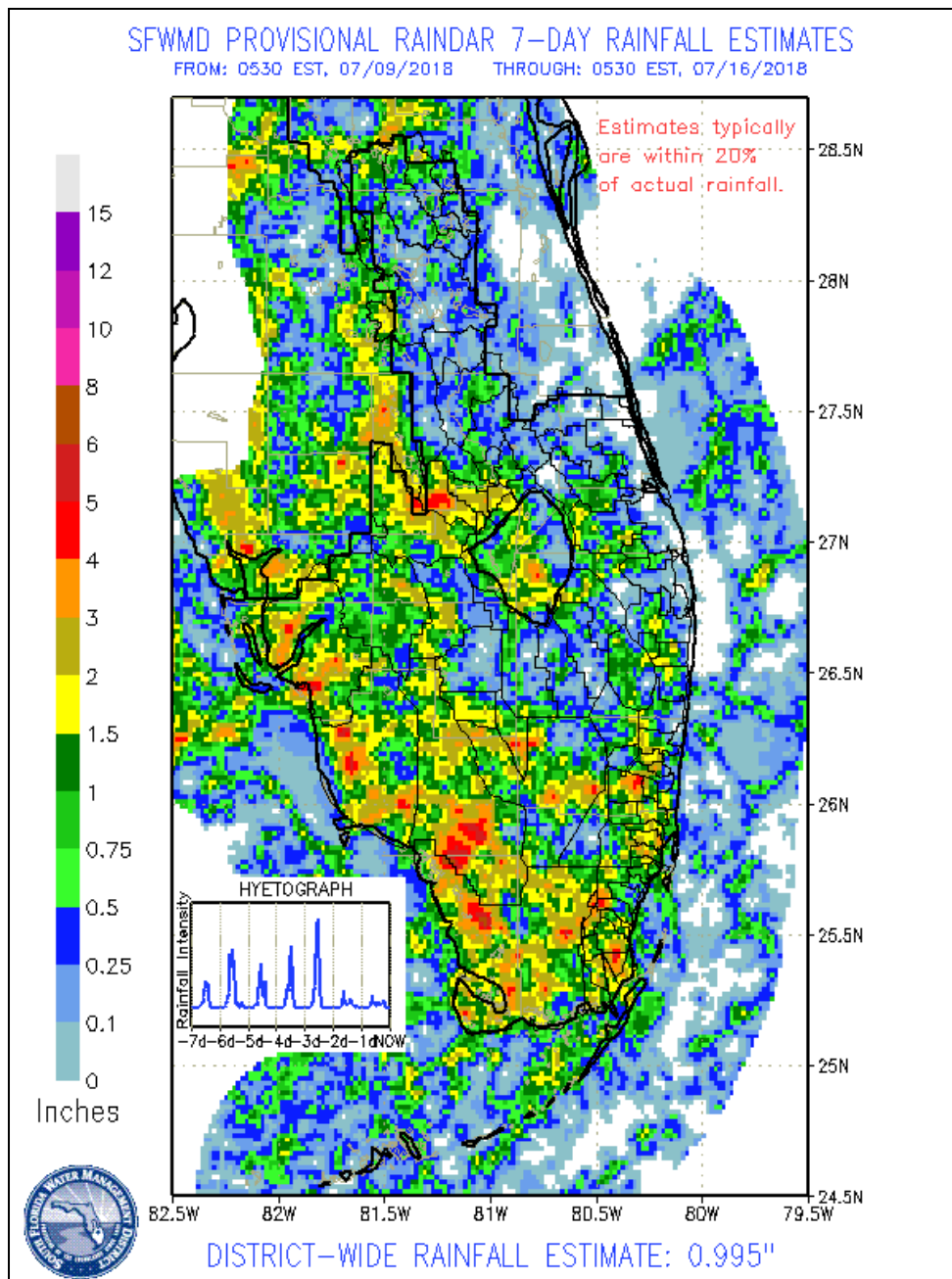


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

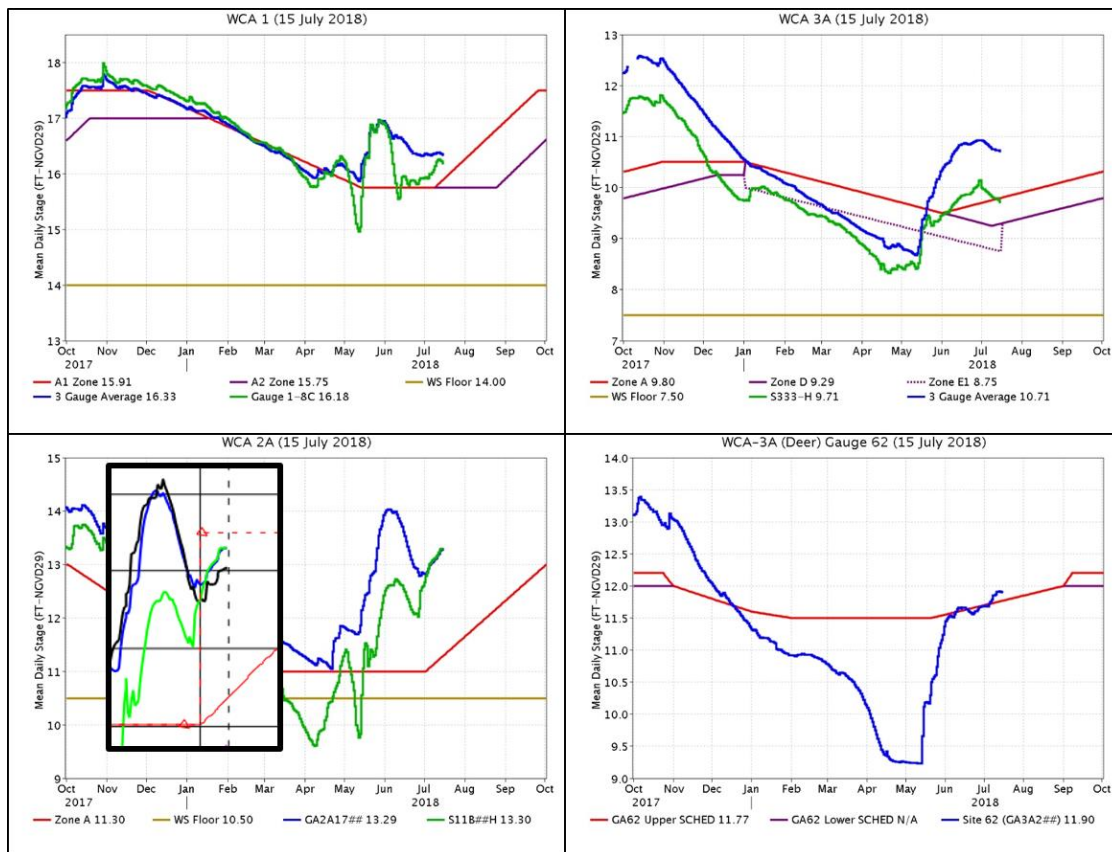
EVERGLADES

At the gauges monitored for this report, stages at the marsh gauges in WCA-1 fell while nearer the canal stages rose 0.05 feet. Stage changes were mixed within WCA-3A. The most extreme individual gauge changes within the WCAs ranged from -0.15 feet (WCA-3A northeast) to +0.21 feet (WCA-2A). Pan evaporation was estimated at 1.60 inches.

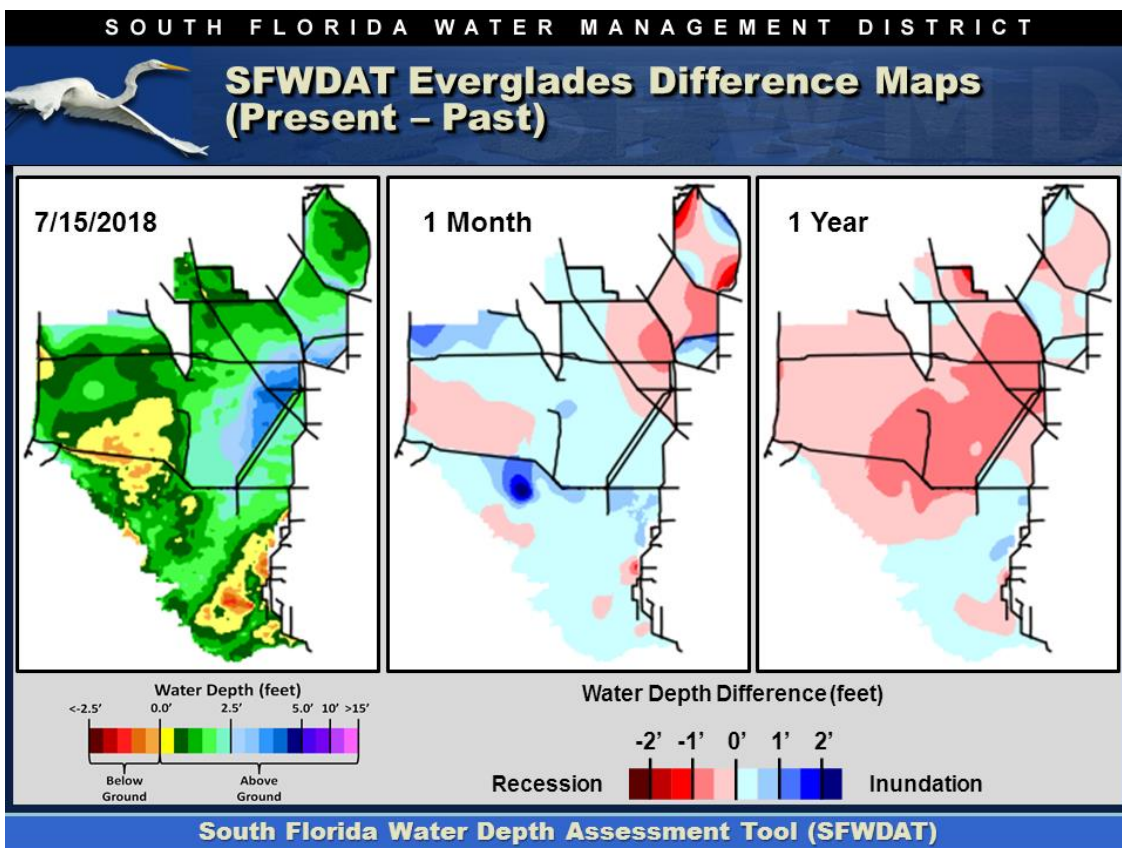
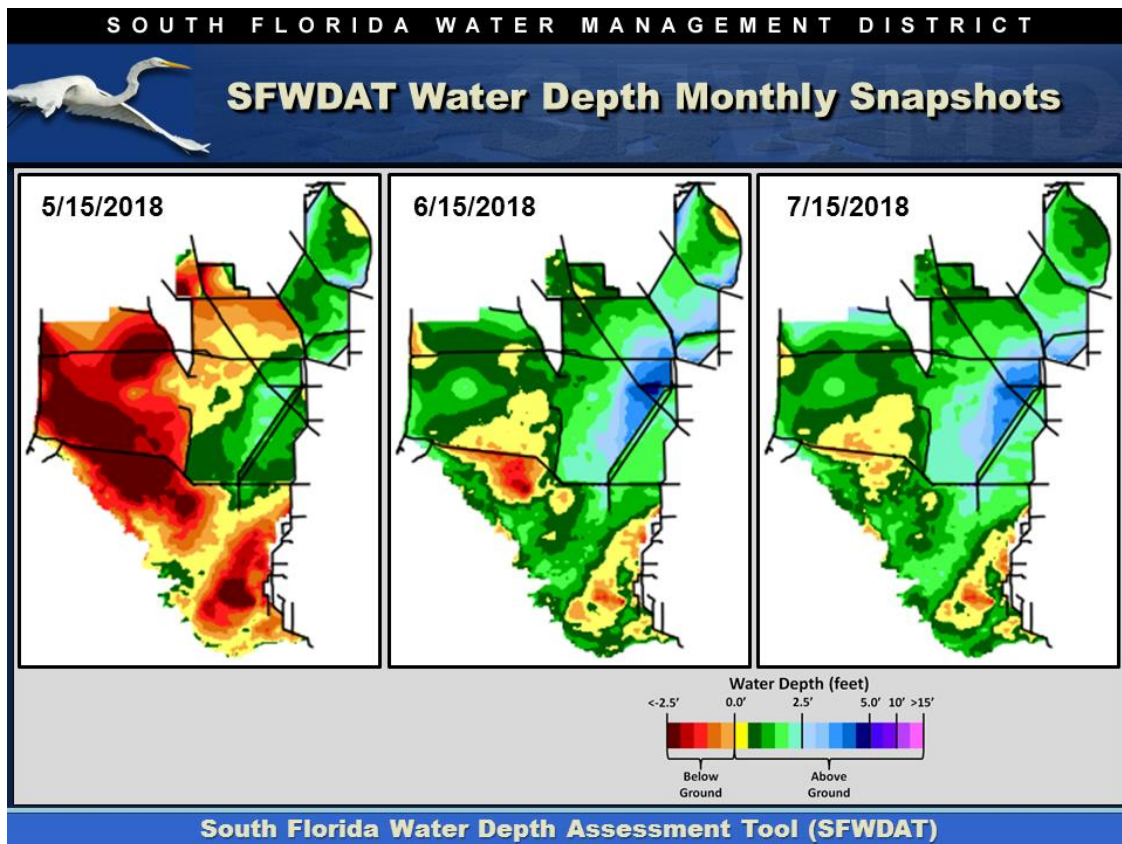
Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.82	-0.04
WCA-2A	0.62	+0.21
WCA-2B	0.48	+0.09
WCA-3A	1.17	-0.05
WCA-3B	0.63	+0.01
ENP	1.88	+0.10



Regulation Schedules: WCA-1 three-gauge average stage is 0.42 feet above Zone A1, 0.2 feet closer to the schedule than last week. Gauge 1-8C stage is 0.27 feet above schedule. WCA-2A marsh stage is 1.99 feet above Zone A. S-11B Headwater stage is 2.0 feet above schedule. WCA-3A three-gauge average stage is now 0.91 feet above Zone A and trending downward. WCA-3A stage at gauge 62 (northwest corner) increased to 0.13 feet above the upper schedule.



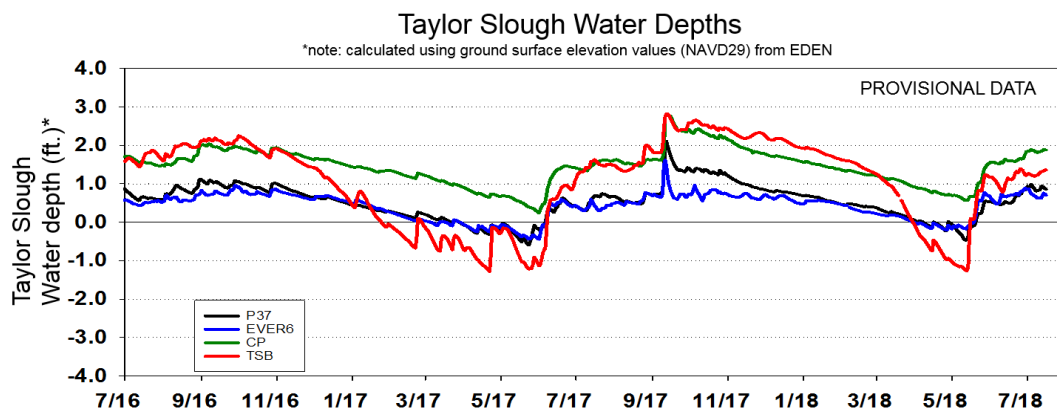
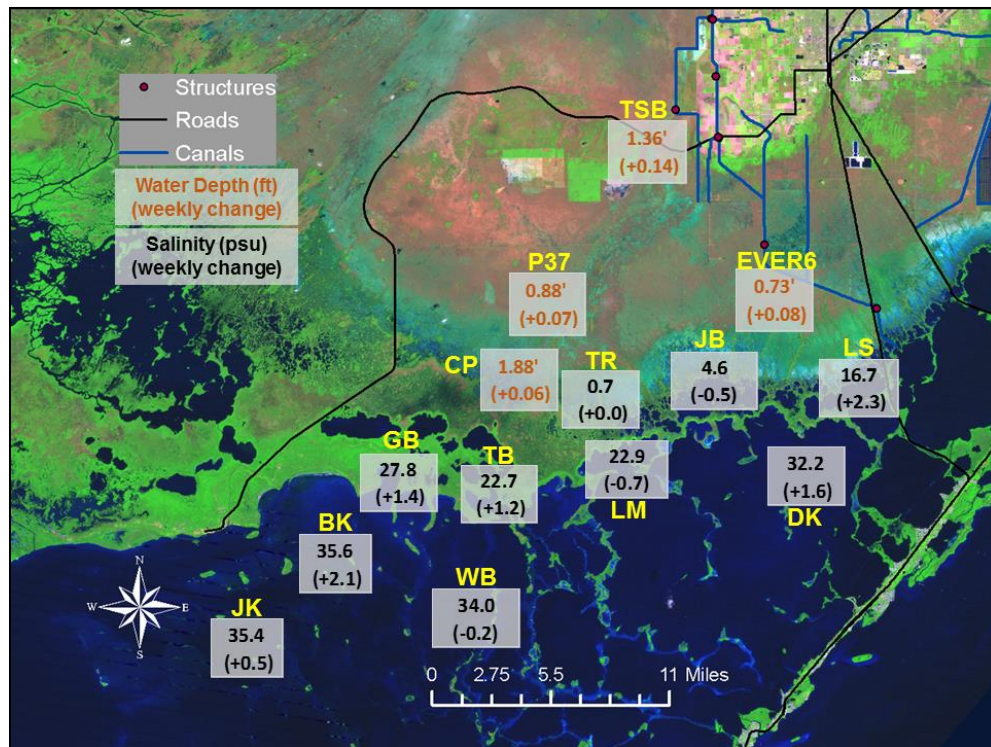
Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate relatively stable depths in WCA-3A over the last month, and lower depths along the northern reaches of the L-67 in WCA-3A South. Hydrologic conditions across the major basins are similar with depths in the northern regions ranging from +0.5 feet to +1.5 feet, and deeper water to the south. WDAT output indicates that water depths decreased over the previous month across central WCA-1, WCA-2A and northeastern WCA-3A while depths increased in WCA-2B, a majority of WCA-3A South and Shark River Slough. WCA-3A is significantly drier at this time than it was a year ago.

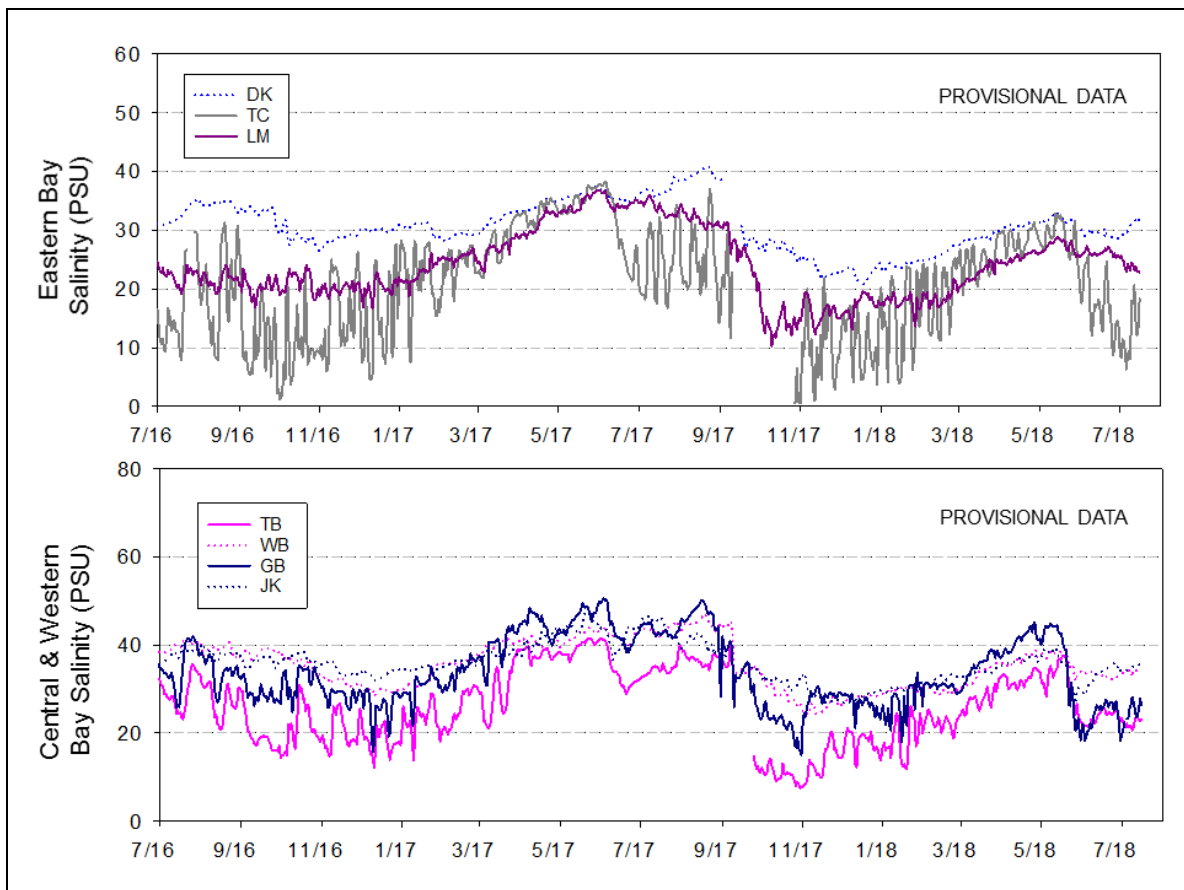


Tree Island Risk Assessment – Work in Progress: Current rough estimates using WDAT suggest that 41% of the tree islands are inundated. The longest duration of continuous inundation is 57 days. 13% of tree islands have been inundated for more than 45 days.

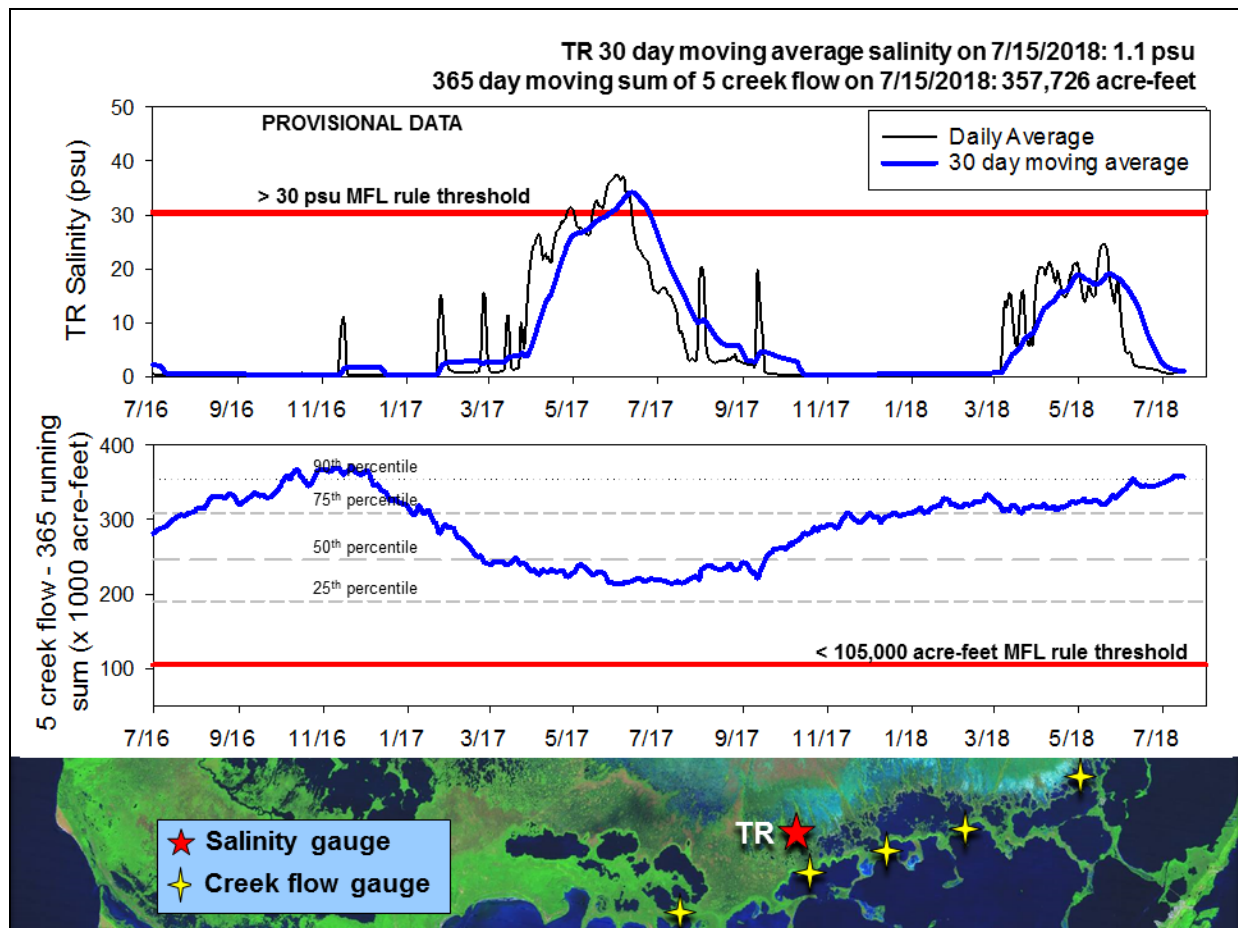
Taylor Slough Water Levels: An average of only 0.26 inches of rain fell on Taylor Slough and Florida Bay. Stages decreased an average of 0.10 feet this past week with individual station changes ranging from -0.21 feet to -0.02 feet. Water depths are 3 to 6 inches above the historical averages.

Florida Bay Salinities: Salinities increased 0.2 psu on average across Florida Bay, with individual station changes ranging from -2.1 psu to +6.9 psu. Salinities ranged from 5 psu in the northeast to 35 psu in the western bay. This range is 5 psu below the historical average for the bay with individual stations ranging from 1 to 11 psu below the historical averages.





Florida Bay MFL: Mangrove zone daily average remains near fresh this week at 0.7 psu. The 30-day moving average decreased 1.0 psu over the week to end at 1.4 psu. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about 6,600 acre-feet for the last week.



Water Management Recommendations

Inflows to northernmost WCA-3A create the least ecological stress when compared to flows to southern WCA-3A. Incremental change in the rate of structure flows (i.e., when changing flow rates from 0 cfs to 1,000 cfs, make 500 cfs adjustment per week) to the WCAs is more ecologically sensitive than abrupt rate changes. Ascension rates are now critical for apple snail reproduction in the Everglades. The current recommended stage ascension rate is less than 0.25 feet per week (or 0.5 feet per 2 weeks). Due to elevated levels of phosphorus in the S-332D detention area and the Frog Pond detention area, a recommendation is being made to limit the increase in depths within the L-31W to no more than 3 inches per day over the course of 3 to 4 weeks when S-332D, S-328, and/or G-737 are opened. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, July 17th, 2018 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage changes ranged from -0.10' to +0.05'	Maintain depths at regulation schedule.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage increased by 0.21'	Maintain depths at regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife.
WCA-2B	Stage increased by 0.09'	Maintain depths at regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage decreased by 0.15'	Maintain depths at regulation schedule.	Protect habitat including peat soil development and wildlife.
WCA-3A NW	Stage increased by 0.04'	Maintain depths at regulation schedule.	
Central WCA-3A S	Stage increased by 0.02'	Maintain depths at regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect habitat and wildlife.
Southern WCA-3A S	Stage decreased by 0.10'		
WCA-3B	Stage changes ranged from -0.05' to +0.06'	Maintain depths at or above regulation schedule. Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife.
ENP-SRS	Stage increased 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 +0.02' to +0.14'	Move water southward as possible. Limit increases in the L-31W to less than 3 inches per day for 3-4 weeks to allow for reductions in phosphorus concentrations.	When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP.
FB- Salinity	Salinity changes ranged -0.7 to +2.3 psu.	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.