

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, Interim Assistant Executive Director, Executive Office Staff

FROM: SFWMD Staff Environmental Advisory Team

DATE: July 17, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Afternoon thunderstorm activity should be focused west and then over the interior over the coming week. A very typical July pattern has settled in over the area with a deep-layered high-pressure ridge located just north of Florida and an upper level trough with weak circulations embedded within it lying across the Florida peninsula. The circulations tend to migrate slowly southwestward through the upper level trough and alternate between increasing and decreasing daily thunderstorm coverage over portions of the District. One such circulation is currently off the southwest coast of Florida and should take advantage of increasing moisture over the area and generate an increase in thunderstorm coverage mainly over the interior and west this afternoon. A second upper level circulation moving in from the northwest is forecast to suppress thunderstorm development over the northern end of the District today. Expect daily thunderstorm coverage to increase Wednesday and Thursday as this second upper level circulation moves across south Florida. As the upper circulation exits to the southwest, drier air is forecast to spread back over the District so a decrease in daily thunderstorm activity is forecast Friday and Saturday. A return of some moisture and southerly steering winds should bring an increase in afternoon thunderstorm activity and steering winds should focus activity over the interior Sunday and Monday.

Kissimmee

Tuesday morning stages were 55.9 feet NGVD (0.6 feet below schedule) in East Lake Toho, 53.0 feet NGVD (0.5 feet below schedule) in Toho, and 49.9 feet NGVD (1.1 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.3 feet NGVD at S-65A and 25.9 feet NGVD at S-65D. Tuesday morning discharges were 965 cfs at S-65, 971 cfs at S-65A, 1250 cfs at S-65D and 1118 cfs S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 3.3 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.5 feet. Recommendation(s) this week: (7/14/2019) Do not increase S-65/S-65A flow today. (7/12/2019) Postpone second 150 cfs increase today (total 150 cfs). (7/11/2019) Increase S-65/S-65A by 300 cfs tomorrow (double the ramp up guidelines) in two increments of 150 cfs; Increase S-65/S-65A flow by 150 cfs today (double the ramp up guidelines). (7/10/2019) Increase S-65/S-65A flow by 150 cfs today (double the ramp up guidelines). Purpose for all recommendations is control rate of stage rise in KCH while addressing DO sag concerns.

Lake Okeechobee

Lake Okeechobee stage is 11.47 feet NGVD, increasing 0.11 feet from the previous week and 0.33 ft higher than the previous month, but still 3.0 ft below the stage one year ago. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and has been slowly approaching or running parallel to the Water Shortage sub-band, currently just 0.06 feet above. The lake remains below the bottom of the ecological envelope (currently 0.53 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD (+/- 0.5 ft). With the onset of the wet season, lake stage ascension rates are important in the continued

recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone; high ascension rates will stress newly established plants and could dramatically reduce the beneficial effects of low lake stages experienced throughout the dry season. The latest estimate of cyanobacteria bloom coverage on the lake based on satellite imagery was from July 15 and suggests cyanobacterial bloom potential remains high along the west and northern shorelines, and the bloom that has recently been drifting around the center and SW shoreline appears to have dissipated slightly and moved north west, just outside the mouth of Fish-eating Bay.

Estuaries

Total inflow to the St. Lucie Estuary averaged 813 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinities decreased throughout the estuary. The seven-day average salinity at the US1 Bridge is within the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 2784 cfs over the past week with no flow coming from the Lake. Over the past week, salinity decreased in the estuary. The 30-day moving average surface salinity is 0.3 at Val I-75 and 1.8 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass. Salinities are in the good range for adult eastern at Shell Point and Sanibel and fair range at Cape Coral. Given the current estuarine conditions, there are no ecological benefits to the upper estuary associated with freshwater releases from Lake Okeechobee, but some benefits may accrue to the areas further downstream.

Stormwater Treatment Areas

Over the past week, no Lake Okeechobee water was delivered to the STAs. The total amount of Lake releases sent to the STAs/FEBs in WY2020 (since May 1, 2019) is approximately 7,200 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 247,000 acre-feet. All STA cells are at or above target depths. STA-1W Northern Flow-way is offline for STA-1W Expansion project construction activities and STA-5/6 Flow-ways 2 and 3 are offline for the Restoration Strategies project to grade non-effective treatment areas. Operational restrictions are in place in STA-5/6 Flow-ways 1 and 4 to facilitate the Restoration Strategies grading project in Flow-ways 2 and 3, in STA-1E Western Flow-way following levee repairs in the West Distribution Cell, and in STA-1E Central Flow-way and STA-2 Flow-way 3 for vegetation management activities. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to STA-2.

Everglades

With WCA-2A being the exception, increases in stage were consistent across the Everglades over the last week, and no gauges rose faster than 0.25 feet as recommended. Downstream stages in Taylor Slough are currently 4 inches higher than the historical average for this time of year, and salinities downstream in Florida Bay dropped by 4 psu. Cape Sable Seaside Sparrows continue breeding activity.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 1.96 inches of rainfall in the past week and the Lower Basin received 1.77 inches (SFWMD Daily Rainfall Report 7/15/2019).

Upper Kissimmee Basin

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

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

Report Date: 7/16/2019

Water Body	Structure	7-day Average Discharge (cfs) ¹	Stage Monitoring Site ²	Lake Stage (feet)	Schedule Type ³	Schedule Stage (feet)	Daily Departure (feet)						
							7/14/19	7/7/19	6/30/19	6/23/19	6/16/19	6/9/19	6/2/19
Lakes Hart and Mary Jane	S-62	186	LKMJ	60.1	R	60.0	0.1	0.0	-0.4	-0.3	-0.5	-0.7	-0.6
Lakes Myrtle, Preston, and Joel	S-57	0	S-57	60.3	R	61.0	-0.7	-0.9	-1.2	-1.1	-1.1	-1.3	-1.2
Alligator Chain	S-60	0	ALLI	62.5	R	63.2	-0.7	-0.8	-1.0	-1.0	-1.0	-1.3	-1.2
Lake Gentry	S-63	0	LKGT	59.7	R	61.0	-1.3	-1.4	-1.5	-1.4	-1.4	-1.6	-1.5
East Lake Toho	S-59	411	TOHOE	55.8	R	56.5	-0.7	-0.7	-1.0	-1.1	-1.4	-1.6	-1.5
Lake Toho	S-61	1,495	TOHOW, S-61	53.1	R	53.5	-0.4	-0.5	-0.8	-1.0	-1.1	-1.4	-1.5
Lakes Kissimmee, Cypress, and Hatchineha	S-65	548	KUB011, LKIS5B	49.9	R	51.0	-1.1	-1.6	-1.4	-1.4	-1.9	-2.1	-2.0

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

² Names of in-lake monitoring sites and structures used to determine lake stage; if more than one site is listed, an average is reported.

³ A = projected ascension line, R = USACE regulation schedule, S = temporary recession target line, T = temporary schedule, N/A= not applicable or data not available.
DATA ARE PROVISIONAL

Lower Kissimmee Basin

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

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

Report Date: 7/16/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days ¹								5/12/19
		7/14/2019	7/14/19	7/7/19	6/30/19	6/23/19	6/16/19	6/9/19	6/2/19	5/26/19	5/19/19	
Discharge (cfs)	S-65	872	548	287	400	106	165	284	319	596	984	1,014
Discharge (cfs)	S-65A ²	992	749	387	673	1,014	255	215	244	456	815	823
Discharge (cfs)	S-65D ²	1,230	1,020	1,288	1,801	975	290	222	329	706	920	795
Headwater Stage (feet NGVD)	S-65D ²	25.90	25.81	25.70	25.84	25.80	25.84	25.78	25.79	25.80	25.82	25.78
Discharge (cfs)	S-65E ²	1,161	944	1,158	1,606	903	331	208	313	591	810	703
Discharge (cfs)	S-67	96	97	92	62	96	22	0	0	0	79	102
DO (mg/L) ³	Phases I & II/III river channel	3.2	3.3	1.8	0.0	3.0	5.9	5.7	6.0	6.7	5.9	5.9
Mean depth (feet) ⁴	Phase I floodplain	0.50	0.46	0.46	0.82	0.39	0.13	0.06	0.07	0.11	0.16	0.15

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

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

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

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

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

KCOL Hydrographs (through Sunday midnight)

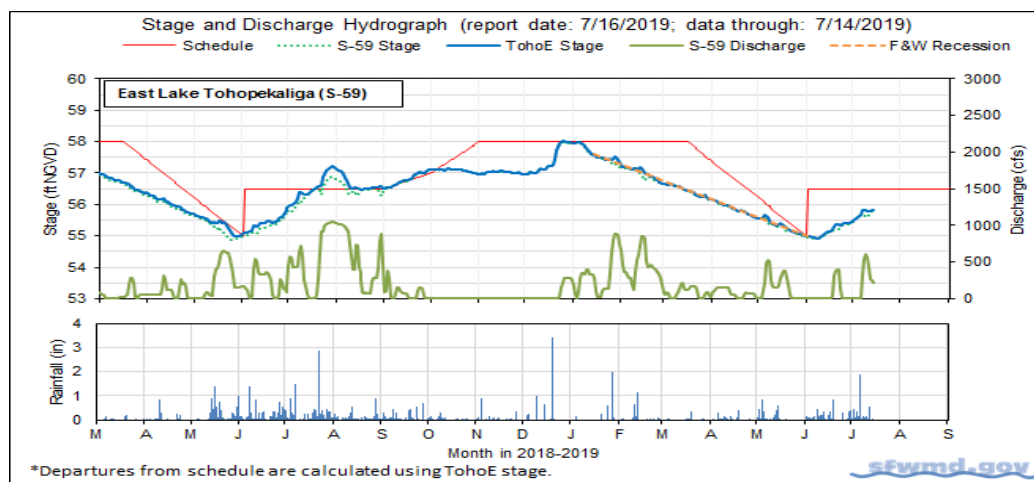


Figure 1.

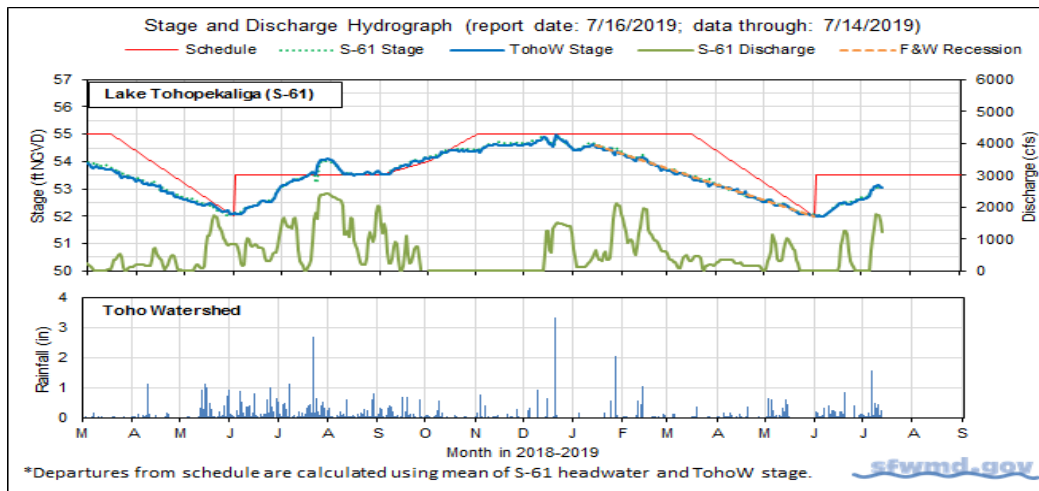


Figure 2.

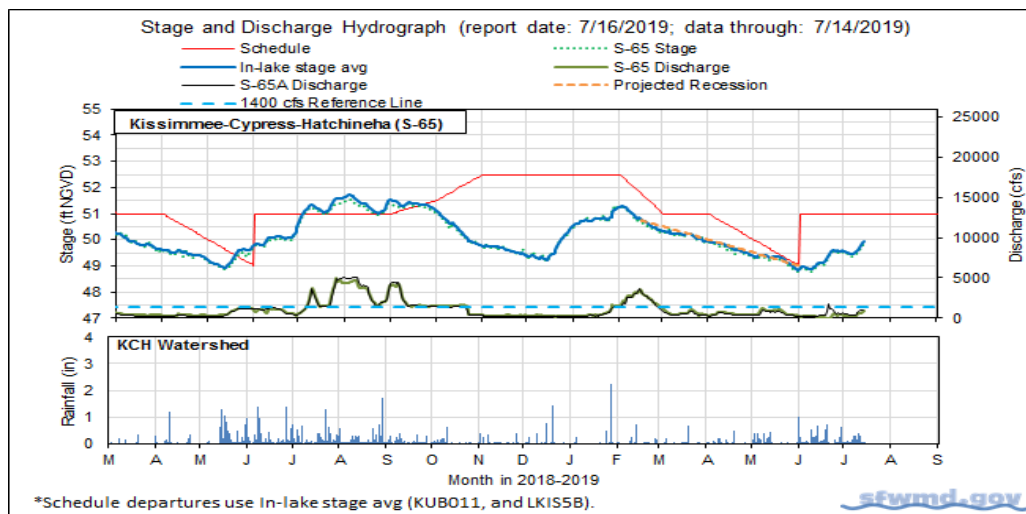


Figure 3.

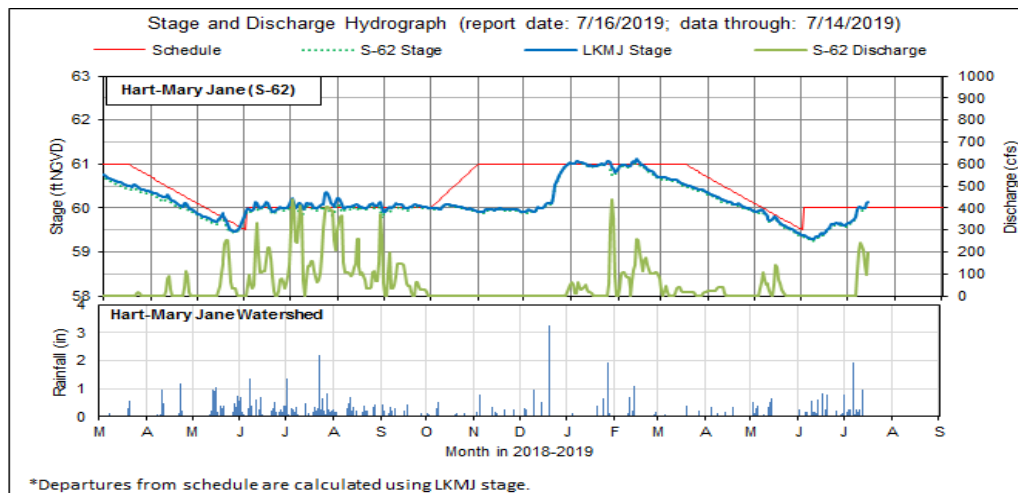


Figure 4.

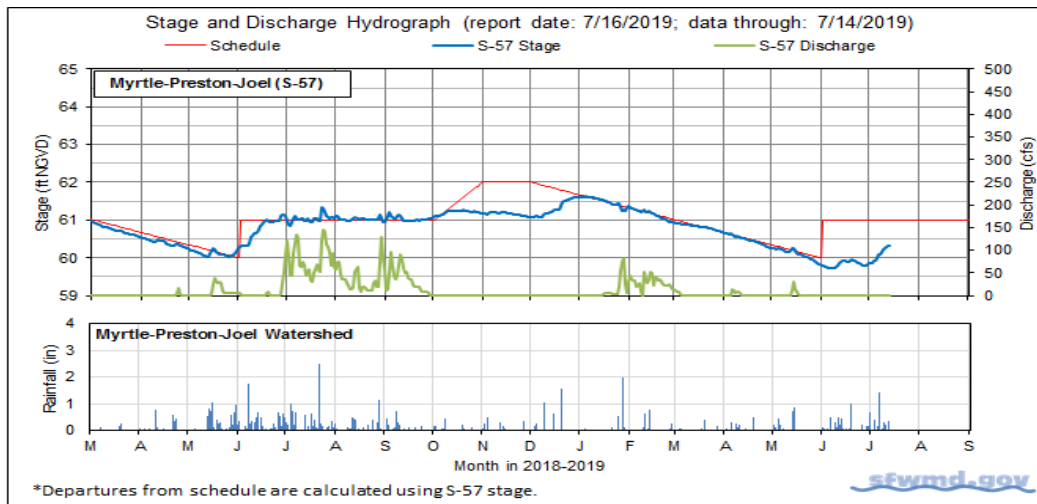


Figure 5.

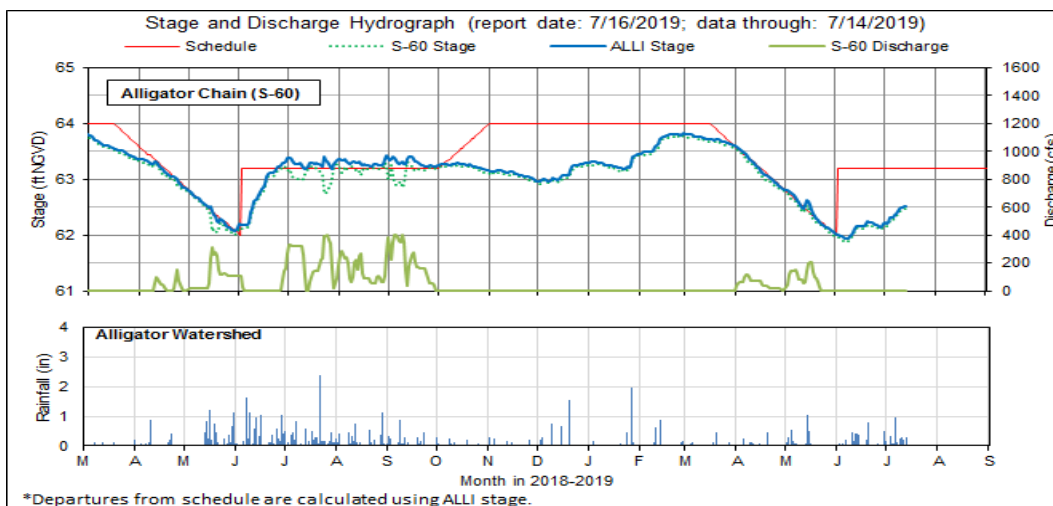


Figure 6.

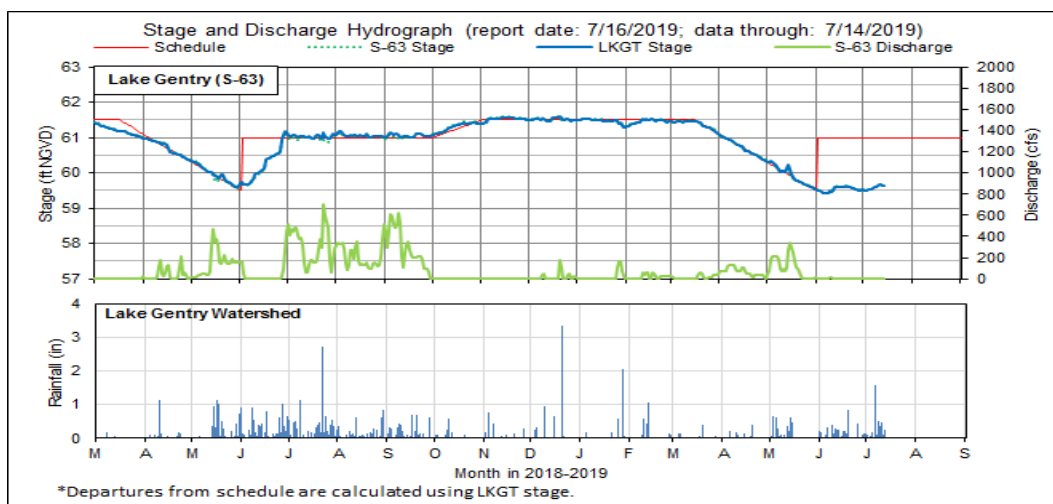


Figure 7.

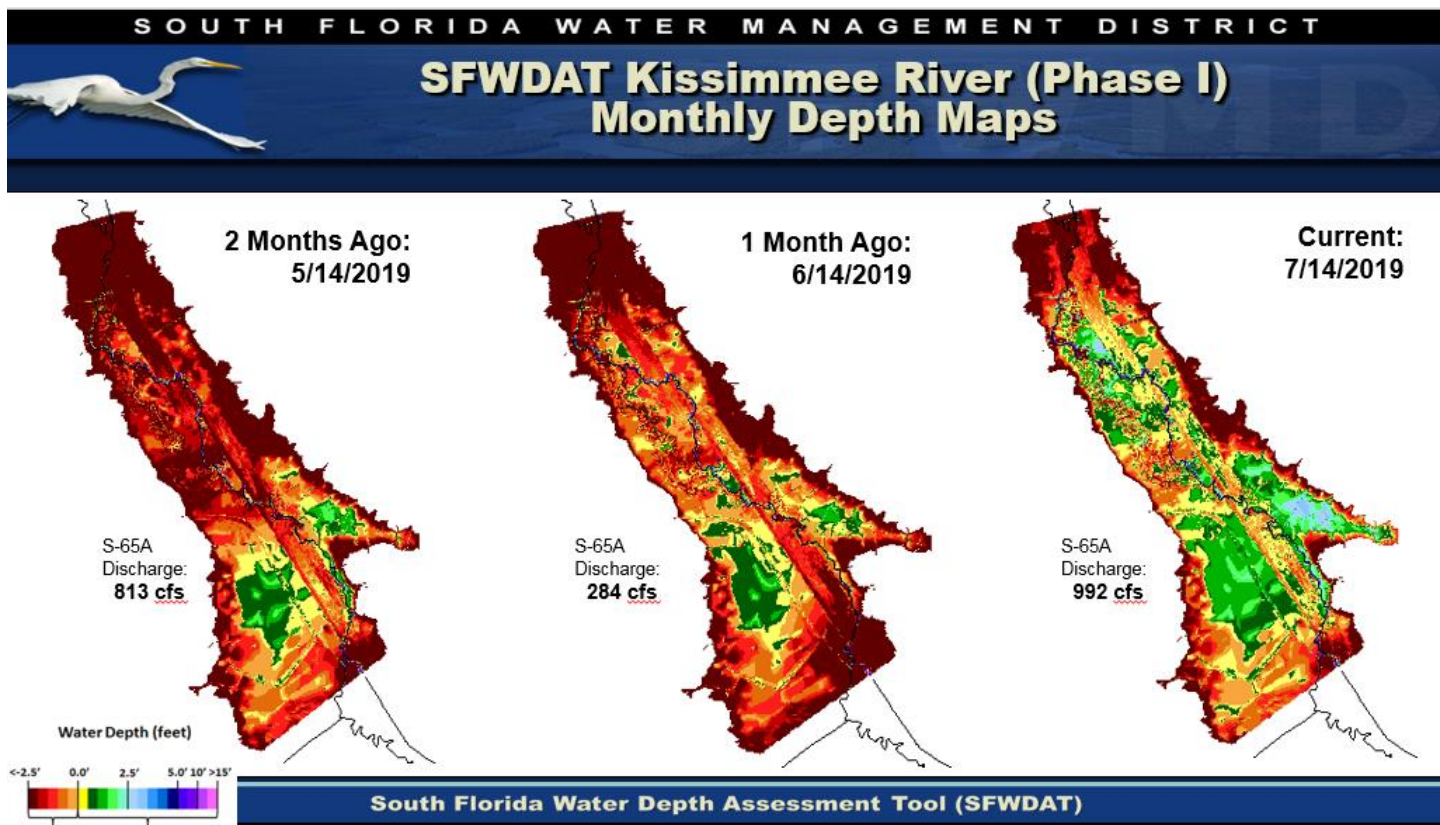


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

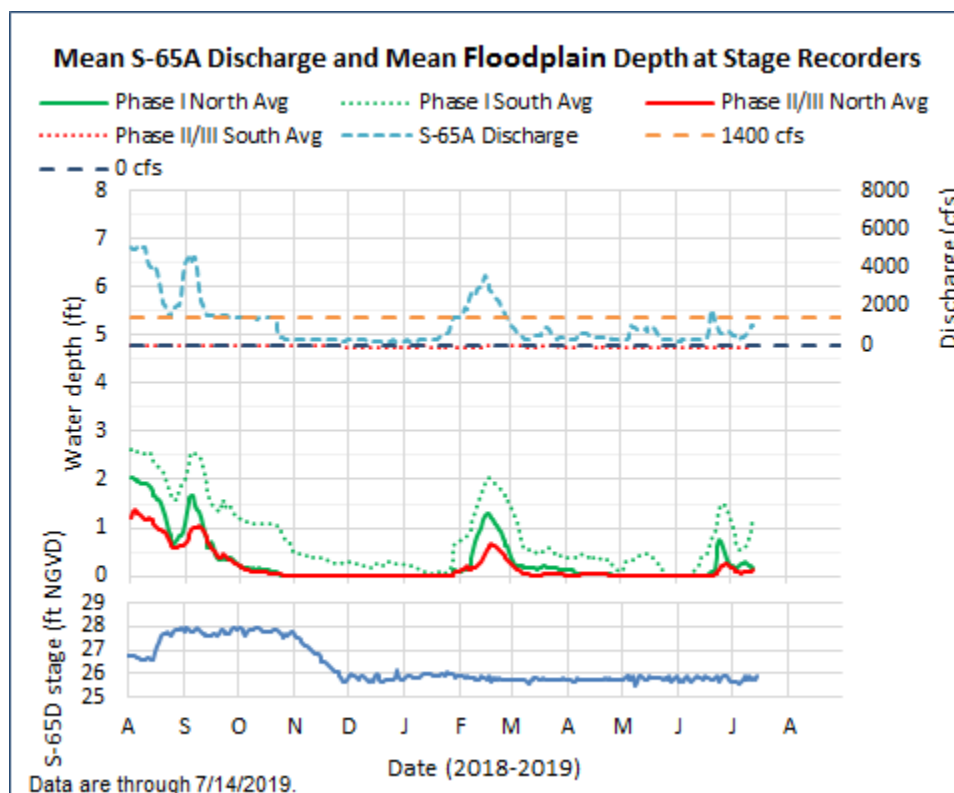
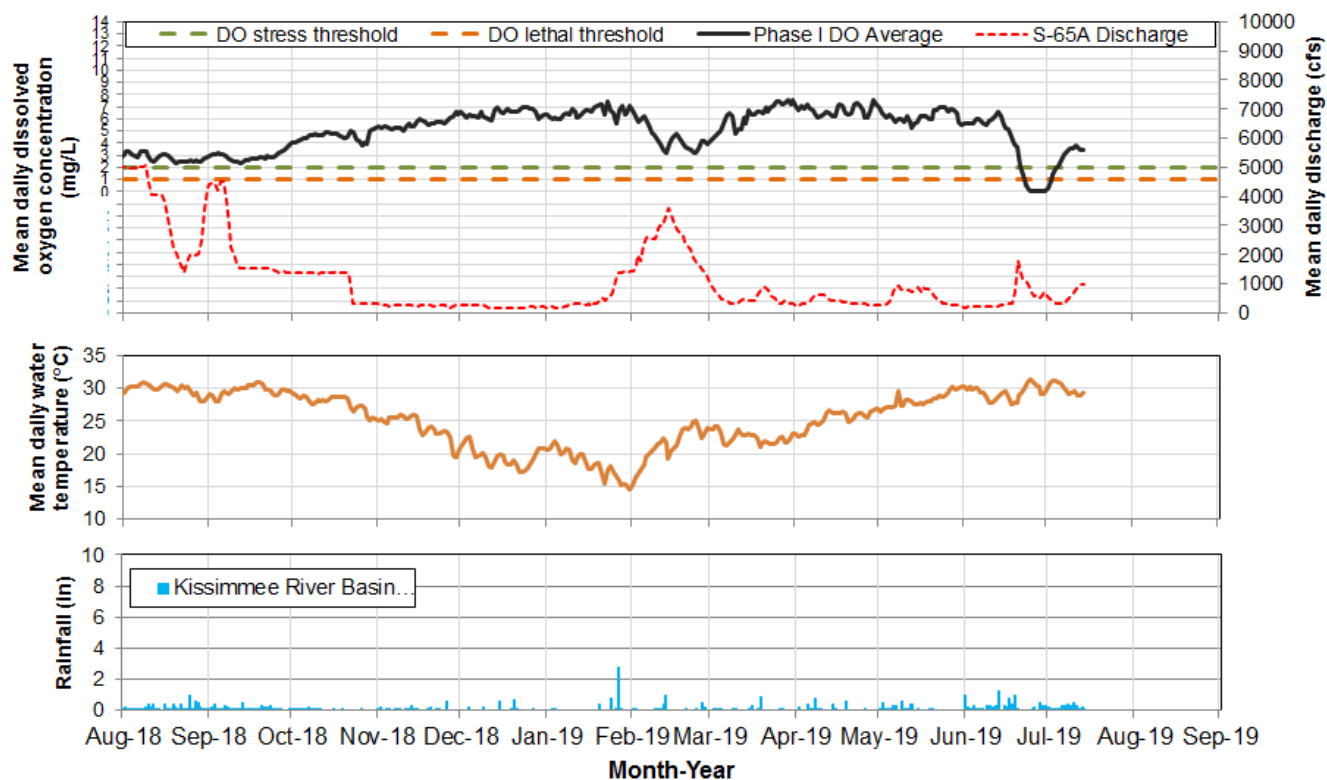


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.



Report Date: 7/16/2019; data are through: 7/14/2019.

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

Water Management Recommendations

Kissimmee Basin Adaptive Recommendations and Operational Actions

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
7/14/2019	Do not increase S-65/S-65A flow today	Control rate of stage rise in KCH while addressing DO sag concerns.	Implemented	SFWMD Water Management/KB Ops	7/16/2019
7/12/2019	Postpone second 150 cfs increase today (total 150 cfs).	Control rate of stage rise in KCH while addressing DO sag concerns.	Implemented	KB Ops	7/16/2019
7/11/2019	Increase S-65/S-65A by 300 cfs tomorrow (double the rampup guidelines) in two increments of 150 cfs	Control rate of stage rise in KCH while addressing DO sag concerns.	Implemented	KB Ops	7/16/2019
7/11/2019	Increase S-65/S-65A flow by 150 cfs today (double the rampup guidelines).	Control rate of stage rise in KCH while addressing DO sag concerns.	Implemented	KB Ops	7/16/2019
7/10/2019	Increase S-65/S-65A flow by 150 cfs today (double the rampup guidelines).	Control rate of stage rise in KCH while addressing DO sag concerns.	Implemented	KB Ops	7/16/2019
7/8/2019	No new recommendations.		N/A		7/9/2019
6/27/2019	Continue discharge reductions at S-65A at up to double the normal rampdown rate, as possible.	Reduce river channel stage to allow DO recovery.	TBD	KB Ops	7/2/2019
6/27/2019	Manage S65 discharge to slow stage ascension to the extent possible.	Slow the rate of stage ascension in KCH.	TBD	KB Ops	7/2/2019
6/24/2019	Continue discharge reductions at S-65A at up to double the normal rampdown rate, as possible.	Reduce river channel stage to allow DO recovery.	Implemented	KB Ops	6/25/2019
6/21/2019	Reduce discharge at S-65A to below 1400 cfs as soon as possible.	Reduce chance of DO crash given the need for continued high discharge.	Implemented	KB Ops	6/25/2019
6/19/2019	Start flood control measures as headwater stage at S-65A reaches 47 ft	Avoid flooding in Pool A.	Implemented (flow increased to 2000 cfs)	SFWMD Water Management/KB Ops	6/25/2019
6/17/2019	If needed, double rates of discharge increase for S-65/S-65A up to 150 cfs/day.	Slow rate of rise in KCH if necessary.	TBD	KB Ops	6/18/2019
6/17/2019	Increase flow at S-61.	Slow Lake Toho ascension rate	Implemented	KB Ops	6/18/2019
6/13/2019	Increase discharge at S-65A. Double the rate of discharge increase if necessary to maintain headwater at S-65A.	Purpose: Control stage in Pool A due to heavy rain overnight in Pool A basin.	Implemented	Water Management/KB Ops	6/18/2019
6/1/2019	Begin implementation of the 2019 Wet Season Discharge Plan for S-65/S-65A (see figure).	Provide variable flow from S-65/S-65A to balance Kissimmee River and Headwaters Lakes objectives, including Kissimmee River floodplain inundation, moderate rates of change in discharge, and controlled rate of stage rise in the lakes.	Planned	KB Ops	6/11/2019
5/31/2019	Reduce S-65 flow by 100 cfs over 2 days (5/31 and 6/1) to about 280 cfs.	Slow rate of stage decline in KCH while sustaining about 150 cfs at S-65A. (Note: Unexpected rainfall late on 6/1 allowed S-65A discharge to be returned to about 220 cfs on 6/2).	Implemented	KB Ops/SFWMD Water Management	6/4/2019
5/28/2019	No new recommendations.		N/A		5/28/2019
5/20/2019	No new recommendations.		N/A		5/21/2019
5/13/2019	No new recommendations.		N/A		5/14/2019
5/6/2019	Due to the rainfall, increase S65-A to 1000 cfs today in two increments and increase flow at S-65 accordingly. We will reassess the rise in KCH stage tomorrow 5/7.	Short-term goals: try to keep S65-A discharge at or below 1000 cfs for KR fish sampling this week and next, while keeping the reversal in KCH less than about 0.4 ft.	Implemented	KB Ops	5/7/2019

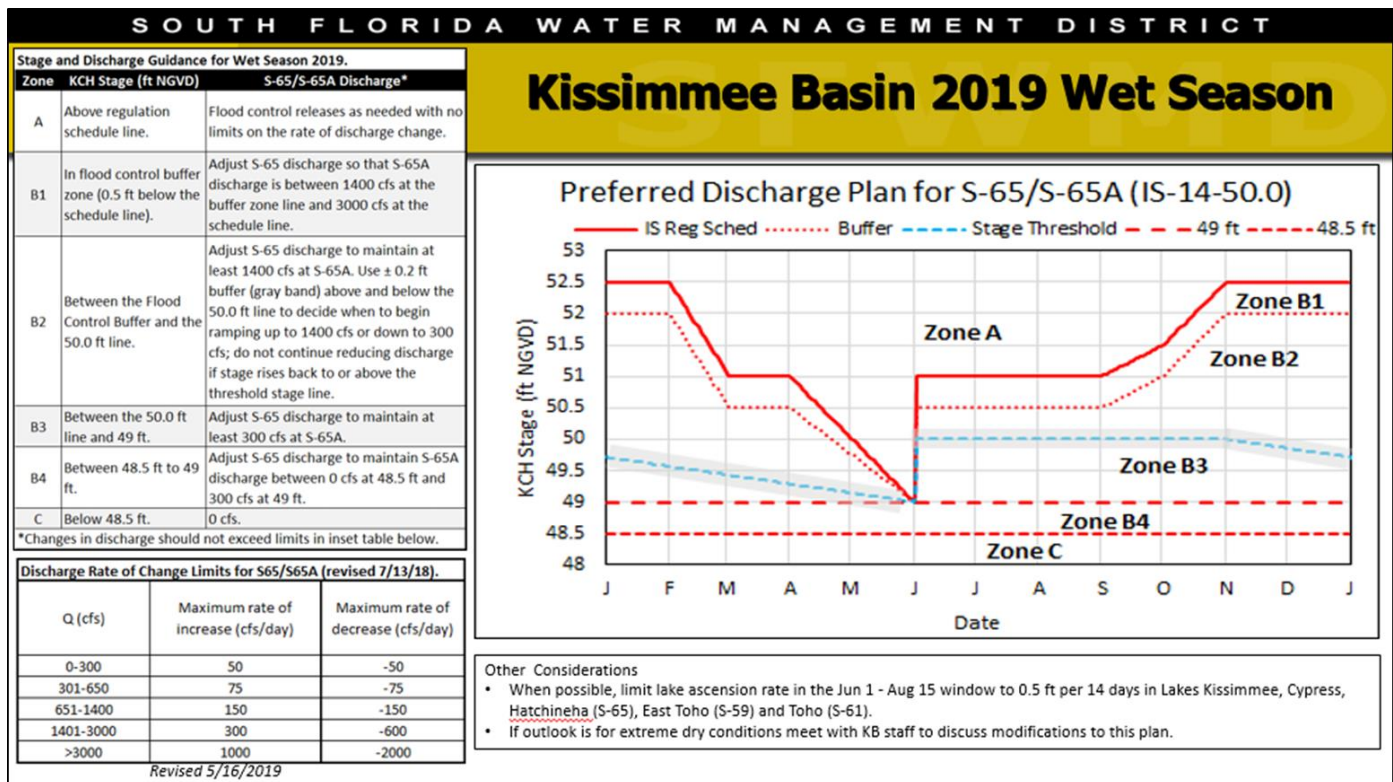


Figure 11. The 2019 Wet Season Discharge Plan for S-65/S-65A.

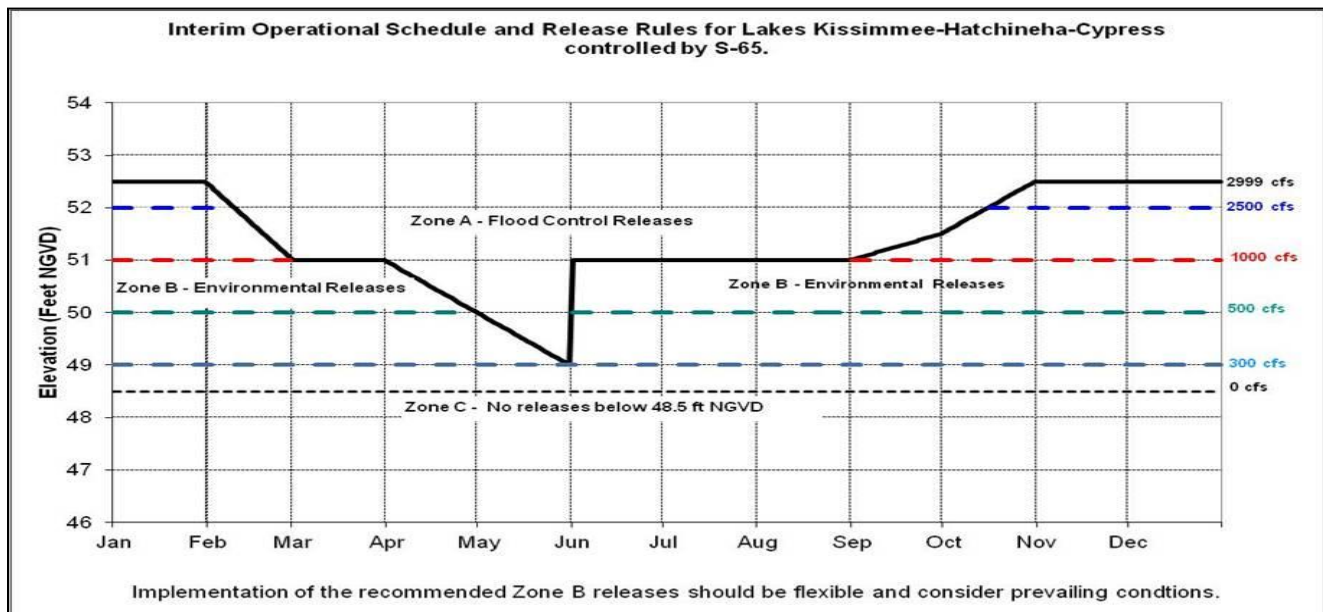


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

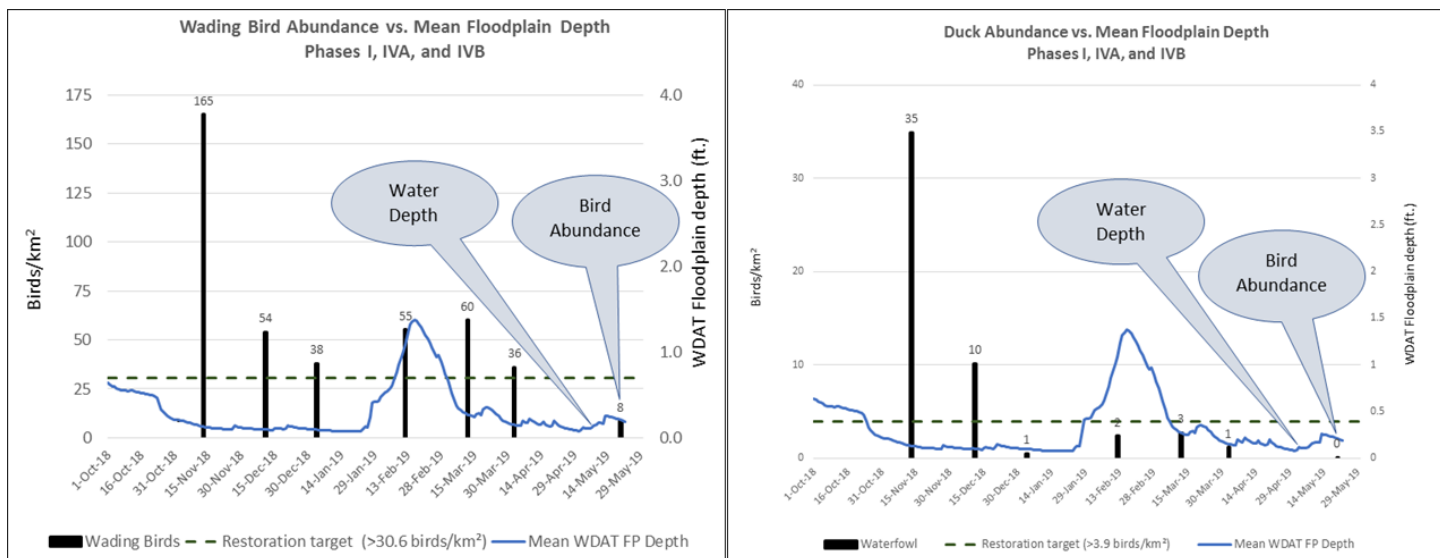


Figure 13. Kissimmee River Wading Bird and Waterfowl Surveys from November 2018 to May 2019.

Table 3. Upper Kissimmee Basin Snail Kite Survey Update
Survey 4: May 19-21, 2019

WATERBODY	KITES	TOTAL NESTS	SUCCESSFUL	ACTIVE
East Toho	2	4	0	2
Toho	97	55	19	11
Kissimmee	225	55	7	30
KCOL Total	324	114	26	43

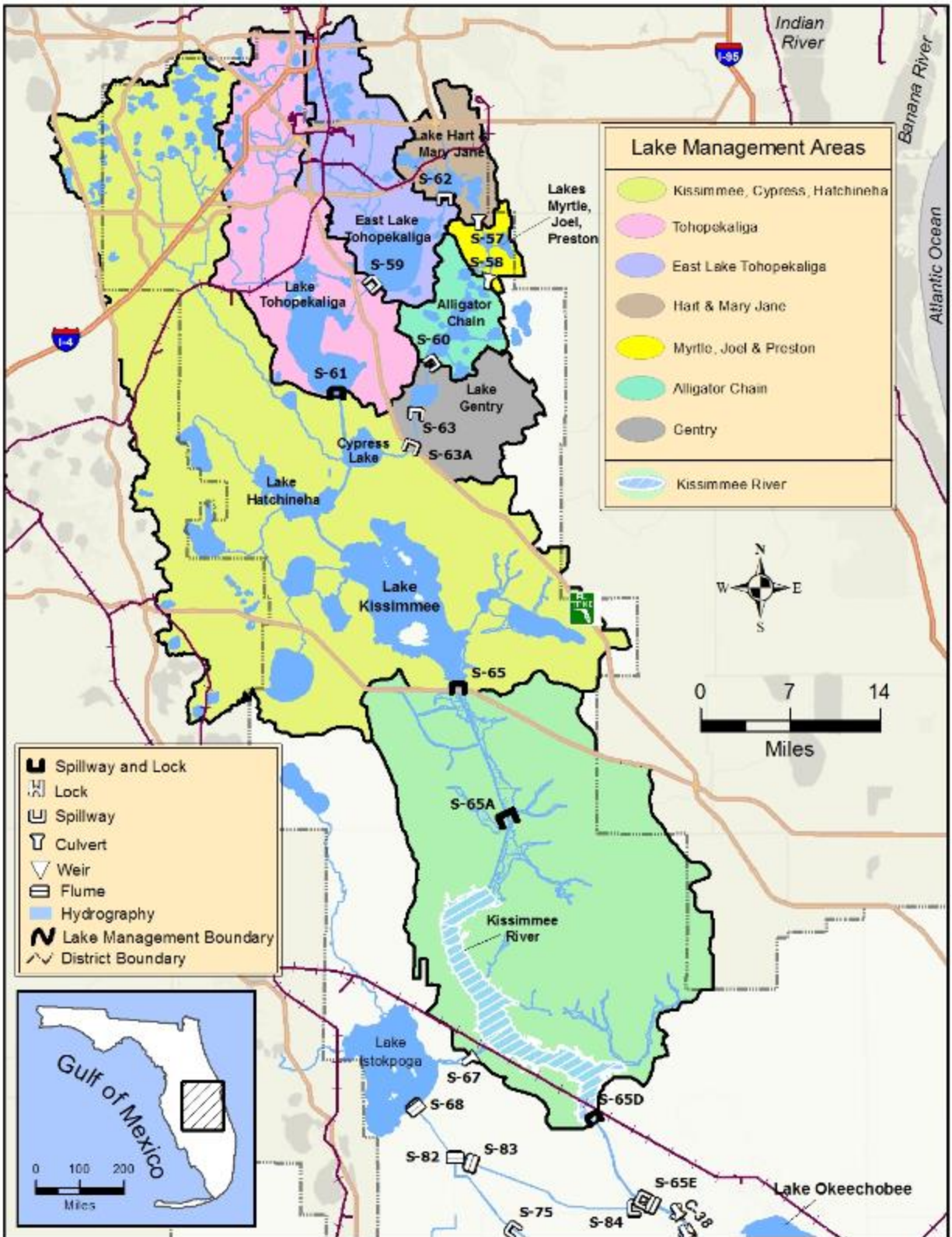


Figure 14. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 11.47 feet NGVD for July 15, 2019 increasing 0.11 feet from the previous week. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and three perimeter stations (S-308, S-4 and S-133). The Lake is now 0.33 feet higher than a month ago and 3.0 feet lower than a year ago (Figure 1) when stages were about 1.5 feet higher than the top of the preferred ecological envelope (Figure 2). The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is currently 0.06 feet above the Water Shortage sub-band after (Figure 3). Lake stage is currently at the lowest levels for this time of year since 2011 but are nearly 1.5 feet above those stages (Figure 4). According to RAINDAR, during the week of July 9 to July 15, 2019, 1.44 inches of rain fell directly over the Lake, compared to 1.27 inches the previous week. Most of the watershed received similar amounts of rainfall, between 1.0 – 1.5 inches, while the east basins received slightly less, generally between 0.5 – 1.0 inches (Figure 5).

The average daily inflows (minus rainfall) to the Lake increased slightly from the prior week, going from 1,396 cfs to 1,790 cfs. The inflows from the Kissimmee River (S-65E) were similar to the prior week at 1,003 cfs, while those from Lake Istokpoga (via S-84 and S71) increased, going from 264 cfs to 530 cfs (Table 1).

There were no outflows from the Lake over the past week. Outflows (minus evapotranspiration) from the previous week were entirely south through the S-350 structures and went from 513 cfs to zero this past week (Table 1). The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation was similar to the previous week at 0.16 inches.

Total lake inflows and outflows for the past week are detailed in Table 1, as well as the approximate change in lake stage from each major structure's total flows over the period. Figure 6 shows the combined average daily cfs for inflows and outflows for the Lake over the past eight weeks. These data are provisional and are subject to change.

The most recent viable satellite imagery (July 15, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel OLCI sensor data showed bloom potential remains high along the west and northern shorelines, and the bloom that has recently been drifting around the center and SW shoreline appears to have dissipated slightly and moved north west, just outside the mouth of Fish-eating Bay (Figure 7). For this time of year, bloom conditions appear better than they have been since at least 2016, based on comparison of satellite imagery from similar dates (Figure 8).

Water Management Recommendations

Lake Okeechobee stage is 11.47 feet NGVD, increasing 0.11 feet from the previous week and 0.33 ft higher than the previous month, but still 3.0 ft below the stage one year ago. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and has been slowly approaching or running parallel to the Water Shortage sub-band, currently just 0.06 feet above. The lake remains below the bottom of the ecological envelope (currently 0.53 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD (+/- 0.5 ft). With the onset of the wet season, lake stage ascension rates are important in the continued recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone; high ascension rates will stress newly established plants and could dramatically reduce the beneficial effects of low lake stages experienced throughout the dry season. The latest estimate of cyanobacteria bloom coverage on the lake based on satellite imagery was from July 15 and suggests cyanobacterial bloom potential remains high along the west and northern shorelines, and the bloom that has recently been drifting around the center and SW shoreline appears to have dissipated slightly and moved north west, just outside the mouth of Fish-eating Bay.

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

INFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-65E & S-65EX1	1047	1003	0.5
S-71 & S-72	20	71	0.0
S-84 & S-84X	244	459	0.2
Fisheating Creek	35	58	0.0
S-154	0	0	0.0
S-191	6	23	0.0
S-133 P	0	23	0.0
S-127 P	0	26	0.0
S-129 P	0	25	0.0
S-131 P	4	17	0.0
S-135 P	22	33	0.0
S-2 P	0	0	0.0
S-3 P	0	0	0.0
S-4 P	0	0	0.0
L-8 Backflow	18	51	0.0
Rainfall	2628	3001	1.4
Total	4023	4791	2.3

OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-77	0	0	0.0
S-308	0	0	0.0
S-351	280	0	0.0
S-352	12	0	0.0
S-354	221	0	0.0
L-8 Outflow			
ET	2193	2387	1.1
Total	2707	2387	1.1

Provisional Data

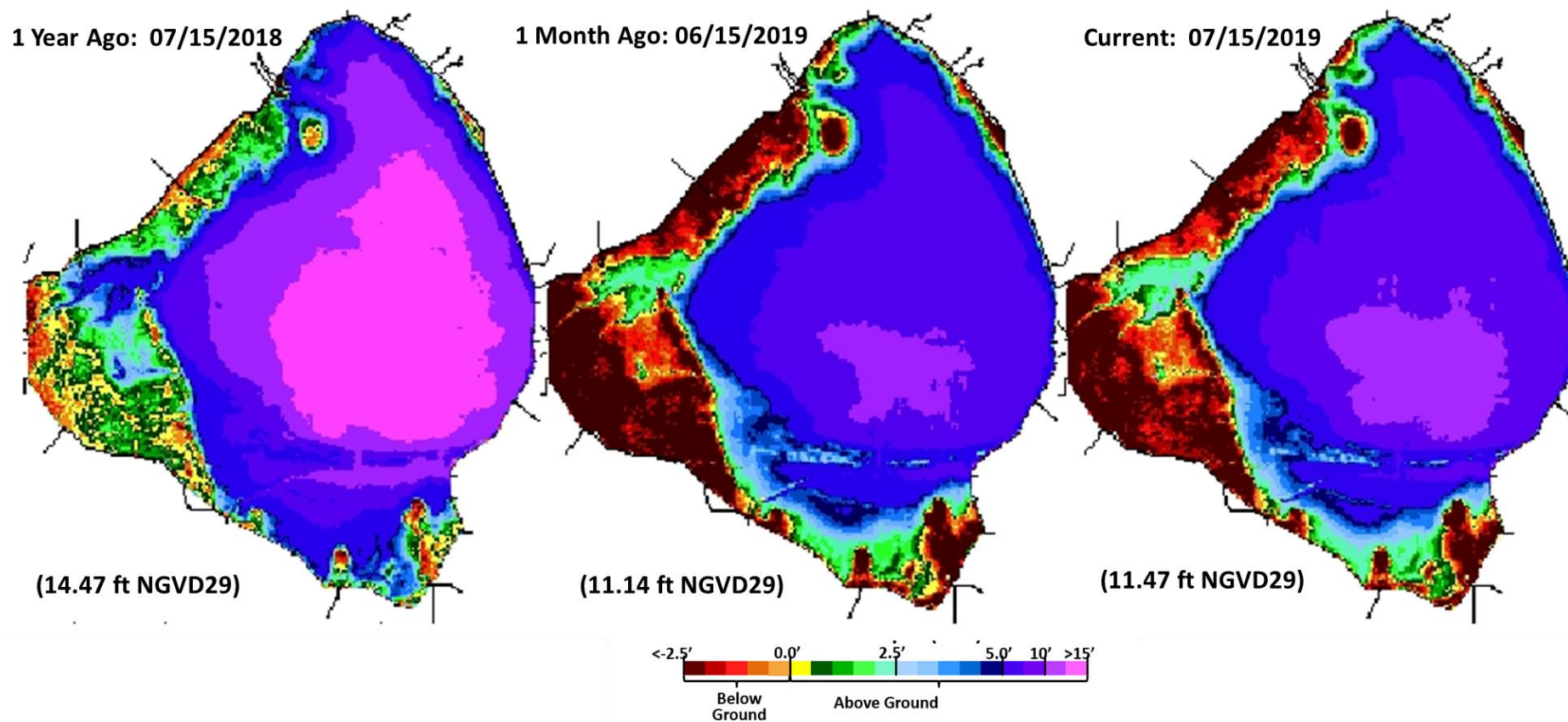


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

Lake Okeechobee Stage vs Ecological Envelope

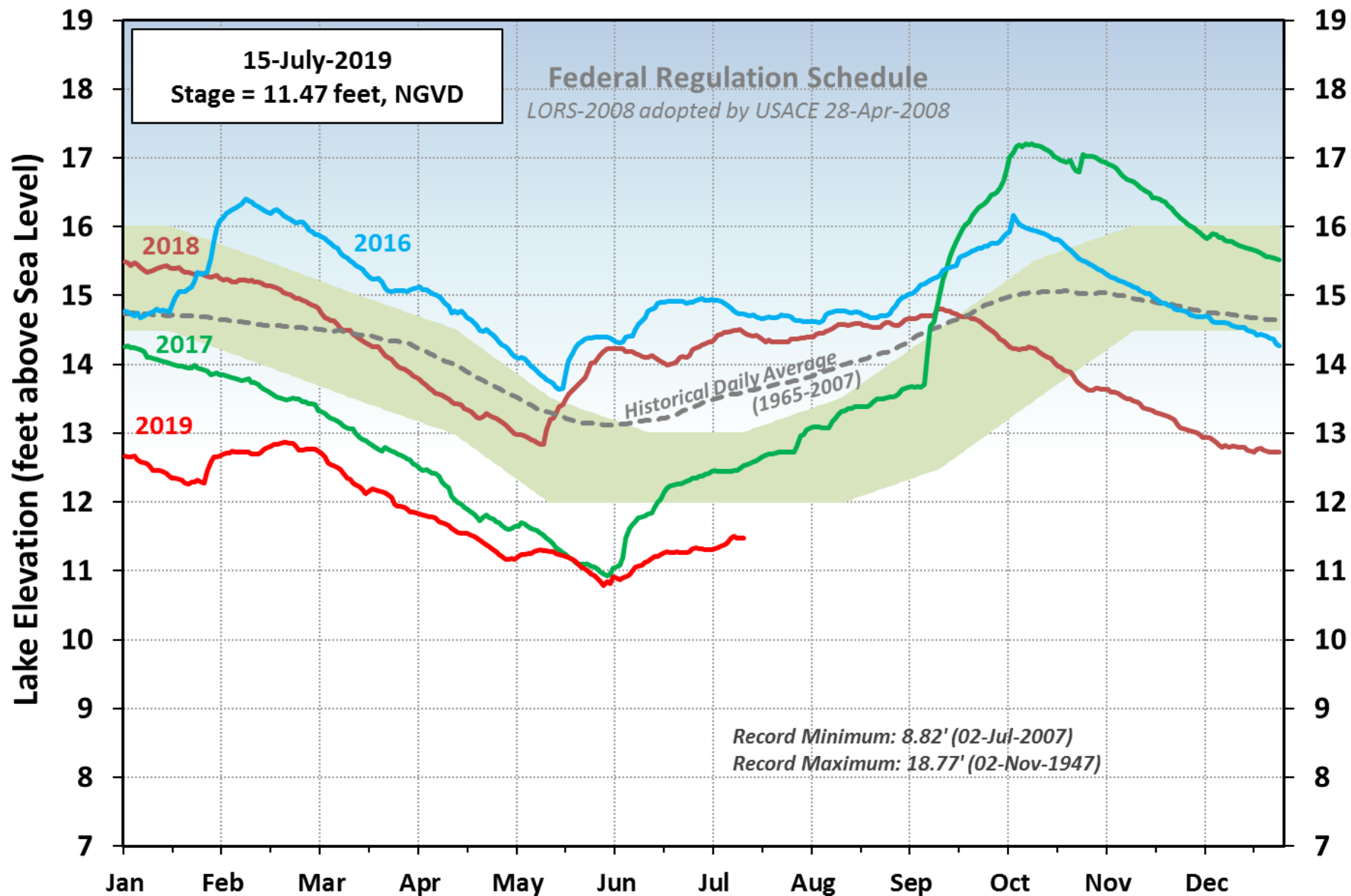
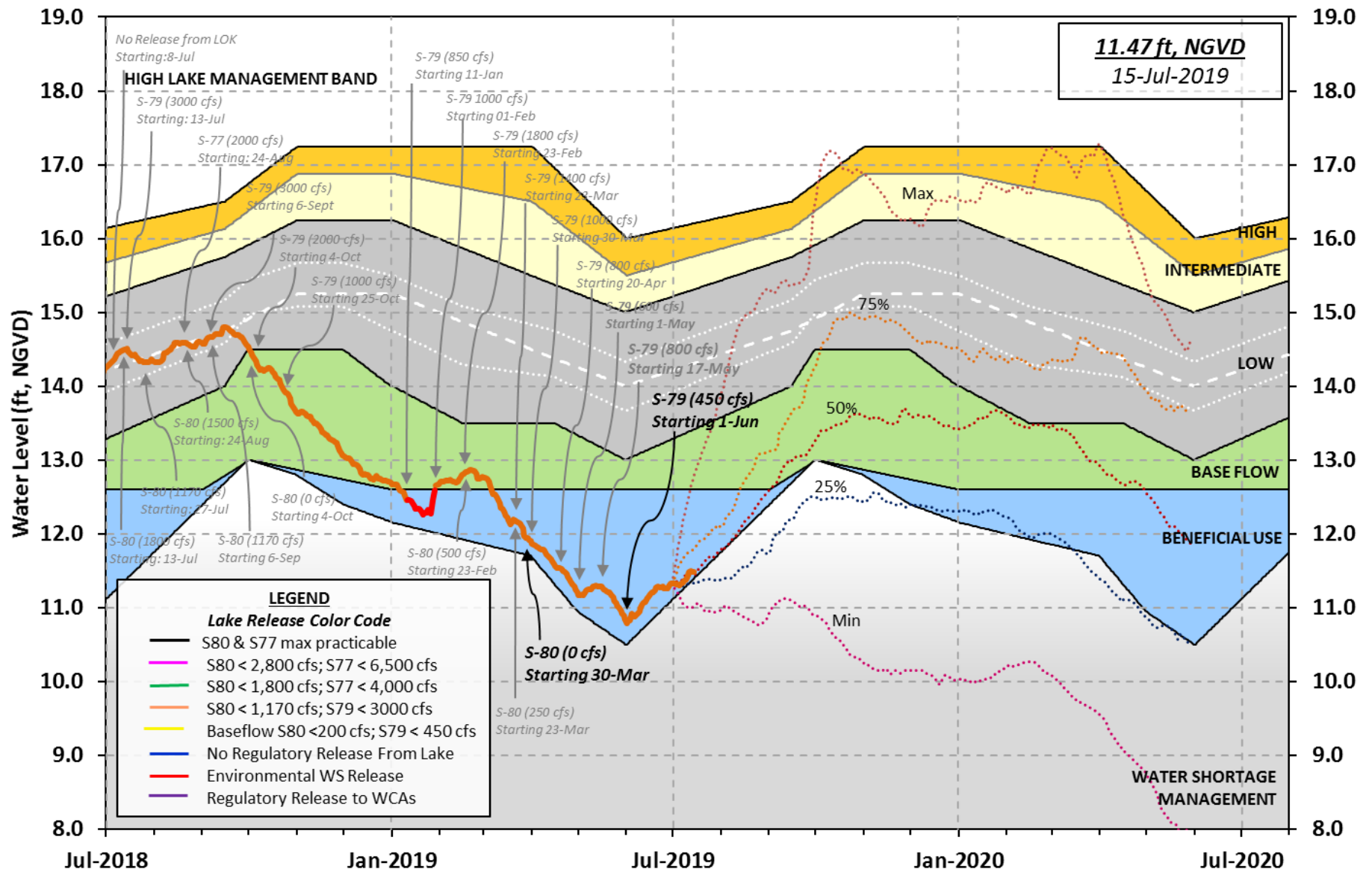


Figure 2. Select annual stage hydrographs for Lake Okeechobee in comparison to the Ecological Envelope.

Lake Okeechobee Water Level History and Projected Stages



LORS-2008
Adopted by USACE 28-April-2008

Projected Stage Percentiles From
SFWMD-HESM Position Analysis

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

Lake Okeechobee Water Level Comparison

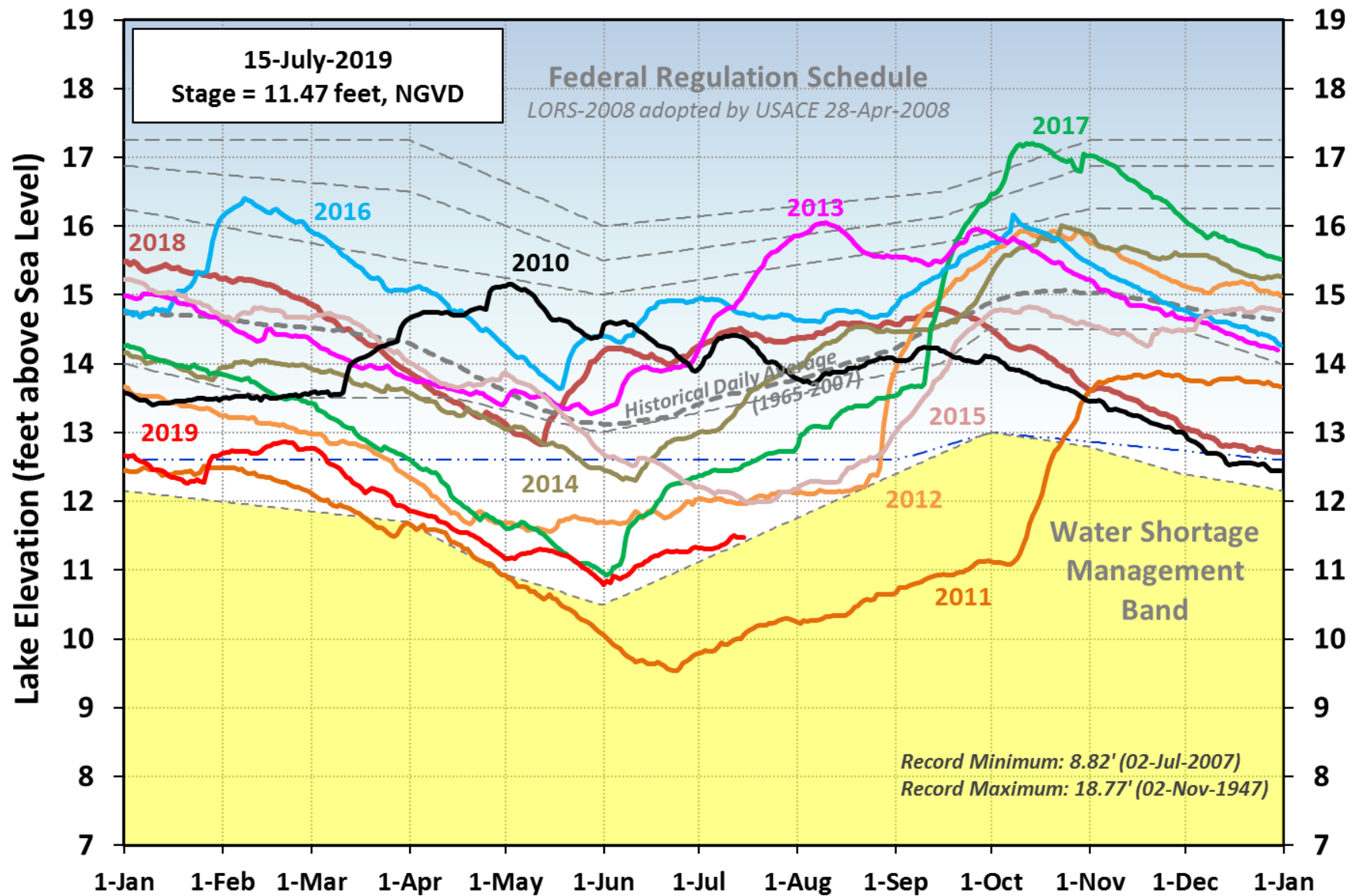


Figure 4. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

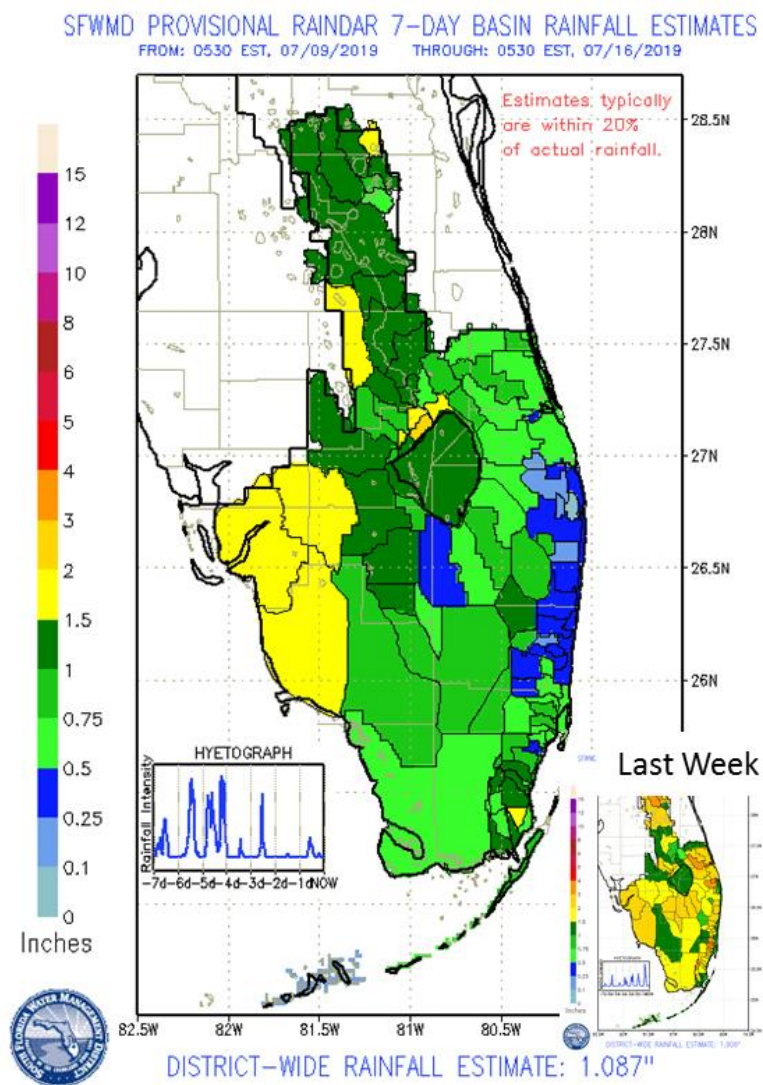


Figure 5. Rainfall estimates by basin.

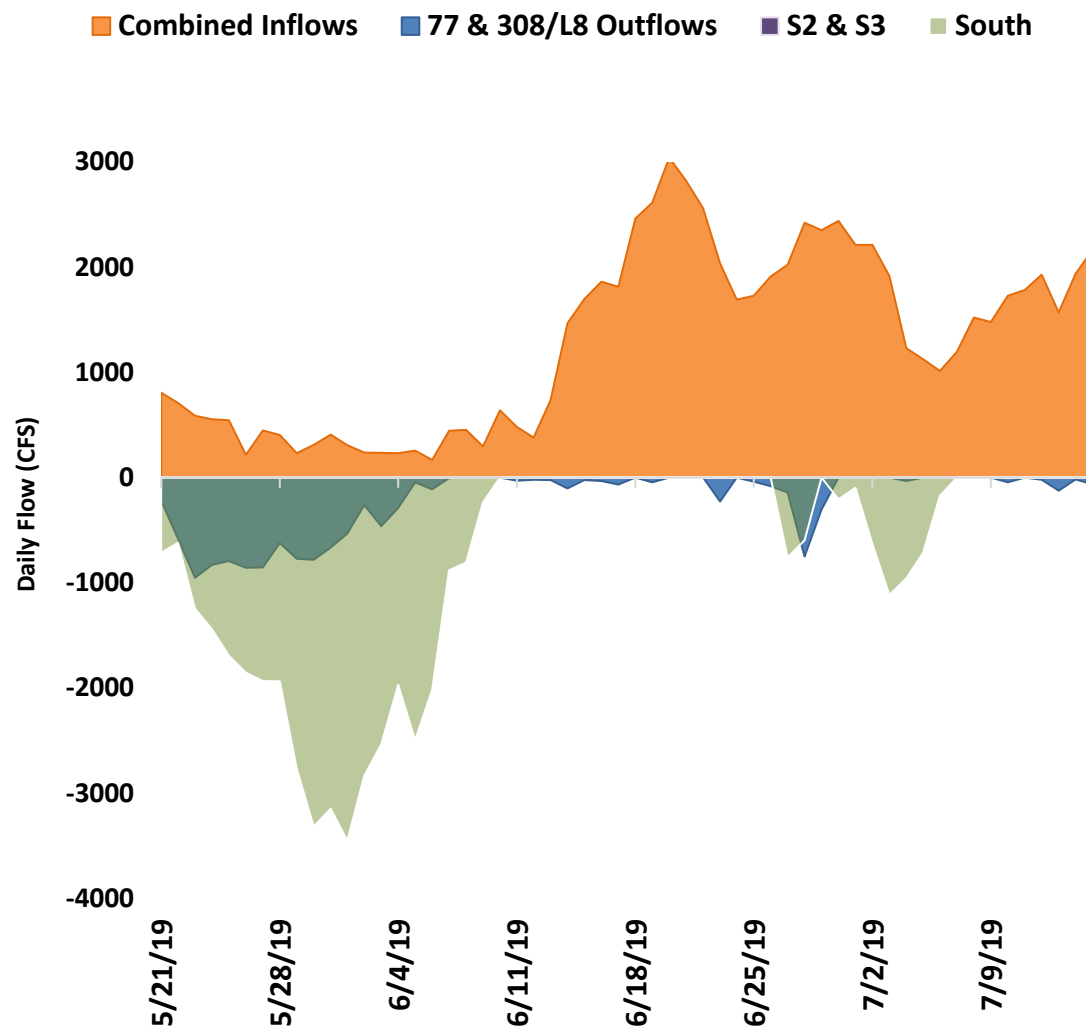


Figure 6. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive and negative, respectively, for visual purposes. Outflows through the S-77 and S-308 structures are shown based on their downstream gauges to account for lock openings for navigation.

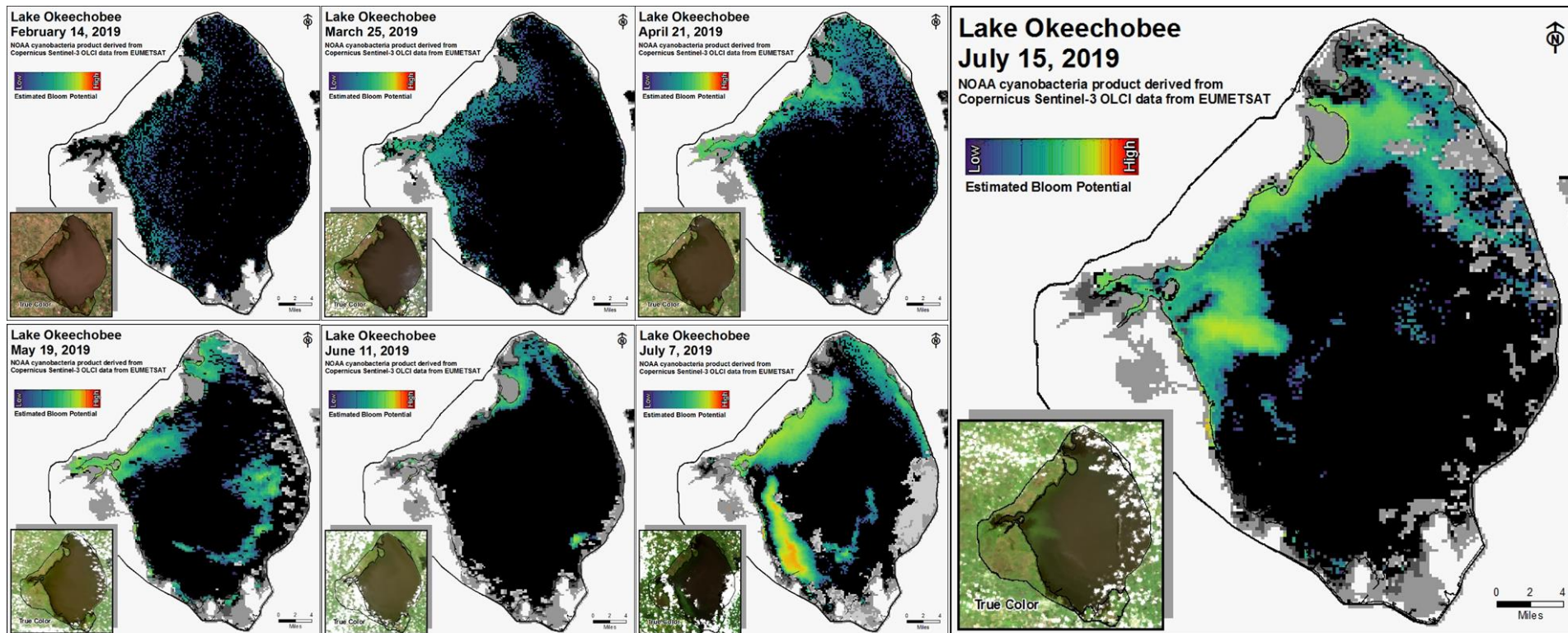


Figure 7. Potential for cyanobacterial blooms on Lake Okeechobee over the past few months, based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover.

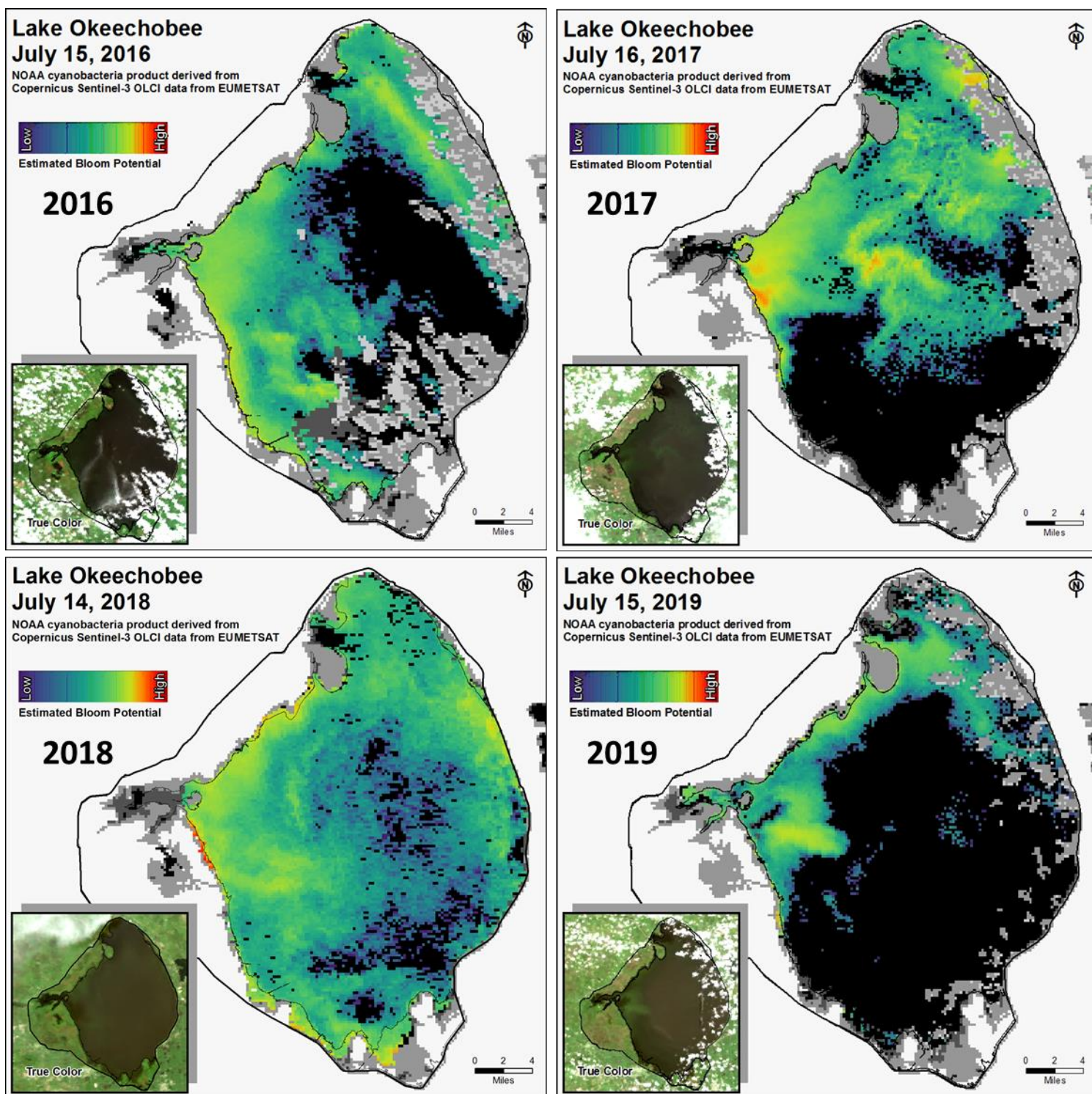


Figure 8. Potential for cyanobacterial blooms on Lake Okeechobee compared to the same time over the past several years, based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 813 cfs (Figures 1 and 2) and last month inflow averaged about 628 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	351
S-80	216
S-308	0
S-49 on C-24	91
S-97 on C-23	61
Gordy Rd. structure on Ten Mile Creek	94

Over the past week, salinity decreased throughout the estuary (Table 2, Figures 3 and 4). The seven-day moving average of the water column (an average of the surface and bottom salinity) at the US1 Bridge is estimated to be 18.5. 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)	11.9 (17.5)	17.1 (20.6)	NA ¹
US1 Bridge	17.7 (21.7)	18.3 (22.6)	10.0-26.0
A1A Bridge	26.1 (29.9)	27.6 (30.3)	NA ¹

¹Envelope not applicable.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 2,784 cfs (Figures 5 and 6) and last month inflow averaged about 2,349 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	0
S-78	934
S-79	2520
Tidal Basin Inflow	264

Over the past week in the estuary, salinity remained about the same to Val I-75 and decreased downstream (Table 4, Figures 7 & 8). The seven-day average salinity values are estimated to be within the good range for adult eastern oysters at Shell Point and Sanibel and most likely in the fair range at Cape Coral (Figure 9). The 30-day moving average surface salinity is 0.3 at Val I-75 and 1.8 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)	0.3 (0.3)	0.3 (0.3)	NA ¹
Val I75	0.3 (0.3)	0.3 (0.3)	0.0-5.0 ²
Ft. Myers Yacht Basin	0.7 (2.5)	0.8 (3.2)	NA
Cape Coral	~8.3 (9.1)	~9.4 (11.4)	10.0-30.0
Shell Point	20.9 (~23)	22.7 (~25)	10.0-30.0
Sanibel	28.8 (EM ³)	29.5 (EM)	10.0-30.0

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

Forecast of surface salinity (Table 5 and Figure 10) at Val I-75 for the next two weeks using the autoregression model (Qiu and Wan, 2013) coupled with a linear reservoir model for the tidal basin predicts daily salinity ranging from 0.9 to 3.0 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 800 cfs and Tidal Basin inflows of 230 cfs.

Table 5. Predicted salinity at Val I-75 at the end of forecast period

Scenario	Q79 (cfs)	TB runoff (cfs)	Daily salinity	30 day mean
A	0	230	3.0	1.0
B	300	230	2.3	0.7
C	450	230	1.8	0.6
D	650	230	1.2	0.5
E	800	230	0.9	0.4

Red tide

The Florida Fish and Wildlife Research Institute reported on July 12, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background concentrations in one sample collected from Lee County and was not observed in samples collected from St. Lucie, Martin, Palm Beach or Miami-Dade counties (no samples from Broward County).

Water Management Recommendations

Lake stage is in the Beneficial Use sub-band of 2008 LORS. Tributary hydrological conditions are normal. The 2008 LORS recommends no release at S-79 and S-80. Given the current estuarine conditions, there are no ecological benefits to the upper estuary associated with freshwater releases from Lake Okeechobee, but some benefits may accrue to areas further downstream.

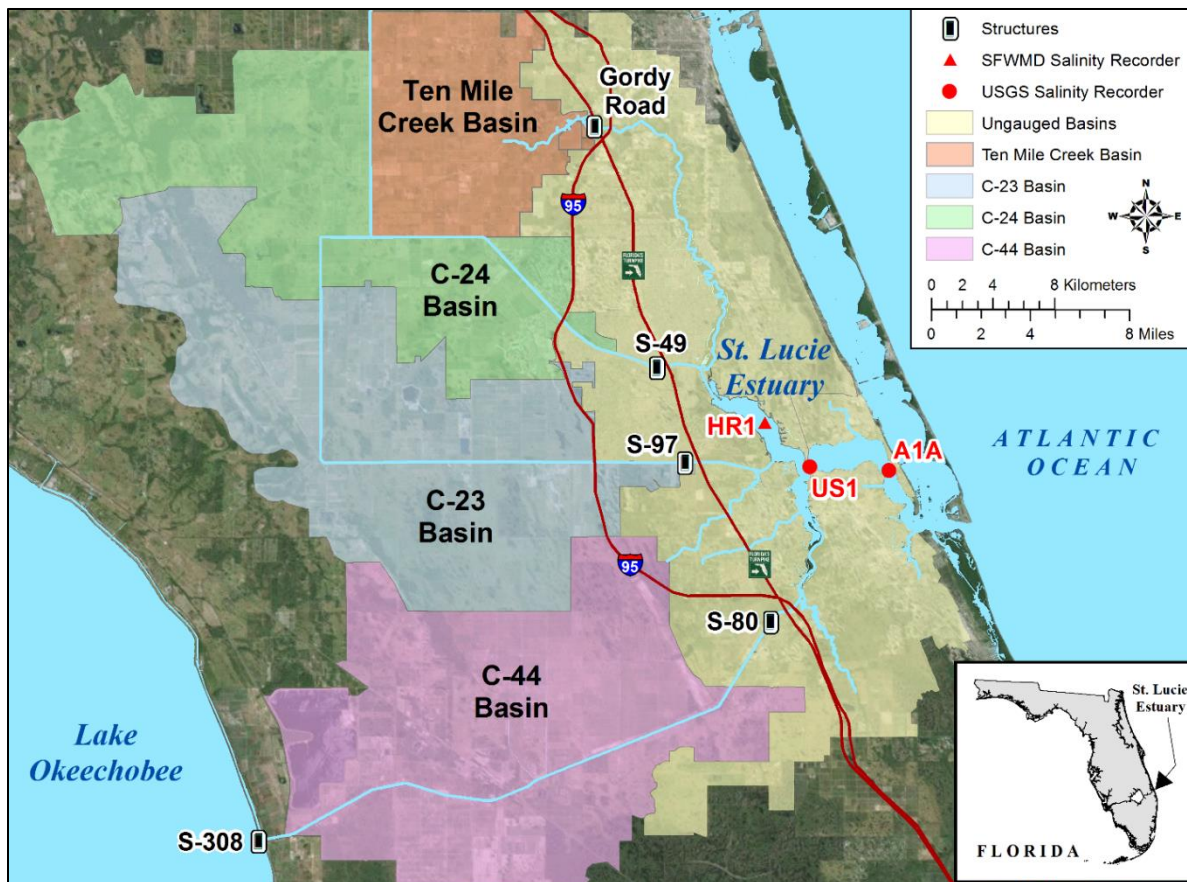


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

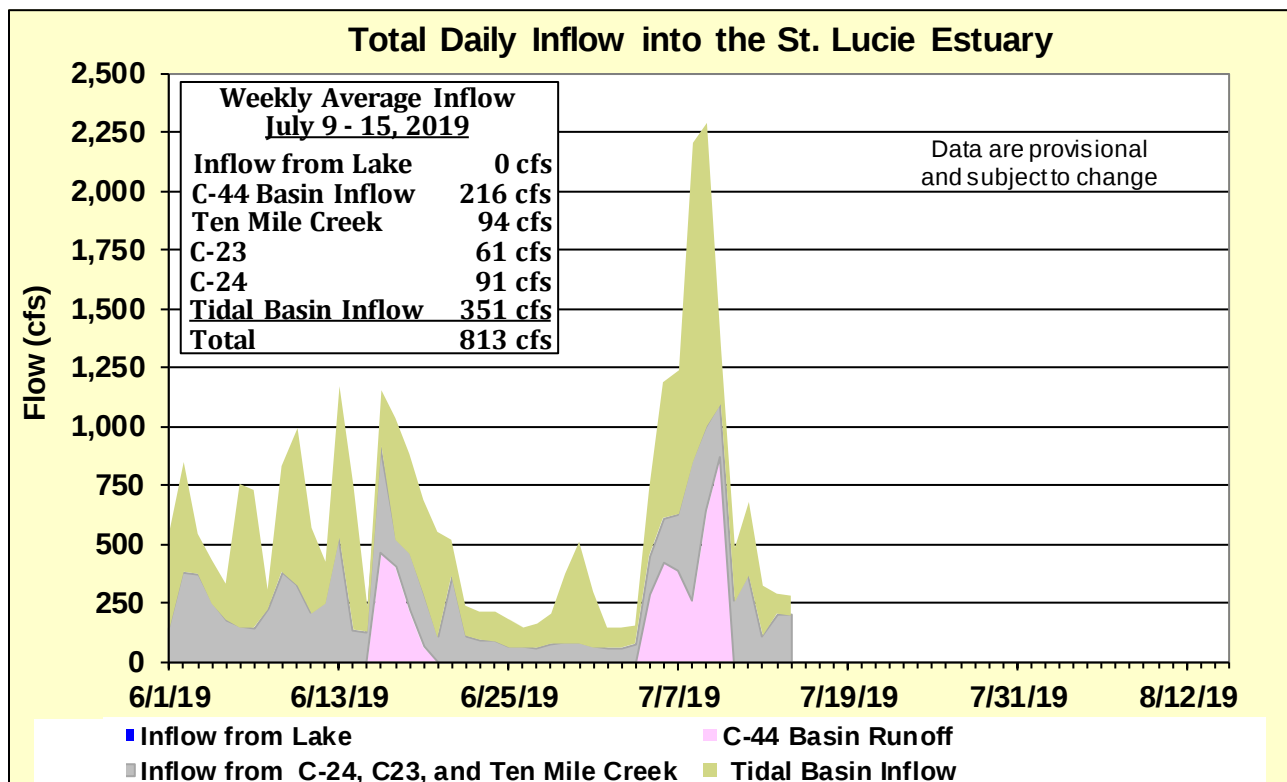


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

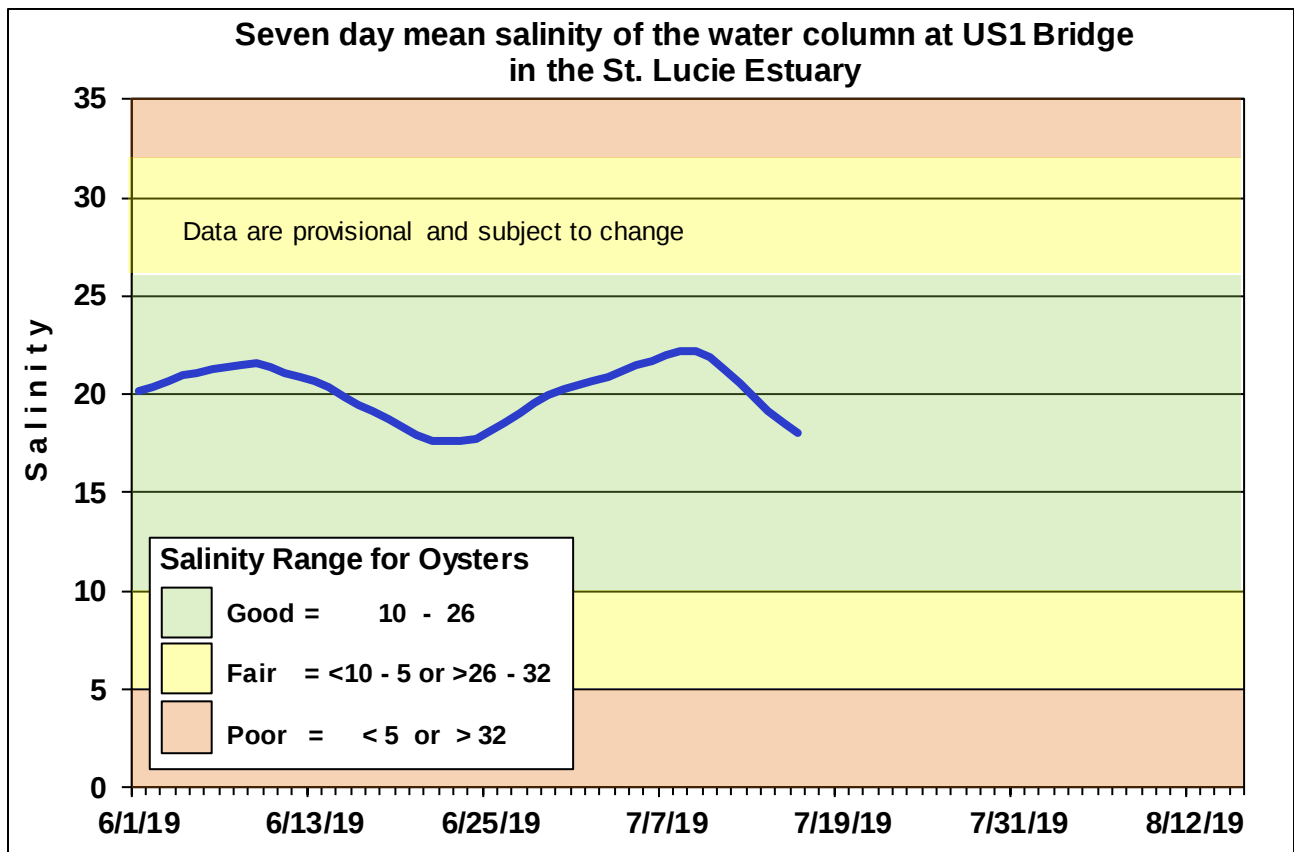


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

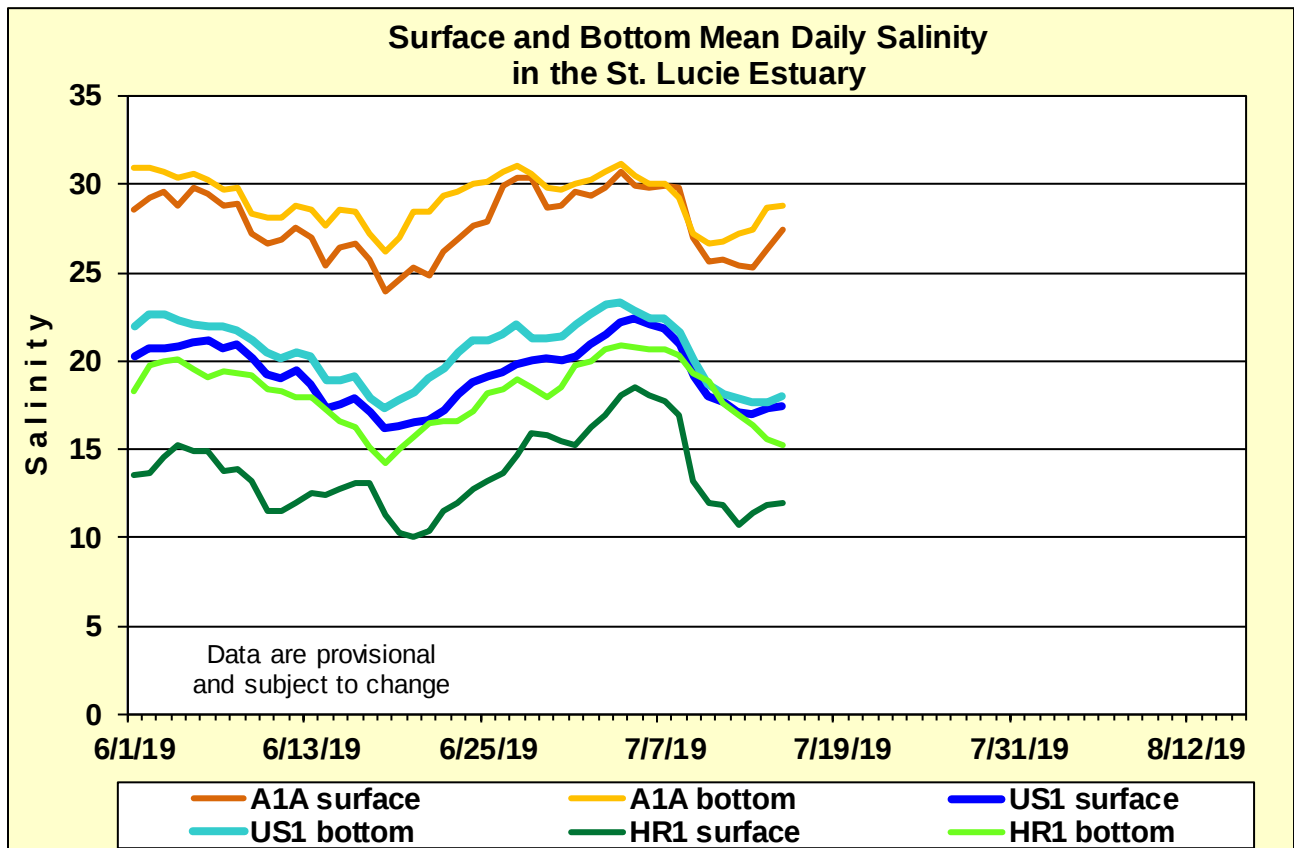


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

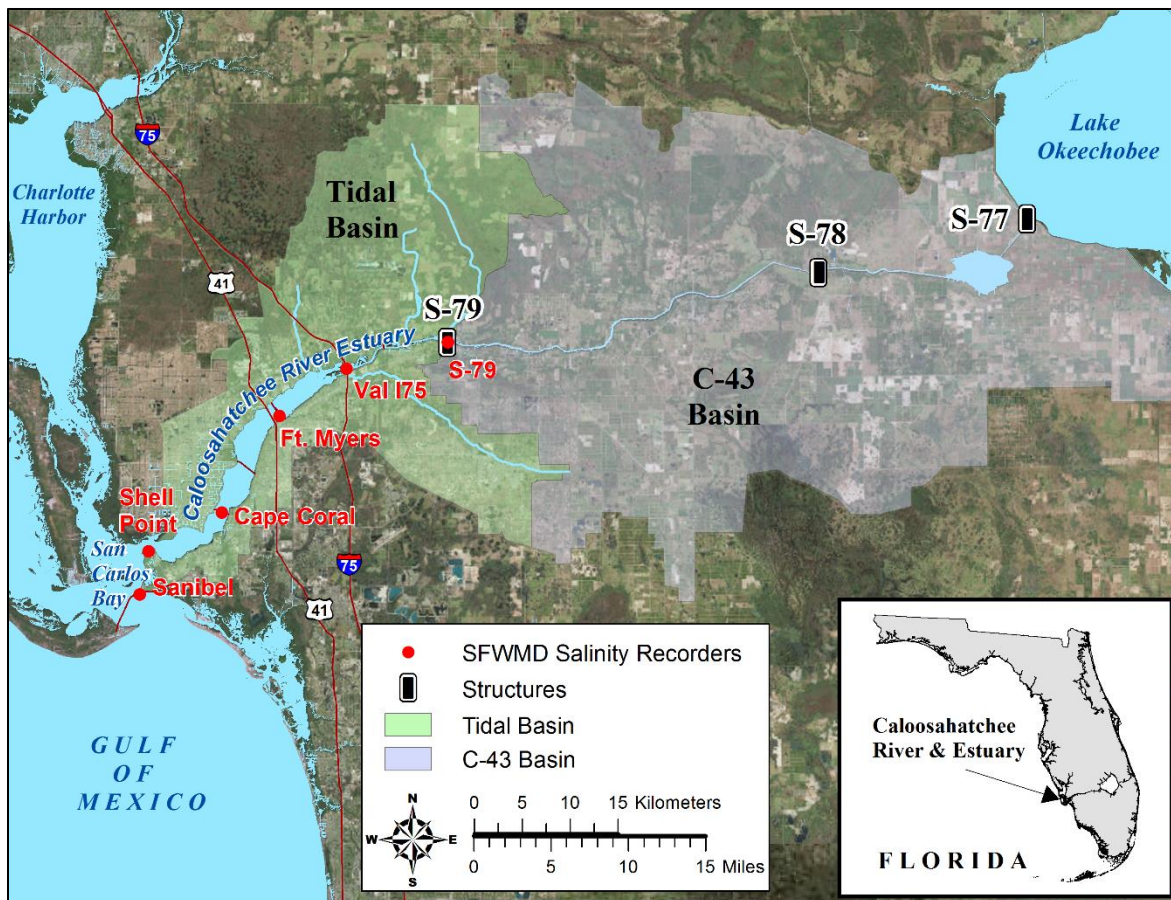


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

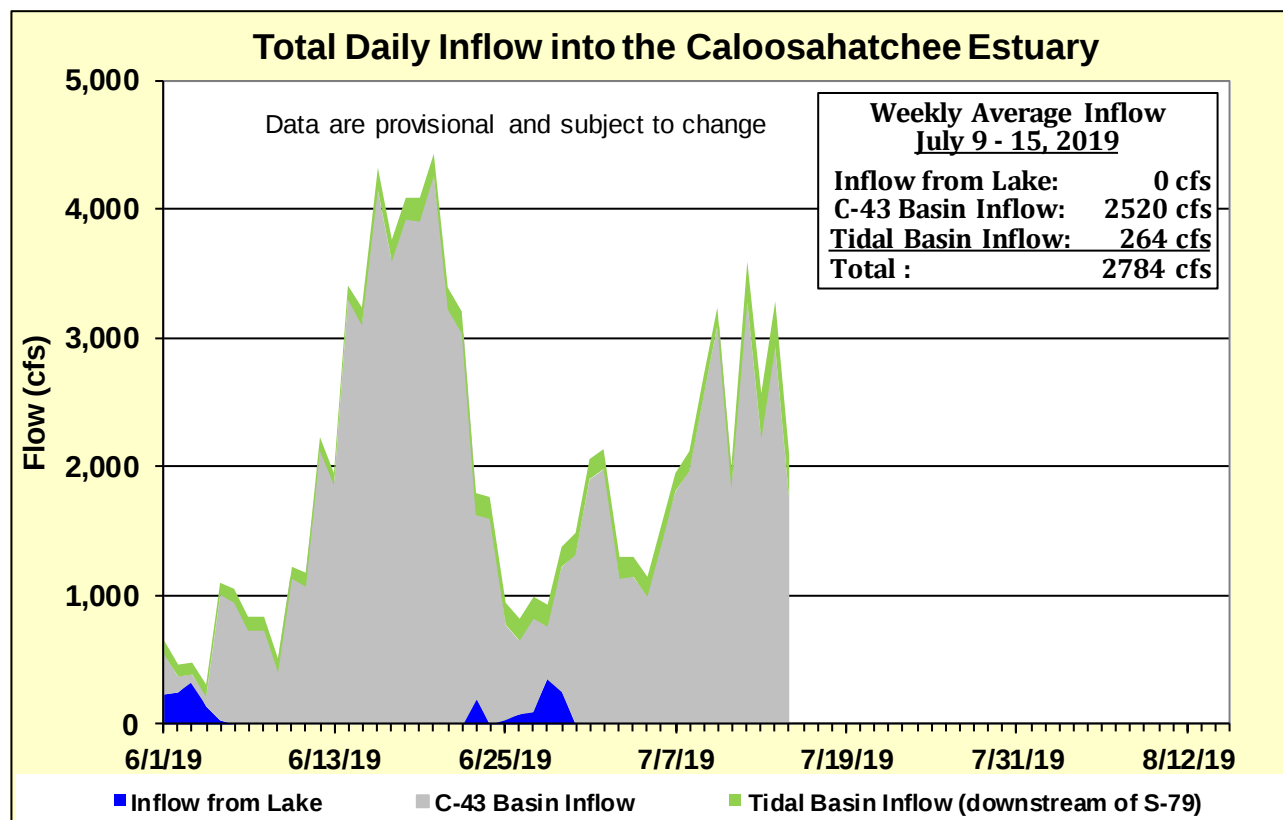


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

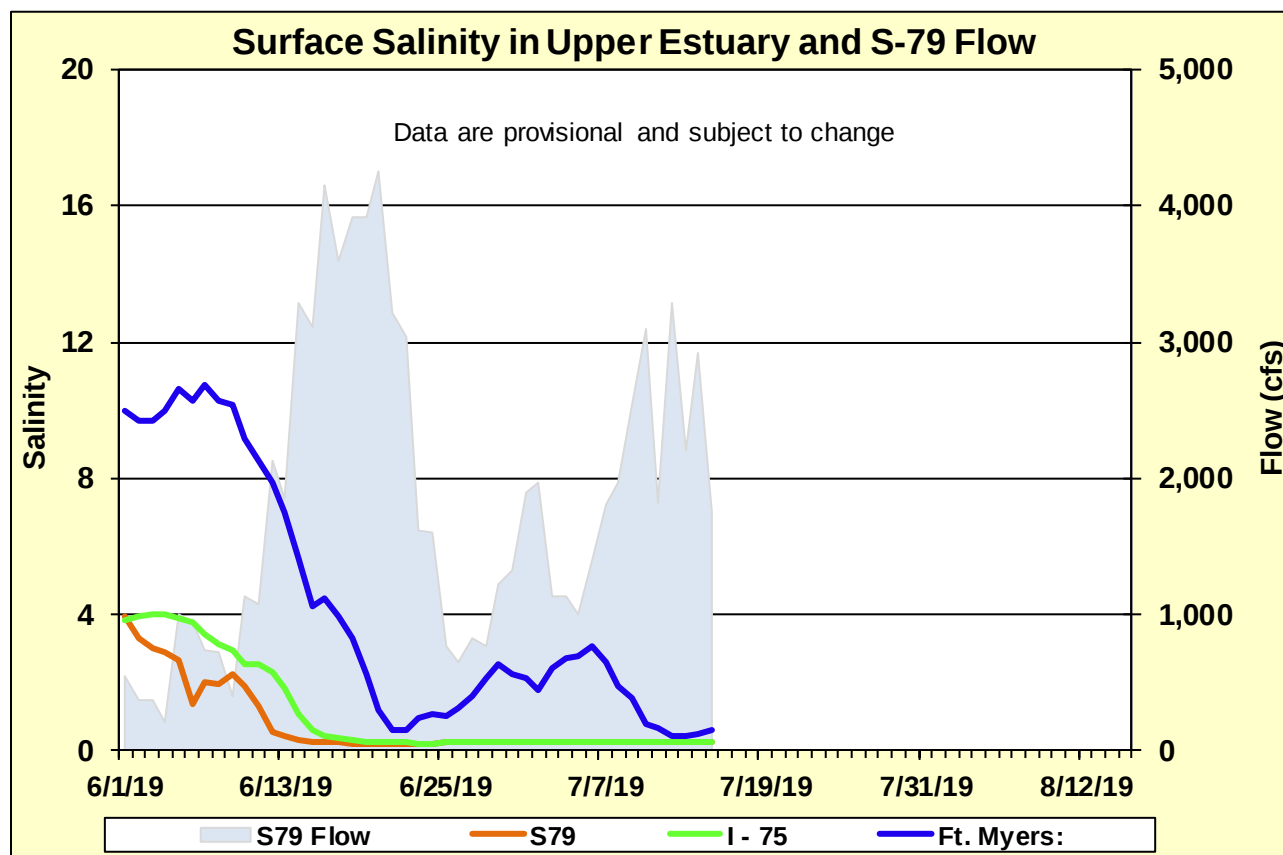


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

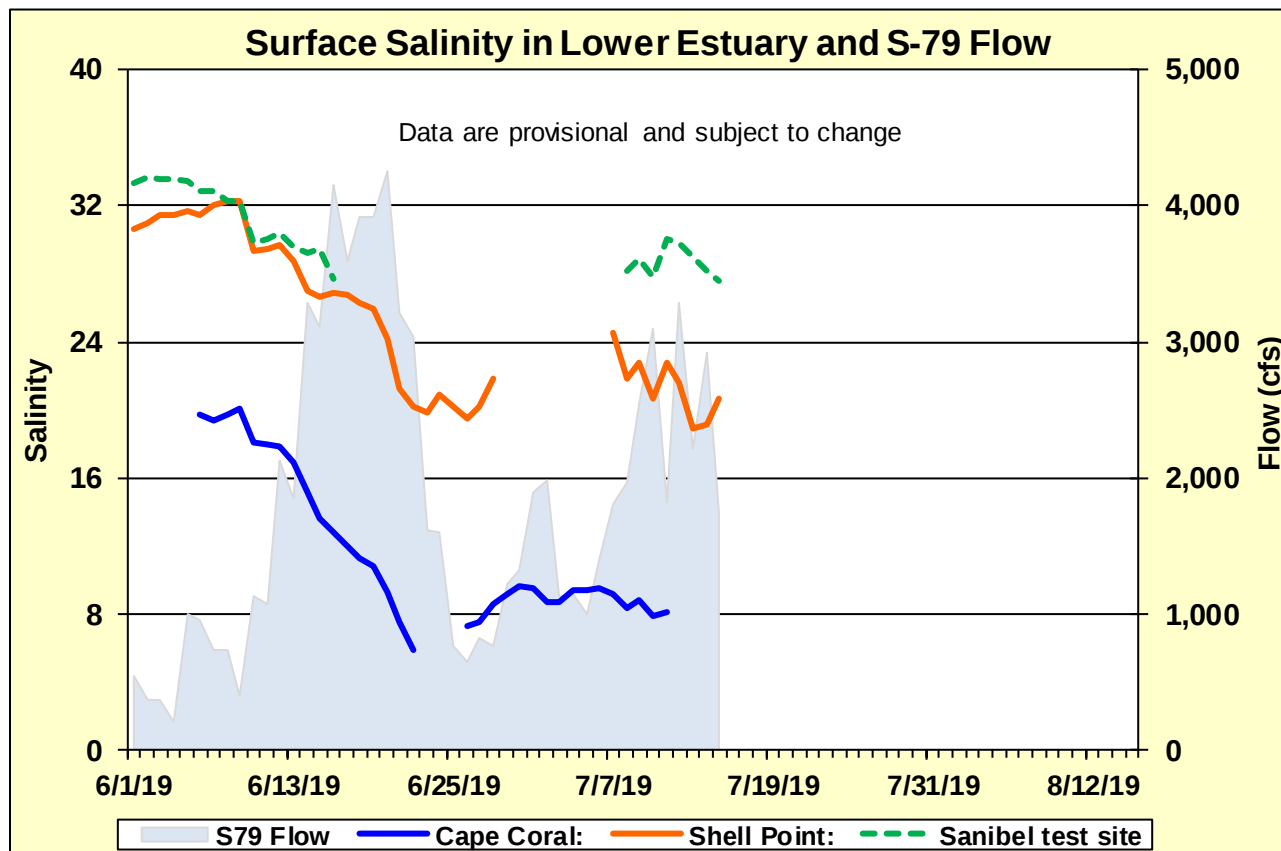


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

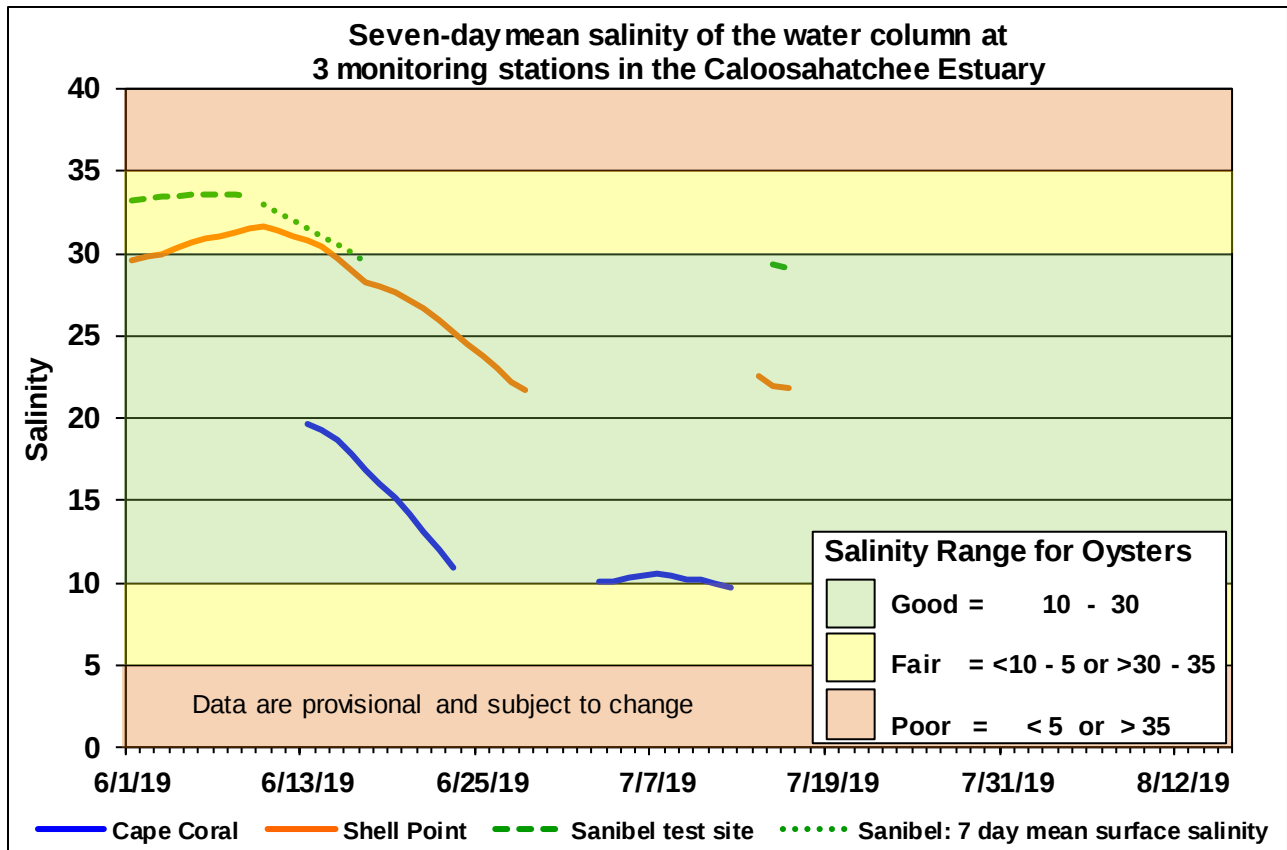


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

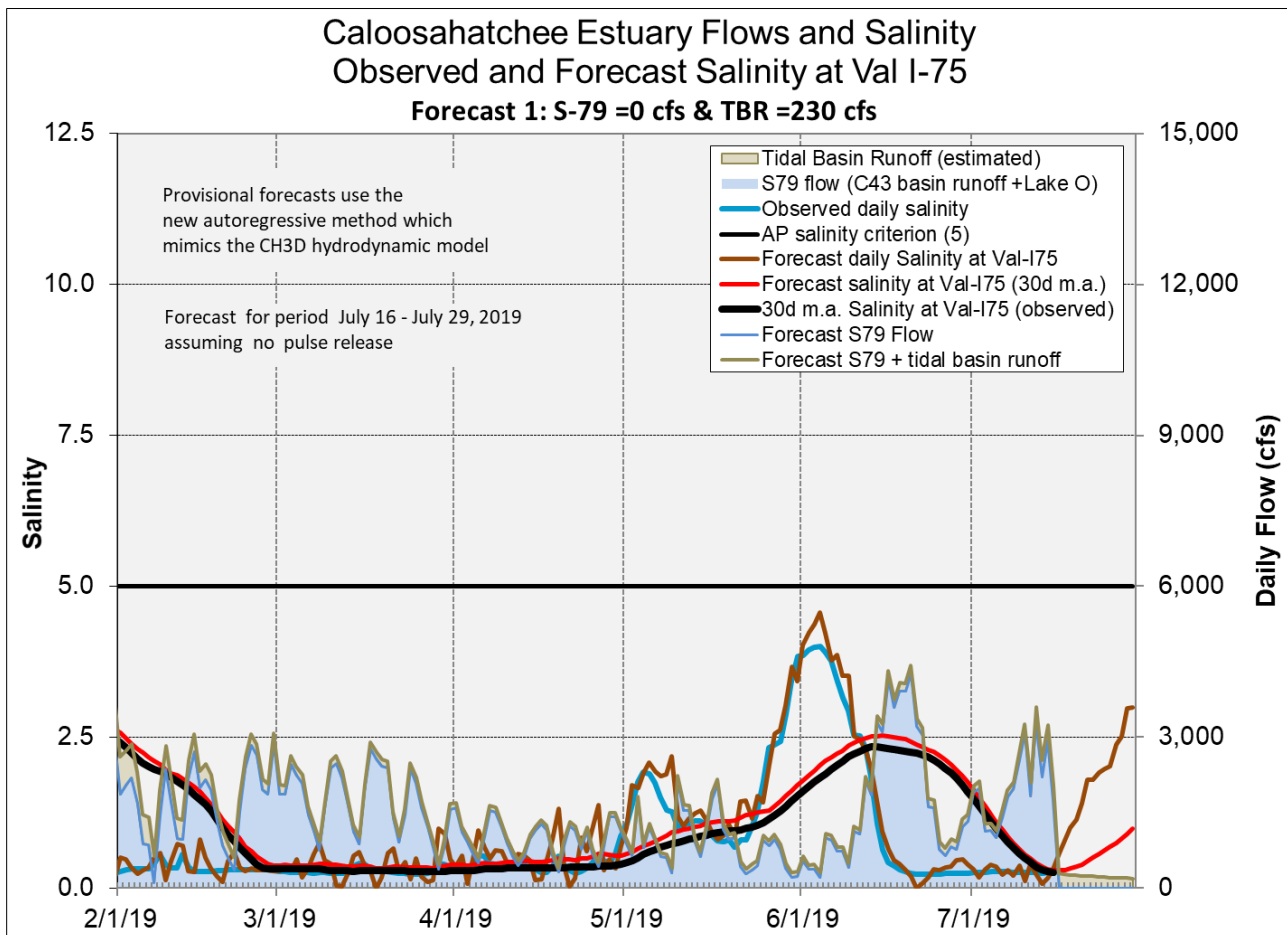
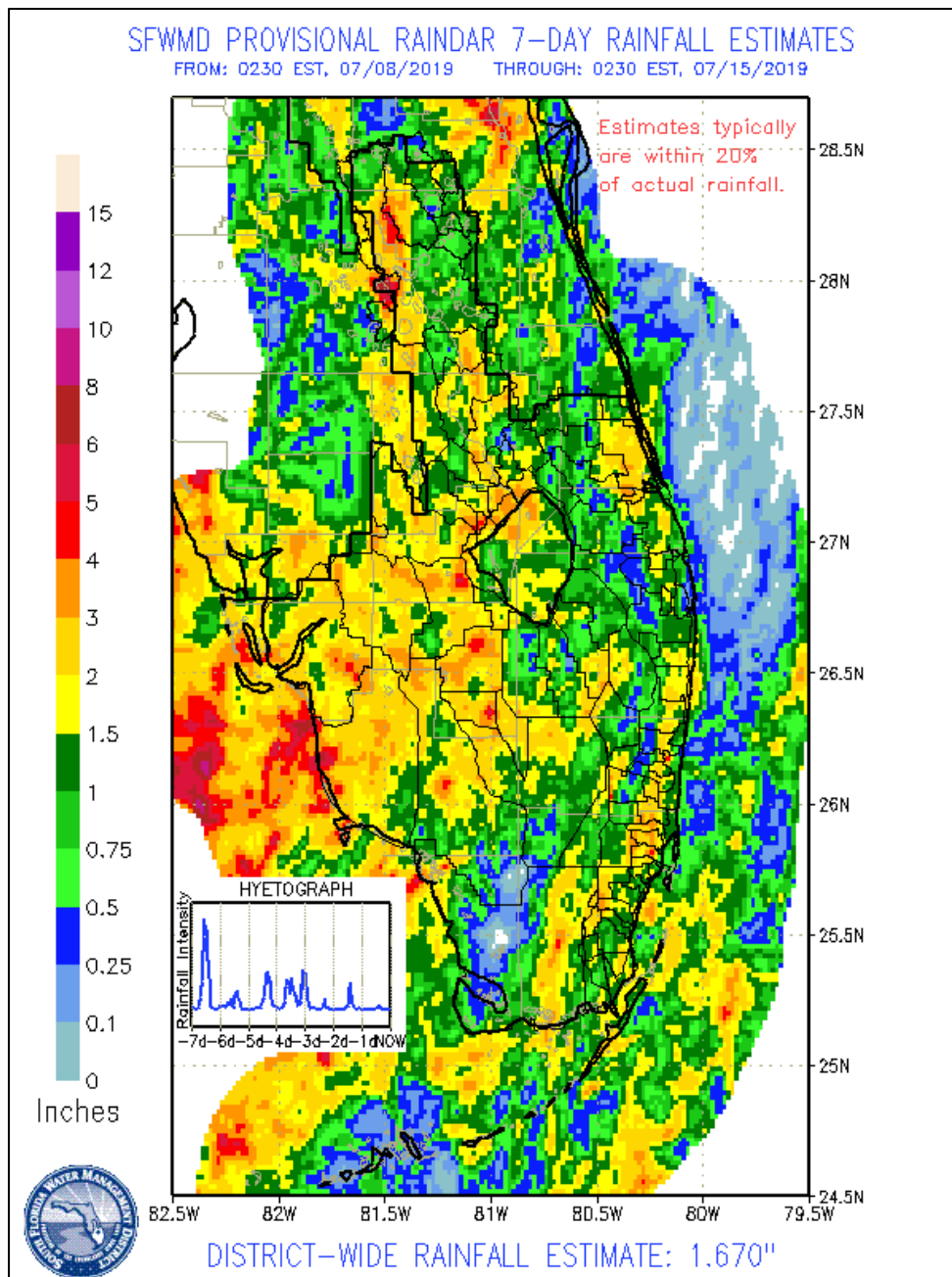


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

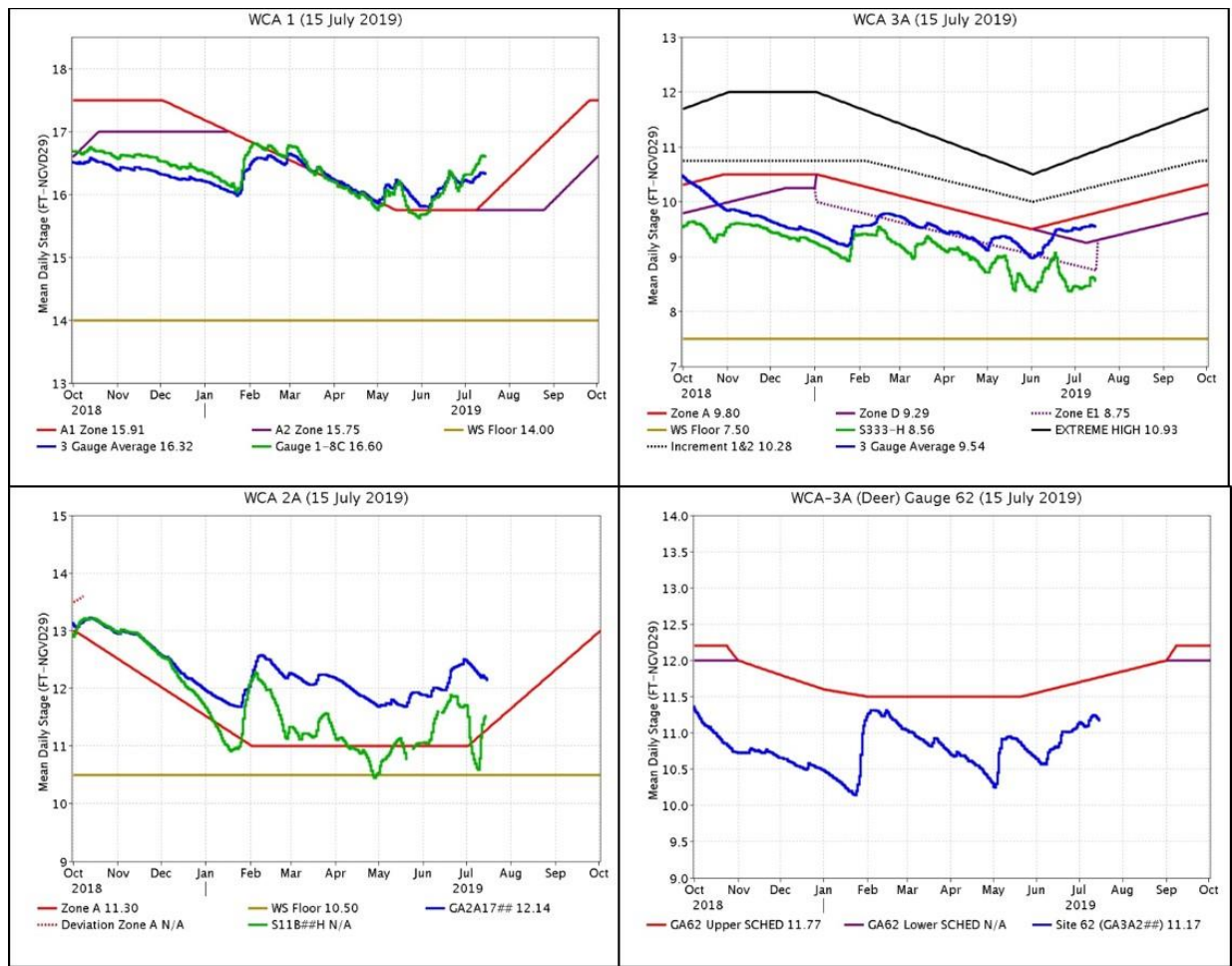
EVERGLADES

At the gauges monitored for this report, the stages in the Everglades increased on average 0.04 feet this past week. Individual gauge changes ranged from -0.14 feet (WCA-2A) to +0.17 feet (WCA-1). Pan evaporation was estimated at 1.75 inches this week which is greater than the estimated 1.67 inches of rain for the corresponding period.

Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	1.16	+0.06
WCA-2A	1.20	-0.14
WCA-2B	1.58	+0.06
WCA-3A	1.43	+0.02
WCA-3B	1.25	+0.07
ENP	1.15	+0.13



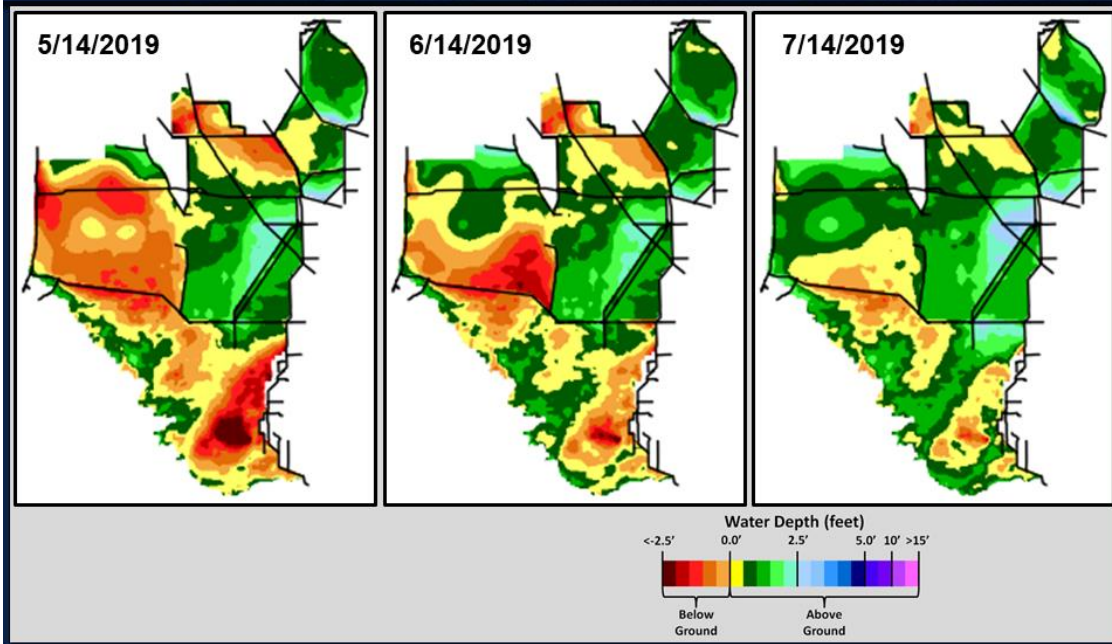
Regulation Schedules: WCA-1: The three-gauge average began trending towards the Zone A1 line this week, currently 0.41 feet above the regulation line. WCA-2A: Stage at Gauge 2A-17 continues to decrease towards the Zone A regulation line, now 0.84 feet above WCA-3A: The three-gauge average continues to parallel the Zone D line, currently 0.25 feet above that line and staying between the zone A and D lines. WCA-3A at gauge 62 (northwest corner) remains below schedule at 0.60 feet below the upper schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate stages in northeastern WCA-3A North have been increasing slowly. Conditions in WCA-1 look typical for this time of year as ponding depths are reached in the southern end of that basin. WCA-2A depths look typical for wet season, and stages are aboveground throughout. WDAT difference maps show that stage changes were consistent within the interior of the WCAs with moderate increases over the last month. Stages in both ENP and the western basins are ascending and changes along the perimeters of the basins are mixed. However, we are mostly drier than last year at this time when the area was under a high-water emergency order for conditions in WCA-3A.



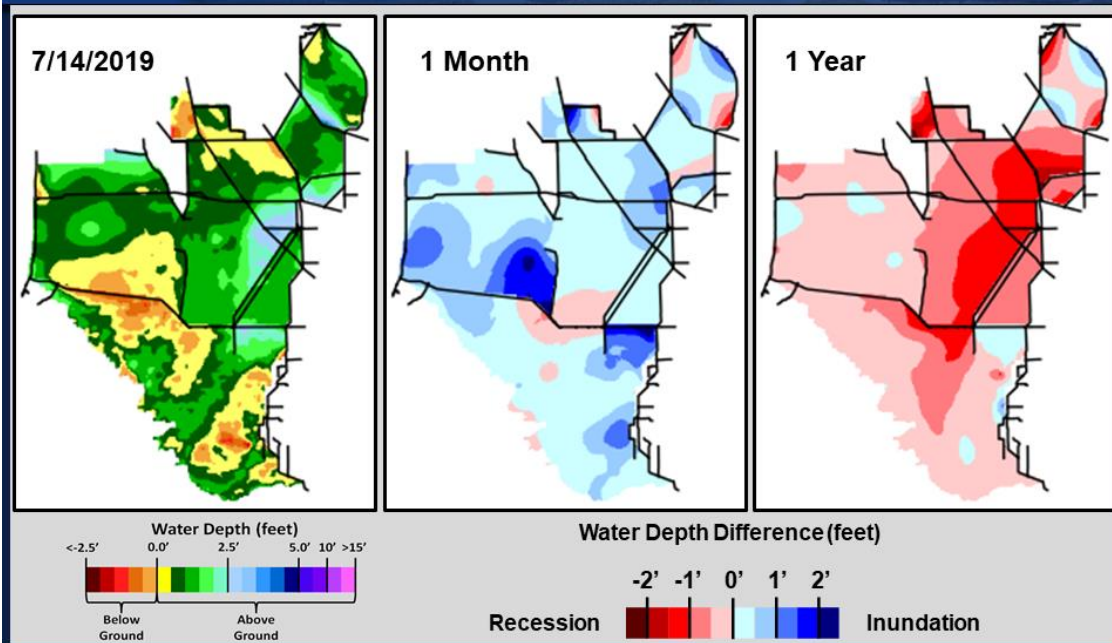
SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)



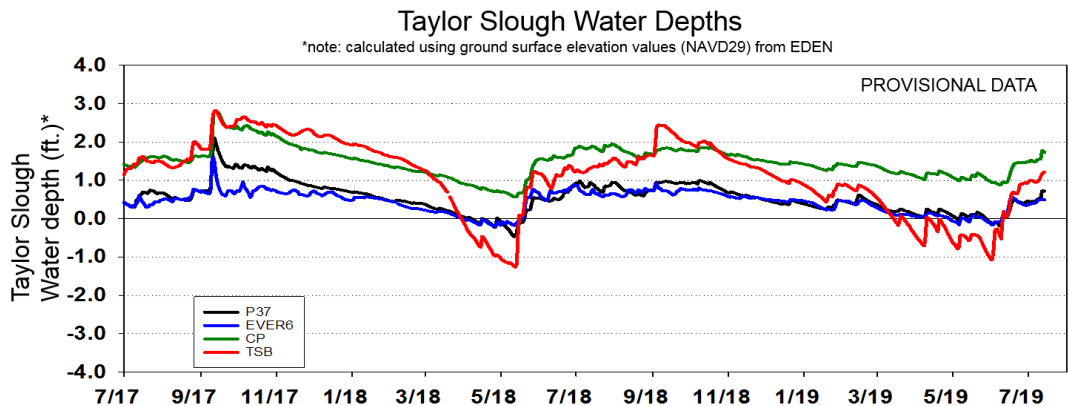
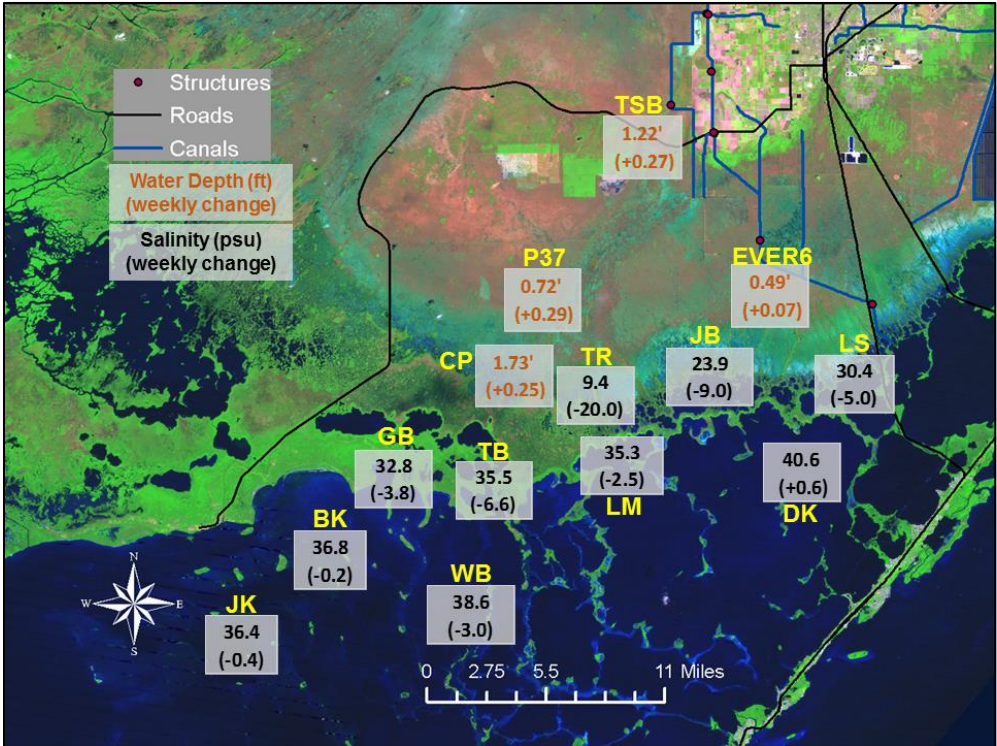
SFWDAT Everglades Difference Maps (Present – Past)

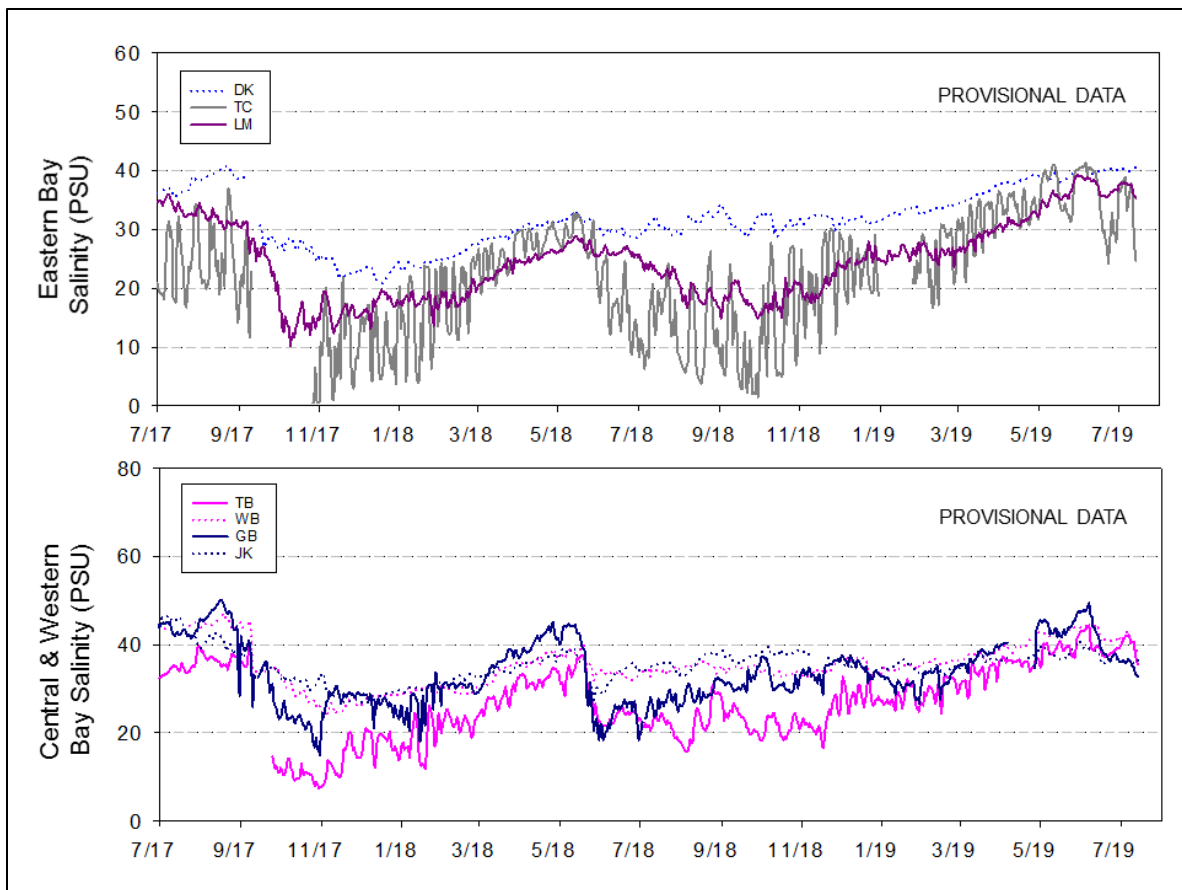


South Florida Water Depth Assessment Tool (SFWDAT)

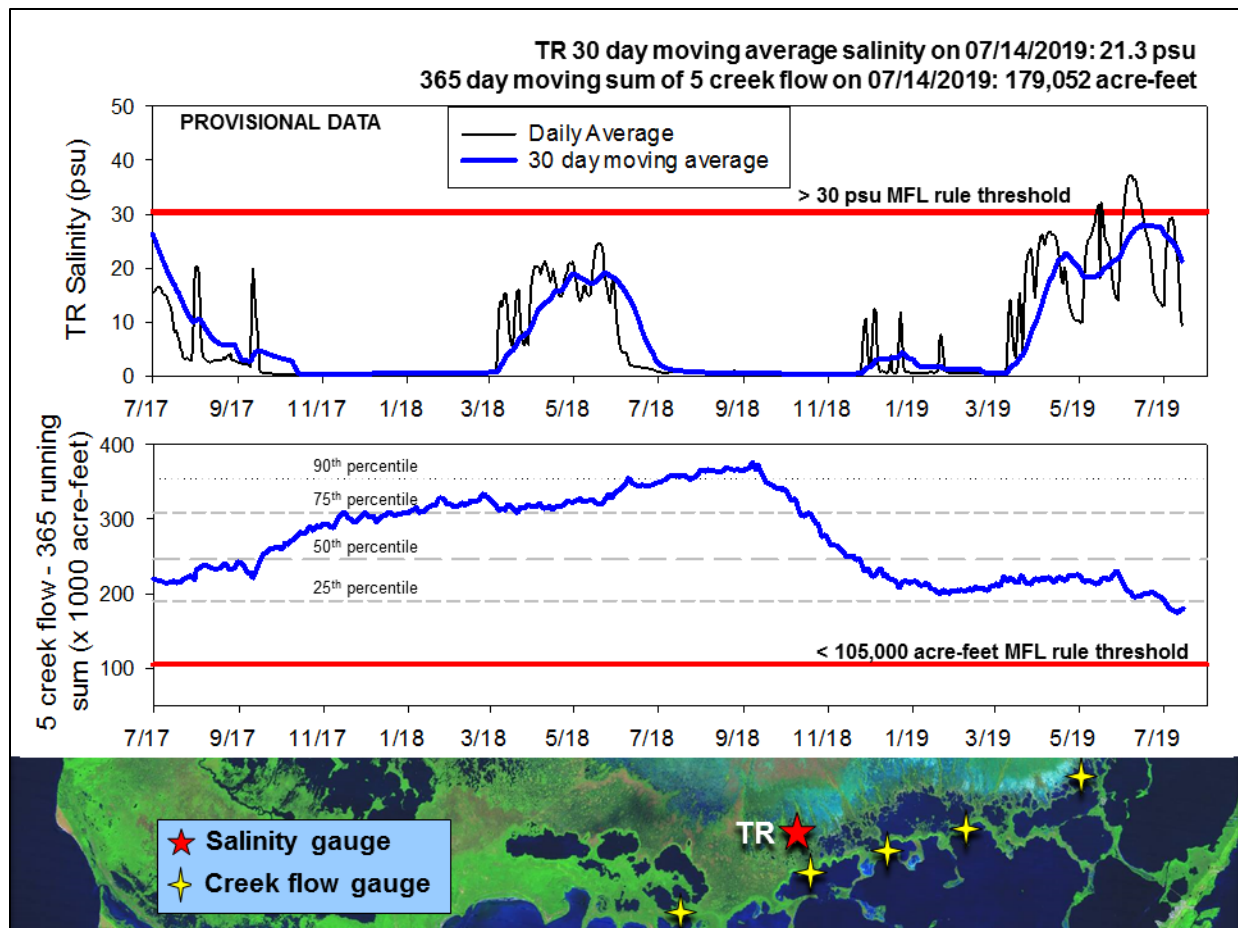
Taylor Slough Water Levels: An average of 1.8 inches of rain fell over Taylor Slough and the ENP panhandle and the Sparrow restrictions have ended for this year. Stages increased 0.22 feet on average with all of the western stations increasing more than 0.25 feet (mostly due to local rainfall). Stages are still 4 inches higher than average for this time of year. TPO4 levels at S328 were to 9 ug/L when the structure was opened (down from 88 ug/L a few weeks ago).

Florida Bay Salinities: Average salinity in Florida Bay was 34 psu, down 4 psu from last week. The nearshore area is still elevated in the 24-36 psu range and needs to decrease to near 25 psu to prevent additional stress to the system.





Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) decreased from 29 psu to 9 psu this past week. The 30-day moving average decreased 3.6 psu to end the week at 21.3 psu. The weekly flow from the 5 creeks feeding Florida Bay was 8,200 acre-feet which is a return to expected conditions for this time of year. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) increased to 179,052 acre-feet which is still less than the 25th percentile (190,165 acre-feet). Creek flow is provisional data from the USGS and is highly variable.



Water Management Recommendations

With the Water Conservation Areas, a rate of ascension less than 0.25 feet per week or less than 0.5 feet per 2 weeks is the general ecological recommendation. Moving water towards Taylor Slough and Florida Bay will freshen salinity conditions within the nearshore areas of Florida Bay and decrease the currently stressful conditions for seagrasses and fauna. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, July 15th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage changes ranged from -0.02 to +0.17'	Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2A	Stage decreased by 0.14'	Manage for a rate of ascension less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2B	Stage increased by 0.06'	Maintain depths at regulation schedule.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage increased by 0.06'	Maintain depths at regulation schedule.	Protect habitat including peat soil development and wildlife.
WCA-3A NW	Stage decreased by 0.05'	Maintain depths at regulation schedule.	
Central WCA-3A S	Stage increased by 0.01'	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 tree islands, upstream/downstream habitat and wildlife. Protect conditions for snail kite nesting.
Southern WCA-3A S	Stage decreased by 0.04'		
WCA-3B	Stage increased by 0.04'	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 0.13'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from +0.07' to +0.29'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP.
FB- Salinity	Salinity changes ranged -9.0 to +0.6 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.