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

M E M O R A N D U M

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

FROM: SFWMD Staff Environmental Advisory Team

DATE: November 28, 2017

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Locally moderate rains possible east today, then lighter rains east tomorrow. Upper level winds will combine with increased low-level moisture to generate some showers and isolated storms mainly over the east coast through this evening. This pattern could play out with only minor rains, but will leave some moderate rains due to deference to the 100-mph jet over south Florida. Upper level winds become less favorable during the day tomorrow as moisture begins to decrease. This will leave showers along the east coast through tomorrow afternoon before drier air decreases activity by tomorrow evening. Dry and pleasant conditions are expected the end of the week and through the weekend.

Kissimmee

Tuesday morning stages and departures from schedule were 58.0 feet NGVD (at schedule) in East Lake Toho, 55.0 feet NGVD (at schedule) in Lake Toho, and 51.4 feet NGVD (1.1 feet below schedule) in Kissimmee Cypress Hatchineha; S65A headwater stage was 46.3 feet NGVD. Tuesday morning discharges were 751 cfs at S65, 660 cfs at S65A, and 1,165 cfs at S65E. Dissolved oxygen concentration in the Kissimmee River averaged 5.8 milligrams per liter (mg/L) for the week. Kissimmee River mean floodplain depth on Sunday was 0.46 feet.

Lake Okeechobee

Lake stage is 16.21 feet NGVD having decreased 0.21 feet over the past week and 0.71 feet over the last three weeks. Stages have exceeded 16 feet NGVD for 67 days, the longest period since late 2004, which was 73 days. The submerged aquatic and emergent vegetation coverage in the nearshore areas of the Lake are expected to decline over the coming months and possibly years due to the high water conditions and turbidity from resuspended Lake sediment associated with Hurricane Irma. The high inflows and resuspended Lake sediment also increased water column total phosphorus, which could lead to algal blooms as turbidity begins to decline and water temperatures rise.

Estuaries

Total inflow to St. Lucie estuary averaged 4,204 cfs over the past week (5,756 cfs week before) with 1,339 cfs coming from Lake Okeechobee (1,611 cfs week before). Salinity slightly increased throughout the estuary. The seven-day average salinity at the US1 Bridge is in the poor range for adult oysters. NOAA satellite imagery indicates low to medium potential for cyanobacteria bloom at just a few nearshore locations. Average chlorophyll *a* concentration levels at the LOBO stations (maintained by FAU-HBOI) remain low (between 1.4-8.6 µg/L), with highest values reported in the North Fork (between 5.1-8.8 µg/L). Dissolved oxygen levels were between 5.5-8.4 mg/L.

Total inflow to Caloosahatchee estuary averaged 7,728 cfs over the past week (7,813 cfs week before) with 5,992 cfs coming from the Lake (6,098 cfs week before). The 30-day moving average surface salinity is 0.2 at Val I-75 and Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass. Salinity conditions are in good range for adult oysters at Shell Point and in poor range at Cape Coral. NOAA satellite imagery was not available this week due to cloud coverage. Chlorophyll *a* measurements by the Sanibel-Captiva Conservation Foundation show low chlorophyll *a* concentration levels near Ft. Myers and Shell Point (between 1.8-4.7 µg/L) over the last week. *Karenia brevis* (red tide dinoflagellate) was observed in background to high concentrations in twenty samples collected along the Lee County coast.

Stormwater Treatment Areas

Over the past week, the STAs/FEBs did not receive Lake releases. The total amount of Lake releases sent to the STAs/FEBs in WY2018 (since May 1, 2017) is approximately 21,800 acre-feet. Most STA cells are at or above target depths. Operational restrictions are in place for vegetation rehabilitation in STA-1E and STA-2. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to STA-1E Eastern Flowway.

Everglades

For the third consecutive week water depths dropped across the Everglades (except those in WCA-2B) at the gauges monitored for this report. WDAT modeling shows some increase in the Northwestern portion of WCA-1. WCA-1 and 2A are at schedule, 3A is trending towards schedule but remains above.

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. The depth on Sunday at that location was 3.74 feet, and has exceeded 2.5 feet for 164 days.

Salinity changes last week in Florida Bay fluctuated from −18 to +3 psu and currently levels range from 4 psu in the northeastern nearshore to 29 in the central bay. The large decrease in the east was due to positive flows resuming this week. Both the western and eastern bay are below their historic averages for salinity.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.31 inch of rainfall over the past week and the Lower Basin received 0.35 inch (SFWMD Daily Rainfall Report 11/27/2017).

Upper Kissimmee Basin

Stages and departures in the Kissimmee Chain of Lakes (KCOL) are shown in Table 1.

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: 11/28/2017

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)						
							11/26/17	11/19/17	11/12/17	11/5/17	10/29/17	10/22/17	10/15/17
Lakes Hart and Mary Jane	S62	65	LKMJ	61.0	R	61.0	**0.0**	0.0	0.1	0.1	0.0	0.3	1.0
Lakes Myrtle, Preston, and Joel	S57	28	S57	62.0	R	62.0	**0.0**	0.0	0.0	0.2	0.3	1.3	2.2
Alligator Chain	S60	5	ALLI	64.0	R	64.0	**0.0**	0.0	0.0	0.0	0.1	0.3	0.4
Lake Gentry	S63	21	LKGT	61.5	R	61.5	**0.0**	0.0	0.0	0.0	0.0	0.2	0.3
East Lake Toho	S59	76	TOHOE	58.0	R	58.0	**0.0**	0.0	0.0	0.0	0.1	0.3	0.7
Lake Toho	S61	238	TOHOW, S61	55.0	R	55.0	**0.0**	0.0	0.0	0.0	0.1	0.3	0.5
Lakes Kissimmee, Cypress, and Hatchineha	S65	925	KUB011, LKIS5B	51.5	R	52.5	**-1.0**	-0.9	-0.7	-0.5	-0.2	0.1	0.5

[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 12. Kissimmee River floodplain stages at selected stations are shown in Figure 13.

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: 11/28/2017

Metric	Location	1-Day Average	Average for the Preceeding 7-Days[1]									
		11/26/2017	11/26/17	11/19/17	11/12/17	11/5/17	10/29/17	10/22/17	10/15/17	10/8/17	10/1/17	9/24/17
Discharge (cfs)	S-65	855	**925**	1,097	1,349	1,439	1,564	2,319	3,200	6,671	11,491	12,054
Discharge (cfs)	S-65A	742	**817**	1,038	1,346	1,638	1,703	2,265	3,723	7,028	7,972	8,336
Discharge (cfs)	S-65D[2]	1,249	**1,425**	1,925	2,467	3,714	3,240	4,298	7,381	12,111	12,914	13,332
Discharge (cfs)	S-65E[2]	1,257	**1,436**	1,988	2,519	3,938	3,453	4,551	7,568	12,702	13,341	13,748
DO (mg/L)[3]	Phase I river channel	5.9	**5.8**	5.0	4.1	4.2	3.4	2.0	1.1	1.4	1.0	0.8
Mean depth (feet)[4]	Phase I floodplain	0.46	**0.54**	0.81	1.09	1.48	1.43	1.94	2.77	4.18	4.85	5.17

[1] Seven-day average of weighted daily means through Sunday midnight.
[2] S-65D discharge combines discharge at S-65D, S-65DX1, and S-65DX2; S65E discharge combines S65E and S65EX1.
[3] DO is the average for sondes at PC62 and PC33.
[4] 1-day spatial average from South Florida Water Depth Assessment Tool (SFWDAT).
DATA ARE PROVISIONAL; N/A indicates that data were not available.

Water Management Recommendations

Kissimmee Basin Adaptive Recommendations and Operational Actions

Date	Recommendation	Purpose	Outcome	Source
11/28/2017	No new recommendations.		N/A	
11/21/2017	No new recommendations.		N/A	
11/13/2017	No new recommendations.		N/A	
11/1/2017	No new recommendations.		N/A	
10/24/2017	No new recommendations.		N/A	
10/17/2017	No new recommendations.		N/A	
10/10/2017	No new recommendations.		N/A	
10/3/2017	No new recommendations.		N/A	
9/25/2017	No new recommendations.		N/A	
9/19/2017	No new recommendations.		N/A	
9/5/2017	No new recommendations.		N/A	
8/29/2017	No new recommendations.		N/A	
8/22/2017	No new recommendations.		N/A	
8/15/2017	No new recommendations.		N/A	
8/4/2017	Increase S65A discharge by 150 cfs to about 1400 cfs.	Reduce rate of stage rise in KCH.		SFWMD Water Mgt, KB Ops
8/1/2017	No new recommendations.		N/A	
7/25/2017	Hold current discharge at S65A, adjusting S65 discharge to maintain current flow to the Kissimmee River.	Maintain current S65A discharge.		SFWMD Water Mgt, KB Ops
7/23/2017	Increase S65A discharge slowly using Figure 8a toward the seasonal target of 1400 cfs. Hold at 1400 cfs while stage in KCH remains above 50 feet (+/- 0.2 foot).	Reduce current rapid rate of stage rise in KCH; provide Kissimmee River floodplain inundation if conditions stay wet.	Implemented	KB Ops
7/16/2017	Reduce S65A flow to ~600-650 cfs. As Pool A runoff diminishes keep S65A around 650 +/- 50 cfs by increasing flow from S65.	Maintain moderate discharge to the Kissimmee River from S65A while maintaining S65A headwater within its operating range using flow from S65.	Implemented	SFWMD Water Mgt, KB Ops
7/6/2017	Hold 450 cfs at S65A due to reduced forecast.	Reduced-rainfall forecast led to decision to hold 450 cfs at S65A rather than continuing to ramp up.	Implemented	KB Ops
7/5/2017	Increase S65A flow by 150 cfs today to 450 cfs and by another 150 cfs tomorrow.	Control stage in KCH and Pool A in anticipation of forecast significant rainfall; begin discharge rampup in anticipation of forecast rainfall.	Implemented	KB Ops
6/28/2017	Reduce S65A discharge by a maximum of 150 cfs per day until 300 cfs is reached.	Allow KCH stage to rise before transitioning to 2017 Wet Season discharge plan; facilitate DO recovery in the Kissimmee River by reducing depth in the river channel.	Implemented	KB Ops
6/26/2017	Hold 800 cfs at S65A until further notice.	Maintain reduced discharge to allow stages in KRR project area to decline to facilitate DO recovery.	Implemented	KB Ops
6/22/2017	Reduce discharge by 150 cfs each day on Thursday 6/22, Friday 6/23, Saturday 6/24, and Sunday 6/25. After the Sunday reduction hold at approximately 800 cfs through Monday when new DO data should be available to help guide next steps.	Attempt to allow Kissimmee River dissolved oxygen concentration to rise.	Implemented	KB Ops
6/20/2017	Maintain 1400 cfs at S65A as KCH stage continues to rise. Supplement declining S65A basin runoff by increasing discharge at S65 as needed.	Transition from current operations to 2017 Wet Season discharge plan.	Implemented	KB Ops, SFWMD Water Management
6/15/2017	Attempt to slow the rates of stage rise in Lakes Toho and East Toho by increasing discharge from S59 into Toho and S61 into KCH.	Slow rates of rise in Lakes Toho and East Toho.	Implemented	KB Ops, SFWMD Water Management
6/15/2017	Increase discharge from S65A as necessary using the discharge rates of change table in Figure 8a.	Lower stage in Pool A following rainfall directly over the S65A Basin.	Implemented	SFWMD Water Management, KB Ops

KCOL Hydrographs (through Sunday midnight)

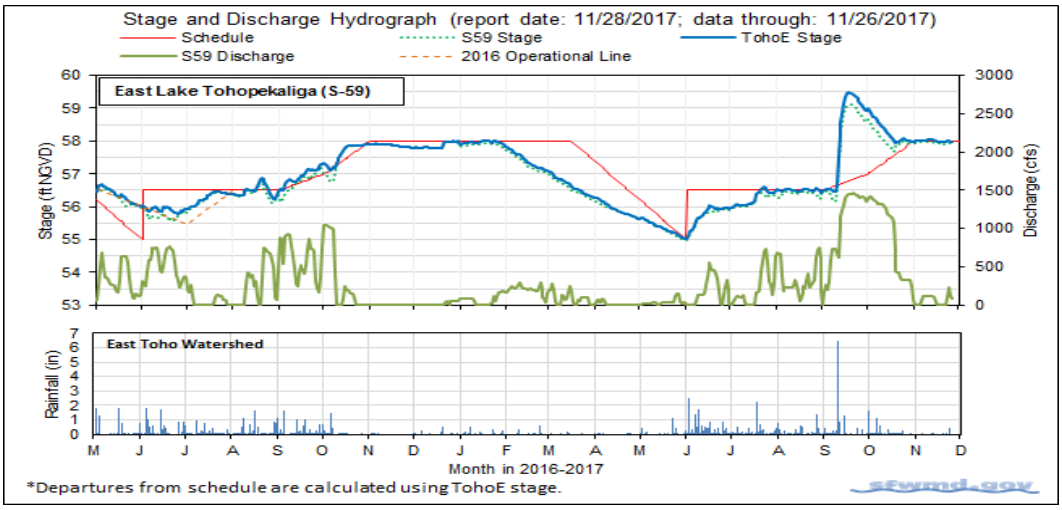


Figure 1.

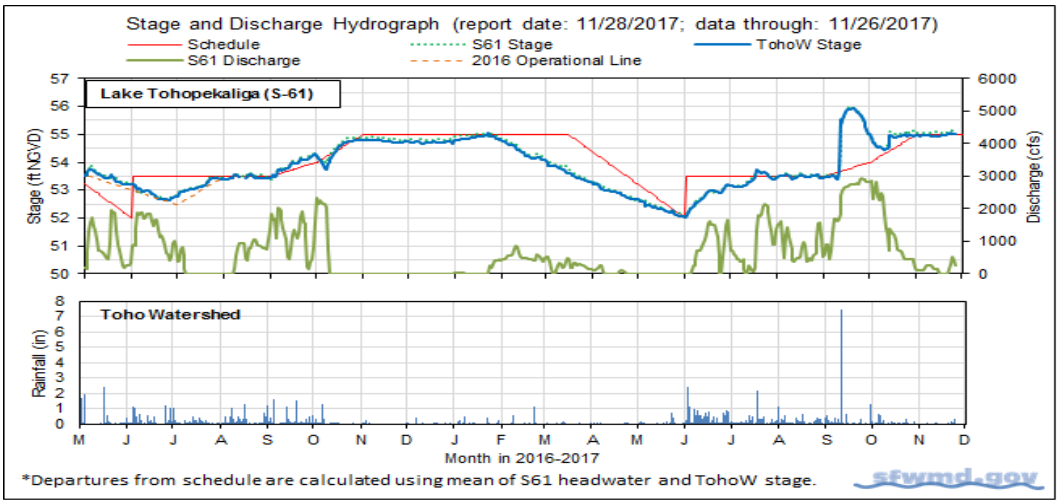


Figure 2.

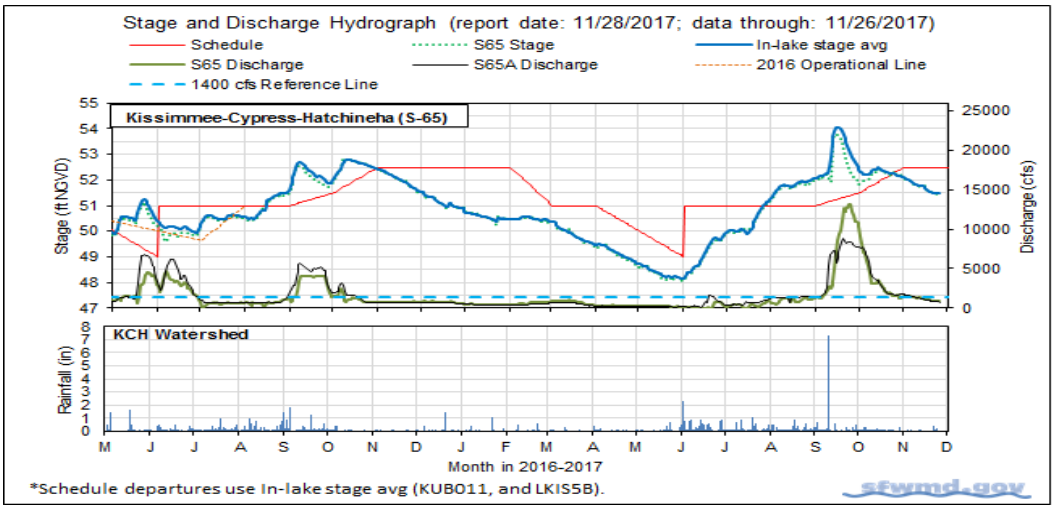


Figure 3.

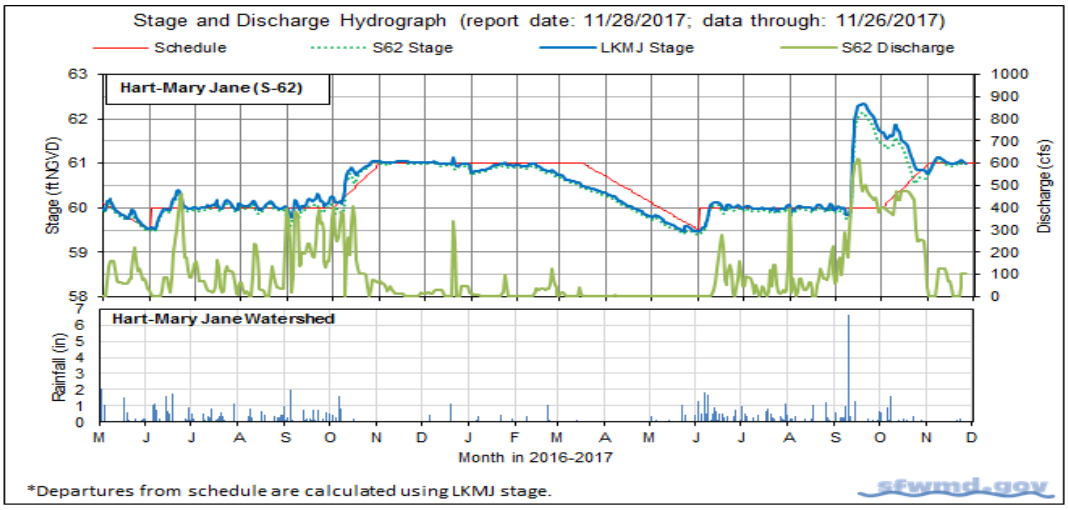


Figure 4.

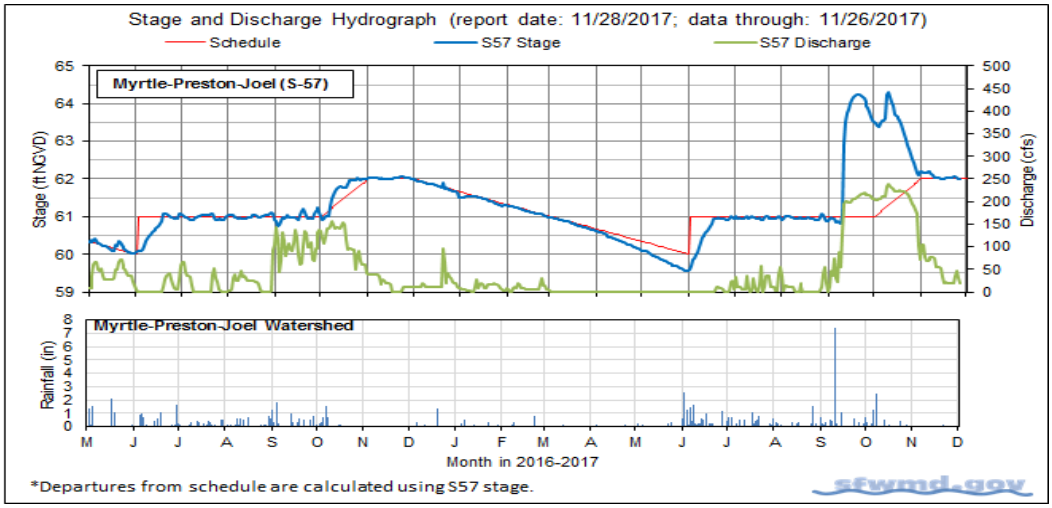


Figure 5.

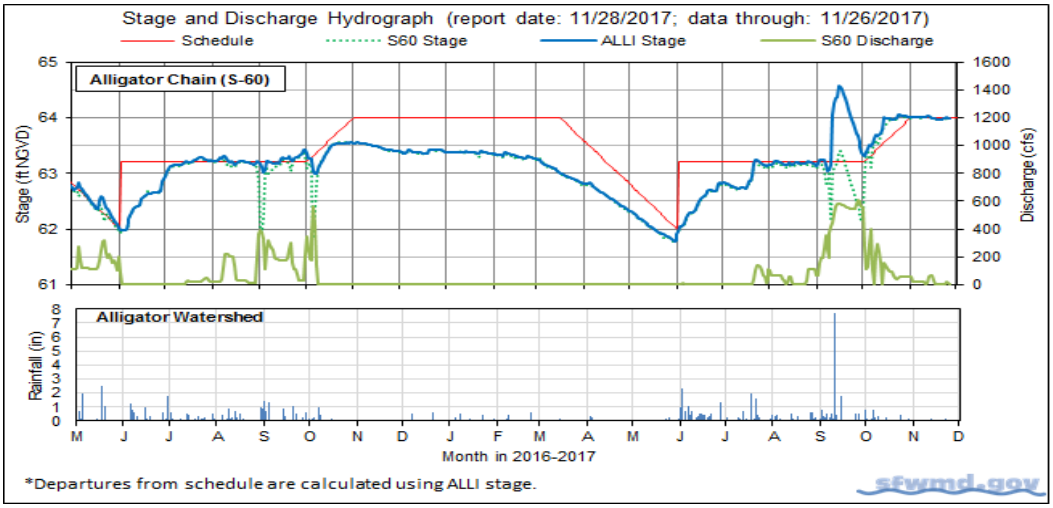


Figure 6.

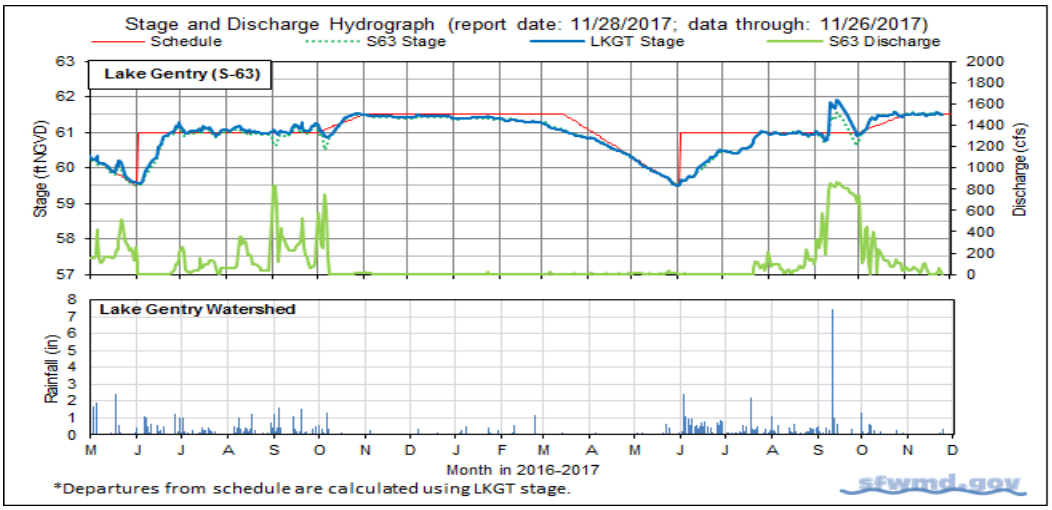


Figure 7.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

S65/S65A Limits on Rate of Change in Discharge

Discharge Rate of Change Limits for S65/S65A (revised 11/16/16).	
Q (cfs)	Maximum rate of increase or decrease (cfs/day)
300-650	75
650-1700	150
1700-3000	300
>3000	1000

Figure 8. Limits on rate of discharge change at S65/S65A starting with the 2016-2017 Dry Season.

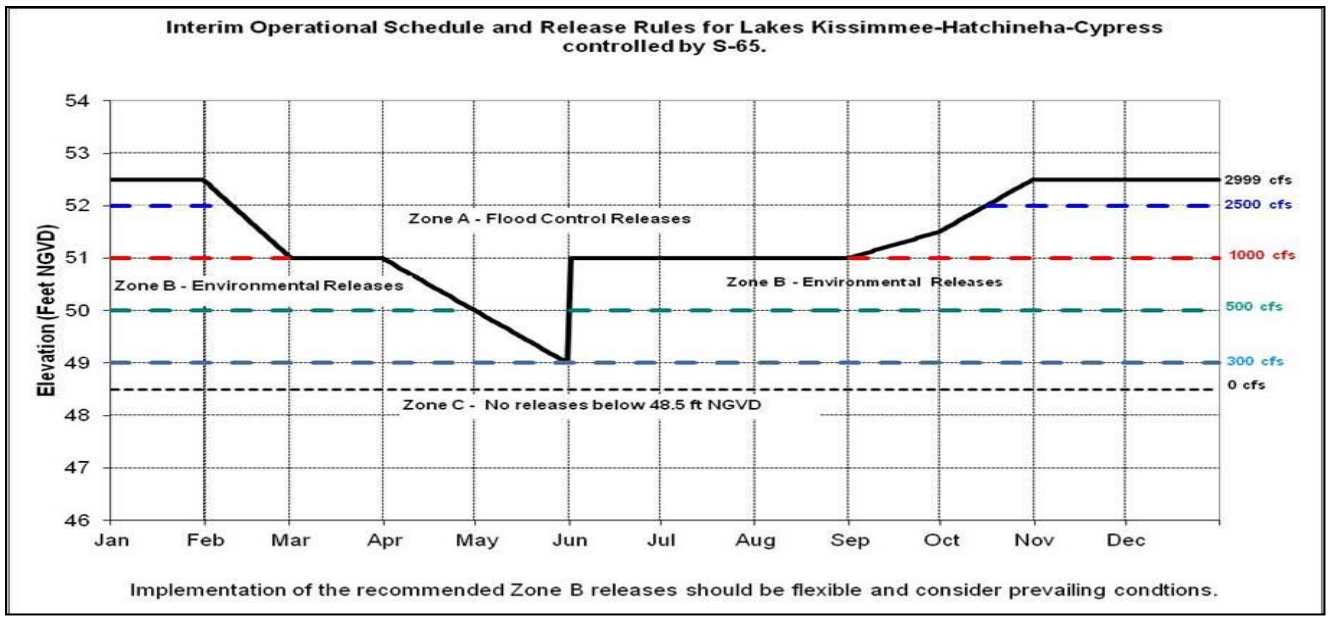


Figure 9. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

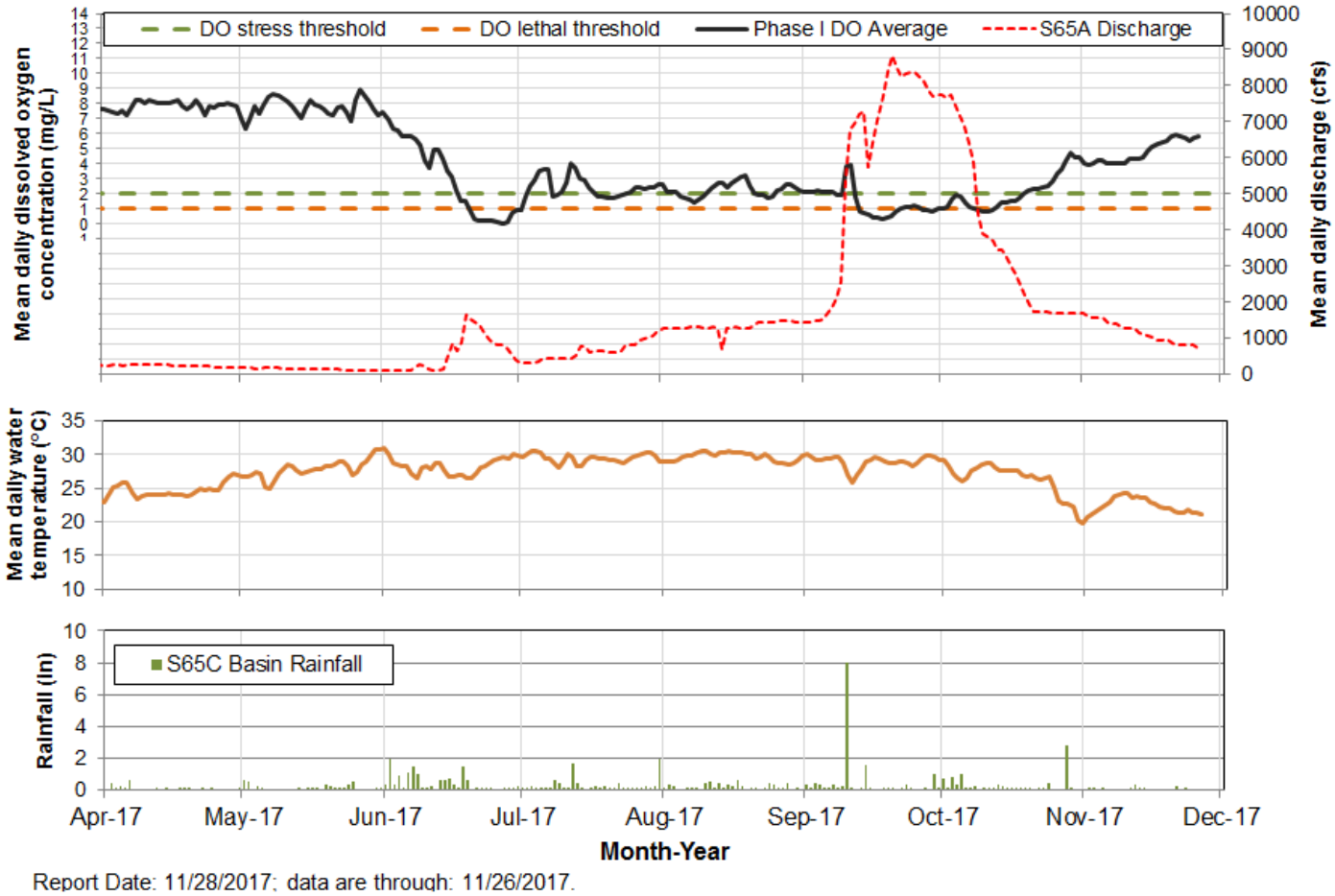


Figure 10. Mean daily Dissolved Oxygen, discharge, temperature and rainfall in the Phase I river channel.

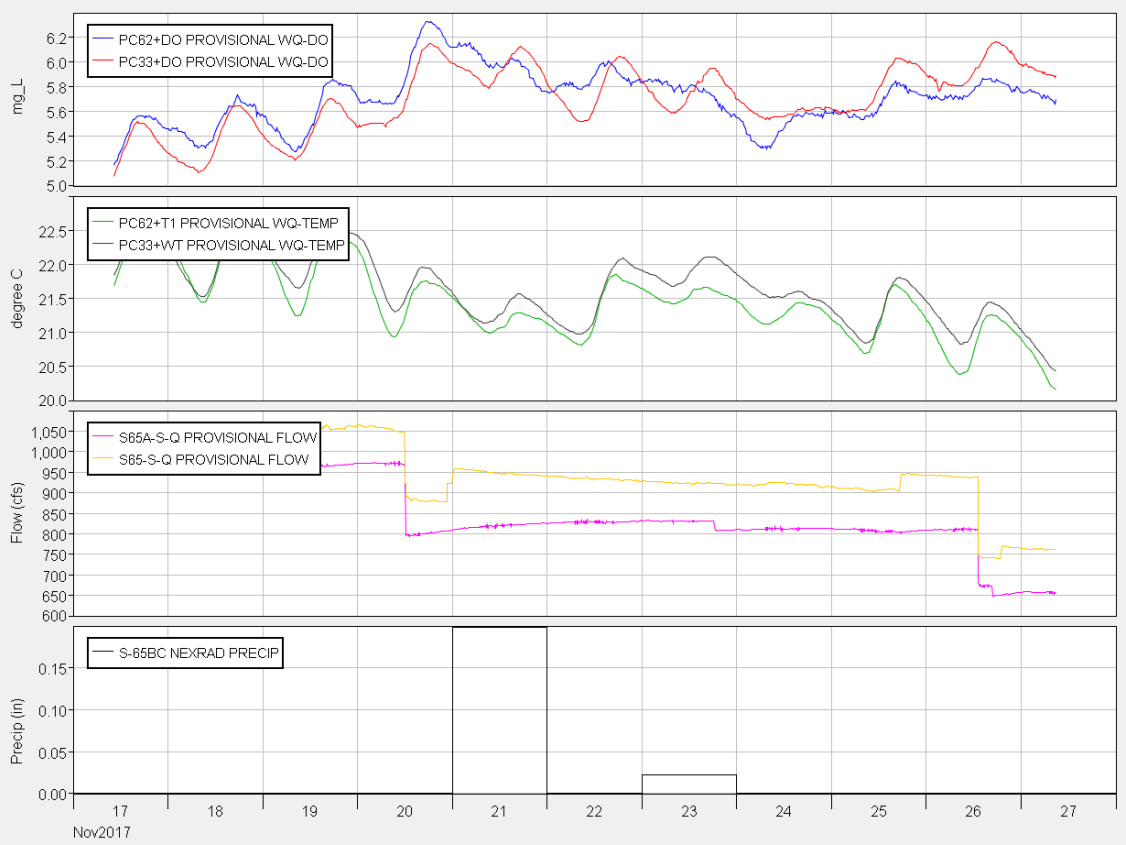


Figure 11. Phase I river channel dissolved oxygen and water temperature (measured at 15 minute intervals) and Pool BC daily rainfall.

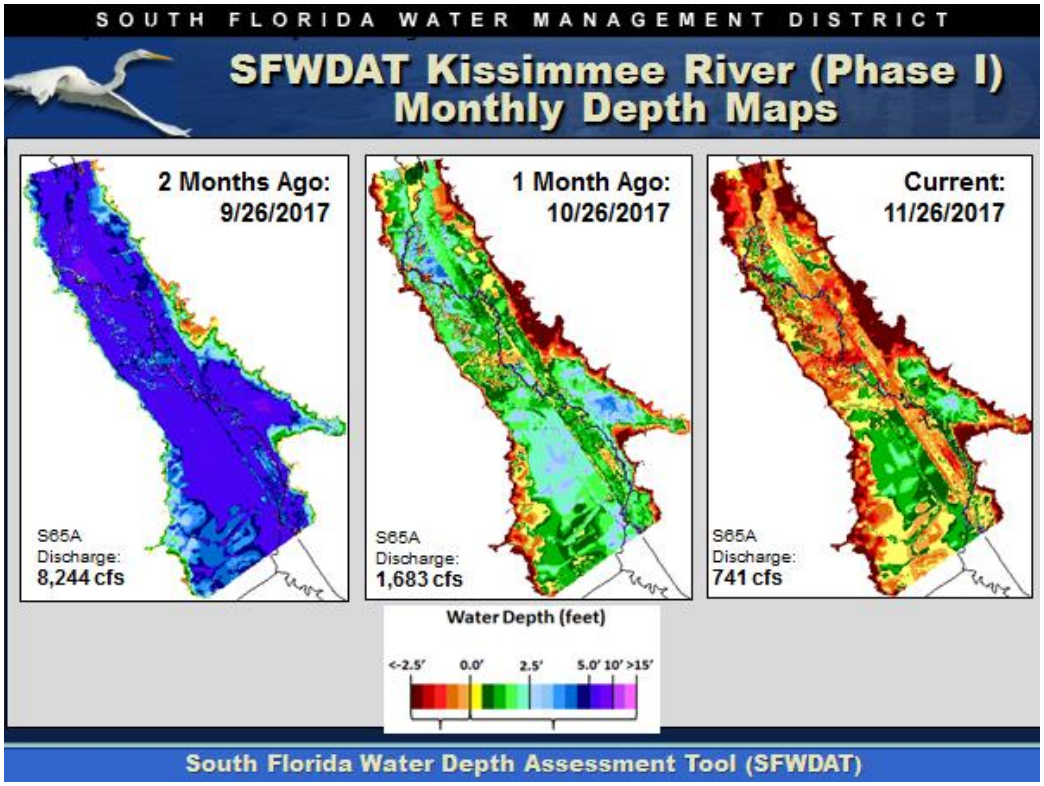
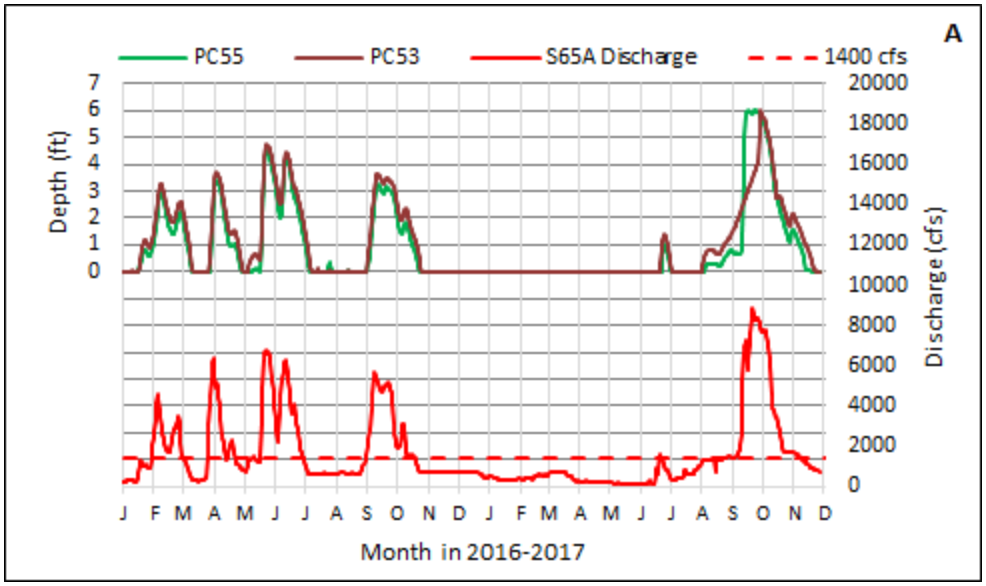
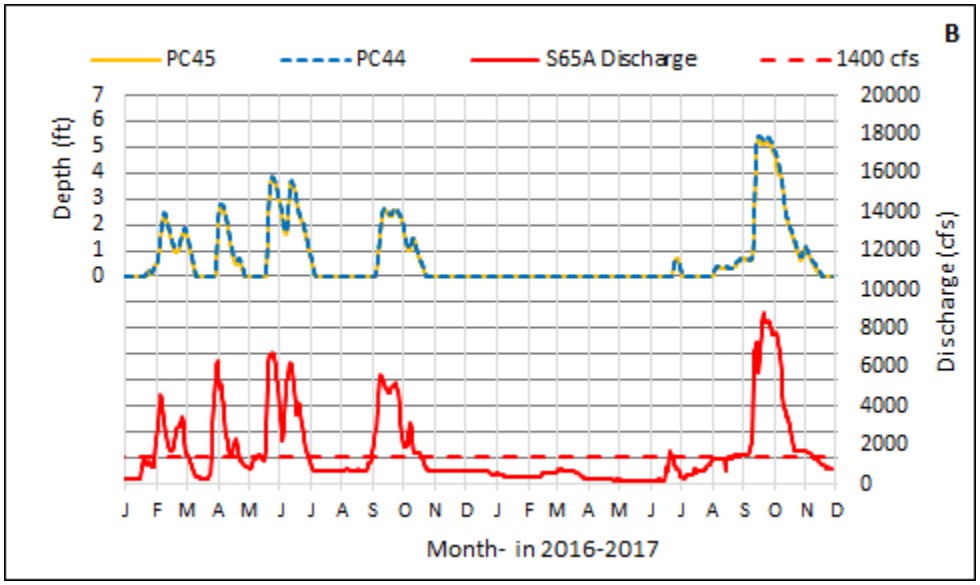


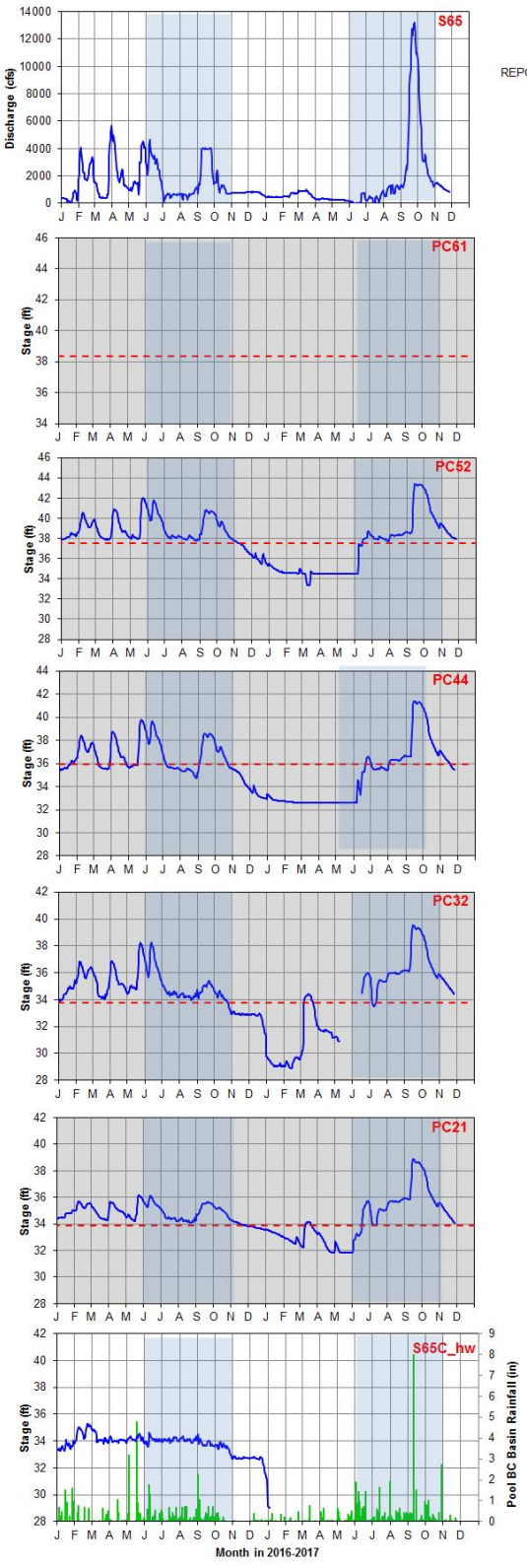
Figure 12. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to Jan. 16, 2012.





Insert. Water depth at selected northern Kissimmee River floodplain sites on (A) the PC5's transect and (B) the PC4's transect, with S65A discharge.

Kissimmee River Hydrographs



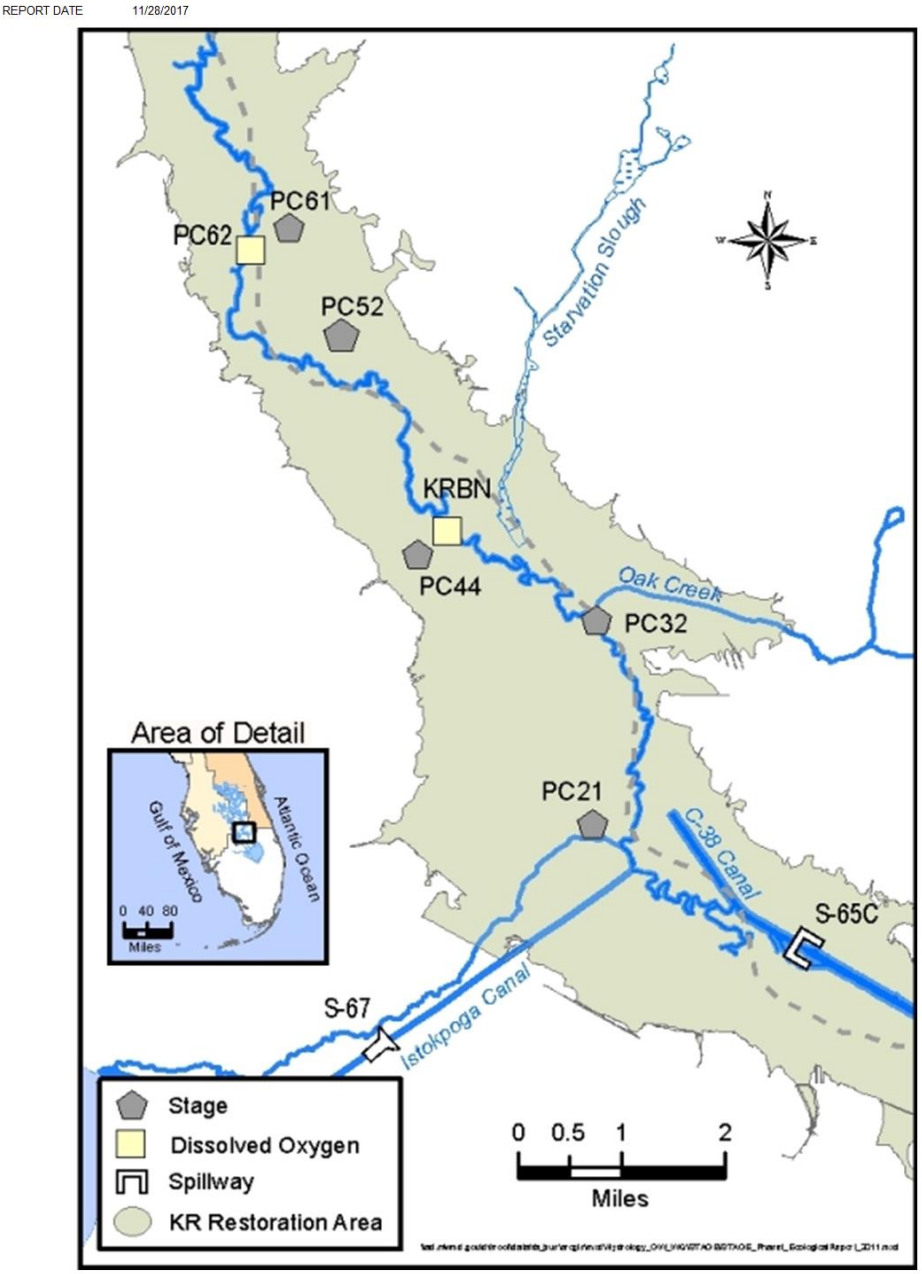


Figure 13. Discharge at S65, stages at five monitoring stations in the Phase I area of the Kissimmee River floodplain, and headwater stage at S65-C since January 1, 2016. The most recent data (~2 weeks) are provisional real-time data from SFWMD DualTrend; previous data are from SFWMD DB-HYDRO (validated). Dashed lines are ground elevations.

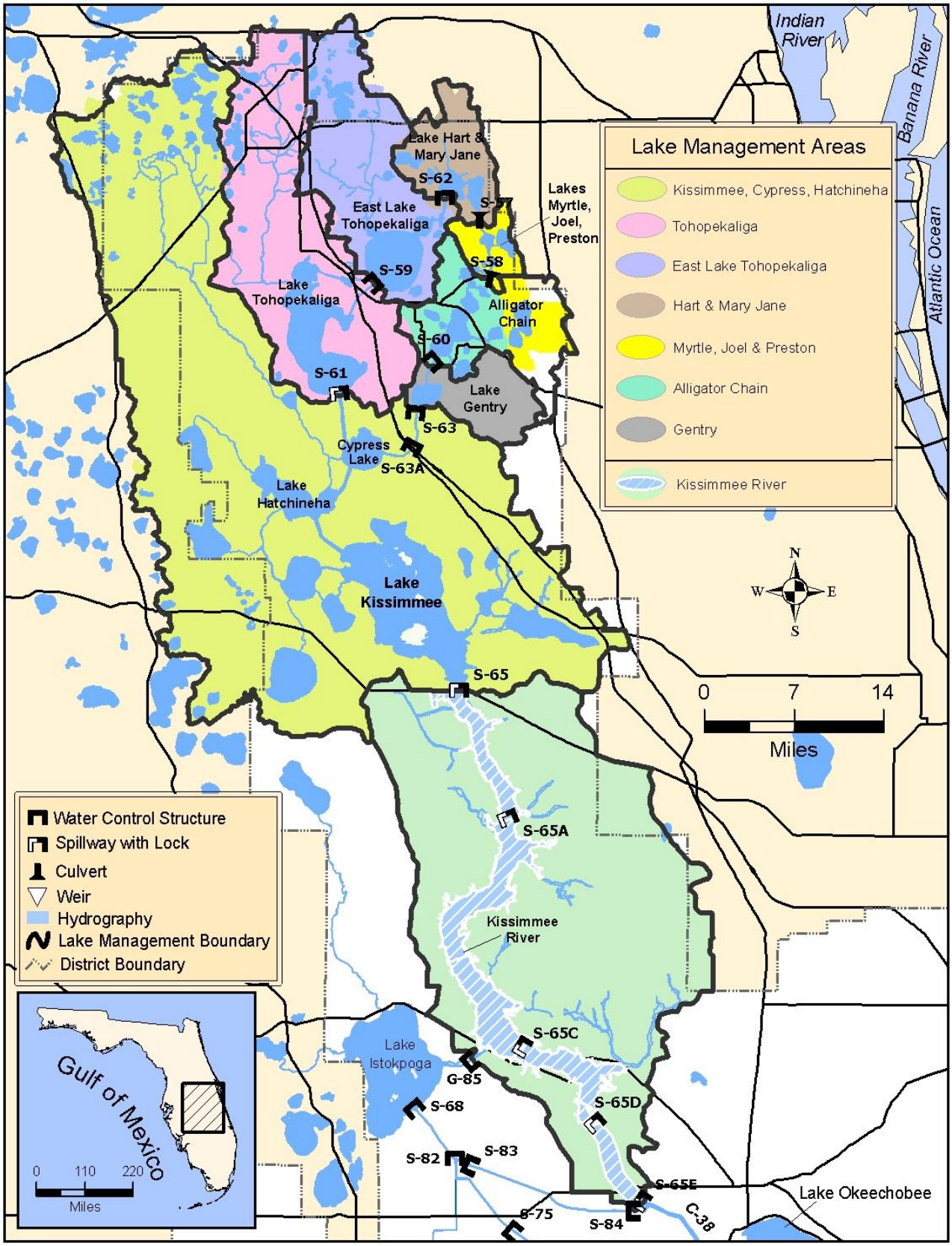


Figure 14. The Kissimmee Basin

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee stage is at 16.21 feet NGVD for the period ending at midnight on November 27, 2017. This value is based on the use of four interior Lake stations (L001, L005, L006 and LZ40) and four perimeter stations (S308, S352, S4 and S133). Lake stage last peaked at 17.20 feet NGVD on October 13, before declining to 16.8 feet NGVD on October 28 and then back up to 17.02 feet NGVD. The Lake is now 0.59 feet lower than it was a month ago, 0.71 feet lower than it was three weeks ago, but 1.40 feet higher than a year ago (Figure 1). The Lake just entered the Low sub-band and is currently only 0.04 feet below the Intermediate (Figure 2). According to RAINDAR, 0.62 inches of rain fell directly over the Lake during the week Nov. 21 – Nov. 27 (Figure 3), with lower rainfall throughout most of the northern watershed (between 0.15 – 0.4 inches).

Average daily inflows to the Lake decreased again over the past week, from 4,453 cfs to 3,356 cfs. Most of the inflows were from the Kissimmee River via the S65E and S84 structures, which averaged 1,370 cfs and 738 cfs daily, respectively. S71 and S72 structures, along with Fisheating Creek, contributed a combined 986 average daily cfs as well.

Average daily outflows for the Lake decreased from the previous two weeks as well, primarily due to reductions through the S308 structure. Total outflows went from 7,730 cfs to 7,386 cfs, with S308 discharges going from 1,618 cfs to 1,347 cfs. S77 discharges decreased slightly from 6,103 cfs the previous week to 6,005 cfs this past week. There were no discharges south through the S350 structures or to the L8 canal via Culvert 10A. The corrected evapotranspiration value based on the L006 weather platform solar radiation data was 0.12 inches for the past week.

Total inflows and outflows for the last two weeks are detailed in Table 1, as well as the approximate change in Lake stage from each major structure's total flows over the period (midnight Nov. 21 to midnight Nov. 27). 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.

Satellite imagery indicates that algal bloom potential has remained very low over the past two months, based on NOAA's cyanobacteria monitoring product derived from the OLCI satellite sensor. Potential for elevated cyanobacterial levels were last observed in the northern portion of the Lake in early September (Figure 5). Along with decreasing temperatures, high winds from Hurricane Irma may have further reduced bloom potential on the Lake by increasing turbidity, but elevated total phosphorus levels from high inflows and resuspended Lake sediment are expected to produce high bloom potentials next year as turbidity declines and temperatures increase.

Table 1

INFLOWS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S65E & S65EX1	1370	0.5
S71 & 72	223	0.1
S84 & 84X	738	0.3
Fisheating Creek	763	0.3
S154	34	0.0
S191	100	0.0
S133 P	33	0.0
S127 P	33	0.0
S129 P	11	0.0
S131 P	4	0.0
S135 P	46	0.0
S2 P	0	0.0
S3 P	0	0.0
S4 P	0	0.0
C5	0	0.0
Rainfall	1698	0.6
Total	**5053**	**1.9**

OUTFLOWS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S77	6005	2.3
S308	1347	0.5
S351	0	0.0
S352	0	0.0
S354	31	0.0
L8	3	0.0
ET	2260	0.9
Total	**9646**	**3.6**

PROVISIONAL DATA

The total phosphorous (TP) concentrations and total suspended solids (TSS) in the water column were very high in September after Hurricane Irma's high inflows and high winds, but declined sharply in October. However, that trend did not continue into November, as values were slightly higher in the nearshore areas and relatively unchanged in the pelagic zone (Figure 5). TP average for the nearshore areas went from 295 ppb just after Hurricane Irma to 179 ppb in October (no samples from FEBIN or FEBOUT locations), then back up to 189 ppb in November. The pelagic average went from 203 ppb after Hurricane Irma to 181 ppb in October, then to 182 ppb in November. The Lake-wide average declined from 251 ppb to 180 ppb, and was 186 ppb in November. Similarly, the TSS went from 44 ppm in the nearshore after Hurricane Irma to 14 ppm in October (no samples from FEBIN or FEBOUT locations), before rising again to 21 ppm. The pelagic average went from 54 ppm after Hurricane Irma to 29 ppm, and was 31 ppm in November. The Lake-wide average went from 49 ppm after Hurricane Irma to 22 ppm in October and 25 ppm in November. While the initial reductions were a good sign, Lake-wide values are still well above pre-storm (August) averages of 113 ppb and 10 ppm TP and TSS, respectively.

Water Management Recommendations

The Lake is 16.21 feet NGVD having decreased 0.21 feet from the week prior, and 0.71 feet over the past three weeks. Submerged and emergent vegetation communities in the nearshore region have experienced stages >16 feet NGVD three times in less than two years, and for 67 consecutive days and counting, the longest since late 2004. These stages, combined with turbid conditions from Hurricane Irma's winds, will likely cause substantial declines in these communities over the coming months and/or years. Lower Lake stages near the end of WY2018 would help to recover these important communities, and long, steady recessions of water levels throughout the dry season may help promote another productive year for wading birds on the Lake as well.

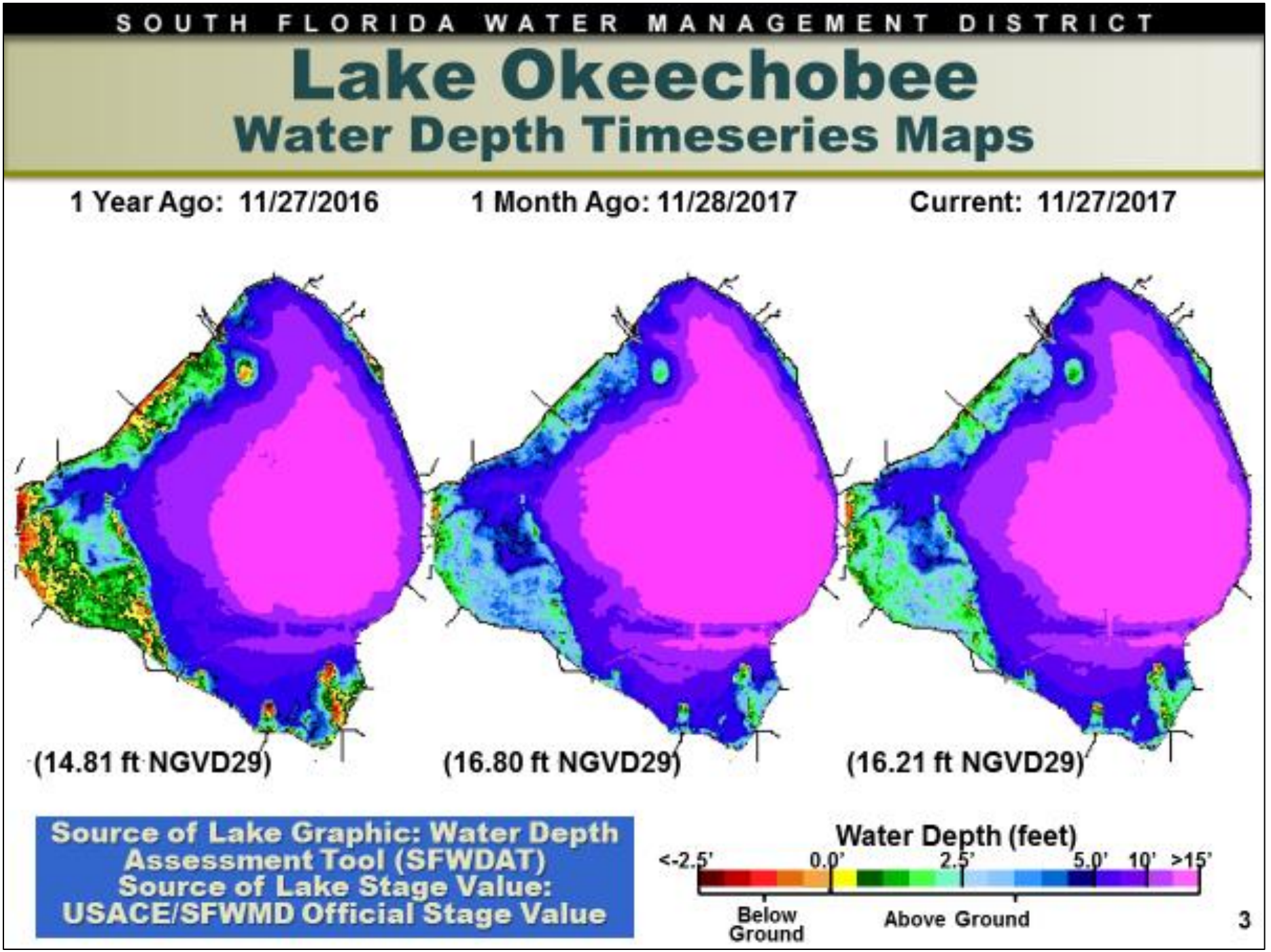
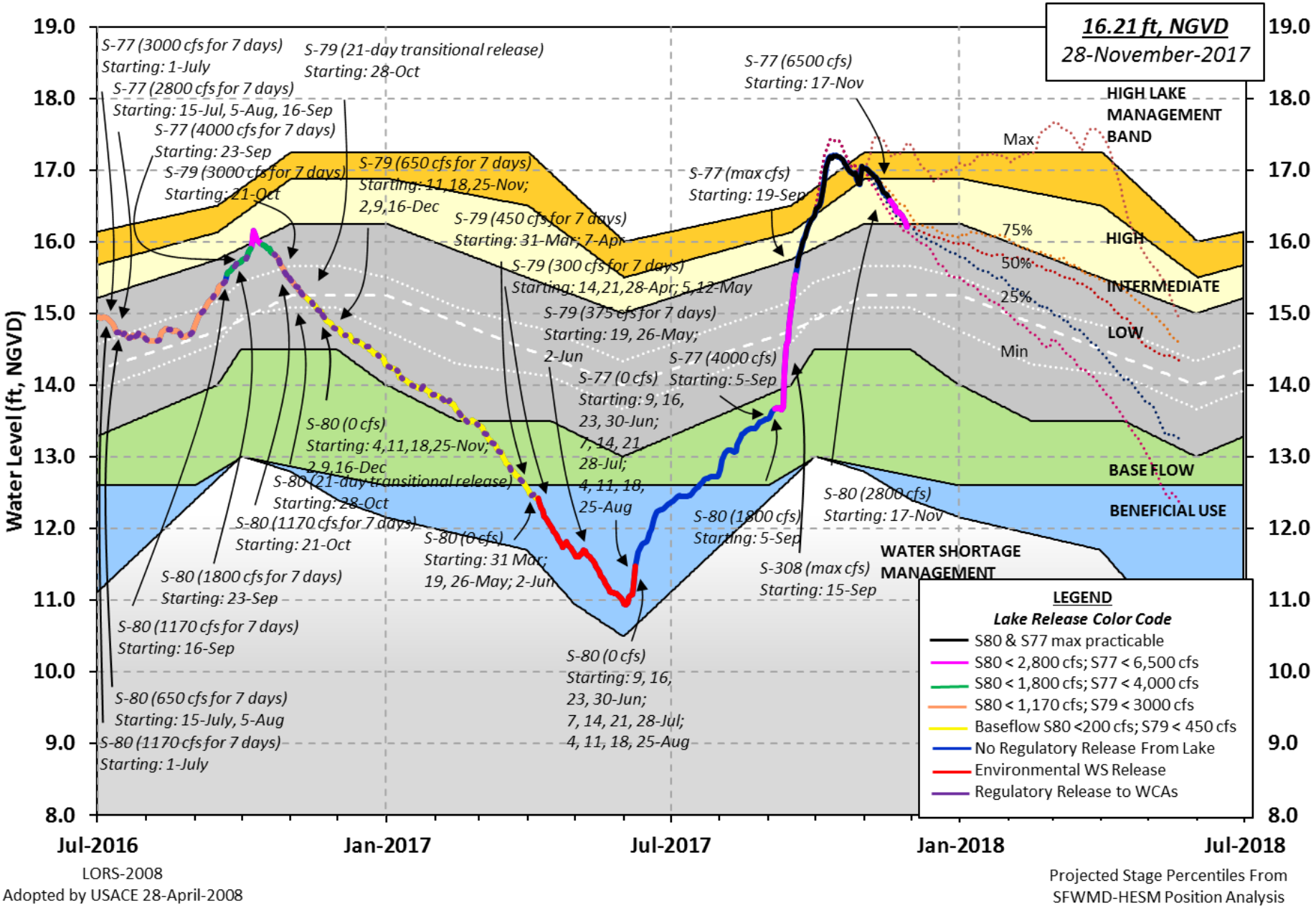

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
Lake Okeechobee
Water Depth Timeseries Maps
1 Year Ago: 11/27/2016
1 Month Ago: 11/28/2017
Current: 11/27/2017
(14.81 ft NGVD29)
(16.80 ft NGVD29)
(16.21 ft NGVD29)
Source of Lake Graphic: Water Depth Assessment Tool (SFWDAT)
Source of Lake Stage Value: USACE/SFWMD Official Stage Value
Water Depth (feet)
<-2.5'
0.0'
2.5'
5.0'
10'
>15'
Below Ground
Above Ground
3

Figure 1

Lake Okeechobee Water Level History and Projected Stages



LORS-2008
Adopted by USACE 28-April-2008

Projected Stage Percentiles From
SFWMD-HESM Position Analysis

Figure 2

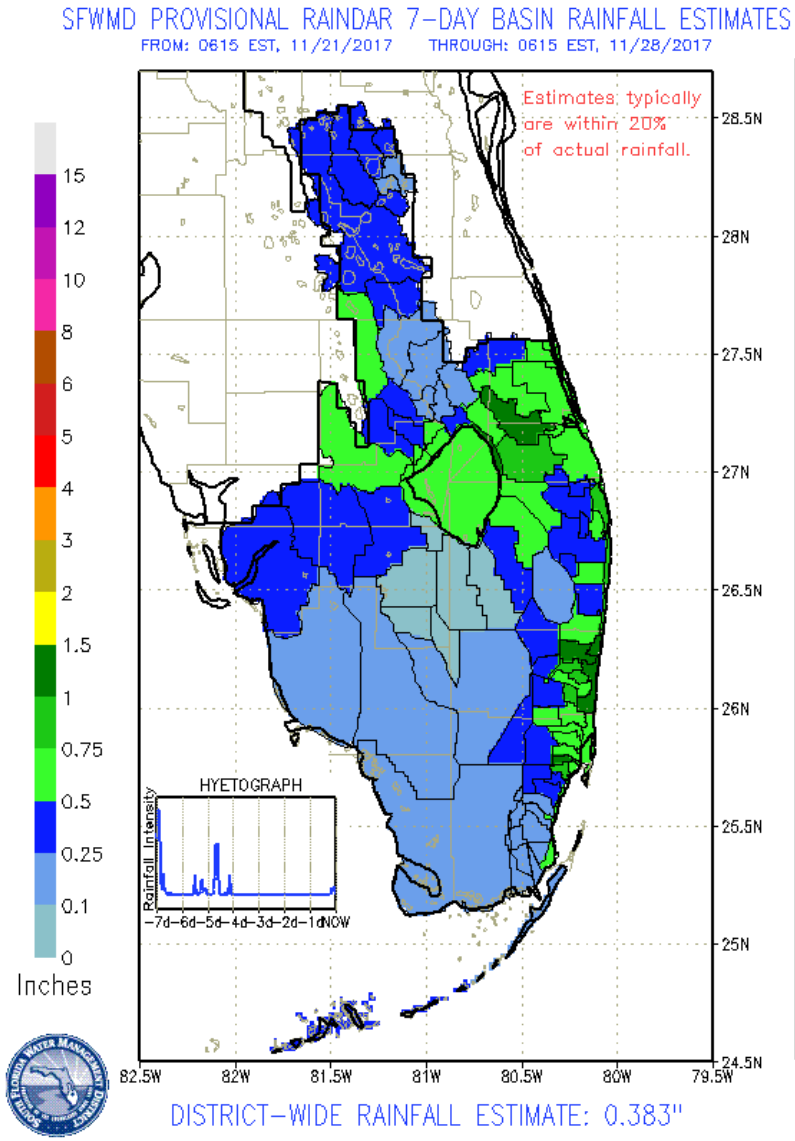
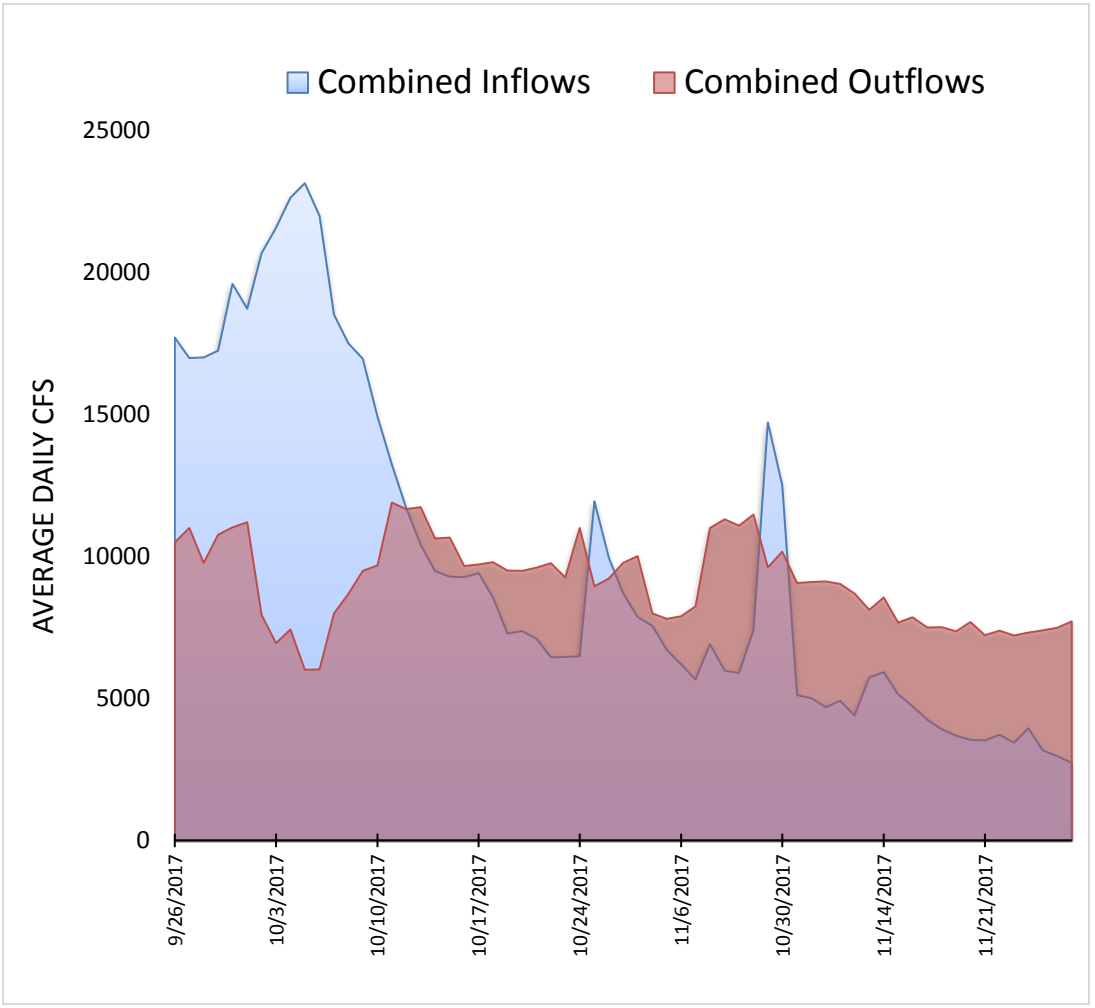


Figure 3



PROVISIONAL DATA

Figure 4

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Lake Okeechobee
Cyanobacteria Bloom Potential

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

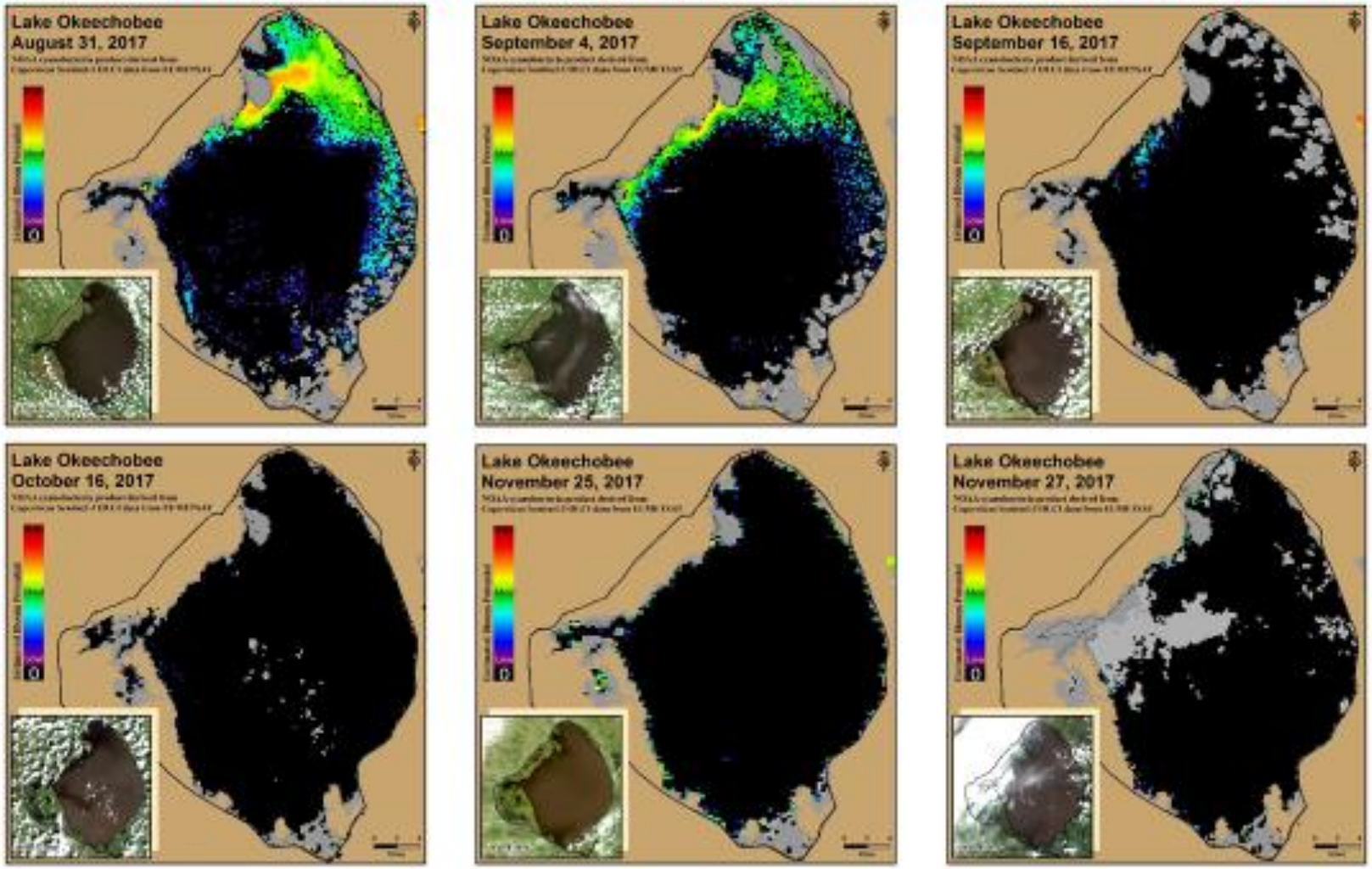


Figure 5

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Lake Okeechobee
Water Quality

Parameter		Aug 2017	Sep 2017	Oct 2017	Nov 2017
TP (ppb)	Nearshore	119	295	179	189
	Pelagic	106	203	181	182
	Lakewide	113	251	180	186
TSS (ppm)	Nearshore	6	44	14	20
	Pelagic	15	54	29	31
	Lakewide	10	49	22	25

TP = Total Phosphorus
TSS = Total Suspended Solids

NOTE: Fisheating Bay sites (FEBIN and FEBOUT) were not sampled in October.

Figure 6

LAKE ISTOKPOGA

Lake Istokpoga stage is 39.24 feet NGVD as of midnight November 27, 2017 and is currently 0.26 feet below its regulation schedule to accommodate construction on downstream structures (Figure 7). Average daily flows into the Lake from Josephine Creek for the week Nov. 21 – Nov. 27 were slightly lower than the previous week, at 112 cfs. No data have been reported for Arbuckle Creek since July 4 as the gauge is being recalibrated after construction in the area. Average daily discharge from S68 and S68X over the past week was similar to the previous week, going from 852 cfs to 799 cfs. According to RAINDAR, 0.65 inches of rain fell in the Lake Istokpoga basin in the past week.

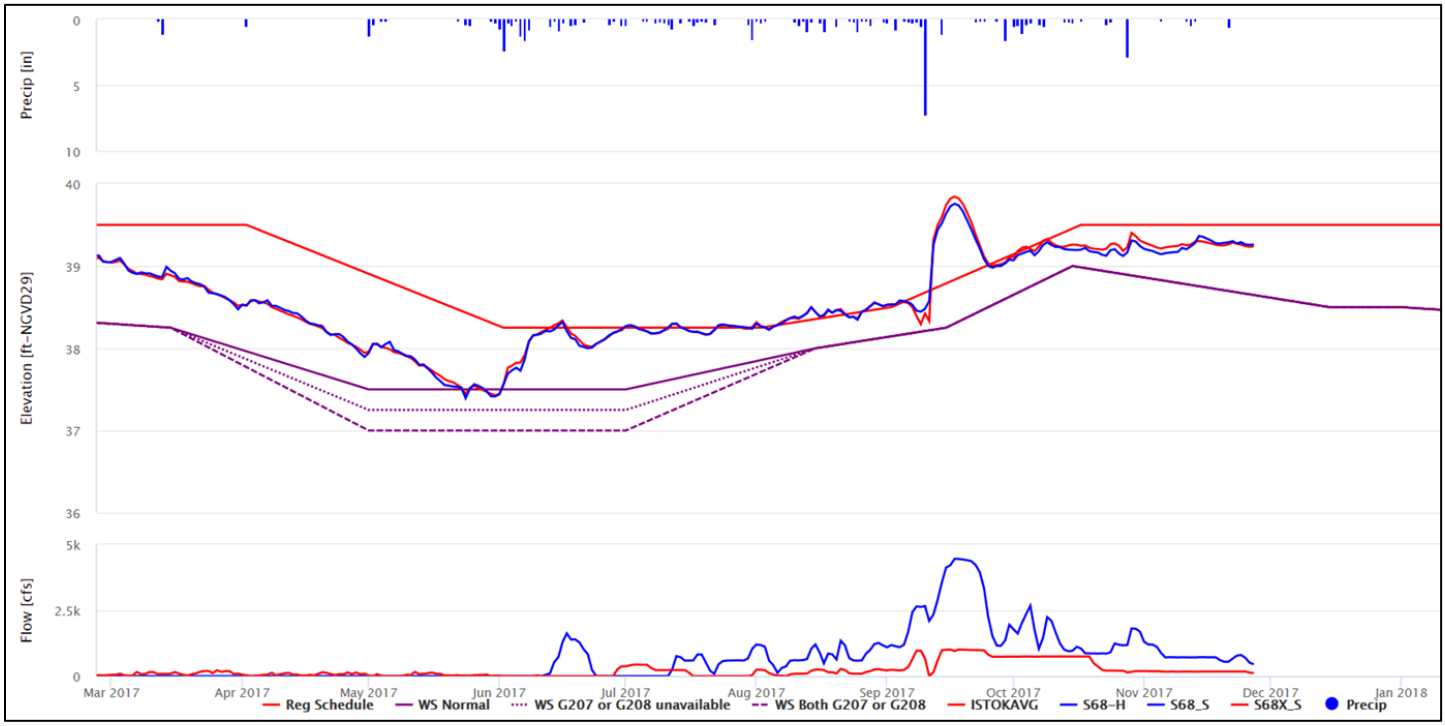


Figure 7

ESTUARIES

St. Lucie Estuary

Over the past week, provisional flows averaged about 2,785 cfs at S-80, 1,339 cfs at S-308, 331 cfs at S-49 on C-24, 410 cfs at S-97 on C-23, and 231 cfs from Ten Mile Creek at the Gordy Road Structure. Average inflow from tidal basin tributaries is estimated to be 447 cfs (Figures 1 and 2). Total inflow averaged about 4,204 cfs last week and 5,920 cfs over last month.

Over the past week, salinity increased throughout the estuary (Table 1, 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 2.7. Salinity conditions in the middle estuary are in the poor range for the adult eastern oysters (Figure 3).

Table 1. Seven-day average salinity at three monitoring stations 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 (N. Fork)	**0.5** (0.4)	**0.9** (0.4)	NA[1]
US1 Bridge	**1.1** (0.5)	**4.4** (1.5)	10.0-26.0
A1A Bridge	**5.3** (4.2)	**17.9** (14.2)	NA[1]

[1]Envelope not applicable.

Continuous monitoring of water quality is conducted at HR1 in the North Fork. Weekly dissolved oxygen data are summarized in Table 2.

Table 2. Weekly dissolved oxygen conditions at HR1 in the North Fork of the St. Lucie Estuary.

Location	Depth	Average DO (mg/l)	Minimum DO (mg/l)	Maximum DO (mg/l)
HR1	surface	6.96	2.77	8.20
HR1	bottom	5.49	2.12	7.91

Continuous monitoring of water quality is conducted at five Land/Ocean Biogeochemical Observatory (LOBO) stations located in the St. Lucie Estuary and maintained by Florida Atlantic University/Harbor Branch Oceanographic Institute (FAU-HBOI). Data are summarized in Table 3 and station location map is shown in Figure 5.

Table 3. Weekly ranges of Instrument Depth, chlorophyll *a* (a measure of algal biomass) and dissolved oxygen concentrations at five FAU-HBOI LOBO stations located in the St. Lucie Estuary.

Location	Depth (m)	Chlorophyll *a* (µg/l)	Average DO (mg/l)	Minimum DO (mg/l)	Maximum DO (mg/l)
SF2	2.94	4.58 - 5.28	6.44	6.21	6.73
SF	1.74	5.05 - 5.77	7.98	7.50	8.38
NF	2.18	5.11 - 8.6	7.26	6.82	7.64
ME	1.95	3.83 - 6.09	7.24	6.43	7.93
IRL-SLE	3.70	1.44 - 5.08	5.93	5.53	6.74

NOAA satellite imagery indicates low to medium potential for cyanobacteria blooms at just a few nearshore locations in the St. Lucie Estuary (Figure 6).

Caloosahatchee Estuary

During the past week, provisional flows averaged approximately 6,005 cfs at S-77, 6,182 cfs at S-78, and 7,498 cfs at S-79. Average inflow from tidal basin tributaries is estimated to be 230 cfs (Figures 7 & 8). Total inflow averaged 7,728 cfs last week and 9,057 cfs over last month.

Over the past week, salinity remained about the same throughout the estuary (Table 4, Figures 9 &10). The seven-day average salinity values are within the poor range for the adult eastern oysters at Cape Coral and in the good range at Shell Point (Figure 11). Salinity data were not available at Sanibel. The 30-day moving average surface salinity is 0.2 at both Val I-75 and 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)	**0.1** (0.1)	**0.1** (0.1)	NA[1]
*Val I75	**0.1** (0.1)	**0.1** (0.1)	0.0-5.0[2]
Ft. Myers Yacht Basin	**0.2** (0.2)	**0.2** (0.2)	NA
Cape Coral	**0.5** (0.6)	**0.8** (0.8)	10.0-30.0
Shell Point	**9.2** (9.8)	**12.5** (11.5)	10.0-30.0
Sanibel	**NR**[3](NR)	**NR** (NR)	10.0-30.0

[1]Envelope not applicable, [2]Envelope is based on a 30-day average, and [3]Not Reporting.
*Val I75 is temporarily unavailable (salinity values are estimated using models developed for this site).

Monitoring data collected by the River, Estuary and Coastal Observing Network of Sanibel-Captiva Conservation Foundation using continuous sensors are summarized in Table 5 as concentration ranges of chlorophyll *a* and dissolved oxygen at Beautiful Island, Ft. Myers, and Shell Point in the Caloosahatchee Estuary.

Table 5. Weekly ranges of chlorophyll *a* (a measure of algal biomass) and dissolved oxygen concentrations at three monitoring stations maintained by the Sanibel-Captiva Conservation Foundation.

	RECON Monitoring Stations		
	Beautiful Island	**Ft. Myers**	**Shell Point**
Chlorophyll *a* (µg/l)	Down for maintenance	1.83 - 2.20	2.20 - 4.72
Dissolved Oxygen (mg/l)	Down for maintenance	No Data	5.98 - 8.14

The Florida Fish and Wildlife Research Institute reported on November 22, 2017, that *Karenia brevis*, *the Florida red tide dinoflagellate,* was observed in very low to high concentrations in twenty samples collected from Lee County.

NOAA satellite imagery in the Caloosahatchee Estuary was unavailable this week due to cloud coverage.

Water Management Recommendations

Lake stage is in the Intermediate sub band of 2008 LORS. Tributary hydrological conditions are wet. The 2008 LORS recommends up to 4,000 cfs at S-77 and up to 1,800 cfs at S-80. Given the current estuarine conditions, there are no ecological benefits associated with freshwater releases from Lake Okeechobee.

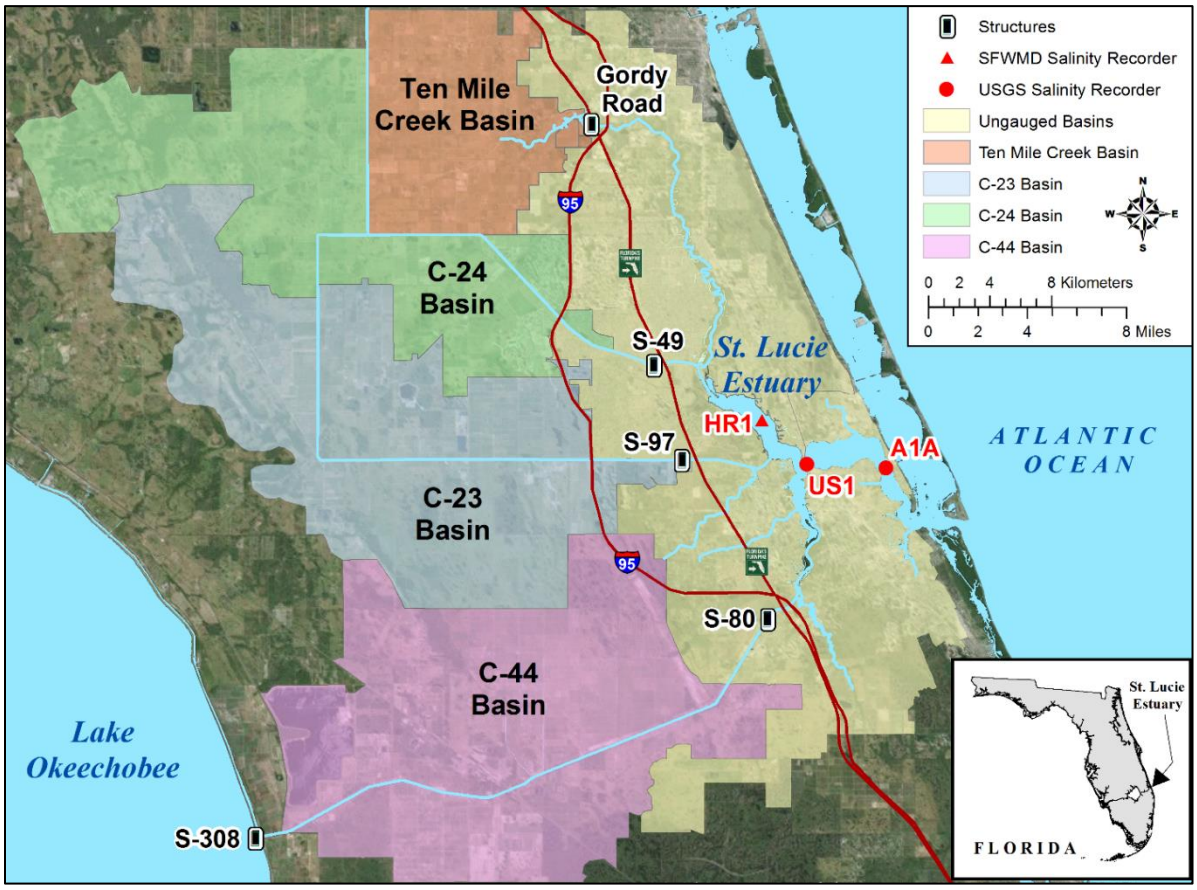


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

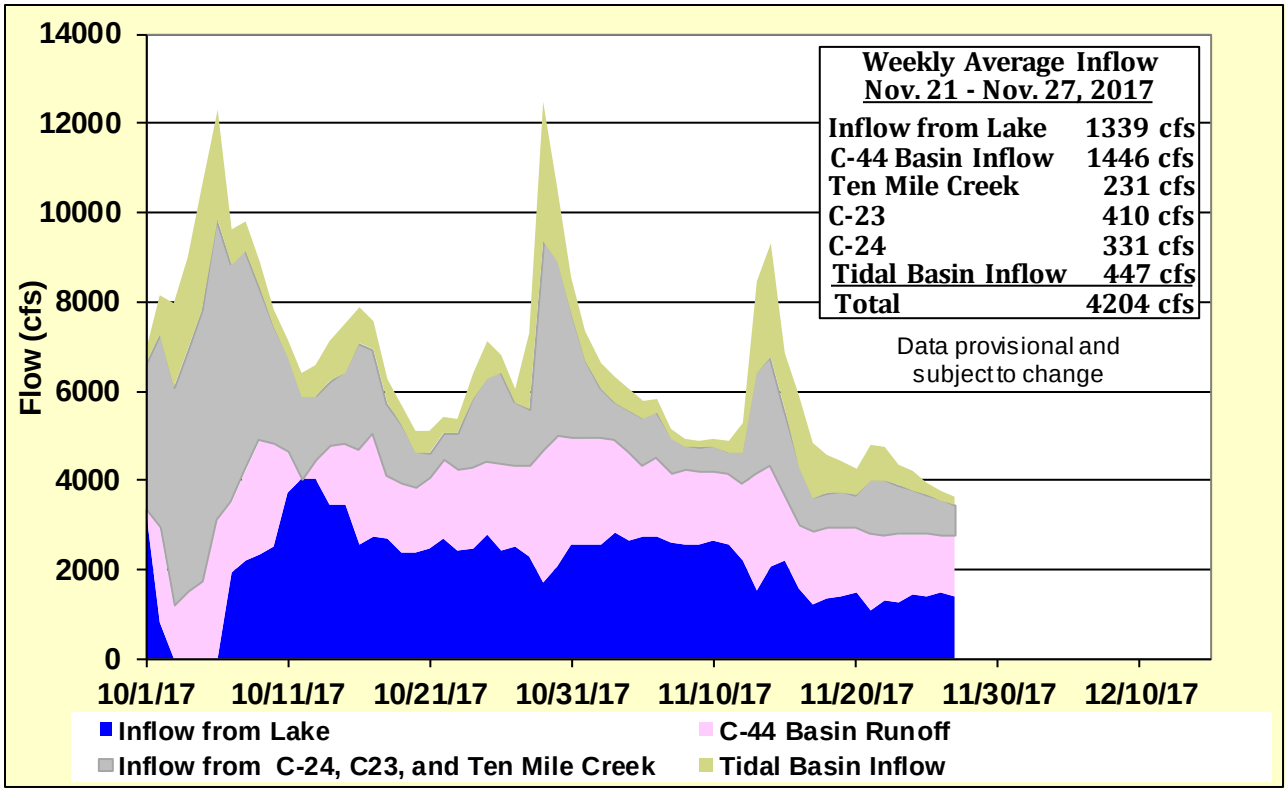


Figure 2. Estimated surface freshwater inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

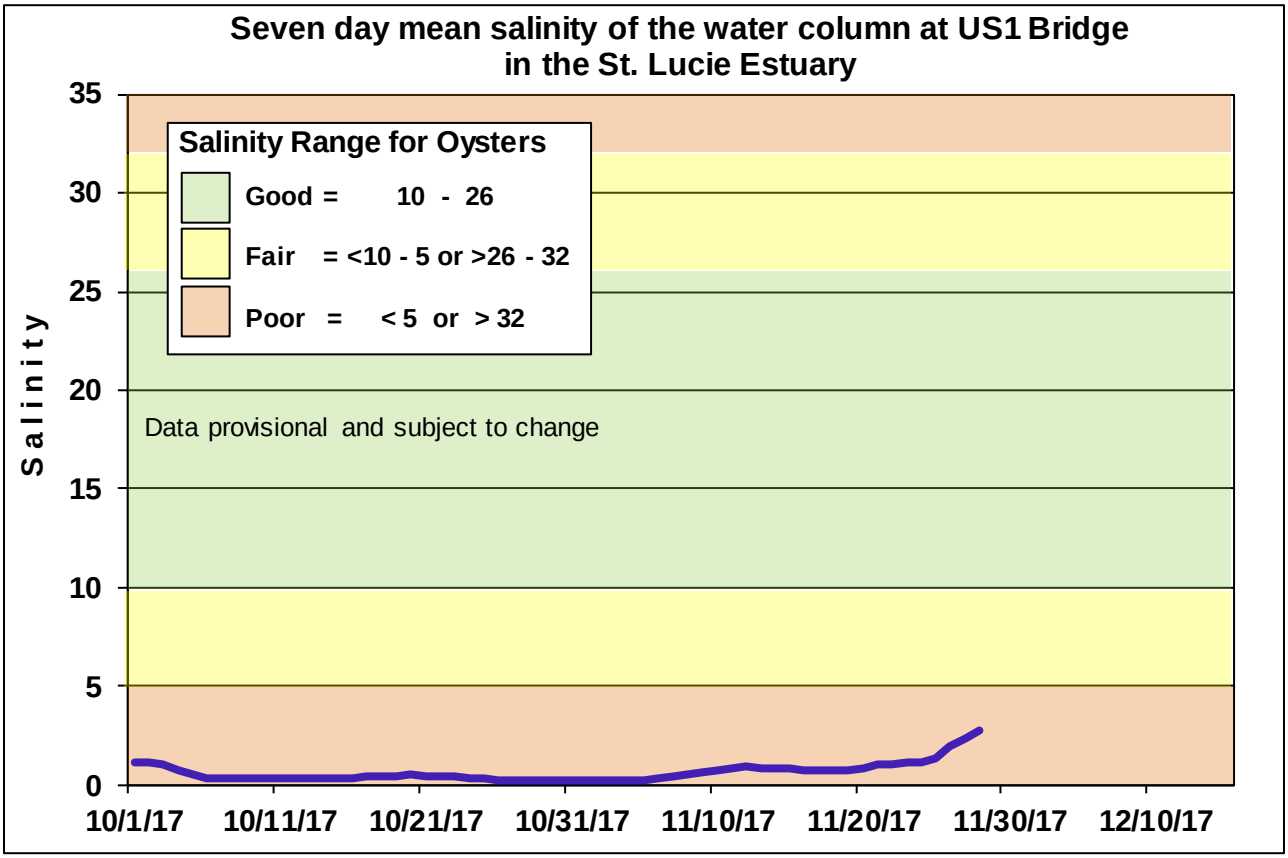


Figure 3. Seven-day mean salinity of the water column at the U.S. Highway 1 Bridge.

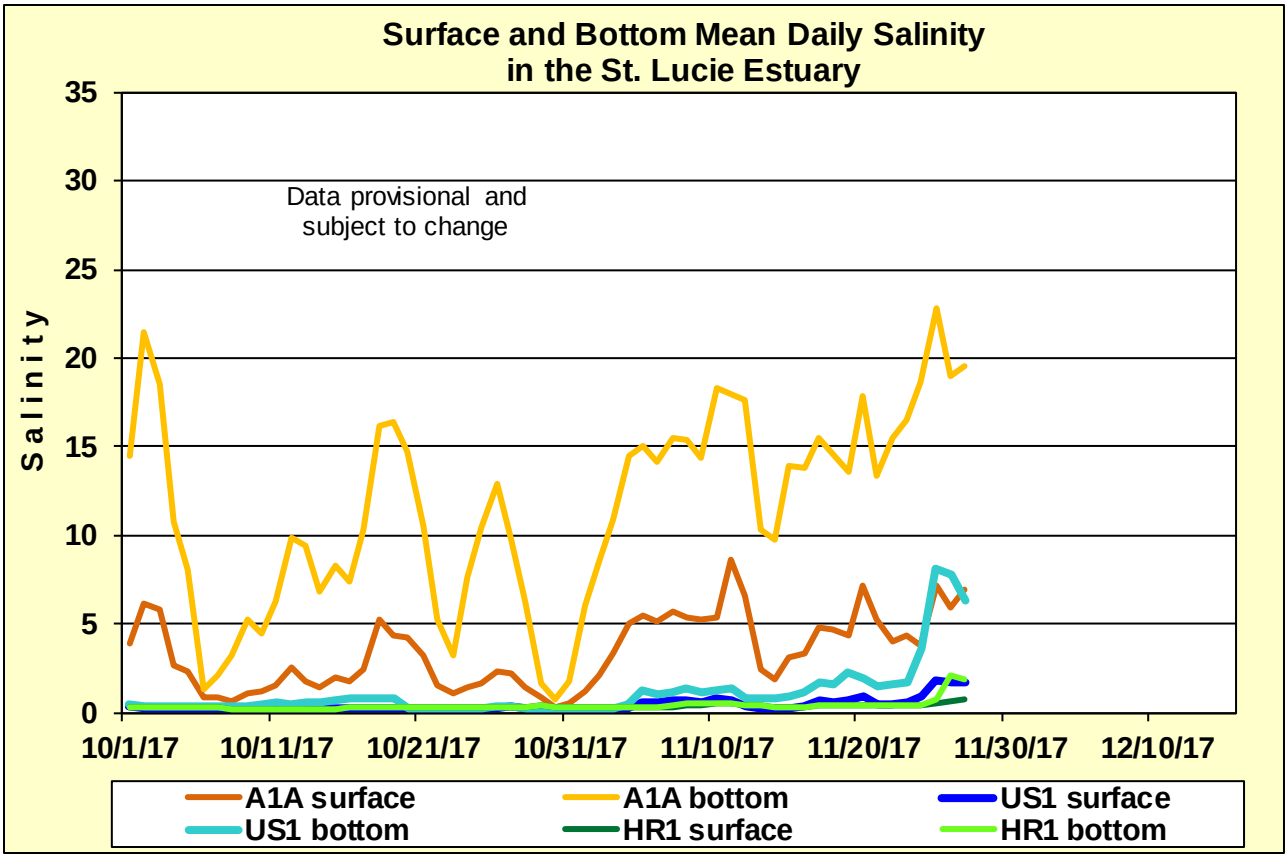


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

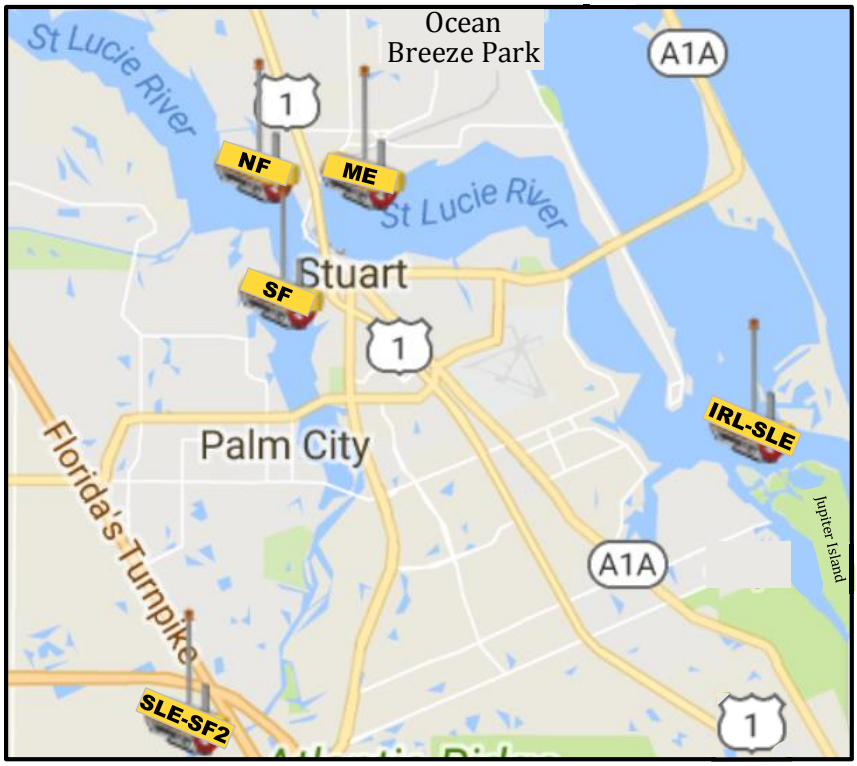


Figure 5. Location of FAU-HBOI LOBO water quality stations in the St. Lucie Estuary.

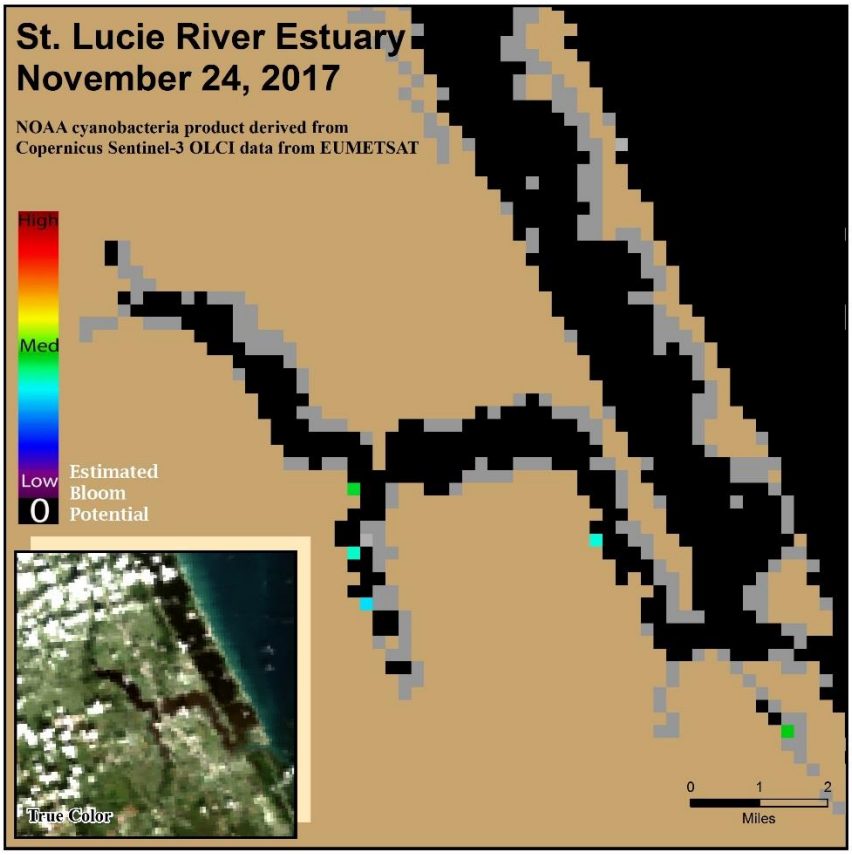


Figure 6. Sentinel 3a Satellite imagery provided by NOAA uses Ocean and Land Color Instrument (OLCI) to estimate cyanobacteria bloom potential in St. Lucie Estuary.

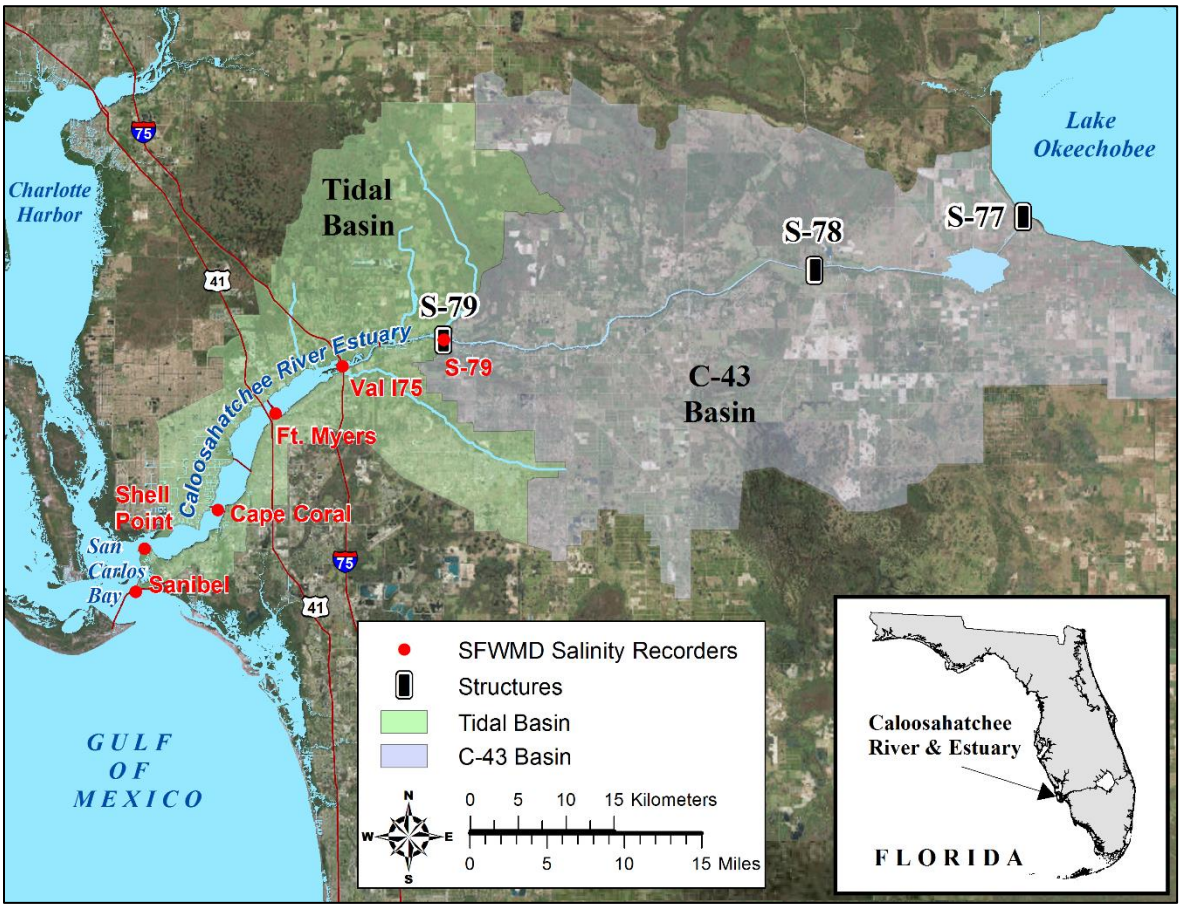


Figure 7. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

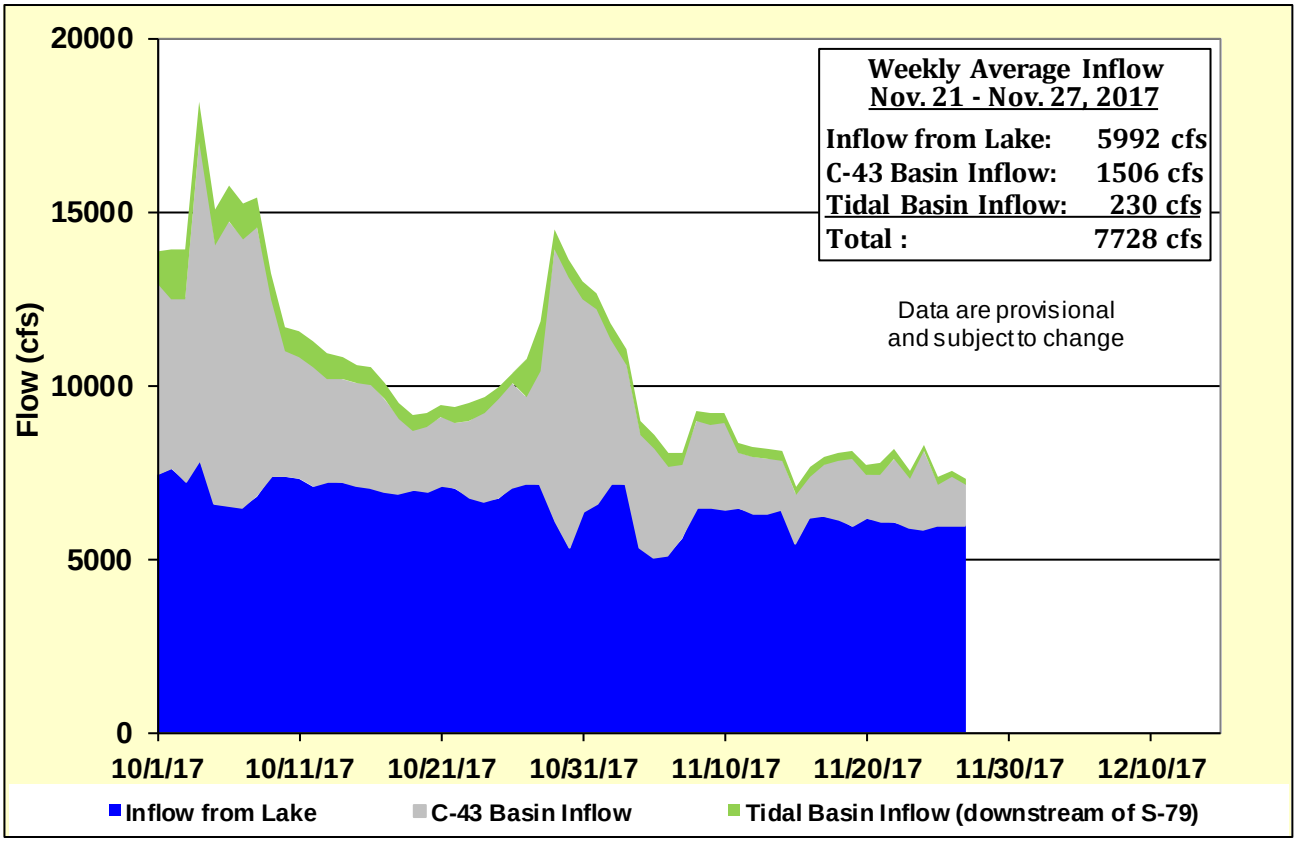


Figure 8. Freshwater inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

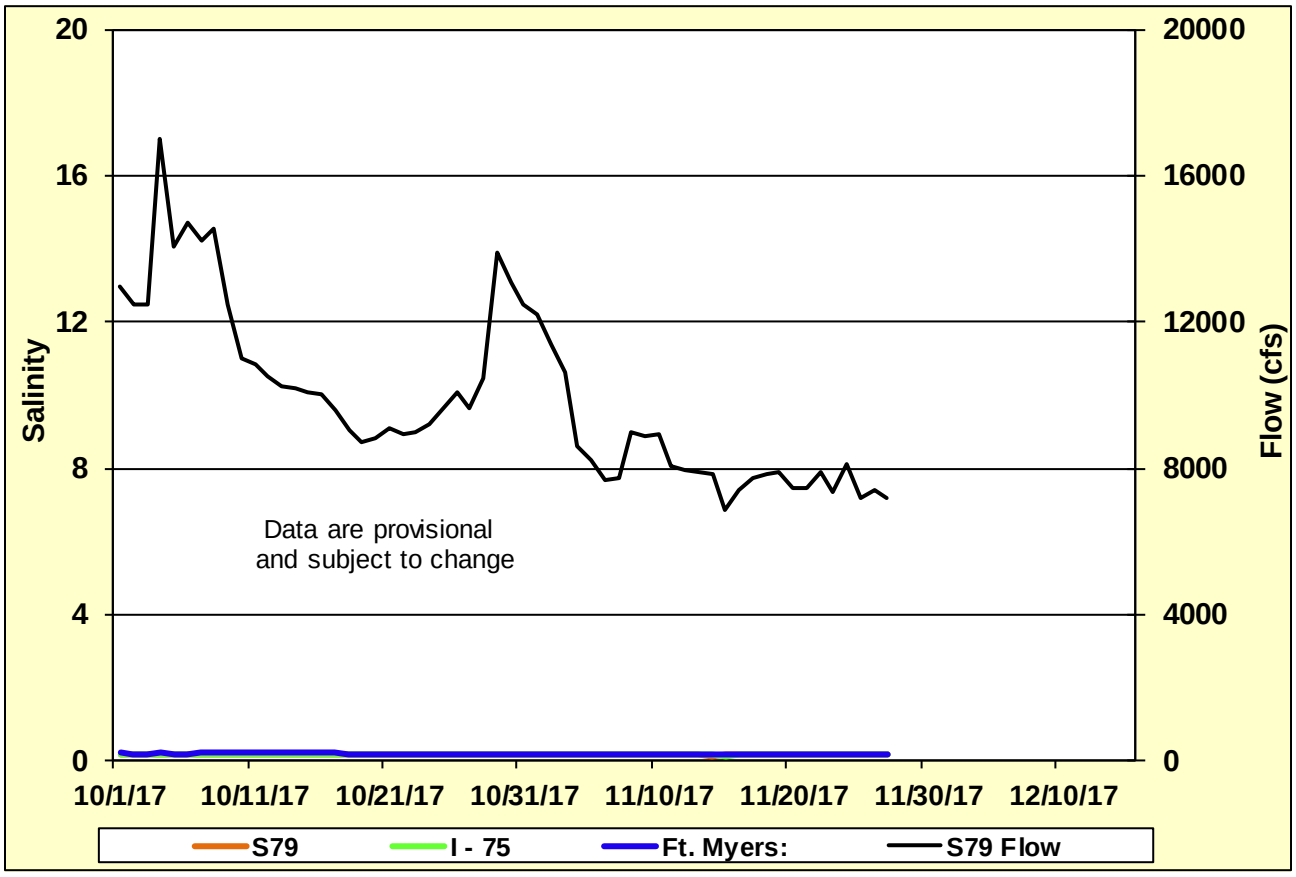


Figure 9. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

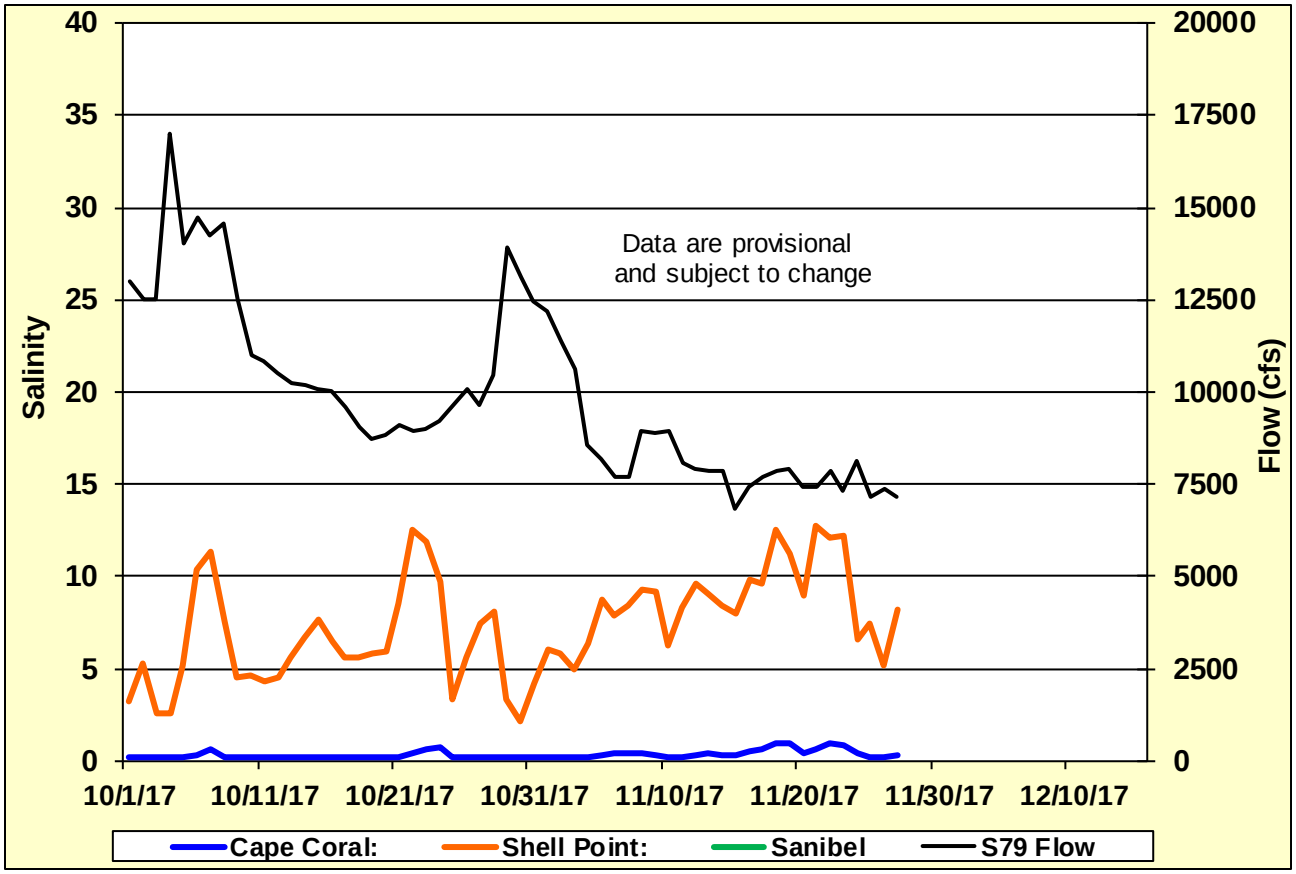


Figure 10. Daily mean flows at S-79 and salinity at lower estuary stations.

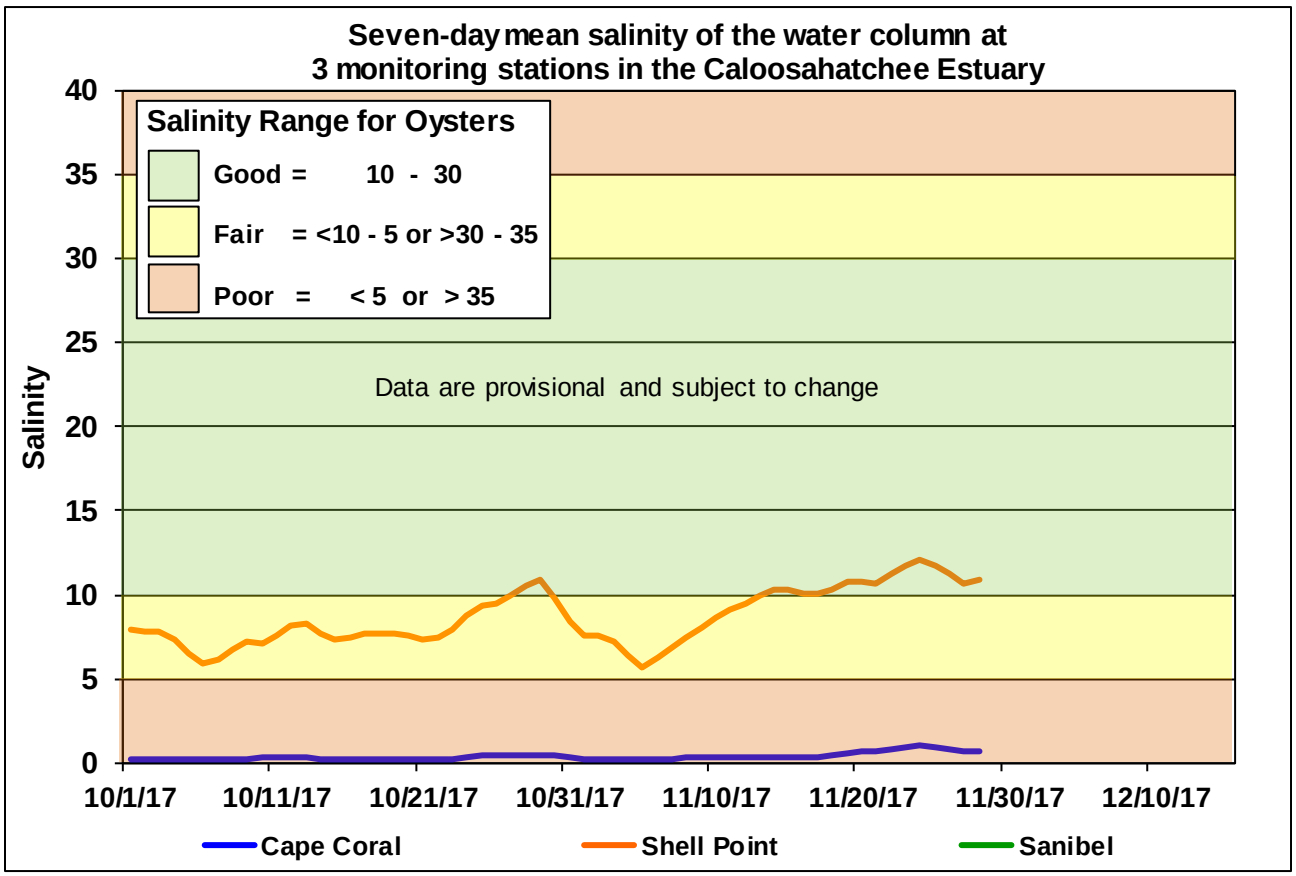
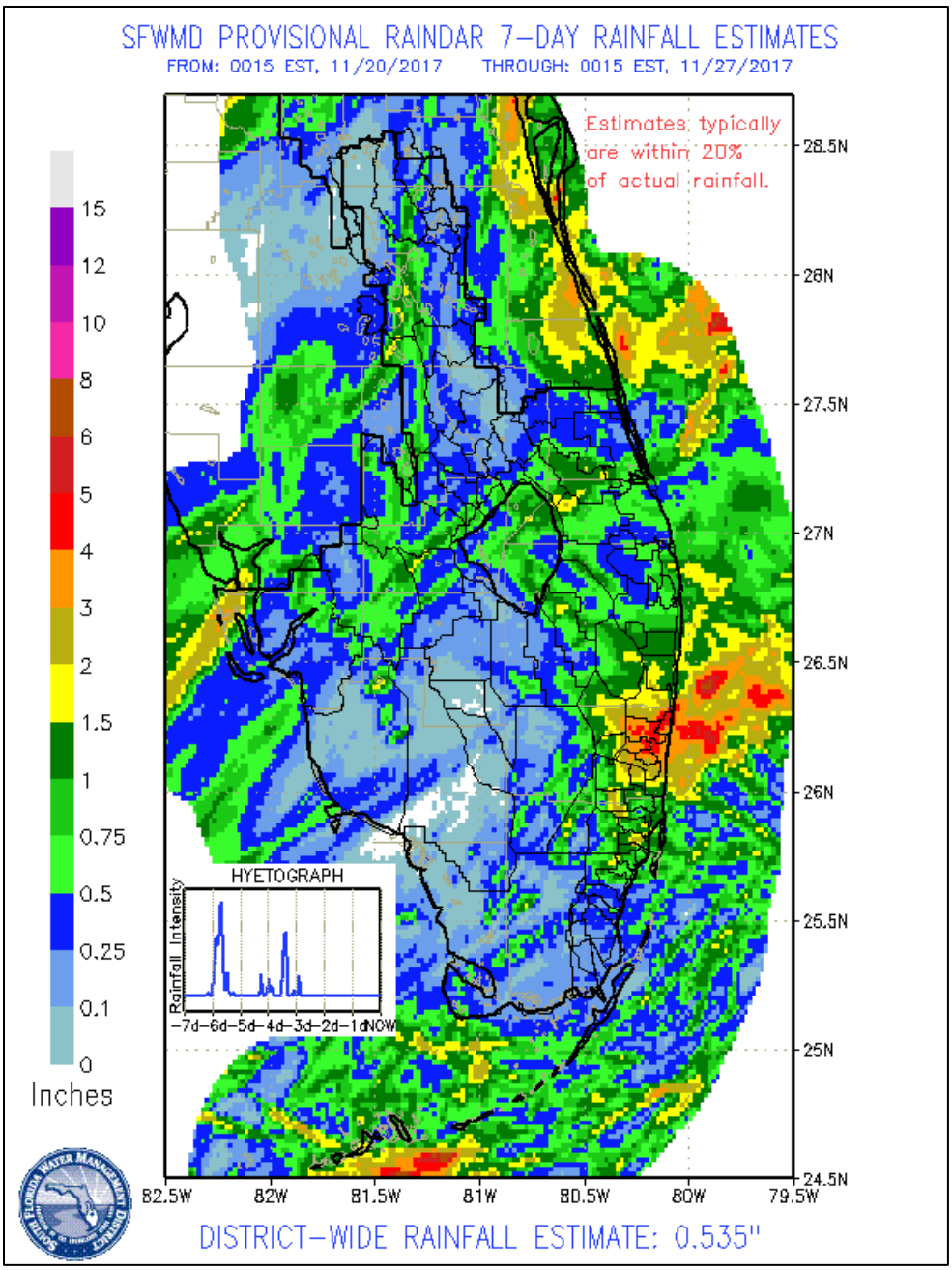


Figure 11. Seven-day mean salinity at Cape Coral Bridge, Shell Point and Sanibel Bridge monitoring stations.

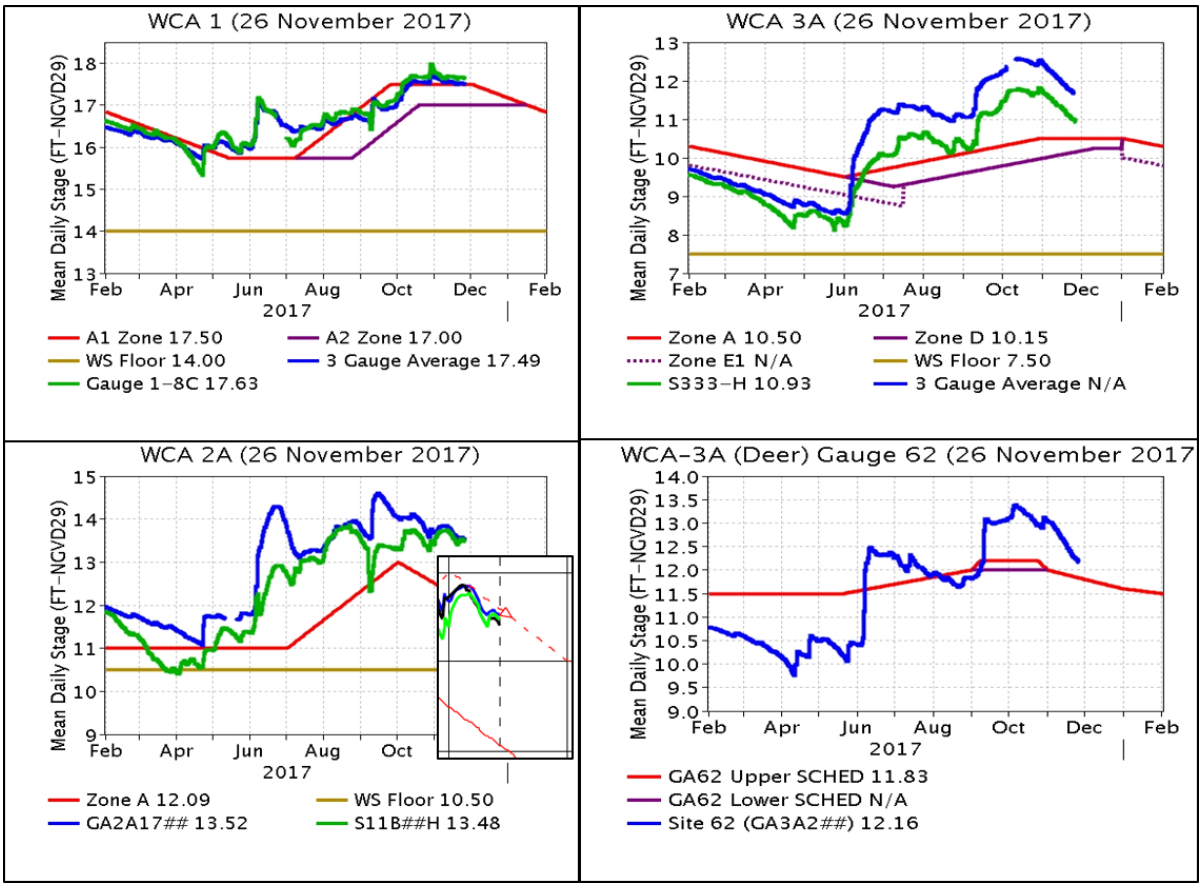
EVERGLADES

The heaviest rain fell in the northern basins, with the south receiving much less, providing an opportunity for much needed water management in WCA-3A. For the third week in a row all the gauges monitored for this report showed a decline in stage within that sub-basin.

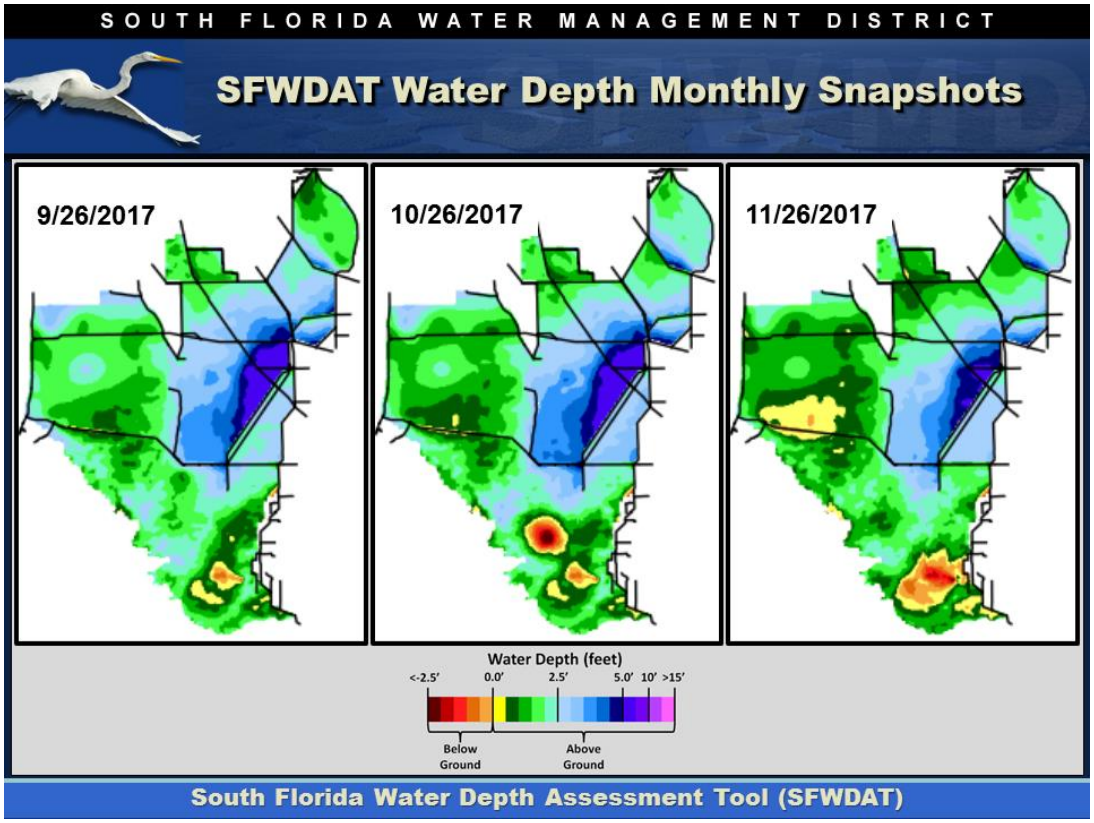
Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	1.06	−0.02
WCA-2A	1.56	−0.04
WCA-2B	1.47	+0.01
WCA-3A	0.31	−0.21
WCA-3B	0.67	−0.08
ENP	0.25	−0.09

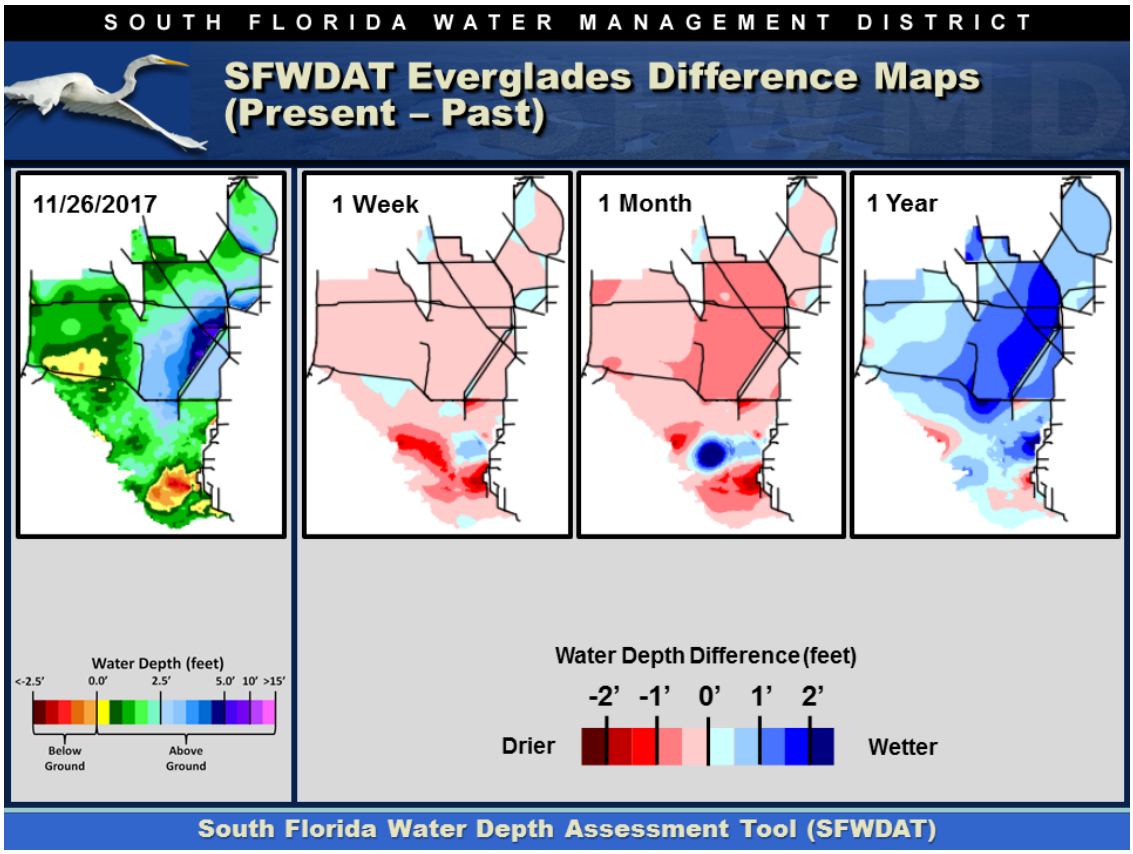


Regulation Schedules: WCA-1 three-gauge average is at Zone A1 schedule, and stage difference between the marsh and the canal is 0.14 feet. WCA-2A marsh stage at gauge GA2A17 is currently 0.08 feet below the current temporary deviation (0.1 feet closer). Marsh stage is 0.04 feet above canal stage at S11B. WCA-3A three-gauge average stage is 1.11 feet above Zone A. Stage difference between marsh and canal is 0.68 feet. WCA-3A at gauge 62 (Northwest corner) is 0.33 feet above the upper schedule.



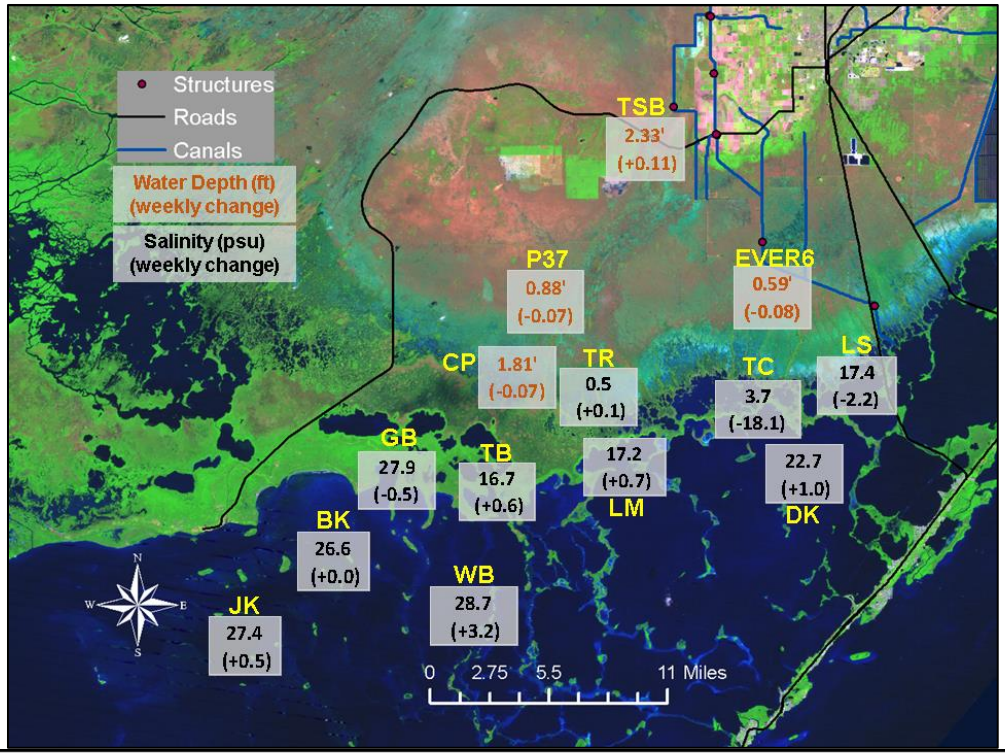
Water Depths and Changes: The WDAT tool for spatial interpolation of depth indicates a range from a low of 0.5 feet to 1.0 feet in Northwest WCA-3A to a high of 5.0+ feet in small pockets along the L-67A canal in WCA-3A South. Anomaly within Everglades National Park (ENP) is thought to be a result of storm damaged sensors. Comparing WDAT water levels from present, water depths over the last week fell across the Everglades, only rising in Northwest WCA-1 and WCA-2B. WCA-3A is again lower than it was a month ago. Over the last week individual gauge changes ranged from −0.04 feet (WCA-1) to −0.30 feet (Northwestern WCA-3A).

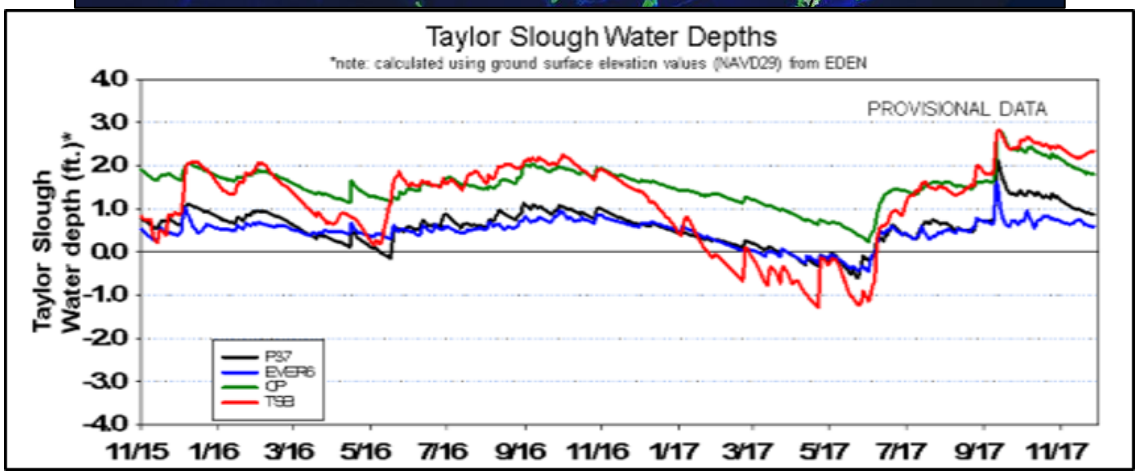


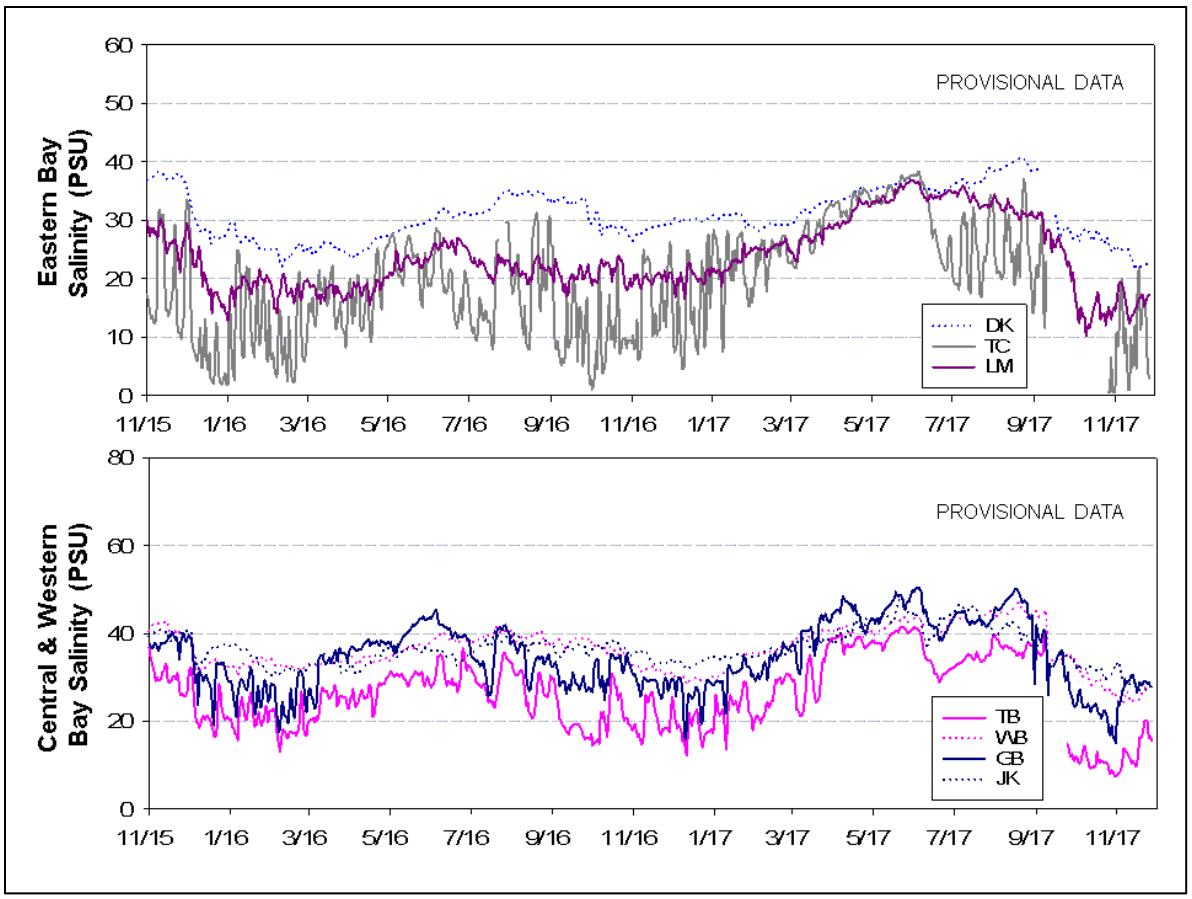


Taylor Slough stages: Water level changes ranged from −0.08 feet in the ENP panhandle to +0.11 feet in northern Taylor Slough. Weekly rainfall in the area averaged 0.09 inches. Water levels are three to 15 inches above the historic average for this time of year with the highest divergence occurring in northern Taylor Slough (similar to last week).

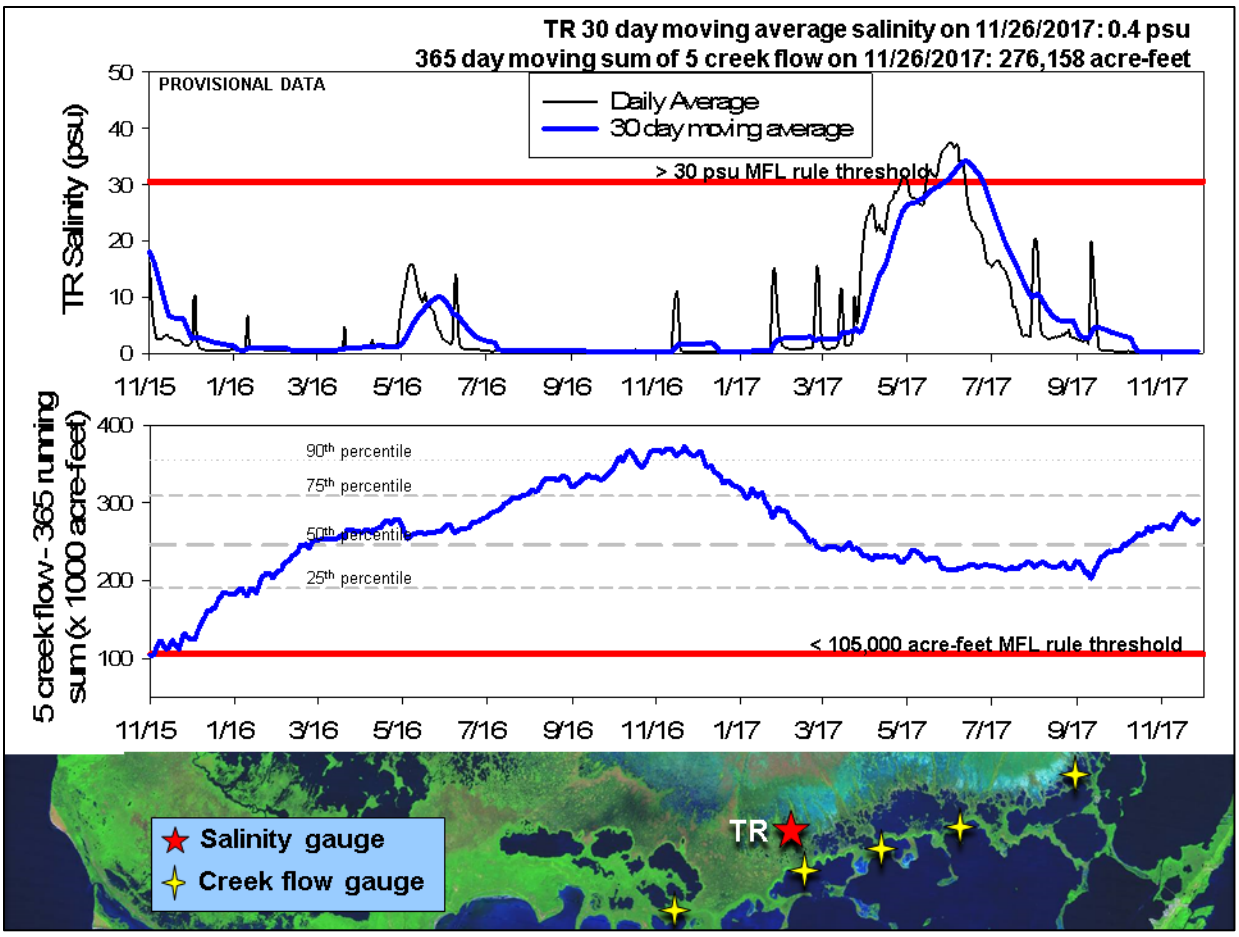
In Florida Bay salinity changes for the last week ranged from −18 to +3 psu and current salinities range from 4 psu in the northeastern nearshore to 29 in the central bay. The large decrease in the east was due to positive flows resuming this week. Western bay salinities are still 7 psu below the historic averages and the eastern bay salinities are 2 to 3 psu below the historic averages.







Florida Bay MFL: Mangrove zone daily average salinity remains near fresh at 0.5 psu, but is very slowly increasing. The 30-day moving average is 0.4 psu. The weekly cumulative flow from the five creeks denoted by yellow stars on the map increased to almost 10,000 acre-feet last week which is more than 90% higher than the average for this time of year. The 365-day moving sum of flow from the five creeks identified by yellow stars on the map decreased about 2,000 acre-feet this past week to end at 276,158 acre-feet (still greater than the long-term average of 257,628 acre-feet). Creek flow is provisional data from the USGS and is highly variable.



Water Management Recommendations

Deep water conditions persist in WCA-3A. All practicable and novel management options should be explored in order to relieve high water conditions particularly in WCA-3A South. Florida Bay continues to show after effects of Hurricane Irma including turbidity and elevated chlorophyll *a* but there are indications that the water column is clearing, helped by continued freshwater flushing and cooler temperatures.

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

Everglades Ecological Recommendations, November 28th, 2017 (red is new)

Area	Current Condition	Cause(s)	Recommendation	Reasons
WCA-1	Stages decreased –0.02'	Rainfall, ET, management	Maintain depths at high water targets (17.5 ft) at regulation schedule or slightly above.	Protect habitat and facilitate invasive plant treatments.
WCA-2A	Stages decreased –0.04'	Rainfall, ET, management	Maintain depths at temporary regulation schedule or slightly above.	Protect habitat and wildlife from high water stress.
WCA-2B	Stages decreased –0.11'	Rainfall, ET, management	Maintain depths at regulation schedule or slightly above.	Protect habitat and wildlife from high water stress.
WCA-3A NE	Stages decreased –0.22'	Rainfall, ET, management	Moderate ascension rates as possible. Manage for relief of high water conditions.	Protect habitat and wildlife from high water stress.
WCA-3A NW	Stages decreased –0.22'	Rainfall, ET, management		
Central WCA-3A S	Stages decreased –0.18'	Rainfall, ET, management	Moderate ascension rates as possible. Manage for relief of high water conditions.	Water depths above 2.5 feet at gauge 65 are indicative that tree islands are flooded and under stress. Depths exceeded that mark on 18 June, meaning the tree islands have been flooded for 164 days.
Southern WCA-3A S	Stages decreased –0.21'	Rainfall, ET, management		
WCA-3B	Stages decreased –0.08'	Rainfall, ET, management	Maintain depths at regulation schedule.	Protect habitat and wildlife from high water stress.
ENP-SRS	Stages decreased –0.09'	ET, rainfall, topography, management	Make discharges to the Park according to the 2012 WCP rainfall plan.	Keep peat wet to promote native habitat and maintain wetland plant and animal communities. Protect habitat and wildlife, including apple snail reproduction.
Taylor Slough	Stage changes ranged from -0.08' to +0.11'	Rain, ET, inflows	Move water southward as possible	When available provide freshwater buffer for ecosystems.
FB- Salinity	Salinity changes ranged -18.1 to +3.2 psu.	Rain, ET, inflows, wind	Move water southward as possible	When available, provide freshwater to main low salinity buffer and promote water movement.