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MEMORANDUM

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

FROM: SFWMD Staff Environmental Advisory Team

DATE: July 19, 2016

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Kissimmee

On Sunday, stage in East Lake Toho, Lake Toho, and Kissimmee-Cypress-Hatchineha were below schedule by 0.1, 0.3, and 0.5, respectively. Over the past week, discharge at S65, S65A, and S65E averaged 545, 633, and 1,147 cfs, respectively. Tuesday morning discharges were: ~661 cfs, ~634 cfs, ~1,111 cfs, and ~1,232 cfs, respectfully at S65, S65A, S65C and S65E. Dissolved oxygen in the Kissimmee River averaged 4.40 mg/L over the past week and 4.63 mg/L on Sunday. Kissimmee River mean floodplain depth on Sunday was 0.63 feet. There are no new recommendations for this week.

Lake Okeechobee

Lake Okeechobee is at 14.69 feet NGVD, which is 0.09 feet decrease from last week. The Lake remains in the Low Flow Sub-band. Lake levels are too high for this time of year and there is a potential for negative impacts to submerged aquatic vegetation. Various data sources indicate the presence of dense cyanobacterial blooms on the Lake. The goal should be to limit the rate of Lake stage increase or continue the current unseasonable recession in Lake stage to avoid exceeding the top of the preferred stage envelope (15.5 feet NGVD) during the wet season.

Estuaries

Total flow to the St. Lucie decreased as compared to last week and averaged 892 cfs with 629 cfs (70%) coming from Lake Okeechobee. Salinity in the estuary increased exceeding 20 at the A1A Bridge but remaining in the fair range for oysters at the US1 Bridge. Total flow to the Caloosahatchee increased slightly as compared to last week averaging 5,264 cfs with 1,856 cfs (35%) coming from Lake Okeechobee. Salinity conditions were favorable for tape grass in the upper estuary and poor for oysters at the Cape Coral Bridge. At Shell Point salinity remained in the good range for adult oysters. Given the current estuarine conditions, there are no ecological benefits associated with additional releases from Lake Okeechobee.

Stormwater Treatment Areas

Over the past week, the STAs/FEBs received approximately 3,800 acre-feet of Lake regulatory releases. The total amount of Lake regulatory releases sent to the STAs/FEBs in WY2017 (since May 1, 2016) is approximately 26,800 acre-feet. All STA cells are at or above target depths. Operational restrictions are in place for vegetation rehabilitation in STA-1E, STA-1W, and STA-5/6 and structure repairs are underway in STA-1E. In addition, nests of ESA-protected species have been observed in STA-1E and STA-5/6. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to STA-1W, STA-1E and the A-1 FEB, and A-1 FEB releases will be sent to STA-2 and STA-3/4.

Everglades

Rainfall was moderate in the Everglades, causing stages to both rise and fall. Stage changes ranged from - 0.10 feet in WCA-1 to 0.14 feet in northern Everglades National Park (ENP). Water levels are very shallow in northeastern WCA-3A. The 30-day moving average salinity at the Florida Bay MFL site has decreased to 0.5 psu and the cumulative 365-day inflow from the five creeks into Florida Bay increased to 302,700 acre-feet. We recommend keeping water depths in southern WCA-3A below 2.5 feet throughout the wet season to protect tree island forests. Water levels in far northeastern WCA-3A are very shallow; additional inflow would improve ecological conditions there. In general, we recommend to limit ascension rates to a maximum of 0.25 feet per week to protect habitat and wildlife, including the apple snail. In WCA-2A, the Active Marsh Improvement Project needs water levels to increase to little over six inches to allow for a planned burn.

Weather Conditions and Forecast

Showers and thunderstorms shifting west today. Scattered showers along the east coast will move inland as they develop and then focus heaviest activity along the west coast this afternoon. Easterly steering winds should continue to focus afternoon thunderstorm activity over western areas Wednesday and Thursday. An upper level trough digging into north Florida is expected to increase thunderstorm coverage over the District on Thursday and into the weekend. The focus of heaviest activity should be over the upper two-thirds of the District Friday and then over the interior and east Saturday.

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 1.43 inches of rainfall in the past week and the Lower Basin received 1.38 inches (SFWMD Daily Rainfall Report 07/18/2016).

Upper Kissimmee Basin

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

Table 1. Departures from KCOL flood regulation (F) or temporary schedules (T, A, or S) (feet NGVD). Discharge and stage data are provisional real-time data from SFWMD OASyS DualTrend; reported values are averages through midnight of the Sunday prior to the report date unless otherwise specified.

Report Date: 7/19/2016							Sunday Departure (feet)						
Water Body	Structure/Site	Discharge (cfs), week's average**	Stage Monitoring Site***	Lake Stage (feet)	Schedule*	Regulation (R) or Target (S or T) Stage (feet)	7/17/16	7/10/16	7/3/16	6/26/16	6/19/16	6/12/16	6/5/16
Lakes Hart and Mary Jane	S62	81	LKMJ	60.0	R	60.0	0.0	0.1	0.0	0.0	0.4	0.0	-0.5
Lakes Myrtle, Preston, and Joel	S57	0	S57	61.1	R	61.0	0.1	0.0	0.0	0.0	0.1	-0.4	-0.9
Alligator Chain	S60	16	ALLI	63.2	R	63.2	0.0	0.0	-0.1	-0.5	-0.6	-0.8	-1.2
Lake Gentry	S63	79	LKGT	61.2	R	61.0	0.2	0.0	0.0	0.1	-0.1	-0.8	-1.4
East Lake Toho	S59	0	TOHOE	56.4	R	56.5	-0.1	-0.3	-0.5	-0.7	-0.5	-0.6	-0.6
Lake Toho	S61	0	TOHOW, S61	53.2	R	53.5	-0.3	-0.4	-0.5	-0.8	-0.8	-0.5	-0.5
Lakes Kissimmee, Cypress, and Hatchineha	S65	545	LKISSP, KUB011, LKISSB	50.5	R	51.0	-0.5	-0.4	-0.5	-1.0	-0.8	-0.8	-0.8

* 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.

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

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

Lower Kissimmee Basin

Discharges and stages 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. Mean weekly discharge at S-65x structures, and mean weekly Phase I area river channel dissolved oxygen and floodplain mean water depth. Discharge and stage data are provisional real-time data from SFWMD OASyS DualTrend; reported values are averages through midnight of the Sunday prior to the report date unless otherwise specified.

Report Date: 7/19/2016

Metric	Location	Sunday's 1-day average	Weekly Average**									
			7/17/16	7/10/16	7/3/16	6/26/16	6/19/16	6/12/16	6/5/16	5/29/16	5/22/16	5/15/16
Discharge (cfs)	S-65	564	545	552	857	2431	3194	3940	2899	4304	2029	1480
Discharge (cfs)	S-65A	643	633	660	1211	2890	4455	5649	3348	6187	4379	1352
Discharge (cfs)	S-65C	1135	1119	1489	2741	4168	6224	5091	4792	6914	3320	1603
Headwater stage (feet NGVD)		34.1	34.1	34.2	34.0	34.1	34.1	34.1	33.9	34.2	34.3	34.1
Discharge (cfs)	S-65D****	1371	1272	1835	3108	4552	7361	5471	5186	7868	2979	1641
Discharge (cfs)	S-65E	1235	1147	1755	2991	4458	7216	5255	5005	7470	2873	1531
DO concentration (mg/L)***	Phase I river channel	4.63	4.40	2.74	2.21	1.66	0.77	1.44	0.48	0.72	3.62	6.06
Mean depth (feet)*	Phase I floodplain	0.63	N/A	0.62	1.18	1.93	2.33	3.12	1.75	2.81	3.09	0.71

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

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

*** DO is the average for PC62 and PC33 starting June 2. PC33 omitted for week of Aug16. DO for week of Sept 15-22 is for PC33 only.

**** S-65D discharge combines discharge at S-65D, S-65DX1, and S-65DX2

***** 1-day spatial average from field measurements in Pools A and BC

N/A Not applicable or data not available.

Water Management Recommendations

Kissimmee Basin Adaptive Recommendations and Operational Actions

Date	Recommendation	Purpose	Outcome	Source
7/19/2016	No new recommendations.			
7/12/2016	No new recommendations.			
6/30/2016	Ramp down S65/S65A discharge by 150 cfs per day to 650 cfs and hold at 650 cfs until lake stage rises to Zone A of the schedule. When stage enters Zone A, ramp up S65 discharge to 1,400 cfs as stage rises from 0.0 to 0.6 feet above the regulation line unless there is a large rainfall event. This ramp up schedule will be reevaluated when the regulation schedule reaches 52.0 feet NGVD.	The ramp down in S65/S65A discharge is intended to lessen the impact of Lake Okeechobee releases on naturally occurring algal blooms. Holding discharge at 650 cfs reflects consideration for the Snail Kites nesting in the Kissimmee River floodplain.	Implemented	SFWMD Operations Control
6/28/2016	No new recommendations.			
6/21/2016	No new recommendations.			
6/14/2016	No new recommendations.			
6/7/2016	No new recommendations.			
5/31/2016	No new recommendations.			
5/24/2016	No new recommendations.			
5/17/2016	No new recommendations.			
5/10/2016	No new recommendations.			
5/3/2016	No new recommendations.			
4/26/2016	No new recommendations.			
4/19/2016	No new recommendations.			
4/12/2016	No new recommendations.			
4/5/2016	No new recommendations.			
3/29/2016	No new recommendations.			
3/22/2016	No new recommendations.			
3/15/2016	No new recommendations.			
3/8/2016	No new recommendations.			
3/1/2016	No new recommendations.			
2/23/2016	No new recommendations.			
2/16/2016	No new recommendations.			
2/9/2016	No new recommendations.			
2/1/2016	Begin F&W recessions in East Toho, Toho, and KCH per the requested recession lines shown in the 2015-16 Dry Season Standing Recommendation (SR). Use Table 2 for guidance on rates of change in discharge to control departures from the line in KCH, and the reversal guidelines shown in the SR for Toho and East.	Initiate and manage lake stage recessions in East Toho, Toho, and KCH for the benefit of fish and wildlife, while avoiding harm to the Kissimmee River	TBD	KB Tech Team
1/20/2016	Continue to adjust discharge at S65 to follow the 2015-16 Dry Season SR guidelines for rampdown at S65A. Balance discharge at the two structures to maintain at least minimum discharge to the river. As stage rises above 51 ft in KCH, temporarily bypass the Fig 1 discharge plan in the SR and manage discharge to let KCH stage rise to 51.5 ft (the Feb 1 recession starting stage) if conditions allow while following rampdown guidelines. If KCH stage rises further than 51.5 ft, we will reevaluate. As changes in discharge become necessary, continue to follow the Table 1 guidelines in the SR. Switch to Table 2 rampup/rampdown guidelines on Feb 1 or when the recession line is intercepted for management of the recession in KCH.	If conditions allow, let stage increase to 51.5 ft to intersect the Feb 1 starting stage for KCH F&W recession line.	Implemented	KB Tech Team

KCOL Hydrographs (through Sunday midnight)

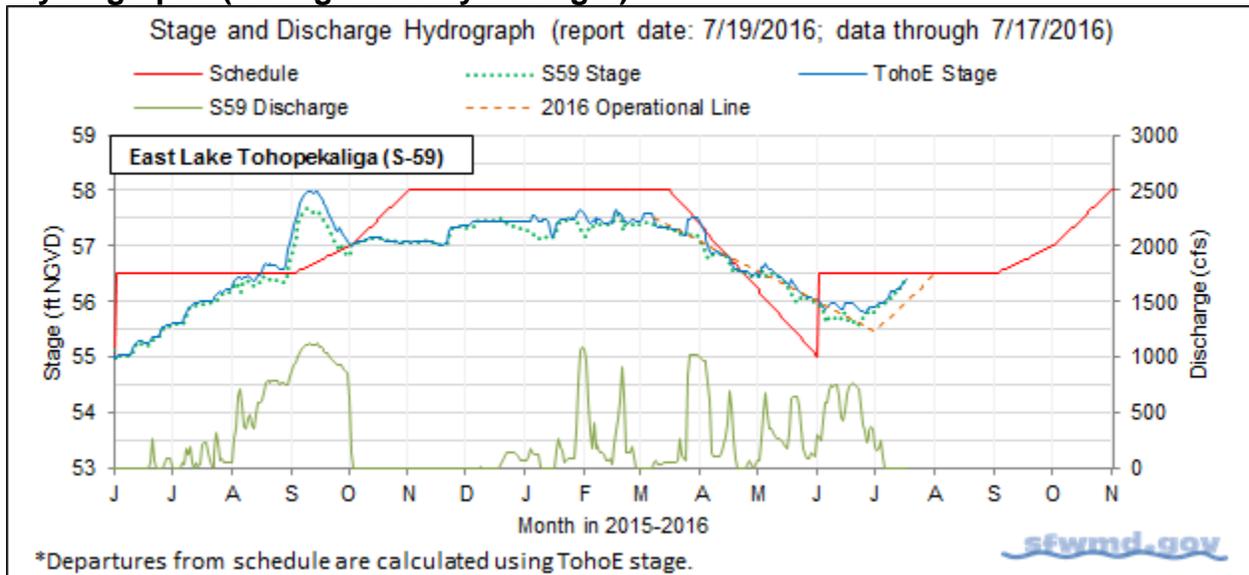


Figure 1.

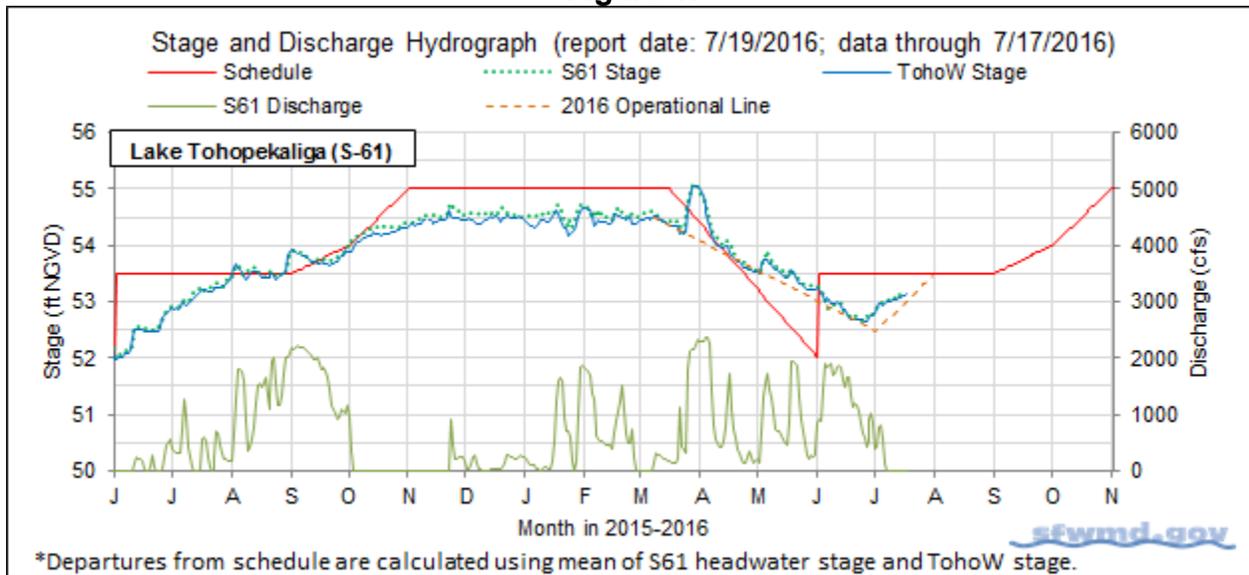


Figure 2.

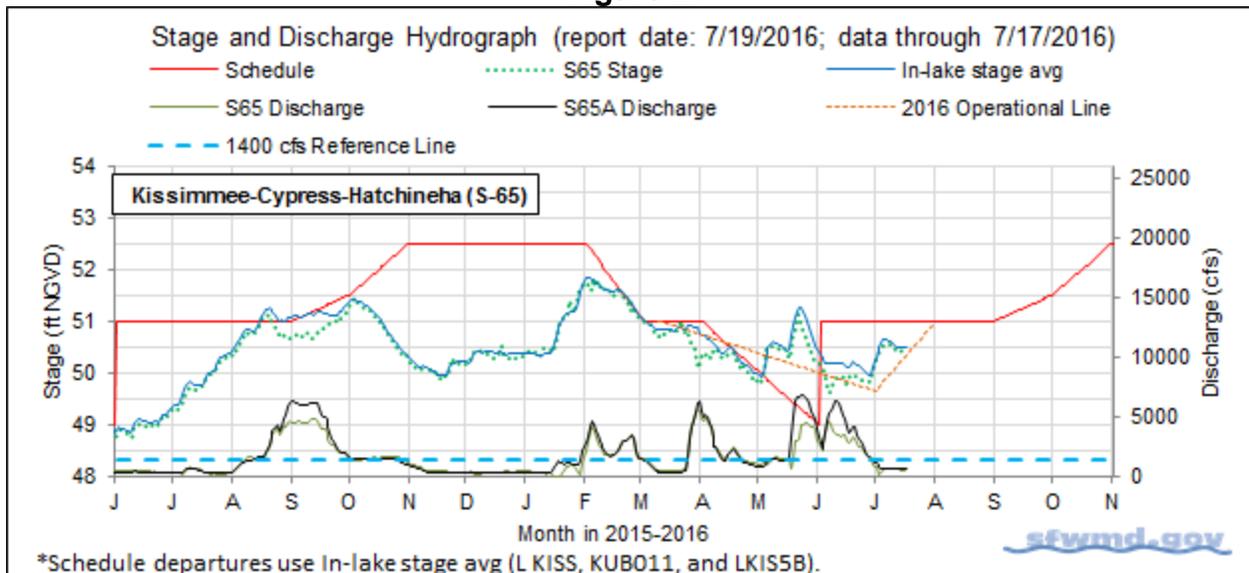


Figure 3.

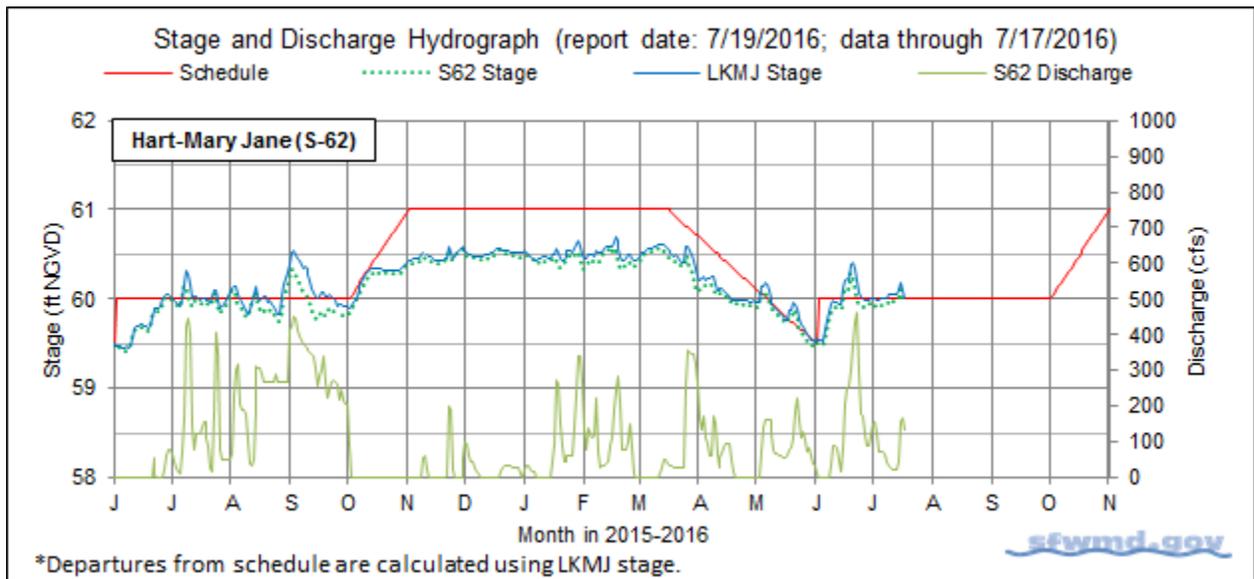


Figure 4.

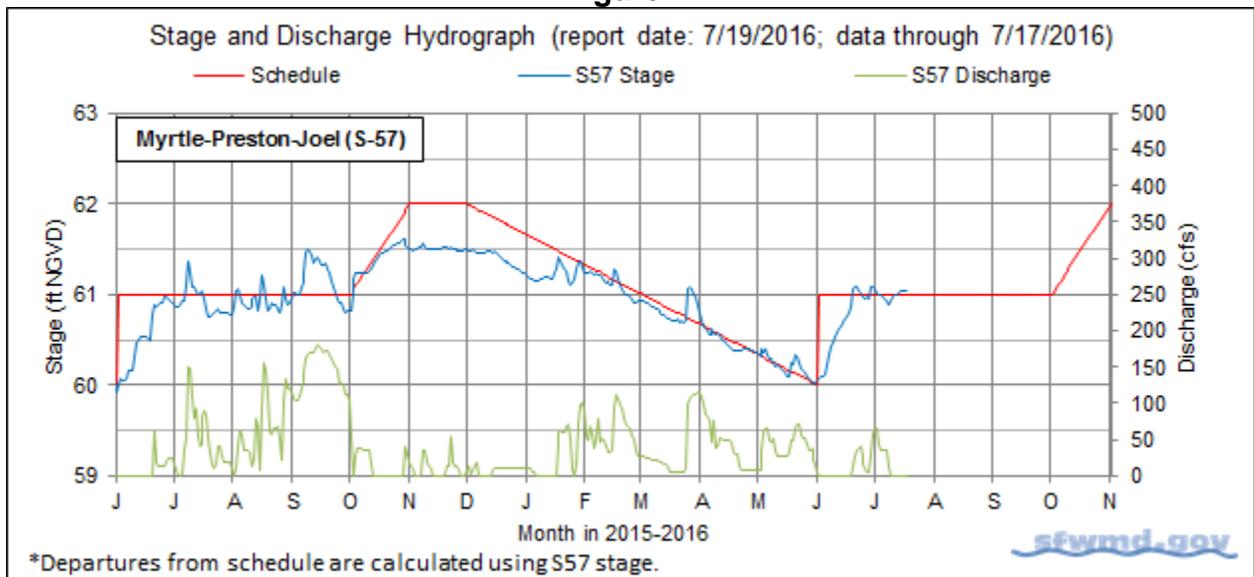


Figure 5.

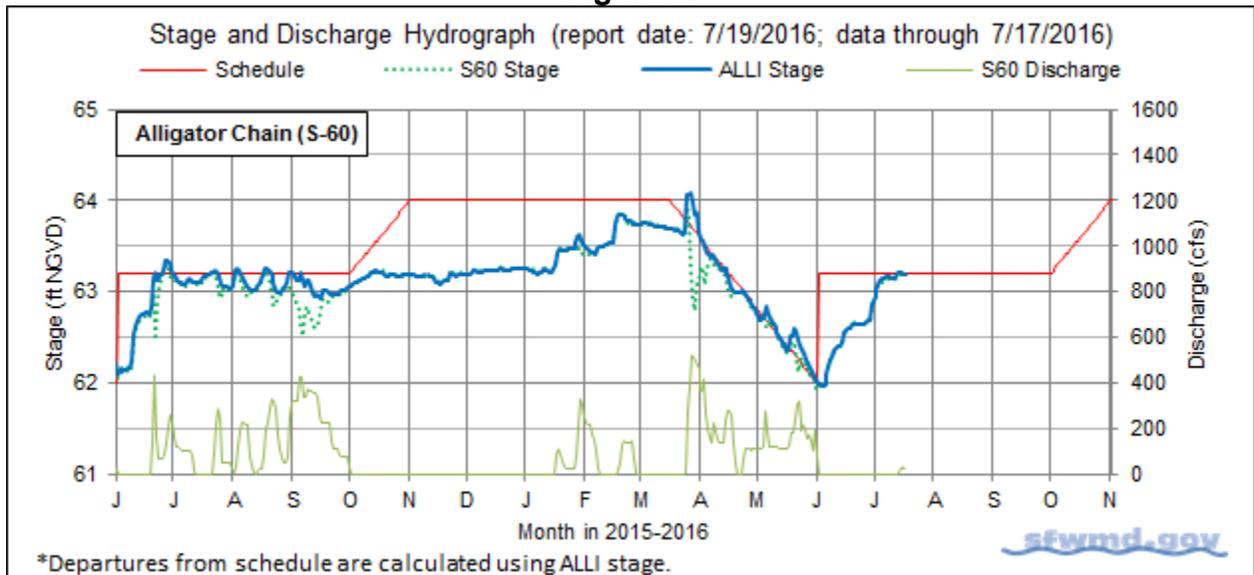


Figure 6.

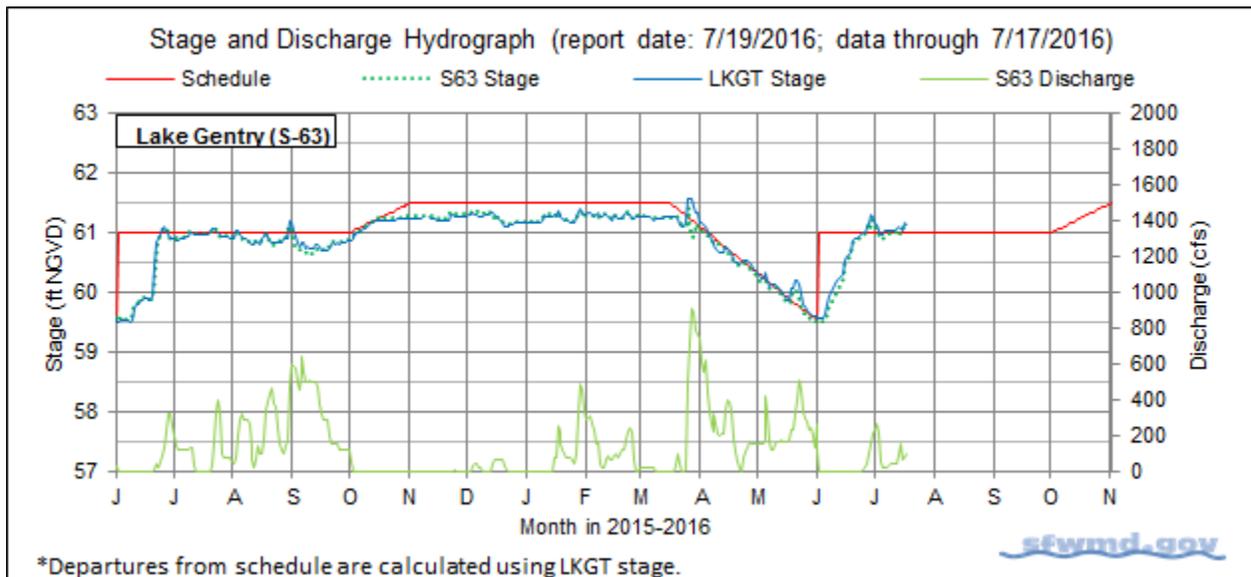


Figure 7.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Limits on Rate of Discharge Change at S65/S65A During Wet Season 2016

Discharge Rate of Change Limits for S65/S65A (revised 6/30/16). **Rate limits apply only in Zone B**			
	Q (cfs)	Maximum rate of increase (cfs/day)	Maximum rate of decrease (cfs/day)
Zone B	650-1450	150	-150
	1450-1700	250	-250
	1700-2600	300	-300
	2600-3000	400	-400
	>3000	1000	-1000
Zone A	No limits		

Figure 8a. Limits on rate of discharge change at S65/S65A for the 2016 Wet Season.

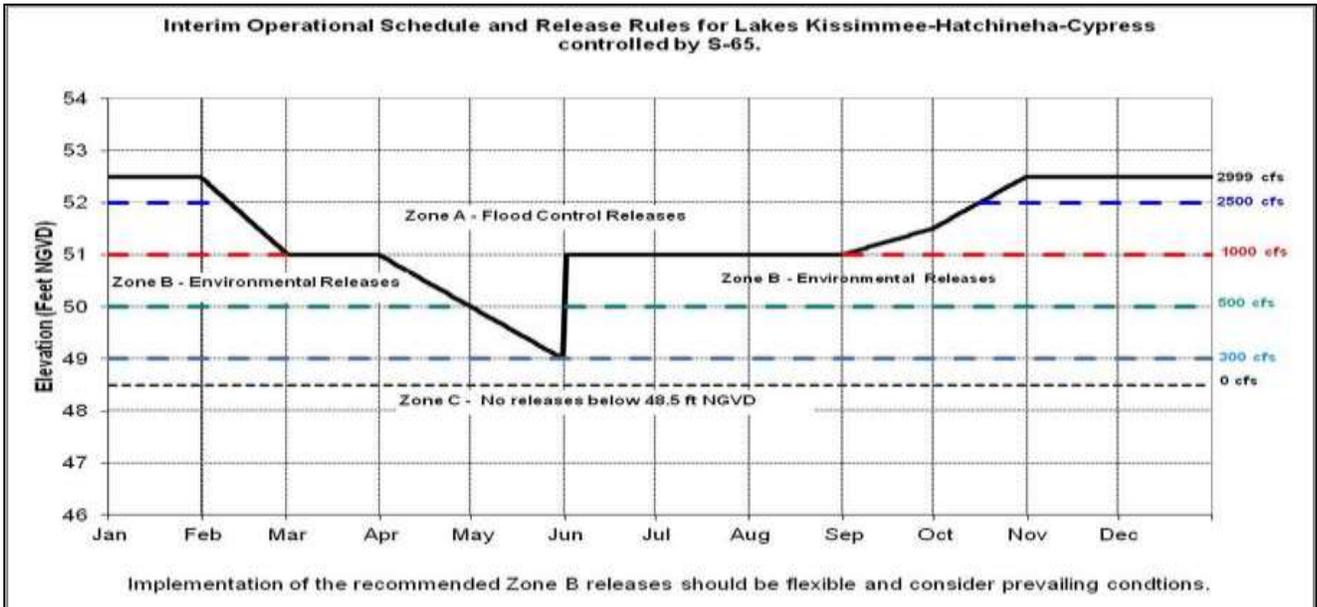


Figure 8b. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years or in Wet Season 2015.

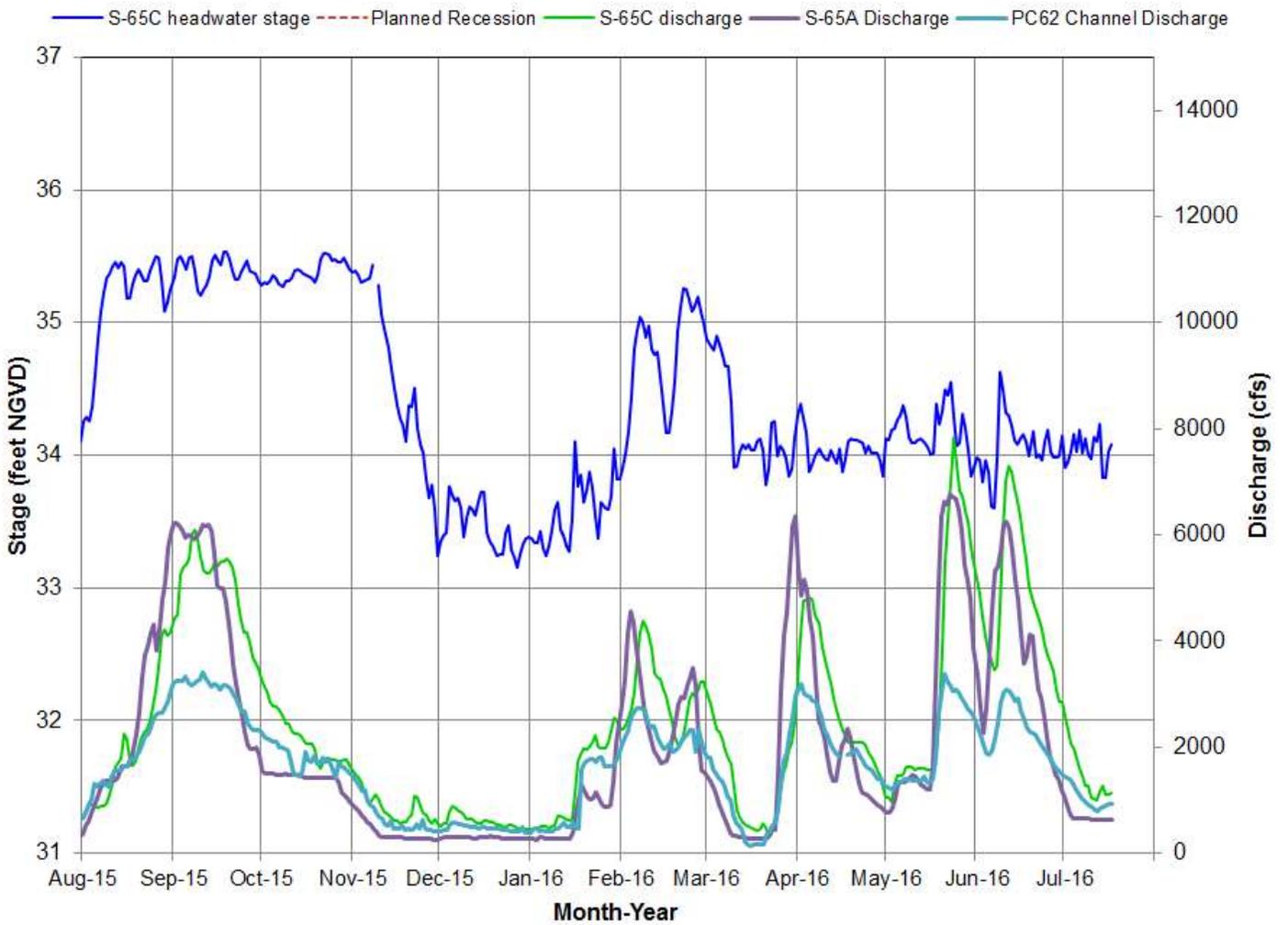


Figure 9. S-65C headwater stage in relation to discharge at S-65C, S-65A, and PC62.

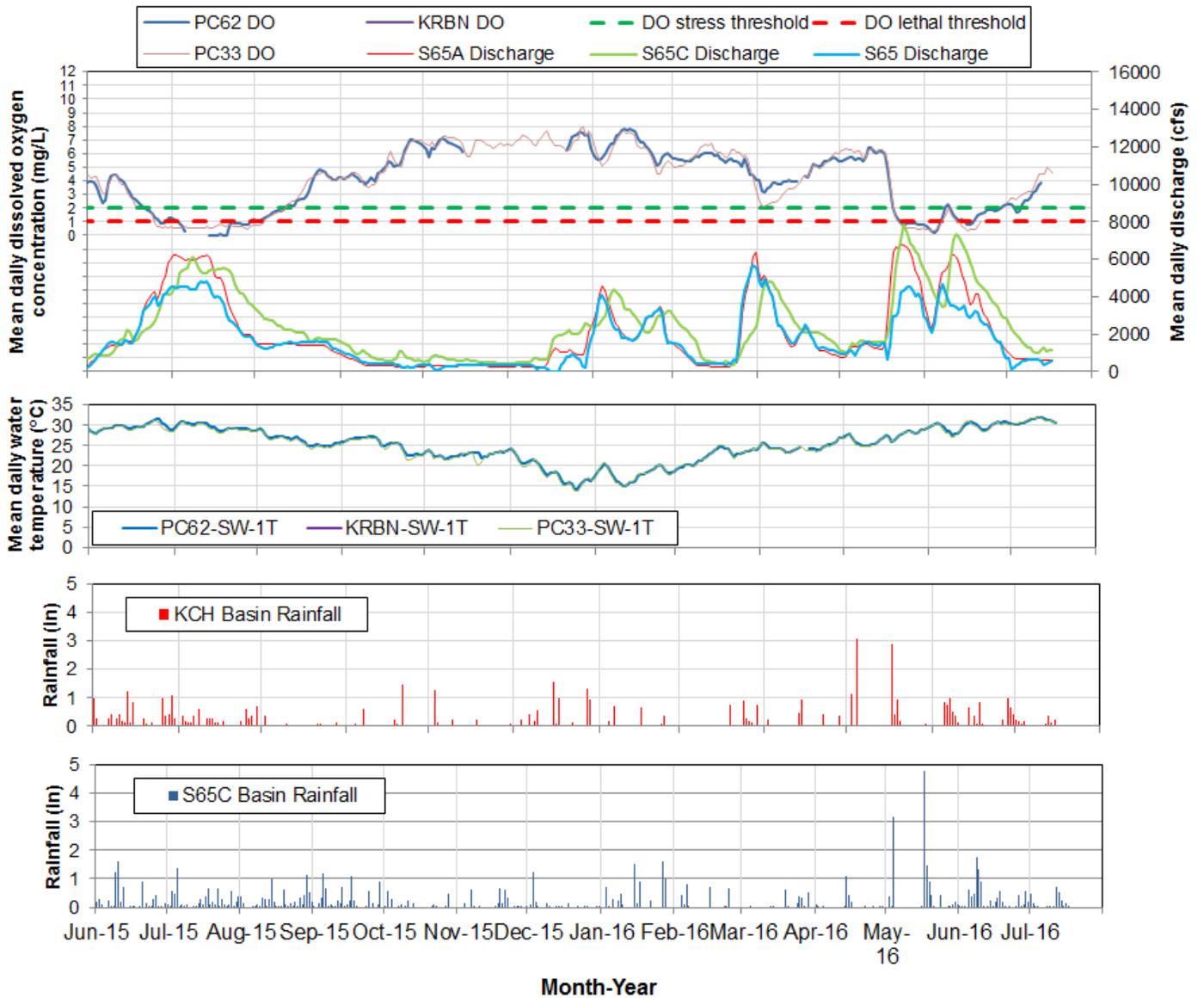


Figure 10. Mean daily Dissolved Oxygen, discharge, temperature and rainfall in the Phase I river channel.

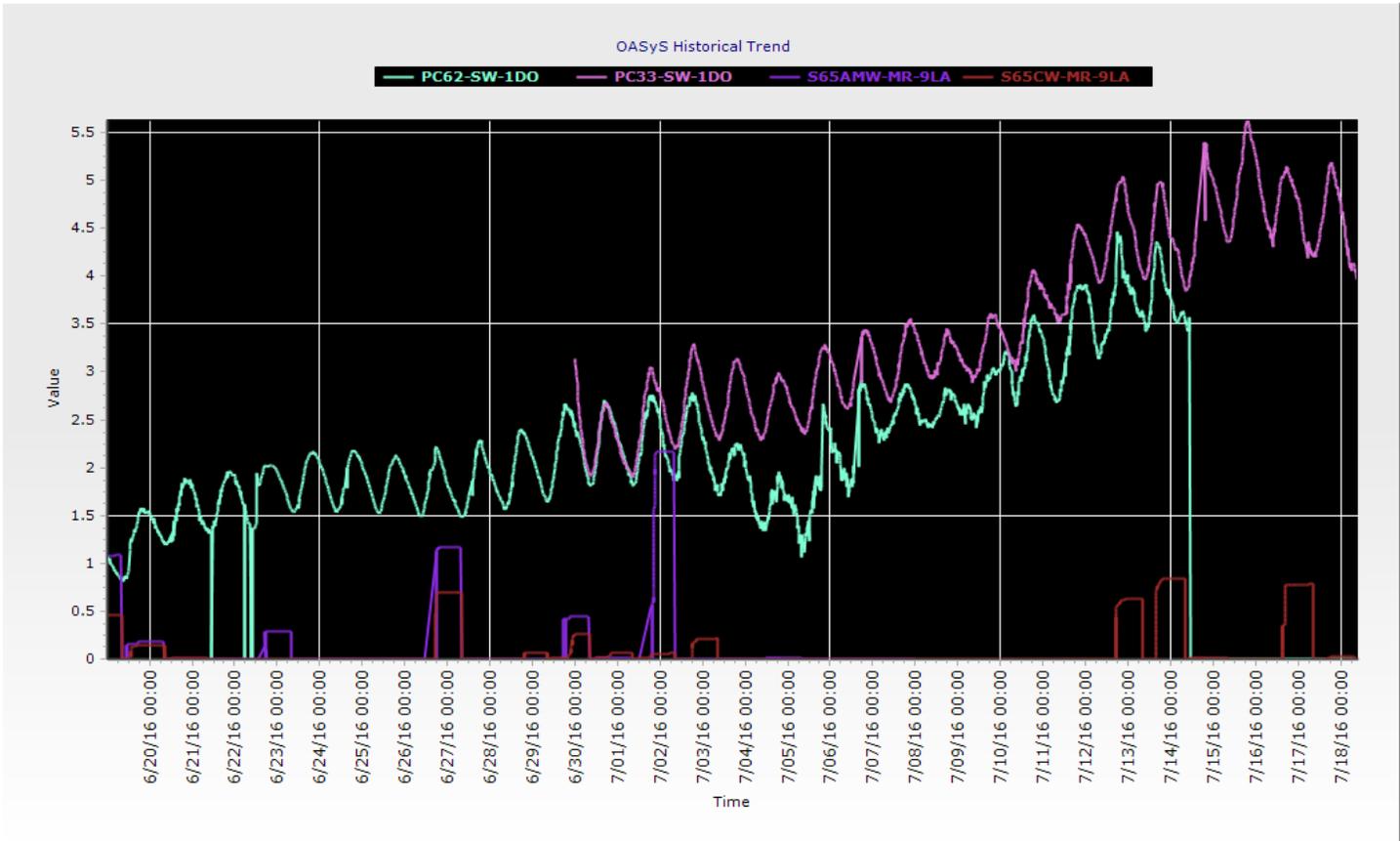


Figure 11. Phase I river channel dissolved oxygen (measured at 15 minute intervals) and rainfall at S65A and S65C.

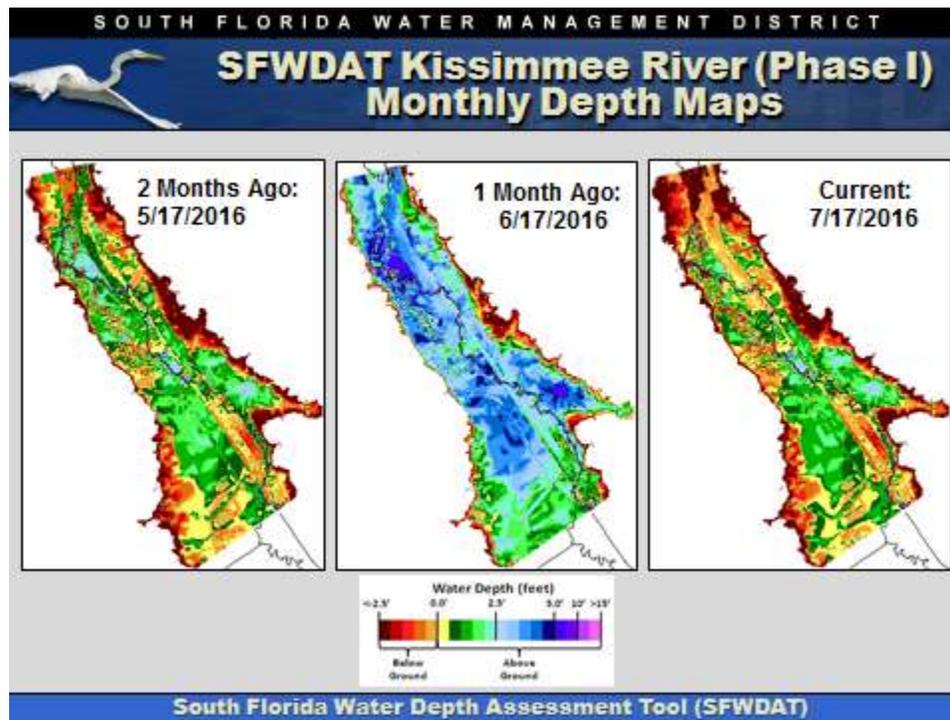
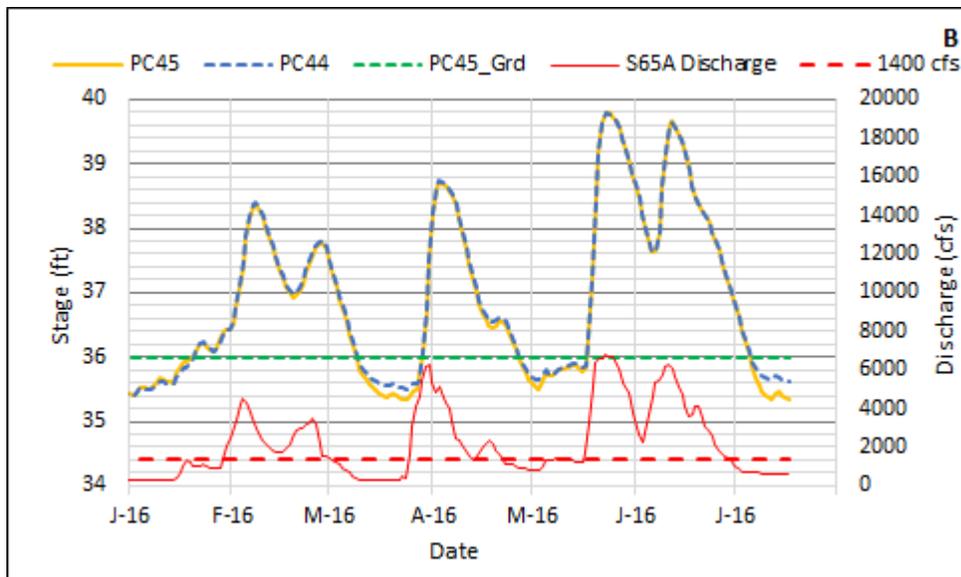
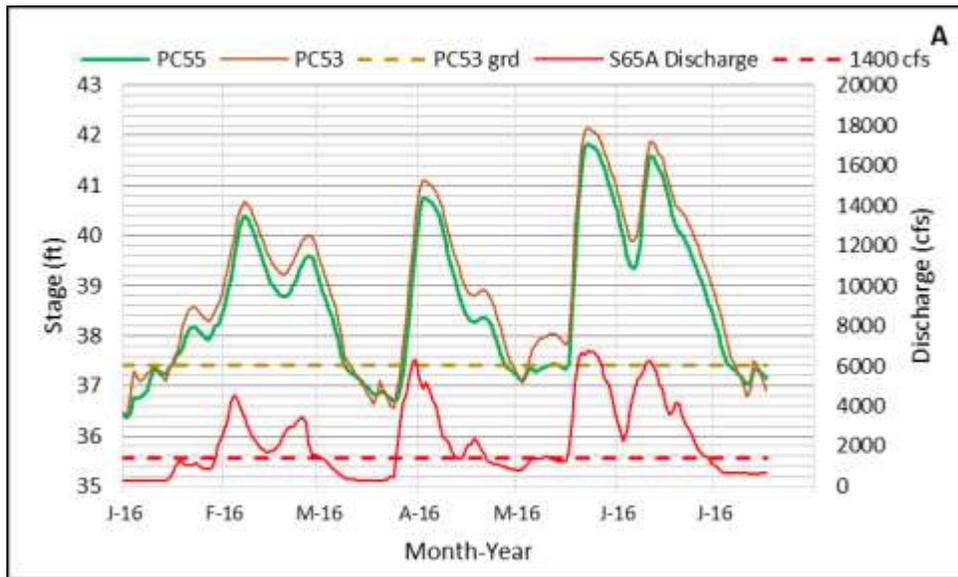


Figure 12. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to Jan. 16, 2012.



Insert. Stage and ground elevations 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

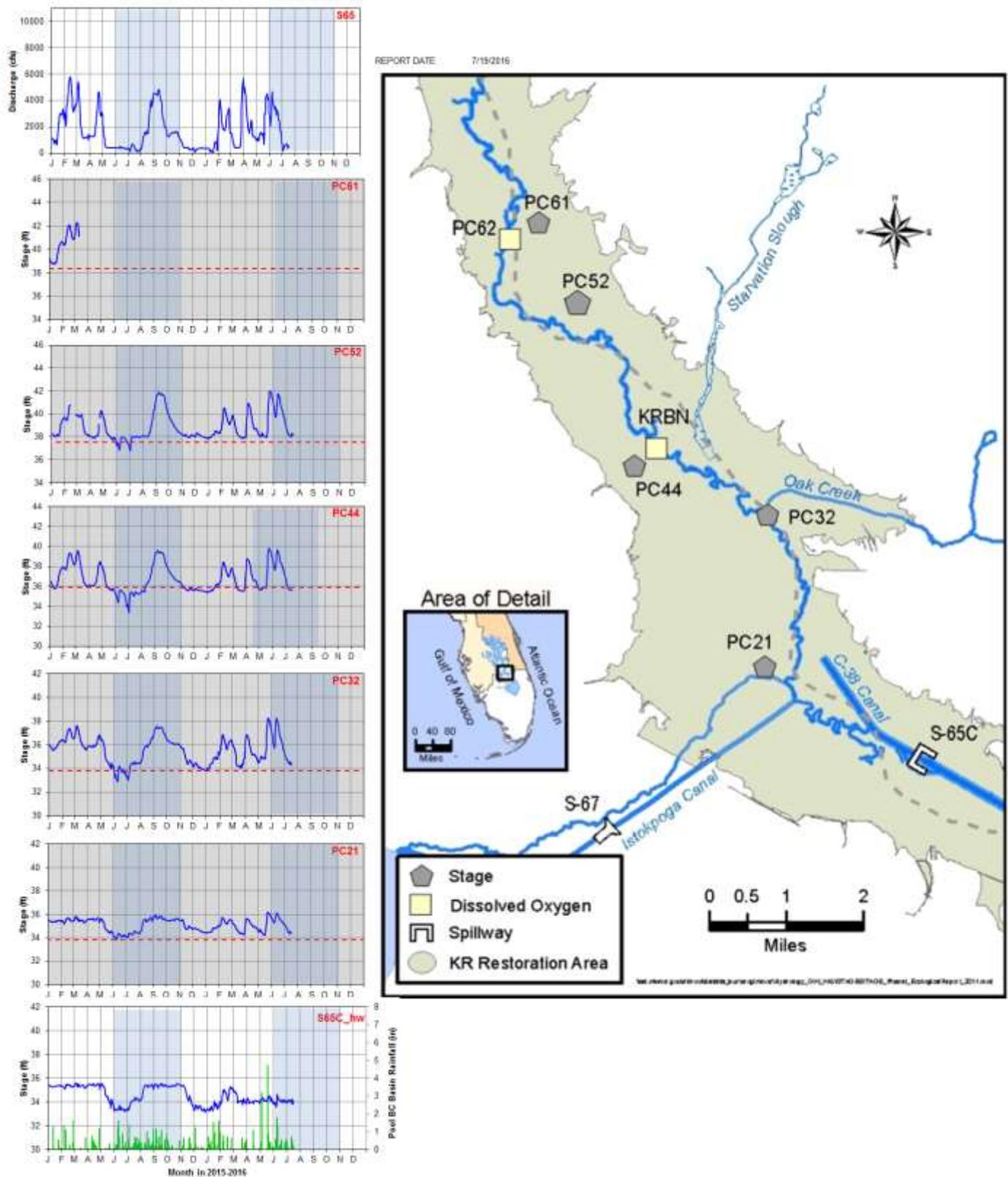


Figure 13. Discharge at S65, stages at five monitoring stations in the Phase I area of the Kissimmee River floodplain, and headwater stage at S65-C since January 1, 2015. The most recent data (~2 weeks) are provisional real-time data from SFWMD DualTrend; previous data are from SFWMD DB-HYDRO (validated). Dashed lines are ground elevations.

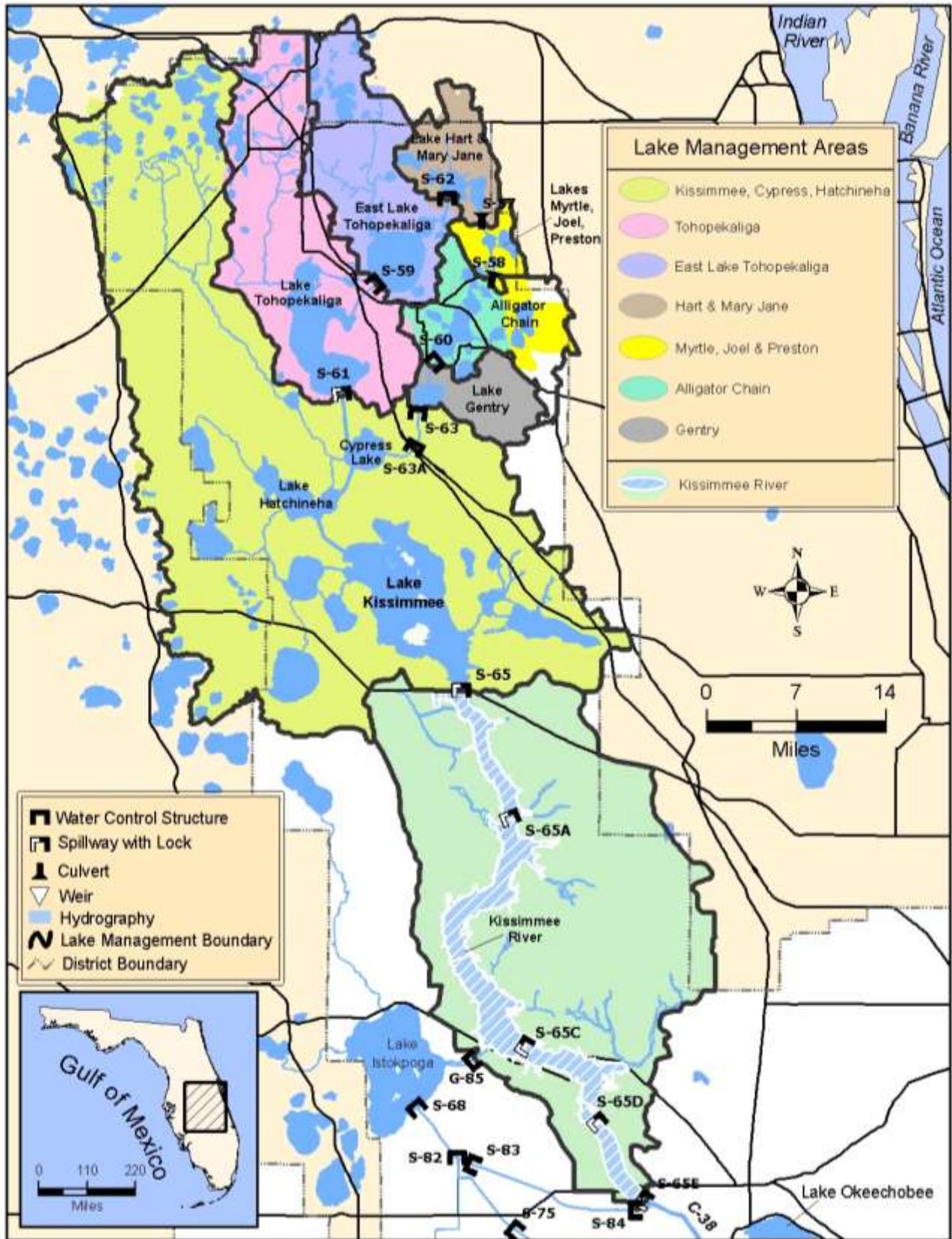


Figure 14. The Kissimmee Basin

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee stage is at 14.69 feet NGVD for the period ending at midnight on July 18, 2016. This value is based on the use of four interior Lake stations (L001, L005, L006, and LZ40) and three perimeter stations (S352, S4 and S133). Lake stage decreased by 0.09 feet over the past week and is 0.21 feet lower than it was a month ago and 2.69 feet higher than it was a year ago (Figure 1). The Lake is in the Low Flow sub-band (Figure 2). According to RAINDAR, 1.22 inches of rain fell directly over the Lake during the past seven days. The surrounding watershed experienced similar or slightly higher rainfall amounts except for the northeastern sub-basins, which experienced generally lower rainfall (Figure 3).

Based on USACE reported values, current Lake inflow is approximately 3,066 cfs as detailed below.

Structure	Flow cfs
S65E	1226
S154	0
S84 & 84X	798
S71	179
S72	57
C5(Nicodemus slough dispersed storage)	-102
S191	0
S133 PUMPS	0
S127 PUMPS	0
S129 PUMPS	0
S131 PUMPS	28
S135 PUMPS	148
Fisheating Creek	633
S2 Pumps	0
S3 Pumps	0
S4 Pumps	0

Current Lake outflow is approximately 4,945 cfs exiting at S77 (1,380 cfs), S308 (989 cfs) and to the L8 canal through Culvert 10A (303 cfs). Water supply demands increased in the EAA with a total of 2,268 cfs exiting through S351, S352, and S354. Corrected evapotranspiration value based on the L006 weather platform solar radiation data for this past week was 2,700 cfs.

Change in elevation equivalents and average weekly flows for major structures are presented in Figure 4. Weekly average values for S77 and S308 are based on USGS data for the below structure gauges.

The most recent satellite images (MODIS for July 13 and 16 and LANDSAT for July 2 and 18) (Figures 5 and 6) indicate the continued existence of algal bloom development across a large portion of the Lake and are in general agreement with field observations through July 18.

Water Management Recommendations

Lake stage continues to decrease slowly in response to decreased tributary flow releases through S77 and S308, water supply demands, and seasonally high ET. However, the current Lake stage is too high for this time of year, which may result in an increased loss of submerged aquatic vegetation (SAV). There also appears to be an increase in the occurrence of cyanobacterial blooms and the potential for

elevated toxin levels. Future short-term recommendations are highly dependent on near-term rainfall patterns and amounts. The goal should be to limit the rate of Lake stage increase or continue the current unseasonable recession in Lake stage to avoid exceeding the top of the preferred stage envelope (15.5 feet NGVD) during the wet season.

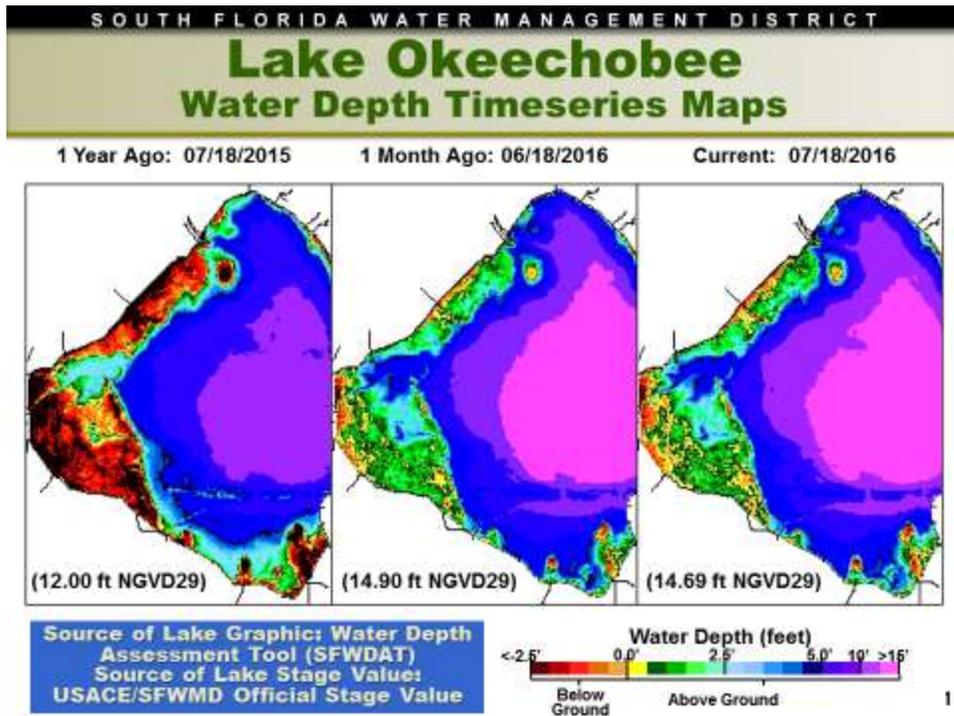


Figure 1

Lake Okeechobee Water Level History and Projected Stages

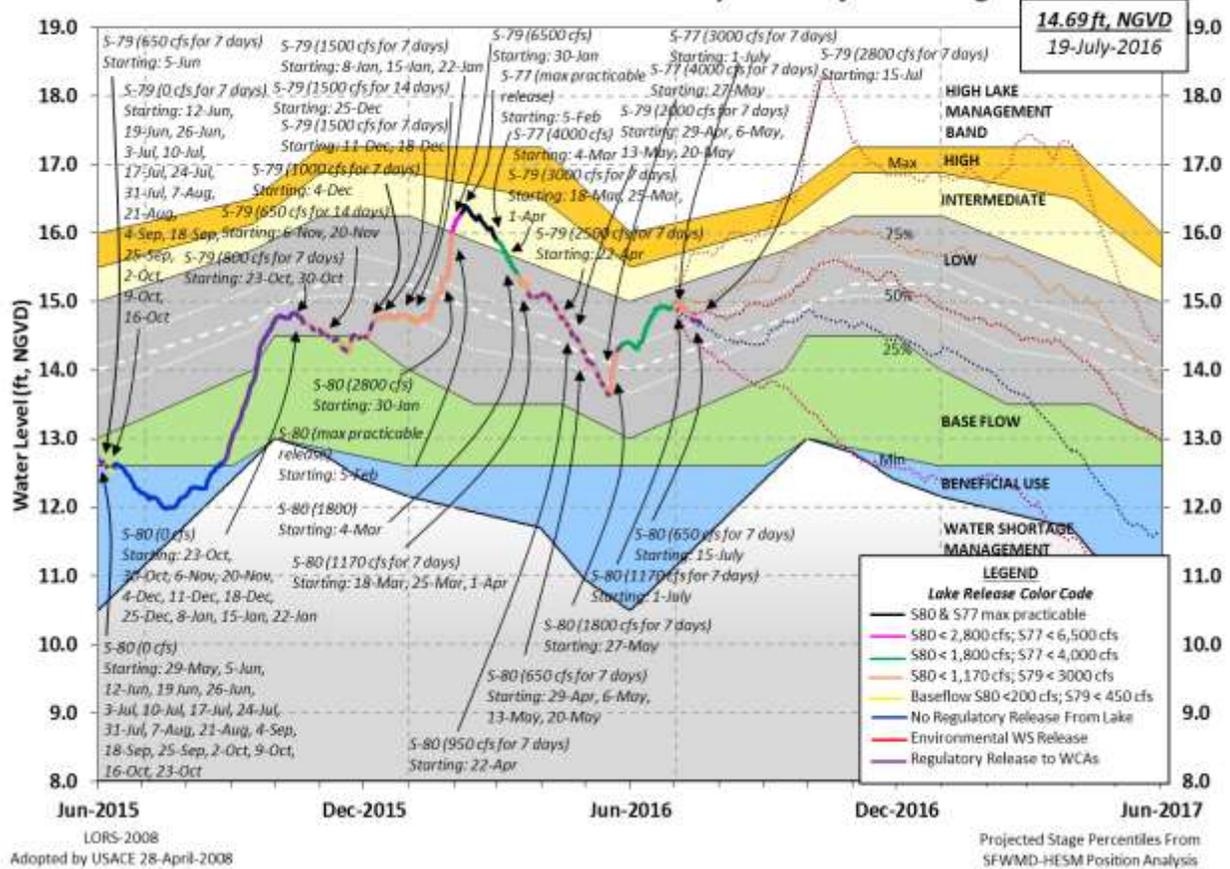


Figure 2

SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES

FROM: 0215 EST, 07/12/2016 THROUGH: 0215 EST, 07/19/2016

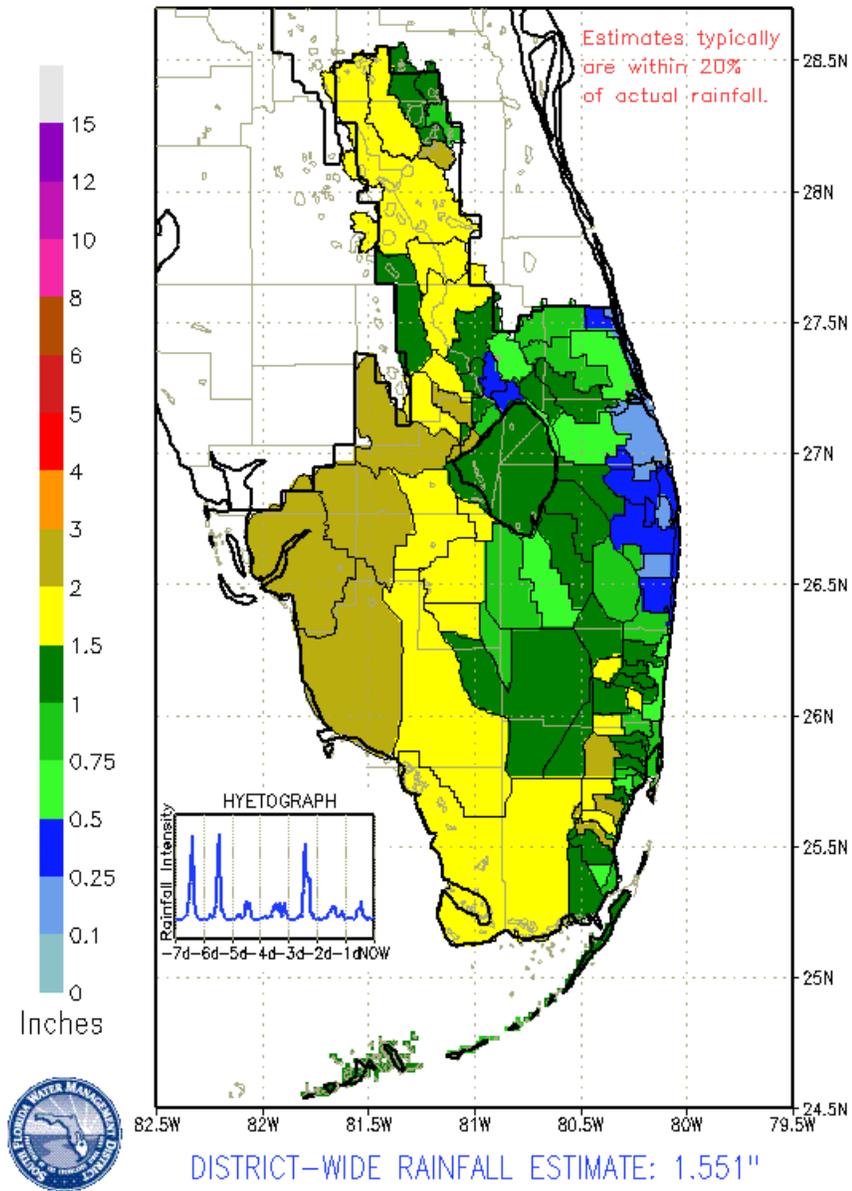


Figure 3

INFLOWS	Average Daily Flow Past Week cfs	Feet of Change Past Week
S65E	1175	0.039
S71 & 72	169	0.006
S84 & 84X	569	0.019
Fisheating Creek	680	0.023
Rainfall	N.A.	0.102
OUTFLOWS	Average Daily Flow Past Week cfs	Feet of Change Past Week
S77	2119	0.071
S308	843	0.028
S351	255	0.009
S352	124	0.004
S354	960	0.032
L8	391	0.013
ET	2700	0.090

Figure 4

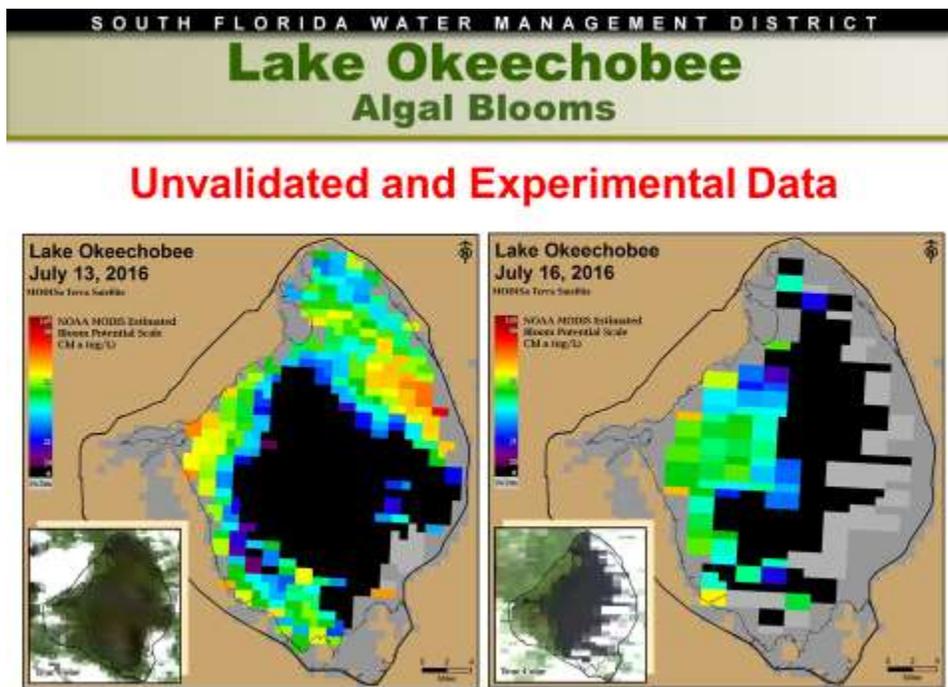


Figure 5



Figure 6

Lake Istokpoga

The Lake Istokpoga regulation schedule has returned to its annual low pool stage of 38.25 feet NGVD. Lake stage is 38.28 feet NGVD and is currently 0.03 feet above regulation (Figure 7). Average flows into the Lake from Arbuckle and Josephine creeks were 512 and 164 cfs respectively, the fourth week of declining net flows. Average discharge from S68 and S68X this past week was 598 cfs, a decrease from the preceding week. According to RAINDAR, 1.43 inches of rain fell in the Lake Istokpoga watershed during the past seven days.

The Fish and Wildlife Commission reports that of the seven active nests reported in the last survey, only one remains active at this time. Twenty-four of the Istokpoga nests have been successful to date which doubles the record for successful nests set last year.

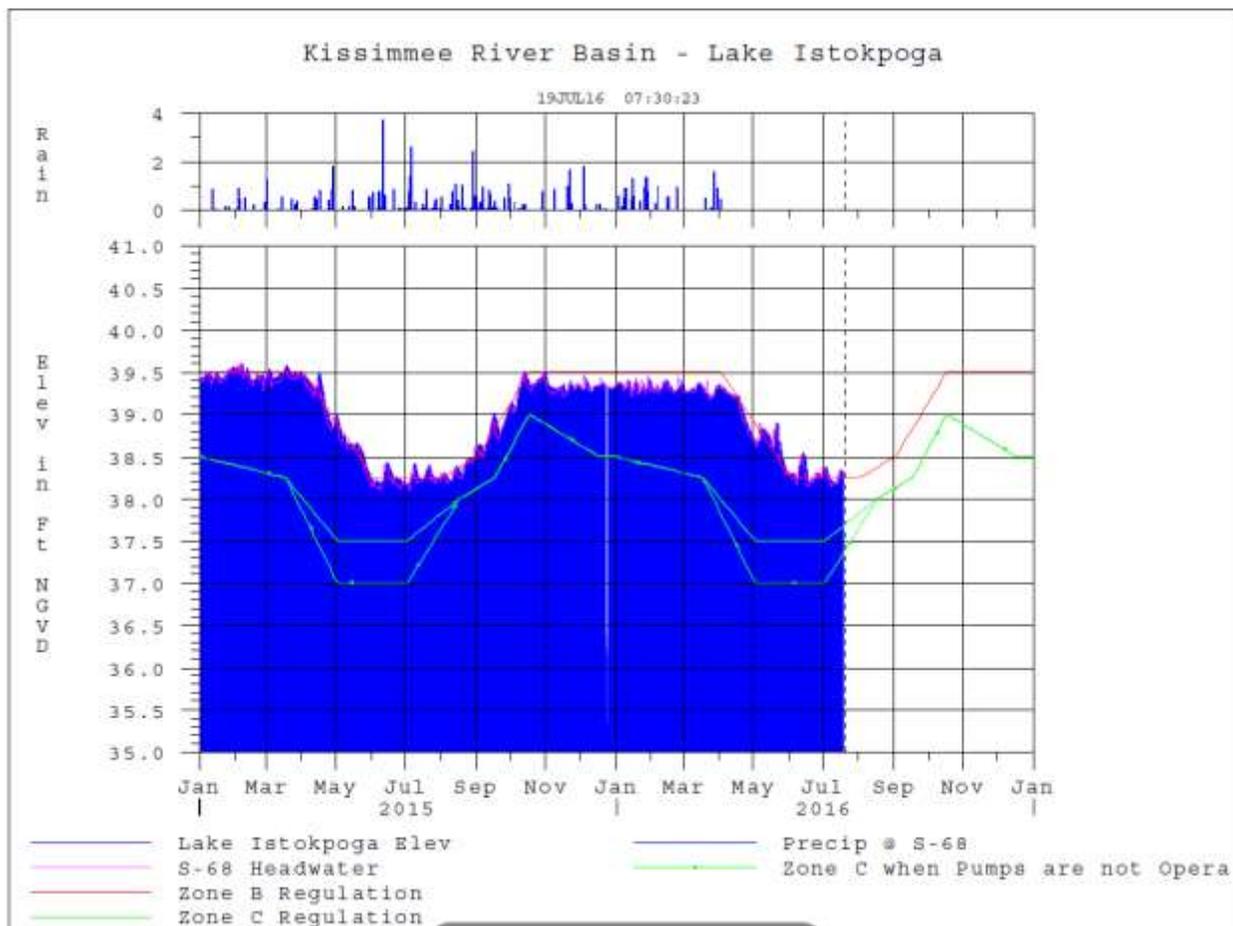


Figure 7

ESTUARIES

St. Lucie Estuary

Over the past week, provisional flows averaged about 629 cfs at S-80, 843 cfs downstream of S-308, 5 cfs at S-49 on C-24, 0 cfs at S-97 on C-23, and 80 cfs from Ten Mile Creek at the Gordy Road Structure. Average inflow from tidal basin tributaries is estimated to be 178 cfs (Figures 1 and 2). Total inflow averaged about 892 cfs last week and 2,106 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 at the US1 Bridge is about 8.3. Salinity conditions in the middle estuary are within the fair range for the adult eastern oyster.

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)	2.5 (1.1)	5.2 (2.1)	NA ¹
US1 Bridge	6.5 (3.9)	10.1 (5.9)	10.0-26.0
A1A Bridge	20.6 (16.0)	24.8 (21.2)	NA

¹Envelope not applicable

Caloosahatchee Estuary

During the past week, provisional flows averaged approximately 2,119 cfs downstream of S-77, 1,875 cfs at S-78, and 3,698 cfs at S-79. Average inflow from tidal basin tributaries is estimated to be 1,566 cfs (Figures 5 and 6). Total inflow averaged 5,264 cfs last week and 6,691 cfs over last month.

Over the past week in the estuary, salinity remained about fresh to Cape Coral Bridge and increased downstream (Table 2, Figures 7 and 8). The seven-day average salinity values are within the good range for adult oysters at Shell Point and at Sanibel and has been in the poor range at Cape Coral for 56 consecutive days (Figure 9). The 30-day moving average surface salinity is 0.2 at Val I-75 and 0.2 at Ft. Myers. Salinity conditions at Val I-75 are in the good range for tape grass.

Table 2. 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	1.2 (0.5)	2.4 (1.0)	10.0-30.0
Shell Point	11.2 (9.6)	16.3 (14.5)	10.0-30.0
Sanibel	25.1 (NR)	27.2 (NR)	10.0-30.0

¹Envelope not applicable, ²Envelope is based on a 30-day average.

*Val I75 is temporarily offline due to bridge construction,
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 3 as concentration ranges of Chlorophyll *a* and dissolved oxygen at Beautiful Island, Ft. Myers, and Shell Point in the Caloosahatchee Estuary.

Table 3. 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 <i>a</i> (µg/l)	5.3 – 5.89	3.7 – 5.0	2.0 – 5.0
Dissolved Oxygen (mg/l)	2.63 – 4.45	4.6 – 5.78	3.5 – 5.78

The Florida Fish and Wildlife Research Institute reported on July 15, 2016, that *Karenia brevis*, the Florida red tide organism, was not detected in samples collected from Lee County.

Water Management Recommendations

Given the current estuarine conditions, there are no ecological benefits associated with additional releases from Lake Okeechobee.

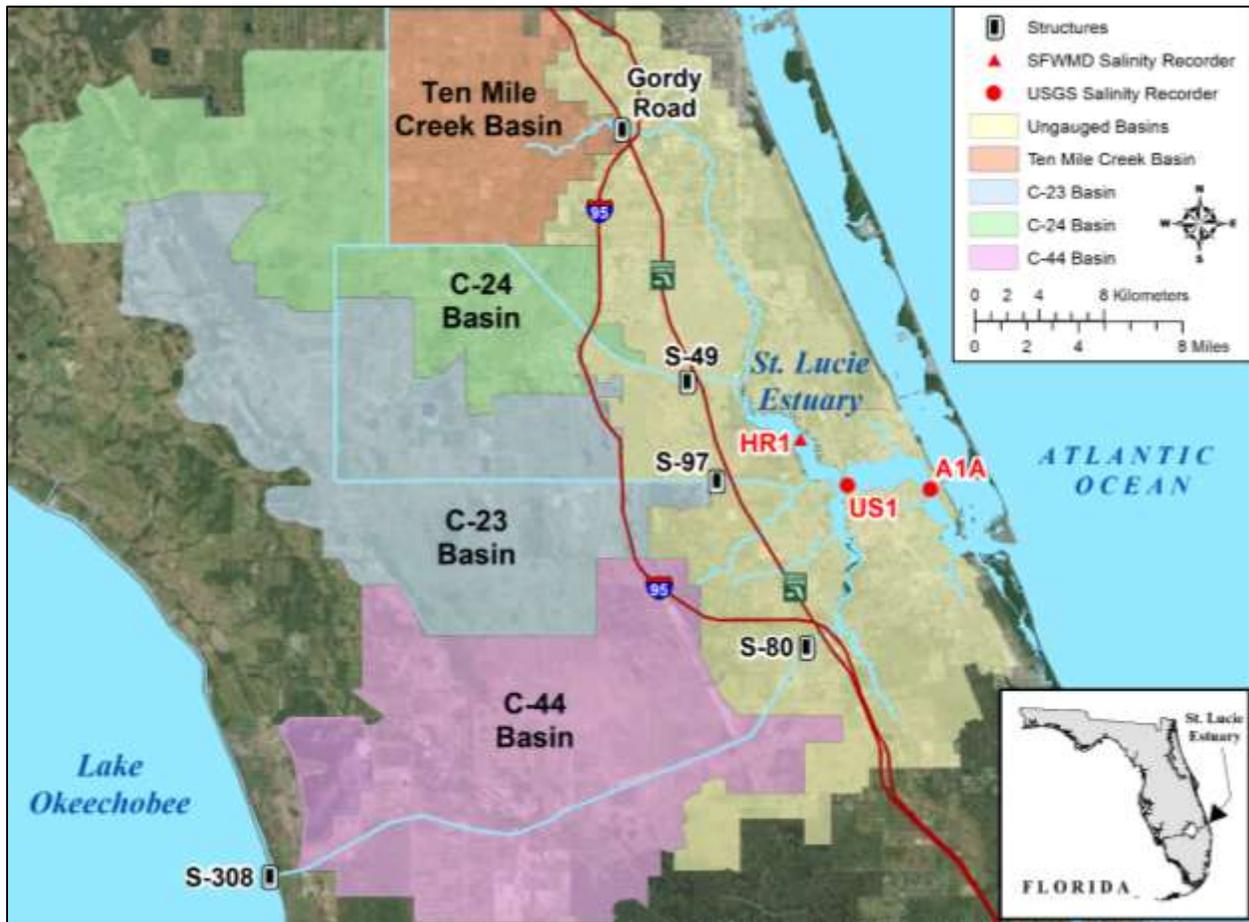


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

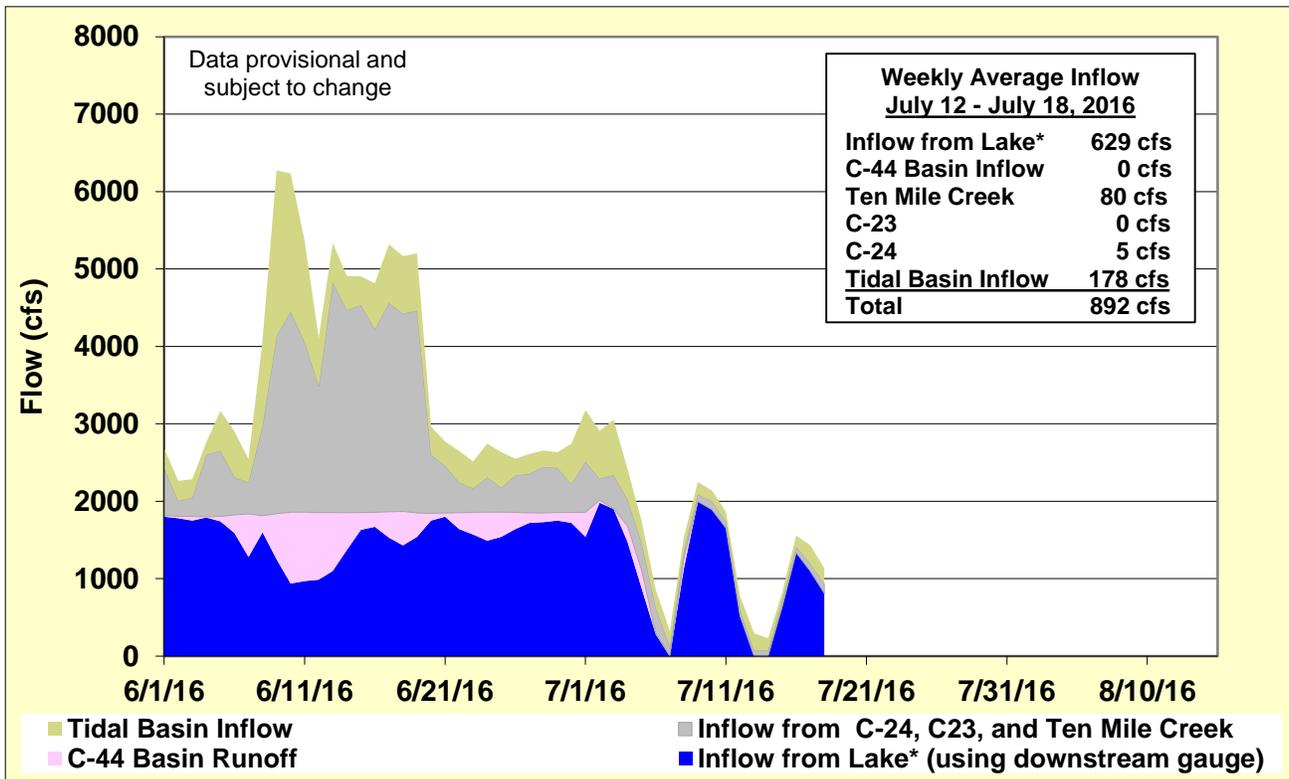


Figure 2. Estimated surface freshwater inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

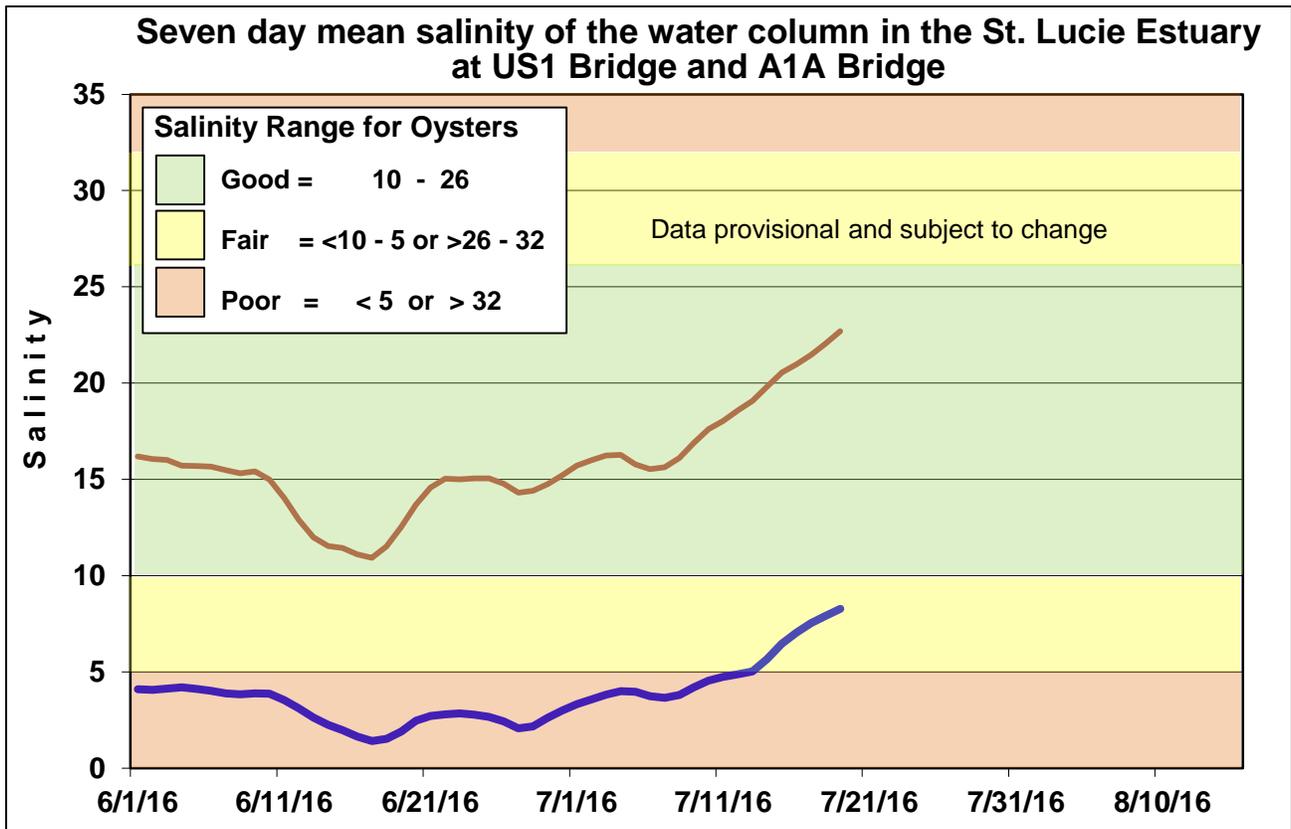


Figure 3. Seven-day mean salinity of the water column at the U.S. Highway 1 Bridge.

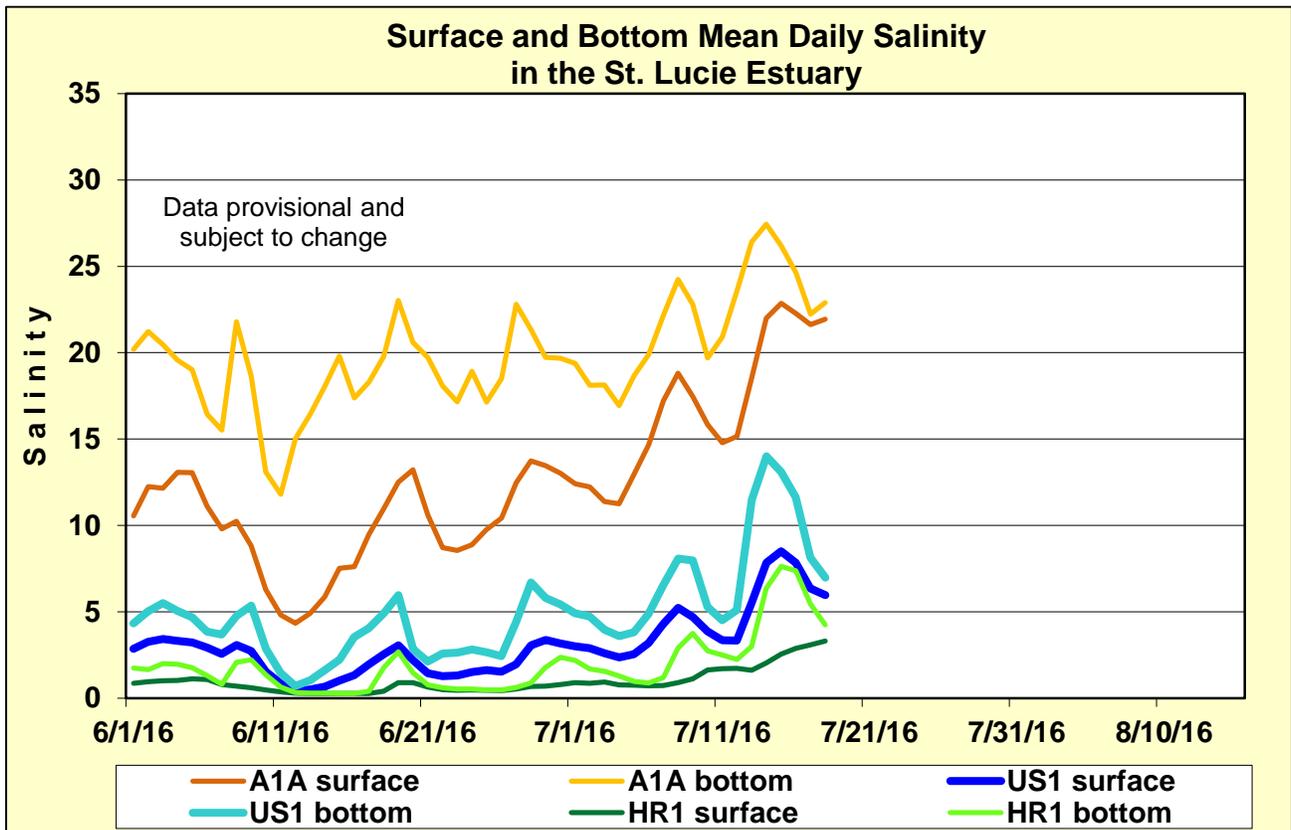


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

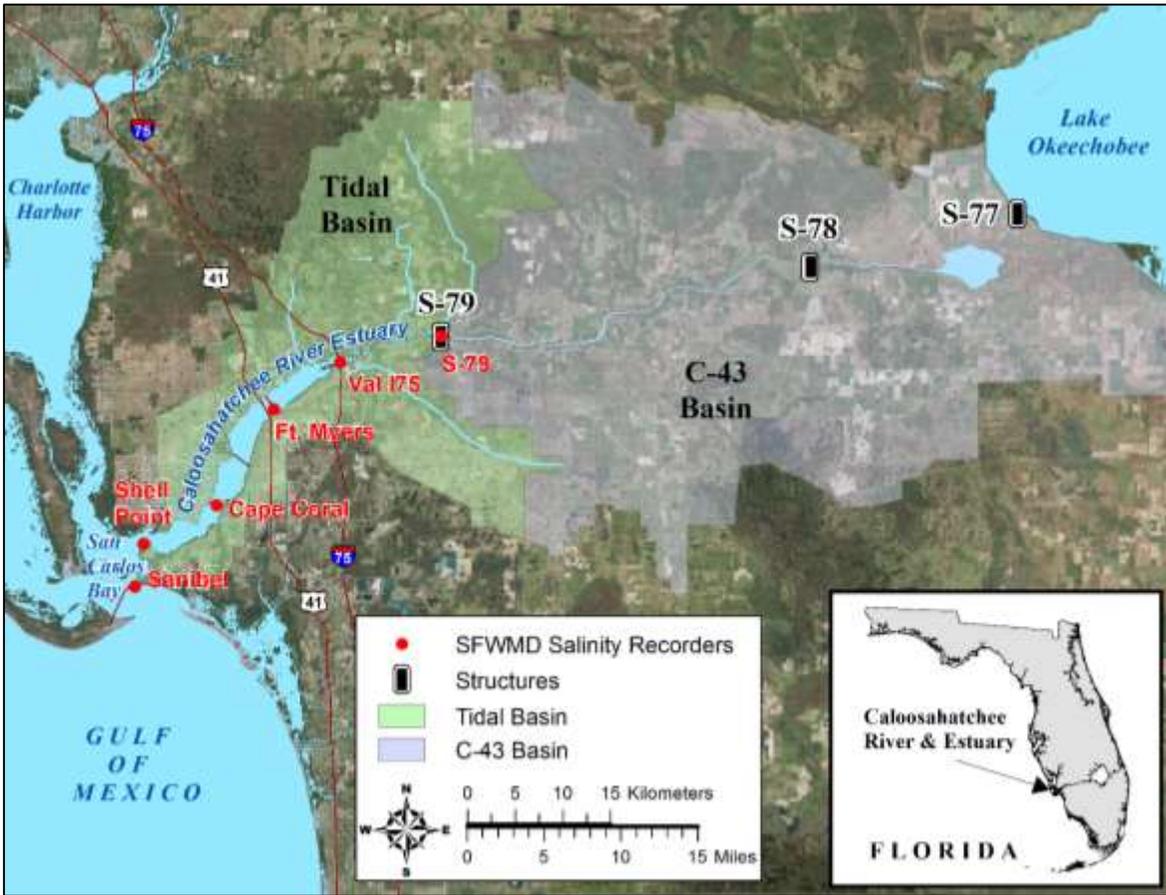


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

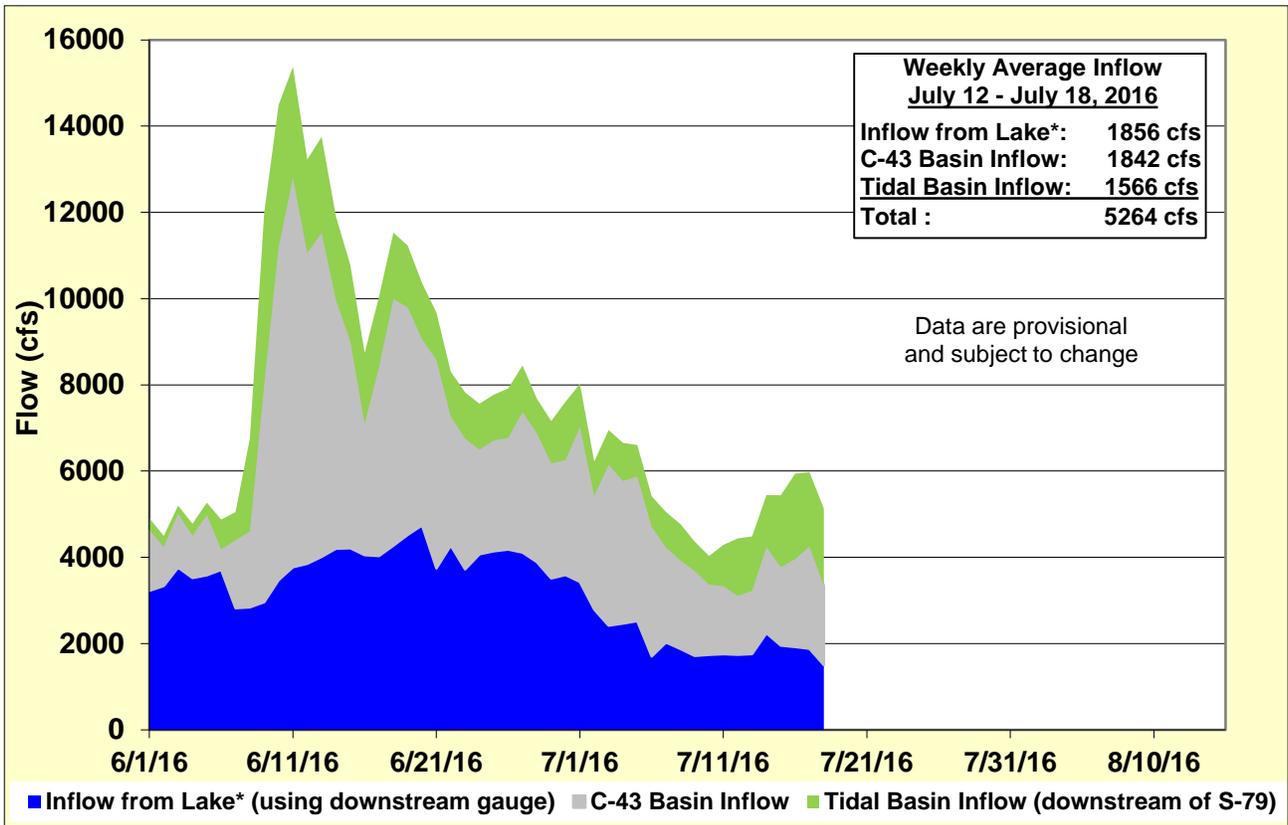


Figure 6. Freshwater inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

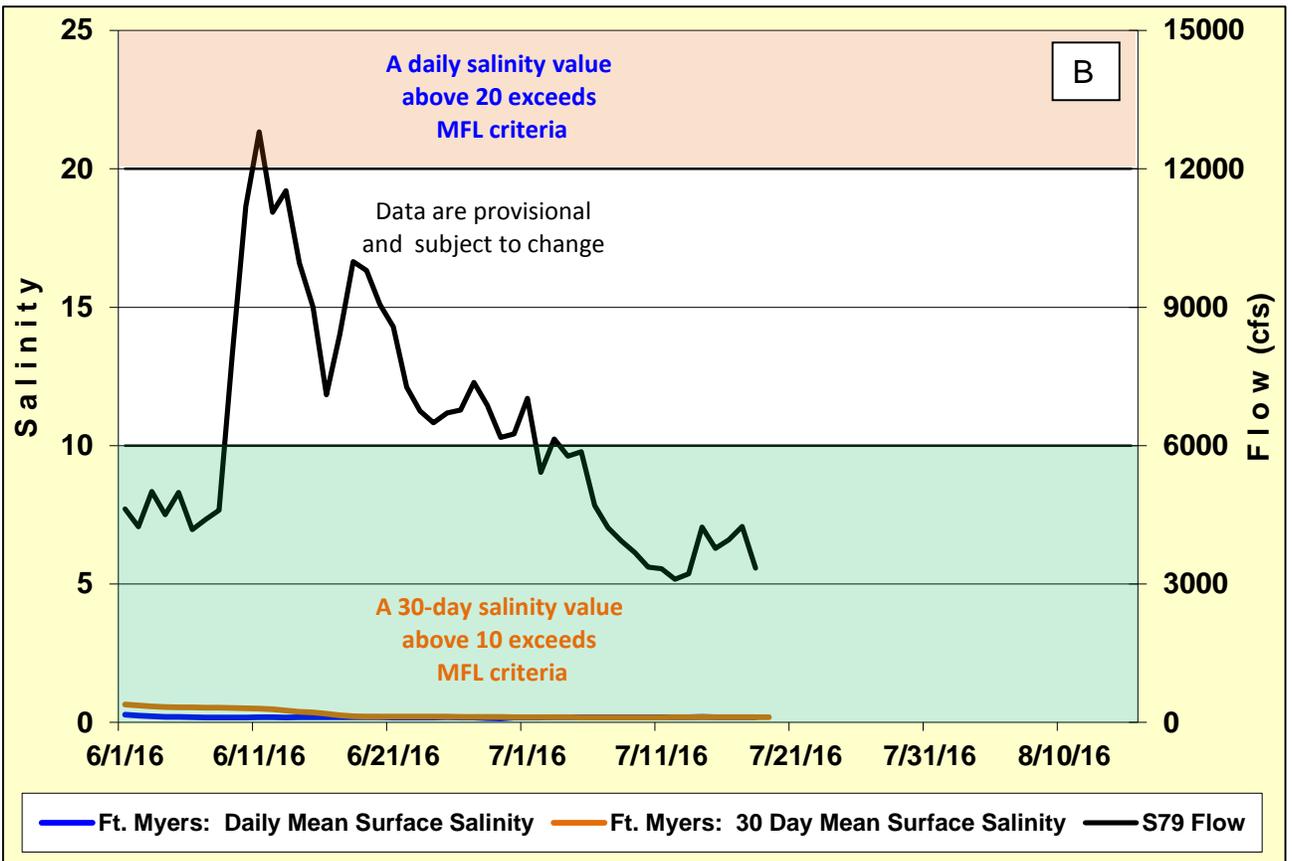
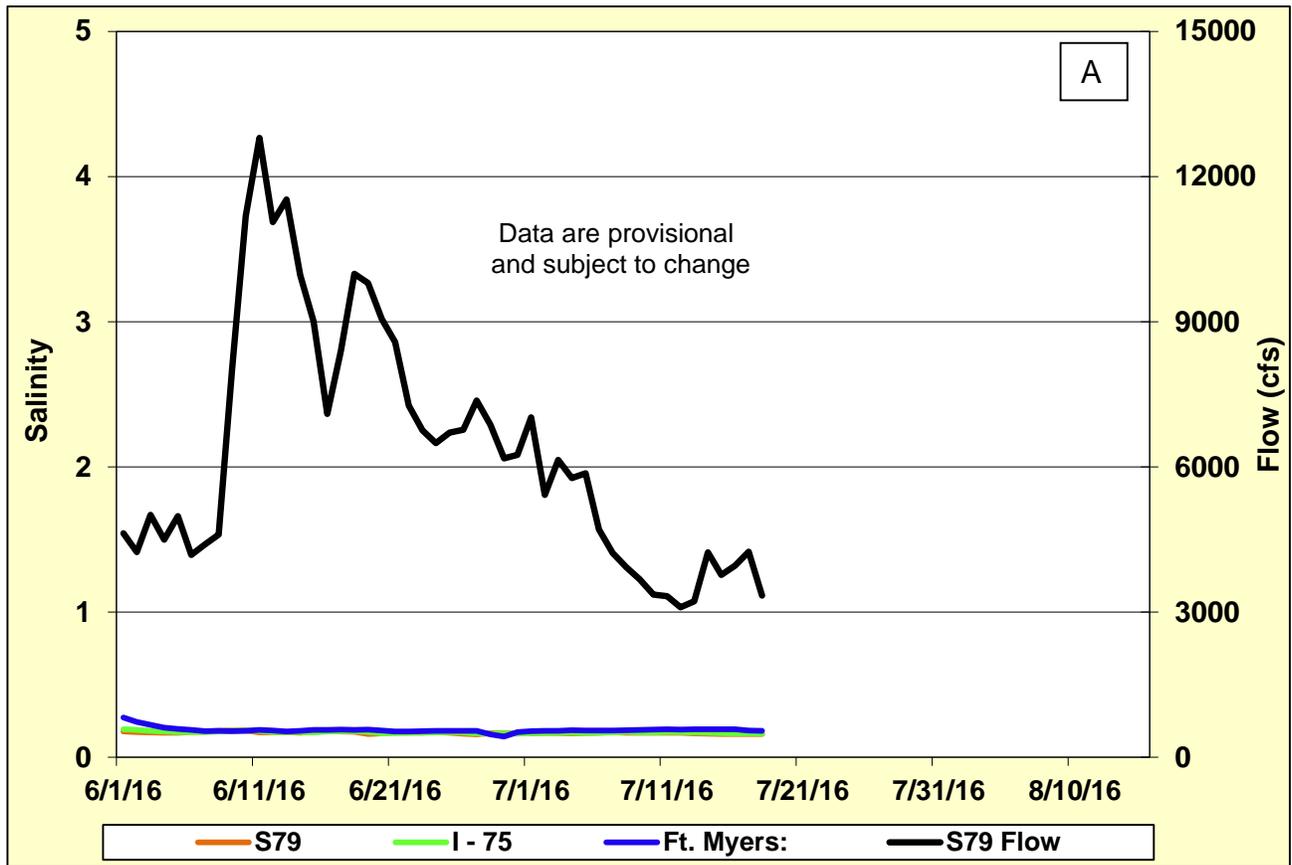


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations (A) and 30-day moving average salinity at Ft. Myers (B).

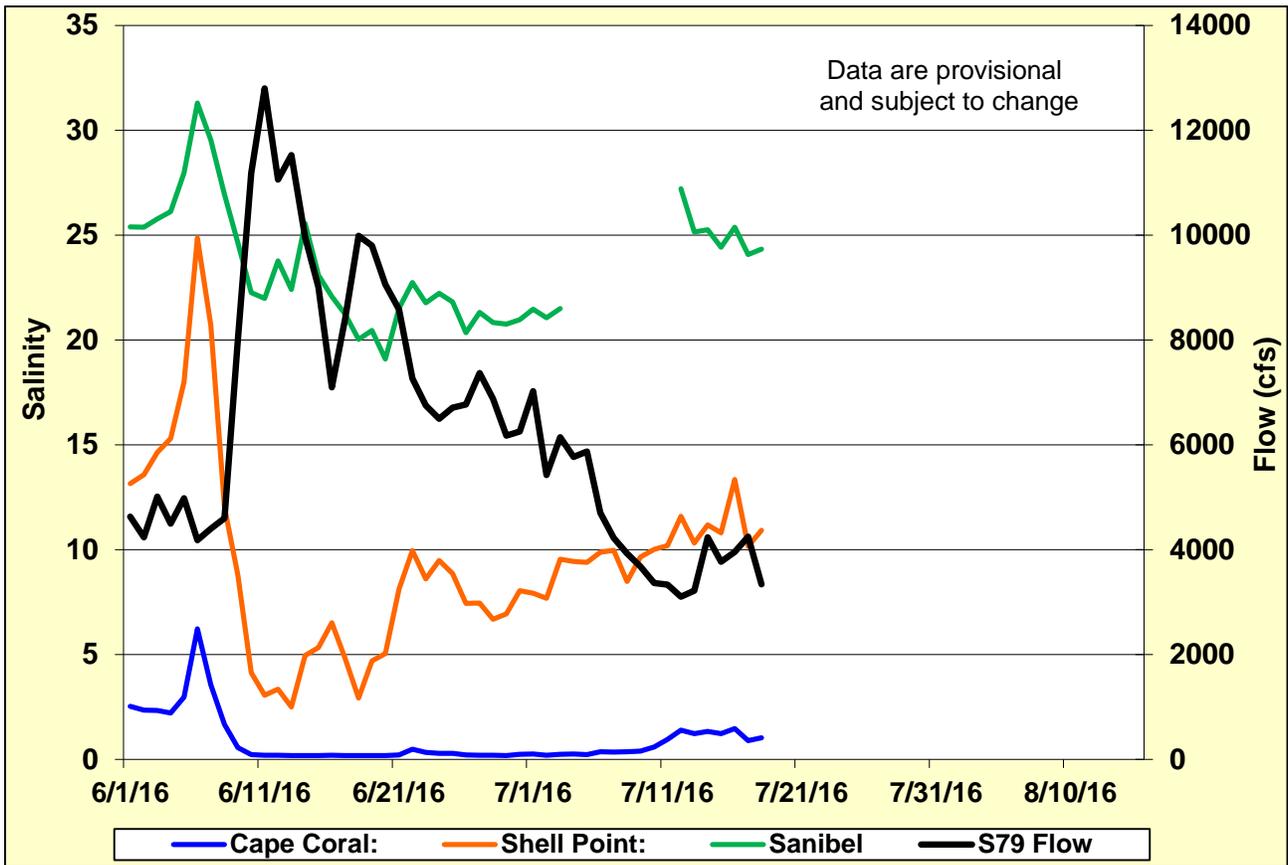


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

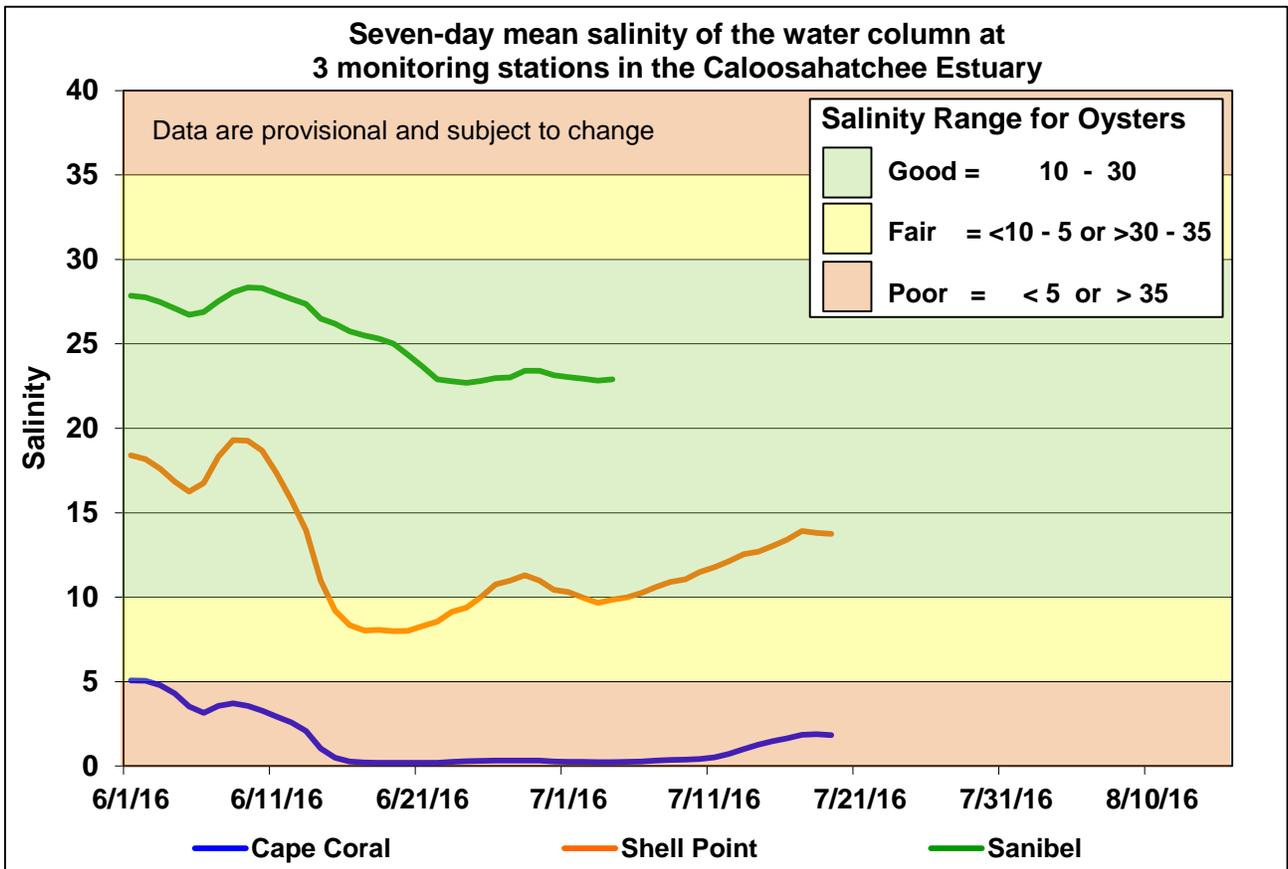


Figure 9. Seven-day mean salinity at Cape Coral Bridge, Shell Point and Sanibel Bridge monitoring stations.

Appendix A

Water quality mapping using an onboard flow through system

The flow through system consists of an intake ram attached to the transom of a boat, a flow meter, Garmin GPSMap_78S, YSI 6600 multi-parameter water quality instrument, C3 submersible fluorometer, and laptop computer with Streamline GEO software (Figure A1). The YSI 6600 was set up to record temperature, salinity, turbidity, dissolved oxygen, and chlorophyll *a*. The C3 measures temperature, colored dissolved organic matter, chlorophyll *a*, and turbidity. The intake ram was set at 0.5 m depth. Streamline Geo software permitted integration of the GPS and surface water data into an ArcGIS shapefile used to display surface water properties and facilitate the post-processing of spatial data. The GPS, YSI, and C3 recorded spatial and hydrographic information at 5-s intervals. Discrete water samples were also taken for analysis of chlorophyll *a* following the SFWMD's Standard Operating Procedures. Laboratory determination of chlorophyll *a* concentrations will be used to calibrate in situ values of chlorophyll *a* reported in the field by the optical chlorophyll probe.

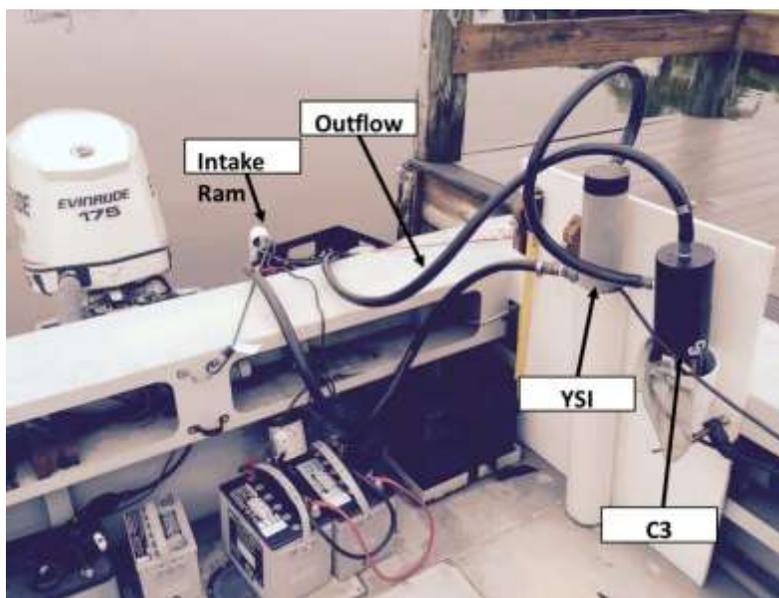
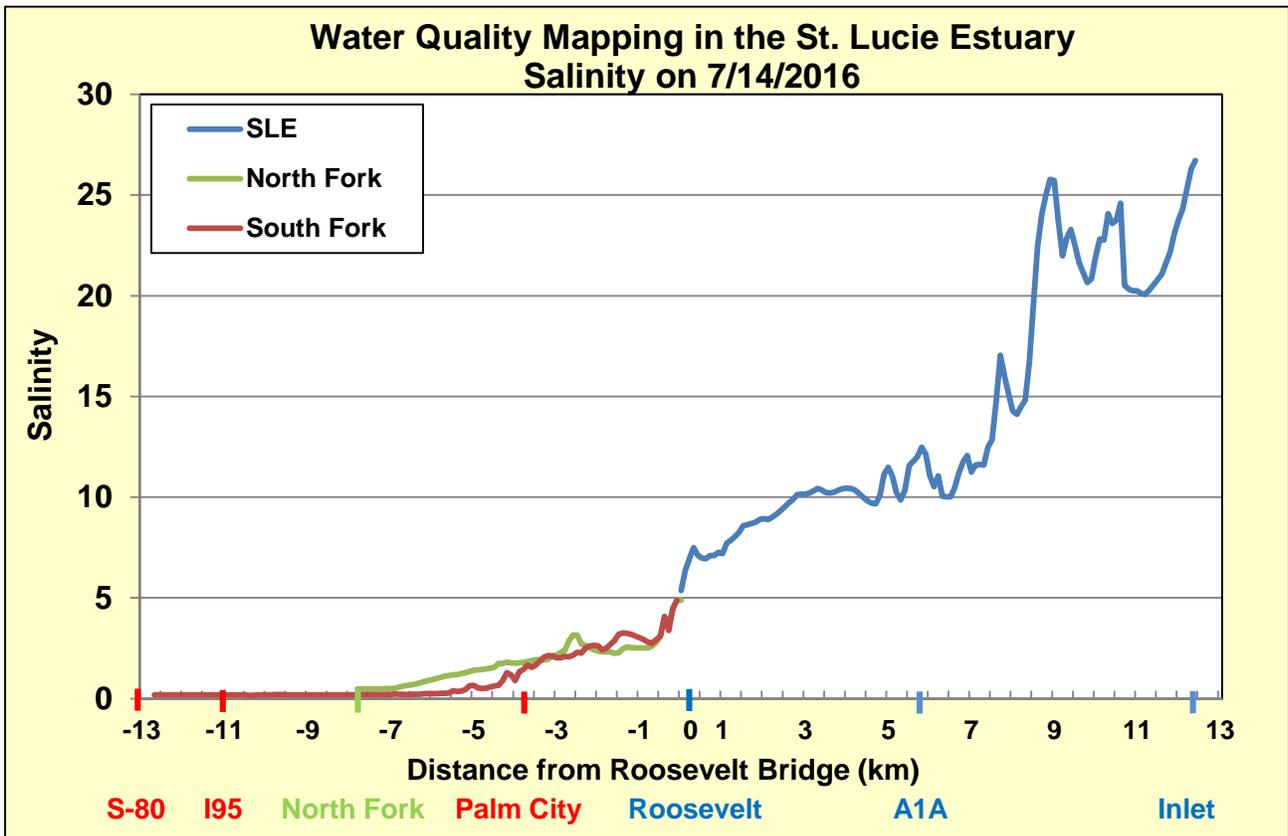


Figure A1. The flow-through system used for water quality mapping.

A map showing the water quality survey track in the St. Lucie Estuary taken on July 7 and 14, 2016 (Figure A2). Values for salinity, chlorophyll on July 14 are shown on Figure A3 and Figure A4 shows values for chlorophyll on both July 7, 2016 and July 14, 2016.



Figure A2. Water quality mapping track with river kilometers away from the Roosevelt Bridge (US1).



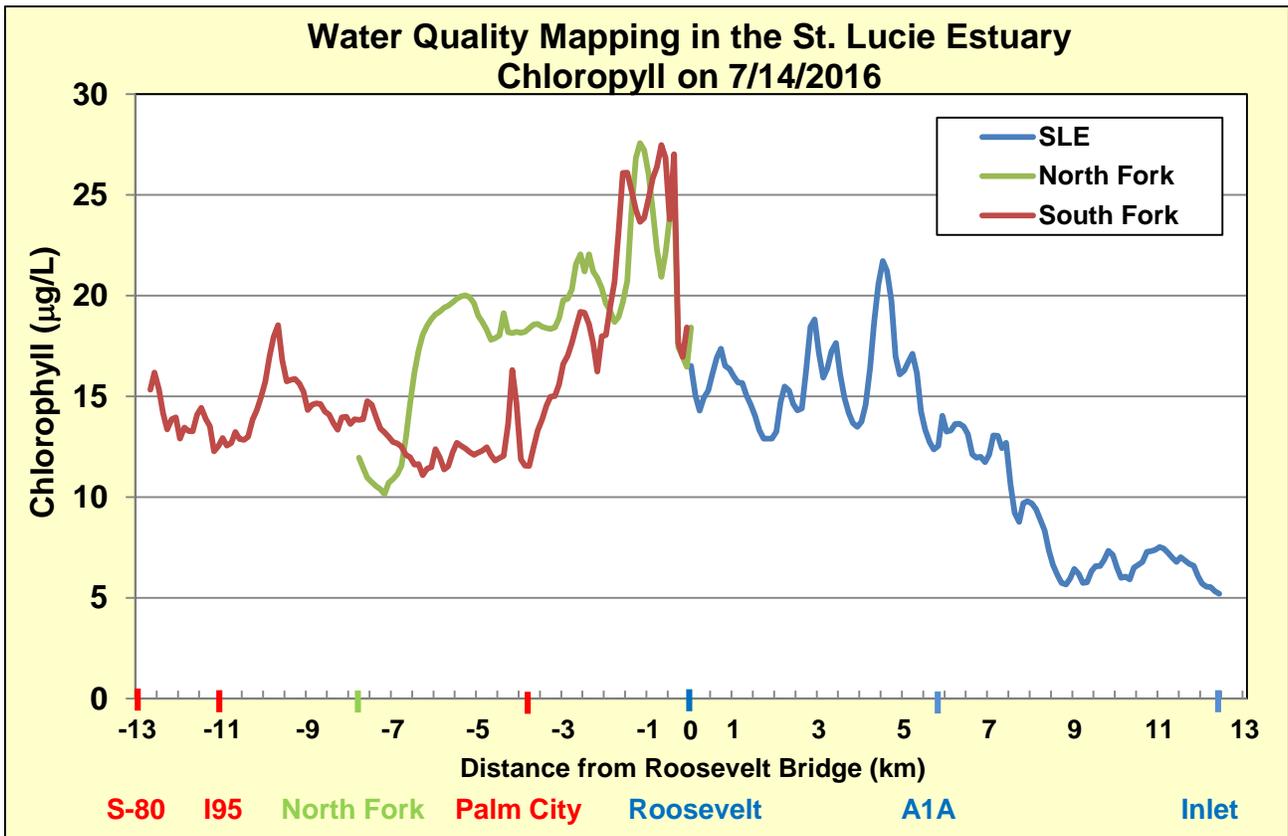


Figure A3. Water Quality Mapping salinity & chlorophyll results from S-80 to the Inlet (July 14, 2016).

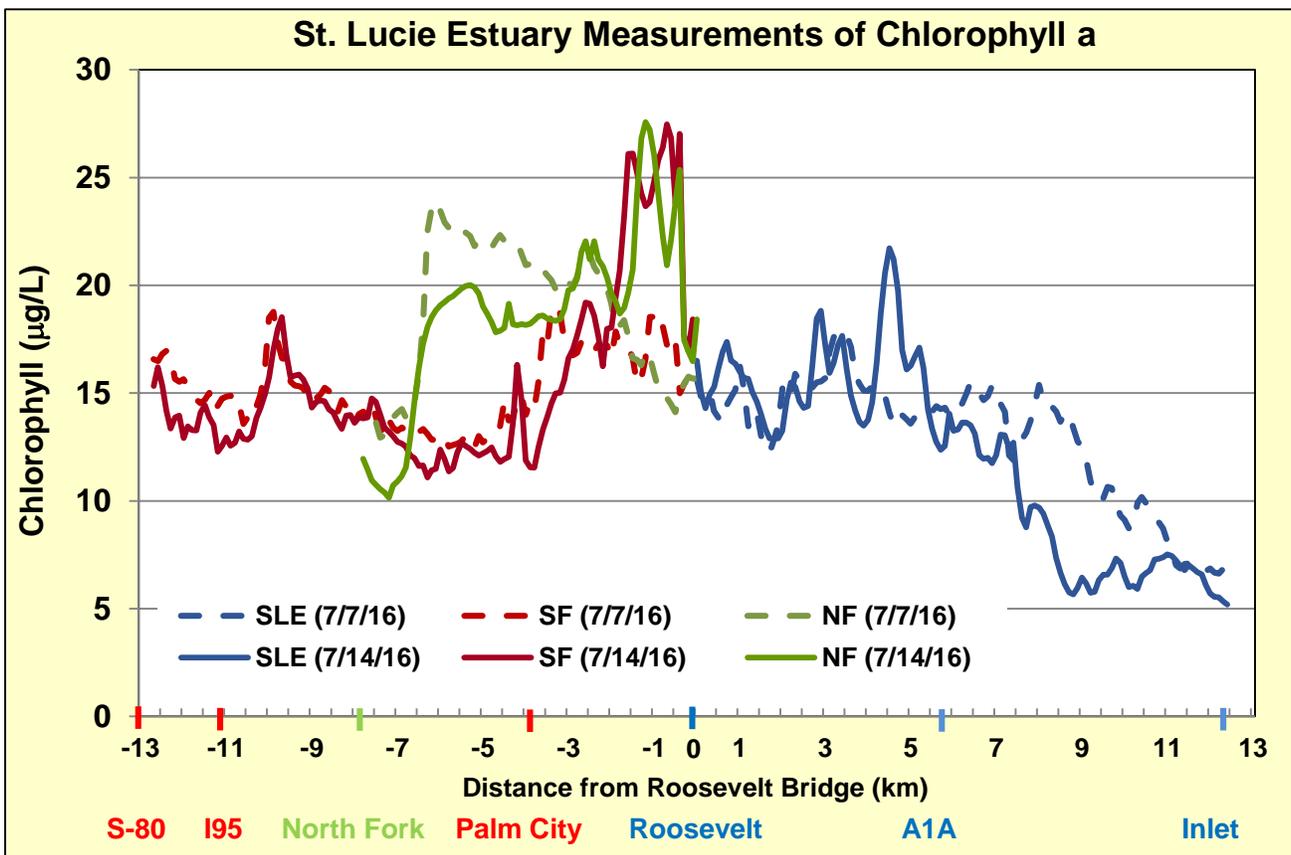
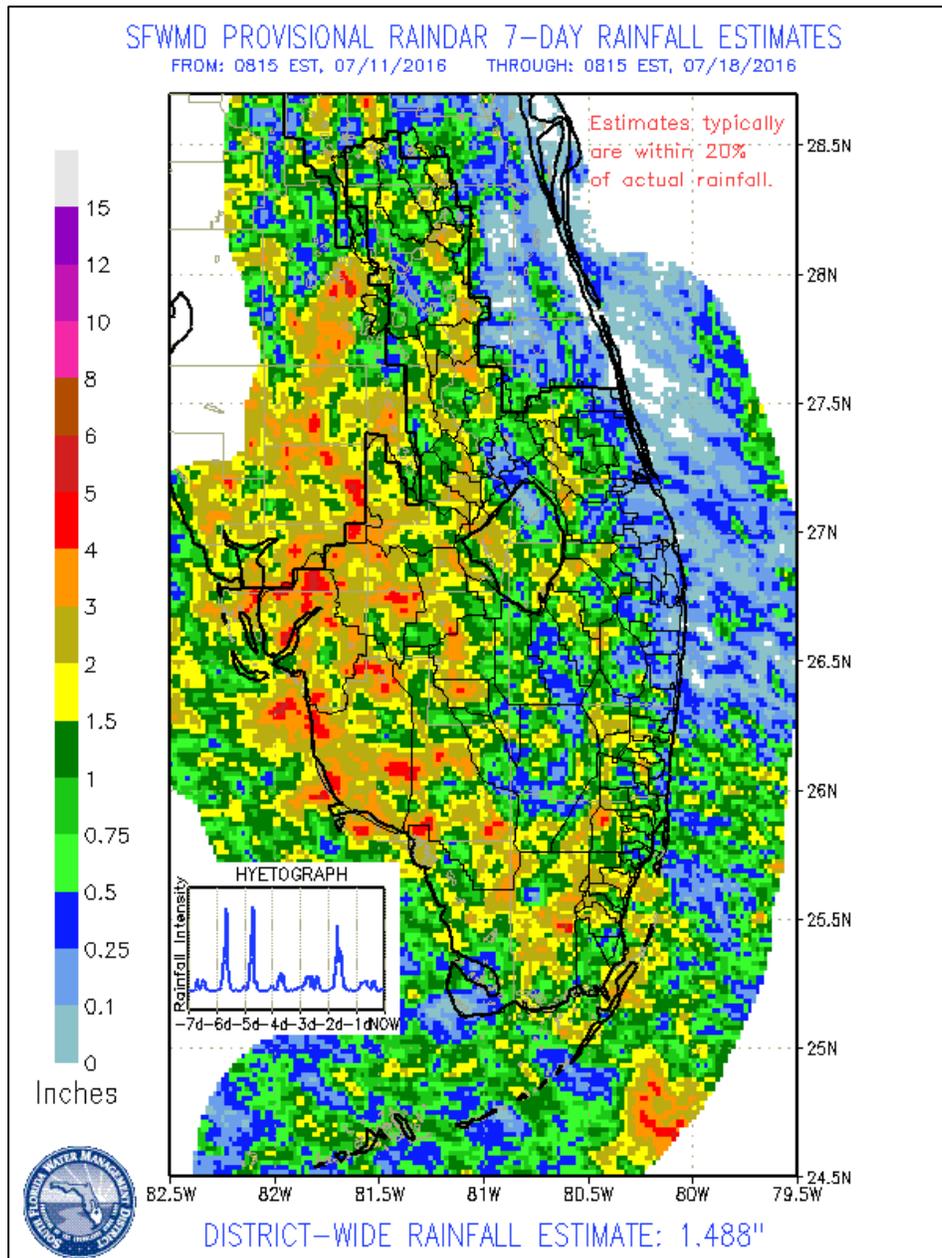


Figure A4. Water Quality Mapping for chlorophyll results from S-80 to the Inlet on July 7, 2016 and July 14, 2016.

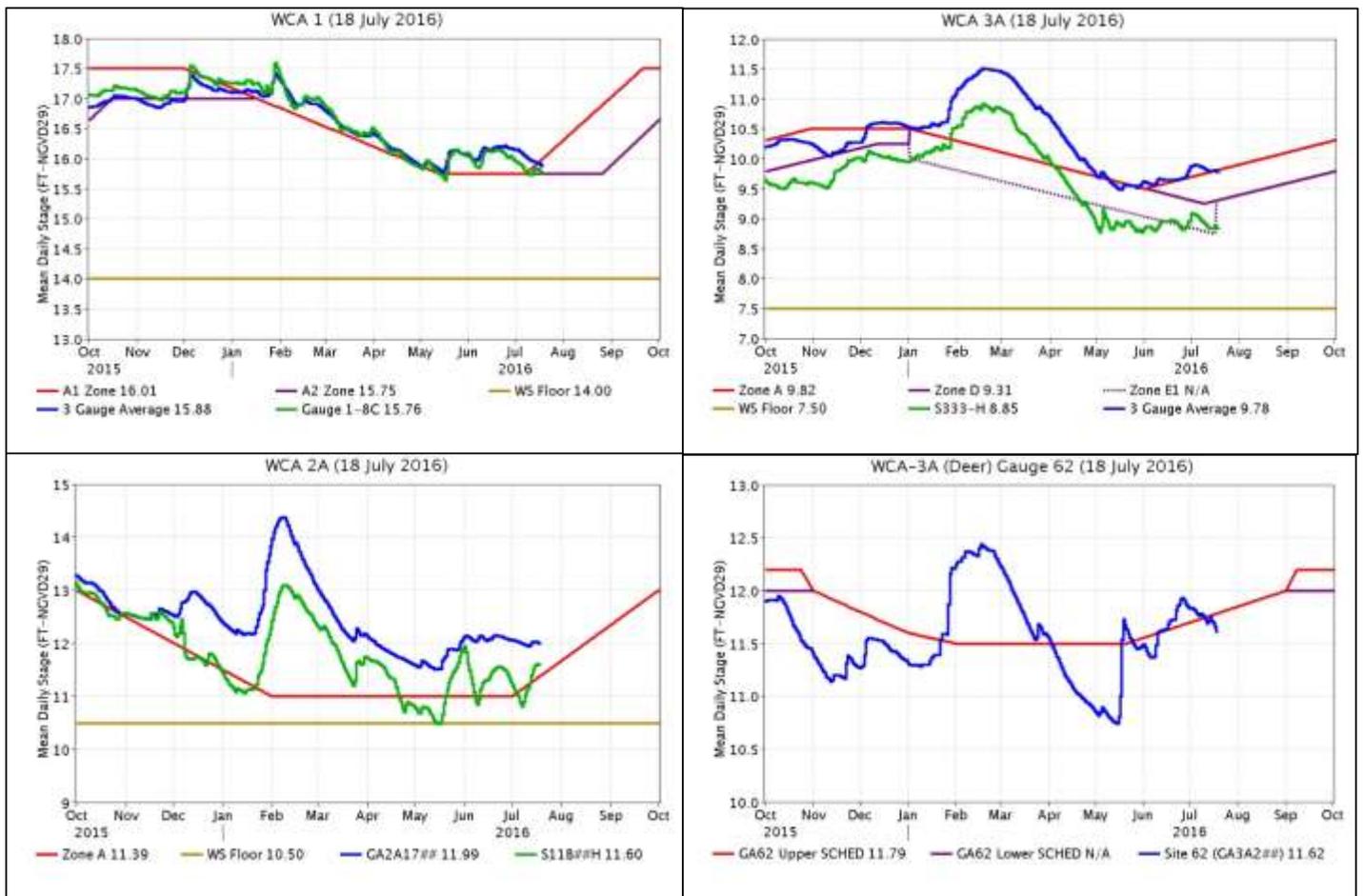
GREATER EVERGLADES

Rainfall was moderate last week, with basin-wide averages ranging from 0.87 inches to 1.79 inches. The local maximum was 6.32 inches in ENP. In most areas, water levels rose slightly but they declined 0.10 inches in WCA-1. This week's pan evaporation was 1.68 inches, 17 percent above the pre-project average of 1.43 inches.

Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.87	-0.10
WCA-2A	1.43	0.05
WCA-2B	1.79	0.02
WCA-3A	0.98	-0.05
WCA-3B	1.49	0.04
ENP	1.52	0.14



Regulation Schedules: Water levels have declined or stayed similar to last week's. Regulation schedules are increasing, which changes the relative difference from regulation. Three of the four areas are now below regulation. The WCA-1 three-gauge average is 0.13 feet below regulation. The WCA-2A stage is 0.60 feet above regulation. The WCA-3A three-gauge average stage is 0.05 feet below regulation and the northwestern WCA-3A gauge stage (gauge 62) is 0.17 feet below regulation.

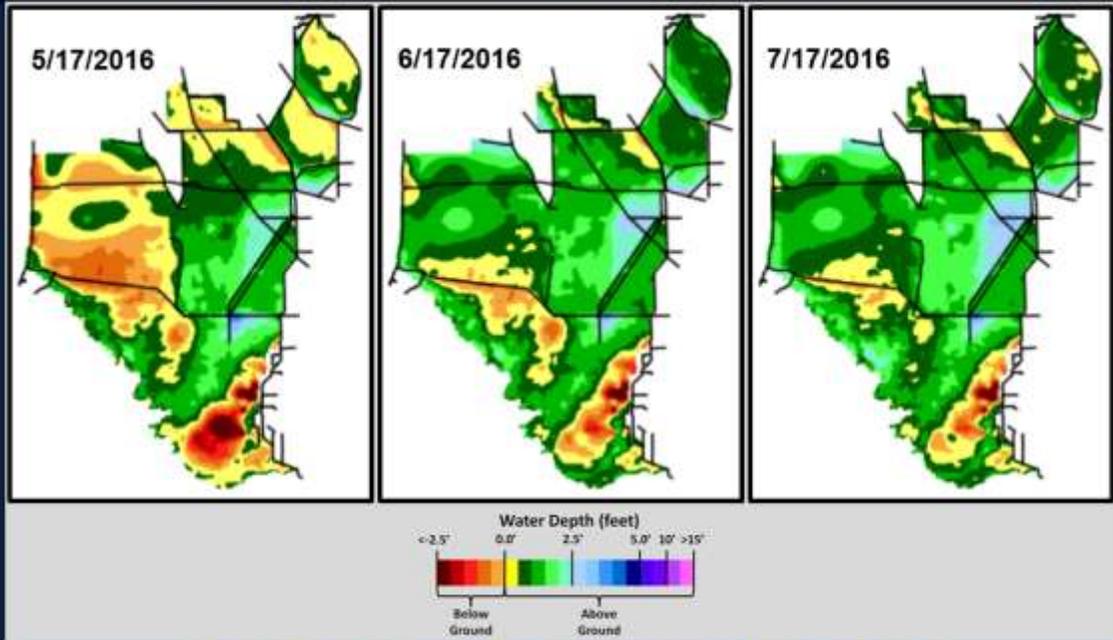


Water Depths and Changes: Water levels are slightly lower than a month ago but higher than two months ago. Water depths at the monitored gauges (except WCA-2B) range from 0.90 to 1.90 feet.

Most WCA stages decreased last week, but those in ENP and southern WCA-3 rose. Gauge changes ranged from -0.12 feet to 0.14 feet. Compared to a month ago, stages are mostly lower in the northern parts of WCAs 1, 2A, and 3A, while higher in the central and southern portions of the Everglades. Relative to a year ago, stages are mostly higher with a few local exceptions.



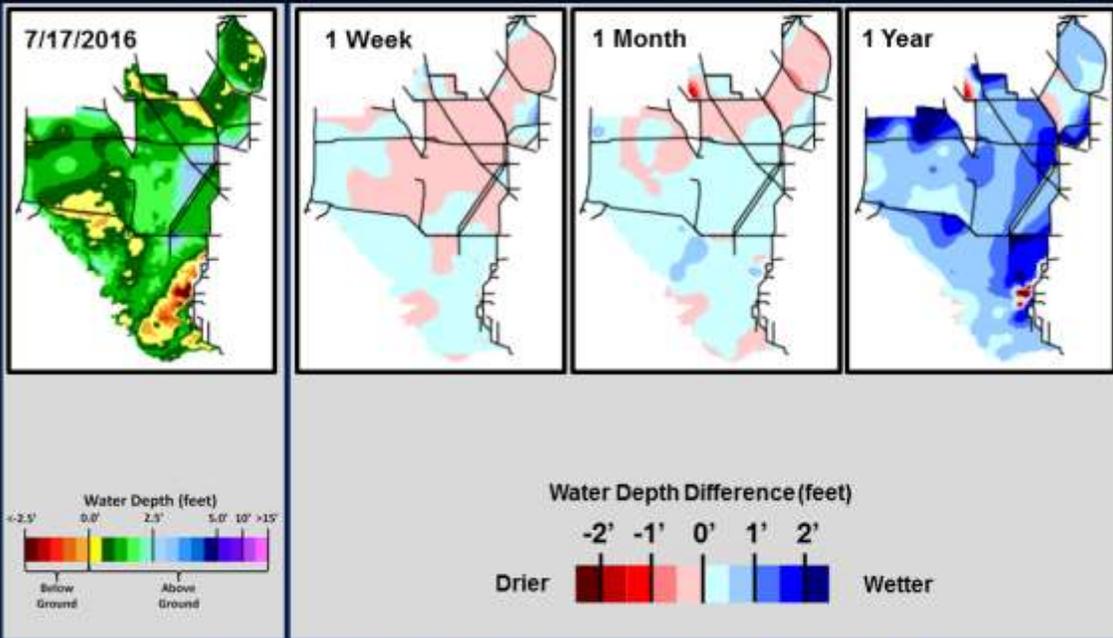
SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)

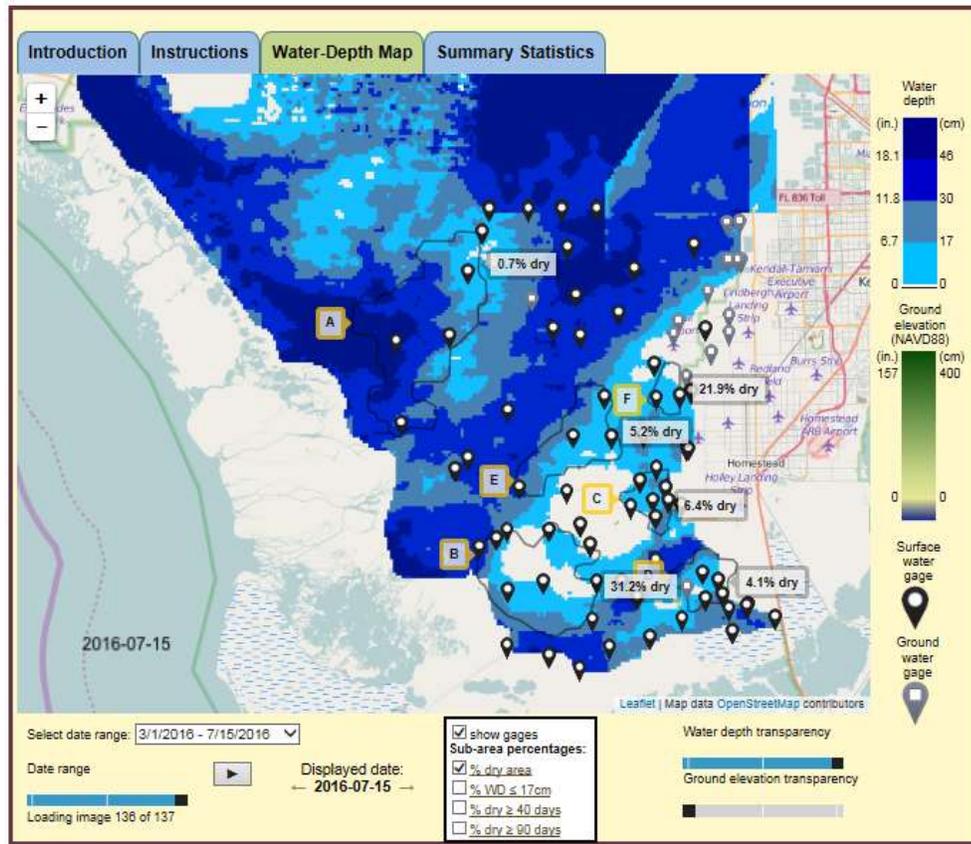


SFWDAT Everglades Difference Maps (Present - Past)



South Florida Water Depth Assessment Tool (SFWDAT)

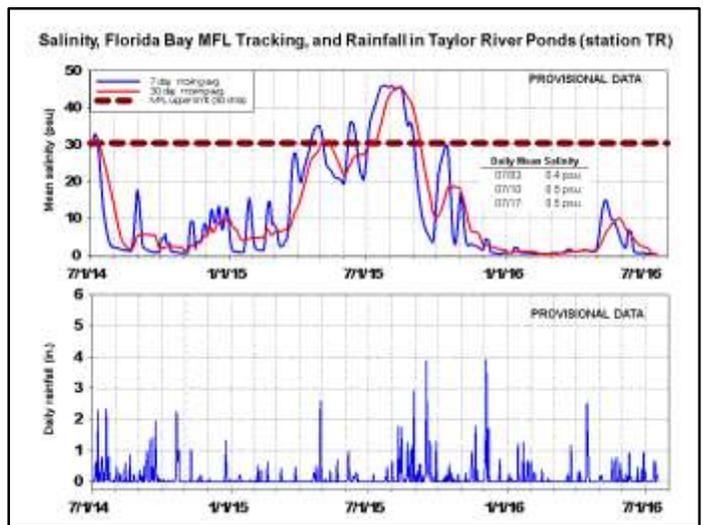
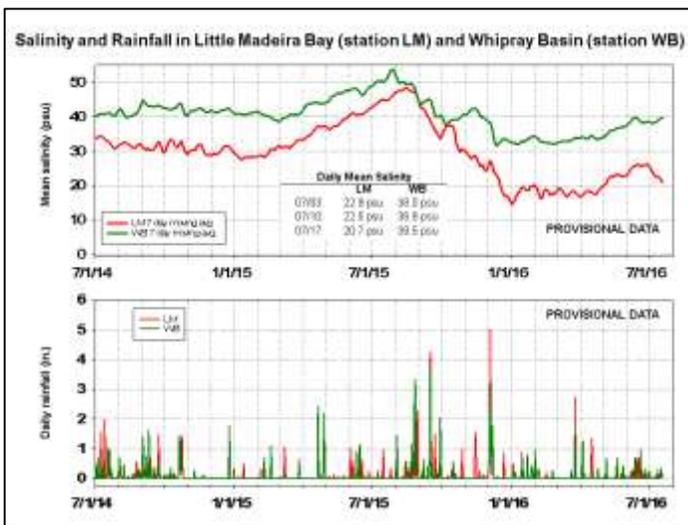
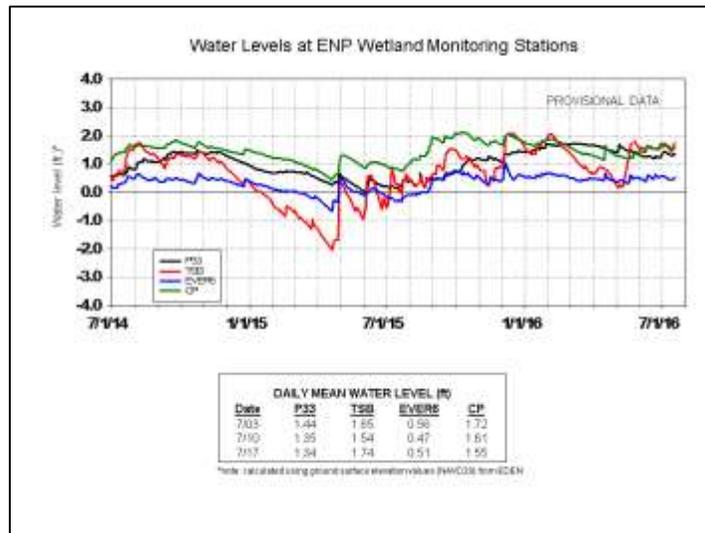
Cape Sable Seaside Sparrows: Percent dry area decreased in all subpopulations except in CSSS-C and CSSS-E. Late breeding appears to be underway.



7/10/2016: CSSS-A 4.4%; CSSS-B 33.3%; CSSS-C 4.3%; CSSS-D 4.9%; CSSS-E 4.4%; CSSS-F 32.2%

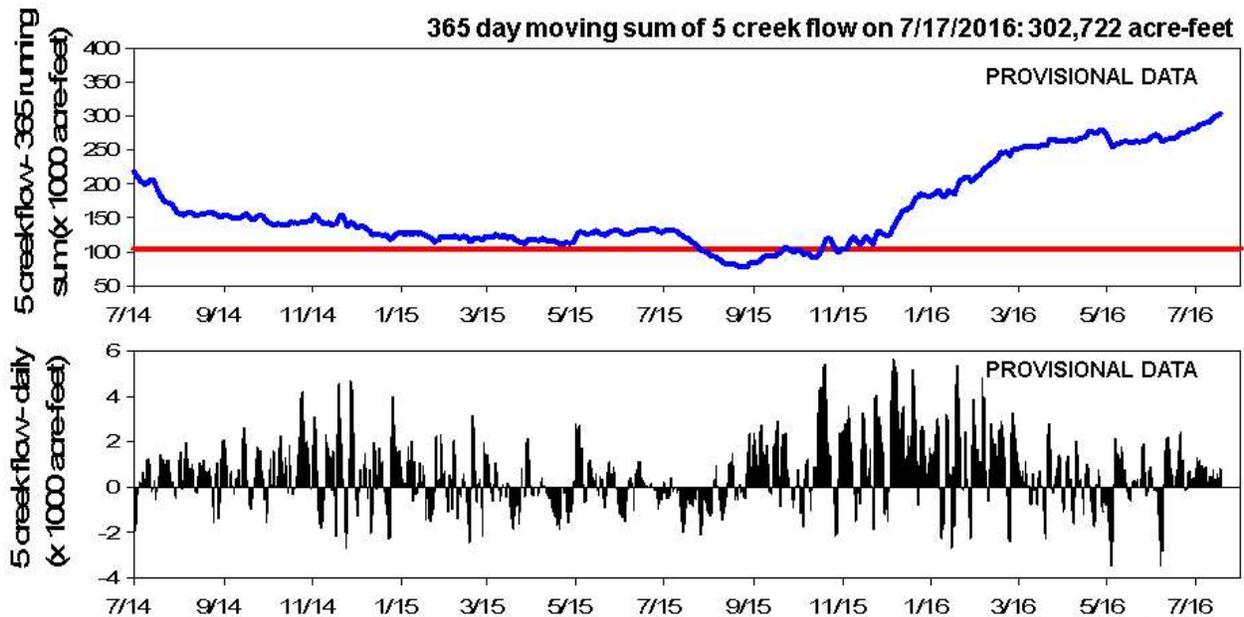
Everglades National Park (ENP) and Florida Bay: Water level changes were mixed last week with the largest change of 0.20 feet increase in northern Taylor Slough. Water levels are the same or higher than a month ago in Taylor Slough and above average by two to ten inches.

Salinities across Florida Bay range from -3 psu below average to 2 psu above average. The largest change last week was a decrease of -5.3 psu in the western nearshore embayments, corresponding to the area of highest rainfall. Daily average salinities ranged from 18 to 40 psu with the highest salinity in central Florida Bay. Both the daily and 30-day moving average salinities at the MFL sentinel site TR in the mangrove zone remain near fresh at 0.5 psu.



The 365-day running summed cumulative flow from the five creeks feeding Florida Bay increased to 302,722 acre-feet (above the average of 257,628-acre feet). Creek flow is provisional data from the USGS and is highly variable.

5 Creek Cumulative Flow and Florida Bay MFL Flow Criteria Tracking



Water Management Recommendations

- We recommend keeping water depths in southern WCA-3A below 2.5 feet throughout the wet season to protect tree island forests. The current depth at gauge 65 is 1.90 feet.
- Water levels in far northeastern WCA-3A are very shallow; additional inflow would improve ecological conditions there.
- Limit ascension rates to a maximum of 0.25 feet per week to protect habitat and wildlife, including the apple snail.
- In WCA-2A, the Active Marsh Improvement Project needs water levels to increase to little over six inches to allow for a planned burn. With depths now 4.5 inches, water levels there need to increase by approximately two inches or more over the next one to two weeks.

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

Everglades Ecological Recommendations, July 19, 2016 (red is new)

Area	Current Condition	Cause(s)	Recommendation	Reasons
WCA-1	Stages fell -0.07' to -0.12'	Rainfall, ET, management	Limit ascension rates to extent possible with a maximum of 0.25 ft/week.	Ascension rates of <0.25'/week will protect habitat and wildlife including reproducing apple snails.
WCA-2A	Stage rose 0.05'	Rainfall, ET, management	Begin wet season operations for this area, including maintaining ascension rates <0.25 ft/week. Attempt to raise water levels by 0.5 to 1 inch per week for the next 2-3 weeks to reach at least 0.5 ft depth at experimental sites for a planned burn.	Ascension rates of <0.25'/week will protect habitat and wildlife including reproducing apple snails.
WCA-2B	Stages rose 0.01' to 0.04'	Rainfall, ET, management	Follow normal seasonal practices. Limit ascension rates to extent possible with a maximum of 0.25 ft/week.	Ascension rates of <0.25'/week will protect habitat and wildlife including reproducing apple snails.
WCA-3A NE	Stage fell -0.10'	Rainfall, ET, management	Limit ascension rates to extent possible with a maximum of 0.25 ft/week.	Ascension rates of <0.25'/week will protect habitat and wildlife including reproducing apple snails.
WCA-3A NW	Stage fell -0.10'	Rainfall, ET, management		
Central WCA-3A S	Stage fell -0.02'	Rainfall, ET, management	Limit ascension rates to extent possible with a maximum of 0.25 ft/week. Water depths should remain below 2.5 feet over this upcoming wet season. When flows are changed a gradual reduction is recommended (stepping down over several days).	Moderate recession rates would benefit habitat and wildlife. Keeping depths below 2.5' is important to allow tree island vegetation to recover from stress of the recent extended inundation duration. Ascension rates of <0.25'/week will protect habitat and wildlife including reproducing apple snails.
Southern WCA-3A S	Stage rose 0.02'	Rainfall, ET, management		
WCA-3B	Stages changed -0.02' to 0.08'	Rainfall, ET, management	Follow normal seasonal practices. Limit ascension rates to extent possible with a maximum of 0.25 ft/week.	Ascension rates of 0.25'/week will protect habitat and wildlife including reproducing apple snails.
ENP-SRS	Stage rose 0.14'	ET, rainfall, topography, management	Make discharges to the Park according to the ERTTP rainfall plan.	Keep peat wet to promote native habitat and maintain wetland plant and animal communities.
ENP-CSSS habitats	S-12A and S-12B remain closed to enhance dry-down.	Rainfall, ET, management	Follow rainfall plan for releases. Adhere to ERTTP closures for S12-A and B. Gradual reduction in flows through S333, S12C and D, as possible, is recommended (stepping down over several days). Reduced flows through S333 would benefit wildlife. Follow guidance in C-111 western spreader canal project operations manual.	Provide appropriate hydrological and habitat conditions for Cape Sable Seaside Sparrow breeding.
Taylor Slough	2 to 10 inches above average	Rain, ET, inflows	Move water southward as needed	Provide freshwater buffer for ecosystems and maintain low salinity conditions downstream
FB- Salinity	-3 psu below to 2 psu above average	Rain, ET, inflows, wind	Move water southward as needed	Maintain lower salinity levels.