

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: August 14, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Updated to reduce areal average rainfall near the southwest coast, but the overall District total rainfall is unchanged. A weak, cyclonic circulation is located over north-central Florida this morning along an elongated low-level trough that extends from the southwestern Atlantic through the far northeastern Gulf of Mexico. This feature is forecast to remain nearly stationary today, creating a region of enhanced low-level convergence to the south of it over central and, to a somewhat lesser extent, southern Florida. The increased 'lift' associated with the enhanced low-level convergence should combine with other conducive factors such as strong daytime heating, greater instability over the northwestern portion of the area than yesterday and considerable moisture (precipitable water values of 2.2"-2.5") to produce another day of greatly enhanced rains and much-above normal total District rainfall. The heavy rain potential is rated as high area wide due to the favorable large-scale conditions for rain, but the greatest risk of significant heavy rainfall appears to be along an axis stretching from Broward/Palm Beach counties through Lake Okeechobee to the far northwestern portion of the District. Over this region, where the low-level convergence is a maximum and the moisture is locally greater, large half-inch or greater areal average rainfall is predicted. Although not the likely scenario, the model guidance indicates that one-inch areal average rainfall north and west of Lake Okeechobee is at least a possibility due to prime environmental conditions (probabilities of around 25%). With greater instability present over the northwest today, some rains could extend later into the day and into the early evening before diminishing. The low-level trough should very gradually lift northwestward during the next few days, with a new cyclonic center forming along it over the far northeastern Gulf of Mexico by late in the week. The persistent southwesterly wind flow to the south of the trough, very high levels of moisture, and sufficient levels of instability suggest that enhanced rains should continue over the District through at least Thursday, with at least a possibility of some drying, if not on Friday, then at the latest over the weekend. The wetter forecast shown from Wednesday-Friday this week (compared to forecast yesterday) is largely related to the model guidance showing the weak cyclonic circulation/trough remaining closer to the District and for a longer period of time before the weather pattern changes over the weekend. The several days of enhanced rains after only a minor break from the significant rainfall the first week of the month, could prove to be too much in some areas by the end of the week. Lower moisture levels, perhaps even below normal for this time of the year, are forecast over the District over the weekend as a weak ridge of high pressure builds across Florida from the northeast. This should result in much less total District rainfall, possibly to climatological levels or lower, by Sunday that could extend into Monday. A tropical wave is forecast to near the area around Monday or Tuesday next week, but it appears that any increase of rainfall associated with it would likely be just after this forecast period. For the week ending next Tuesday morning, the deterministic total District QPF is around two and a third inches or about 135% of normal, with the probabilistic model output indicating a high chance of above-normal total District rainfall and an unlikely outcome of seeing result closer to normal or even somewhat below.

Kissimmee

Tuesday morning stages were 57.0 feet NGVD (0.5 feet above schedule) in East Lake Toho, 53.7 feet NGVD (0.2 feet above schedule) in Toho, and 51.3 feet NGVD (0.3 feet above schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.5 feet NGVD at S-65A and 26.1 feet NGVD at S-65D. Tuesday morning discharges were 3550 cfs at S-65, 4595 cfs at S-65A, 4340 cfs at S-65D and 4042 cfs S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 0.6 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 2.01 feet. Recommendation(s) this week: 8/7/2019 Manage discharge at S-65 and S-65A to control rising stage in KCH. Purpose is to switch to flood control operations as stage in KCH reaches the regulation line.

Lake Okeechobee

Lake Okeechobee stage is 12.38 feet NGVD, increasing 0.38 feet from the previous week and 0.75 feet over the previous two weeks. The Lake dropped into the Water Shortage Band on July 19, 2019, moved back into the Beneficial Use sub-band last week, and may enter the Base Flow sub-band next week. The lake has also moved back into the ecological envelope, which varies seasonally from 12.5 – 15.5 feet NGVD (+/- 0.5 feet), after spending about 215 days below. Lake stage ascension rates remain important to the continued recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone; continued high ascension rates will stress newly established plants and could reduce the beneficial effects that recent low lake stages have had on these communities. The latest estimate of cyanobacteria bloom potential on the lake (August 11) shows elevated potential in the northern areas, though concurrent water quality samples suggest there is no visible bloom, usually no dominant taxon, and usually no microcystin toxin; except for samples in the northeast. The satellite density estimates may be overestimating cyanobacteria presence along the NW shoreline where Chlorophyll-a values are elevated, and water is less turbid but colored.

Estuaries

Total inflow to the St. Lucie Estuary averaged 1,768 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinity decreased significantly throughout the estuary. Salinity at the US1 Bridge is within the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 6,952 cfs over the past week with no flow coming from the Lake. Salinity decreased in the estuary. The 30-day moving average surface salinity is 0.2 at Val I-75 and 0.6 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. 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 7,400 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 457,000 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-way 1 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

The stages within the Everglade's Basins are all relatively near but above regulation. WCA-1 remains slightly above schedule and rose rapidly in the central marsh last week. WCA-2A is more significantly

above schedule. WCA-3A stages just exceed the desired operational band. Stages rose on average 0.23 (+0.05 more than last week) feet over the last week at the gauges monitored for this report within the WCAs, but SRS fell by 0.04 feet. Ascension rates should remain below 0.25 feet per week or 0.5 feet per 2 weeks to protect Apple Snail reproduction within the WCA's. This rate was exceeded in WCA-2B and northwest WCA-3A over the last two weeks. Stages in Taylor Slough remain higher than the historical average for this time of year, and salinity conditions improved downstream in Florida Bay last week, however the nearshore salinities are still elevated but dropping. The flow from the 5 main creeks feeding Florida Bay increased this week.

Supporting Information

KESSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 2.18 inches of rainfall in the past week and the Lower Basin received 1.74 inches (SFWMD Daily Rainfall Report 8/13/2019).

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: 8/13/2019

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)						
							8/11/19	8/4/19	7/28/19	7/21/19	7/14/19	7/7/19	6/30/19
Lakes Hart and Mary Jane	S-62	261	LKMJ	60.0	R	60.0	0.0	0.1	0.0	0.0	0.1	0.0	-0.4
Lakes Myrtle, Preston, and Joel	S-57	19	S-57	61.0	R	61.0	0.0	-0.3	-0.7	-0.8	-0.7	-0.9	-1.2
Alligator Chain	S-60	63	ALLI	63.3	R	63.2	0.1	-0.3	-0.6	-0.7	-0.7	-0.8	-1.0
Lake Gentry	S-63	21	LKGT	60.9	R	61.0	-0.1	-0.9	-1.1	-1.4	-1.3	-1.4	-1.5
East Lake Toho	S-59	754	TOHOE	57.0	R	56.5	0.5	0.0	-0.2	-0.5	-0.7	-0.7	-1.0
Lake Toho	S-61	1,833	TOHOW, S-61	53.7	R	53.5	0.2	0.0	-0.1	-0.3	-0.4	-0.5	-0.8
Lakes Kissimmee, Cypress, and Hatchineha	S-65	2,198	KUB011, LKIS5B	51.2	R	51.0	0.2	-0.3	-0.9	-1.1	-1.1	-1.6	-1.4

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: 8/13/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days ¹								6/9/19
		8/11/2019	8/11/19	8/4/19	7/28/19	7/21/19	7/14/19	7/7/19	6/30/19	6/23/19	6/16/19	
Discharge (cfs)	S-65	3,764	2,198	783	777	1,110	548	287	400	106	165	284
Discharge (cfs)	S-65A ²	4,467	3,248	1,665	903	1,123	749	387	673	1,014	255	215
Discharge (cfs)	S-65D ²	4,123	3,167	1,618	1,378	1,396	1,020	1,288	1,801	975	290	222
Headwater Stage (feet NGVD)	S-65D ²	25.83	25.88	25.77	25.79	25.78	25.81	25.70	25.84	25.80	25.84	25.78
Discharge (cfs)	S-65E ²	3,939	3,000	1,495	1,259	1,250	944	1,158	1,606	903	331	208
Discharge (cfs)	S-67	42	46	85	93	92	97	92	62	96	22	0
DO (mg/L) ³	Phases I & II/III river channel	0.1	0.6	3.2	4.2	3.3	3.3	1.8	0.0	3.0	5.9	5.7
Mean depth (feet) ⁴	Phase I floodplain	2.01	1.73	0.77	0.52	0.55	0.46	0.46	0.82	0.39	0.13	0.06

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

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

³DO is the average for sondes at 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)

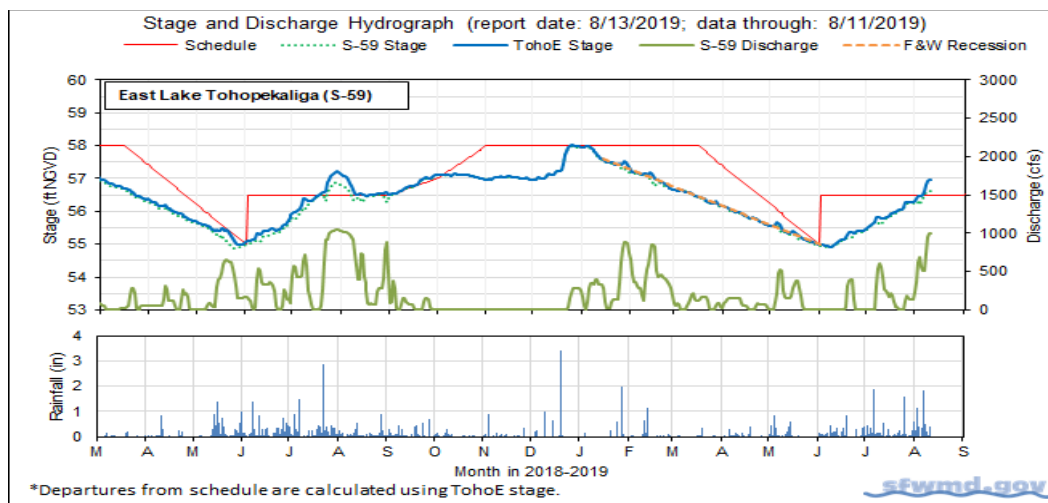


Figure 1.

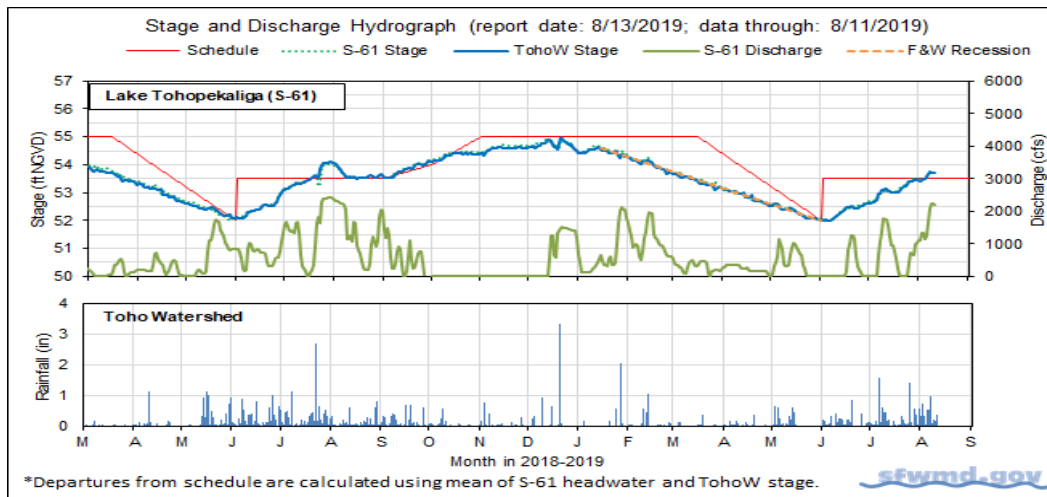


Figure 2.

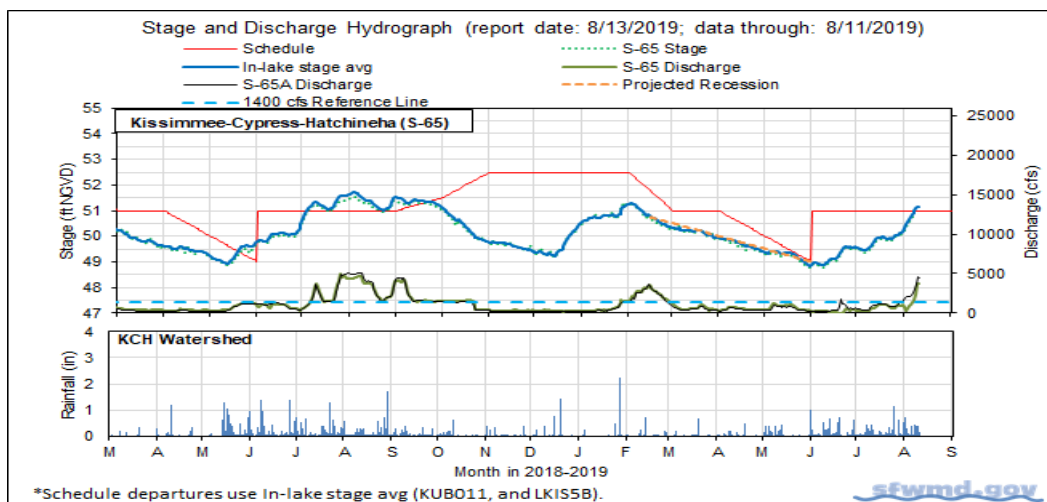


Figure 3.

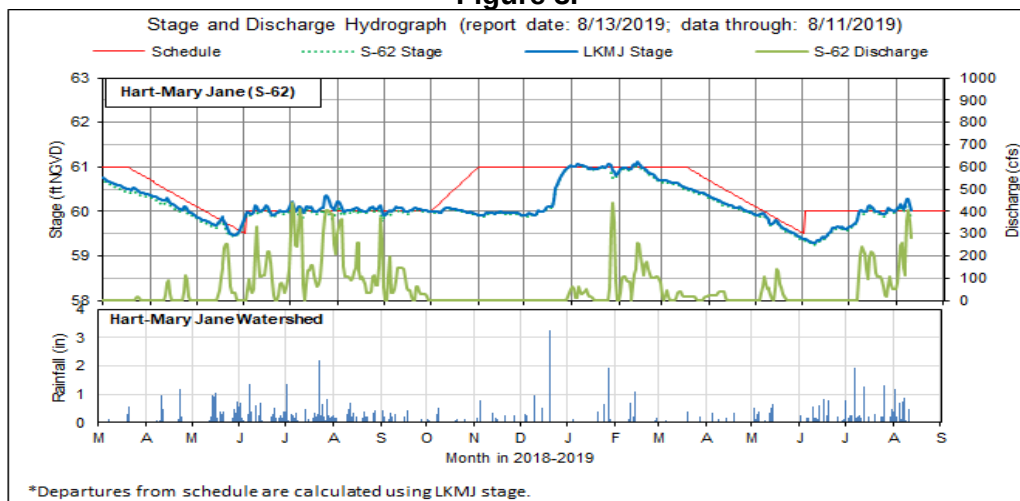


Figure 4.

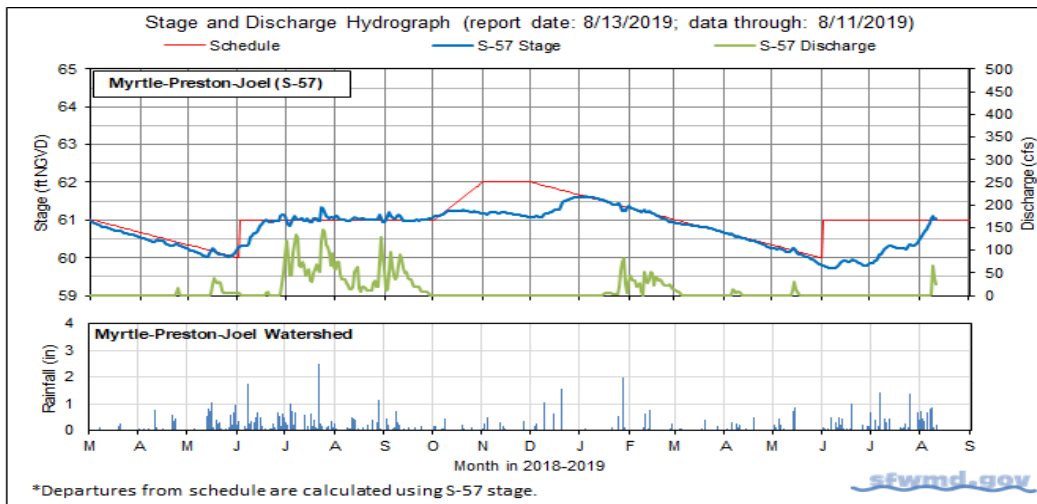


Figure 5.

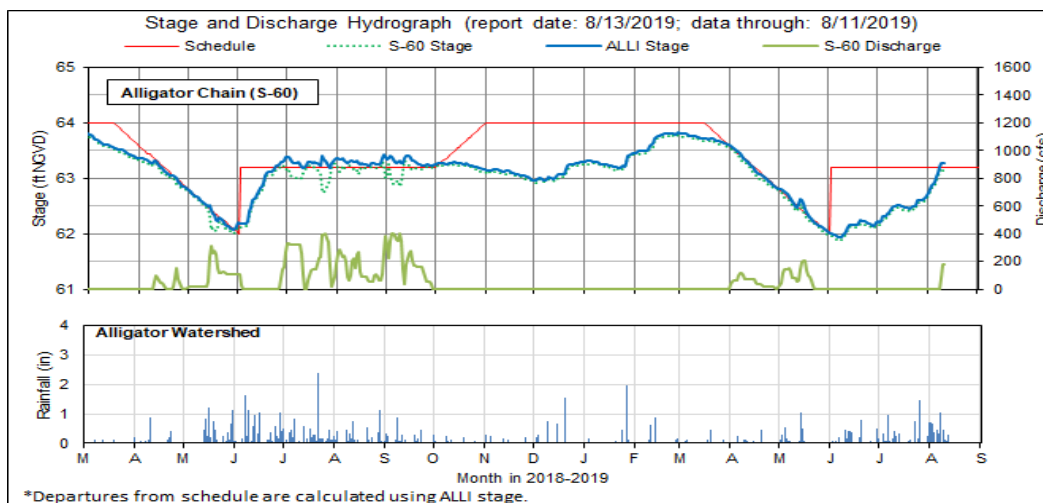


Figure 6.

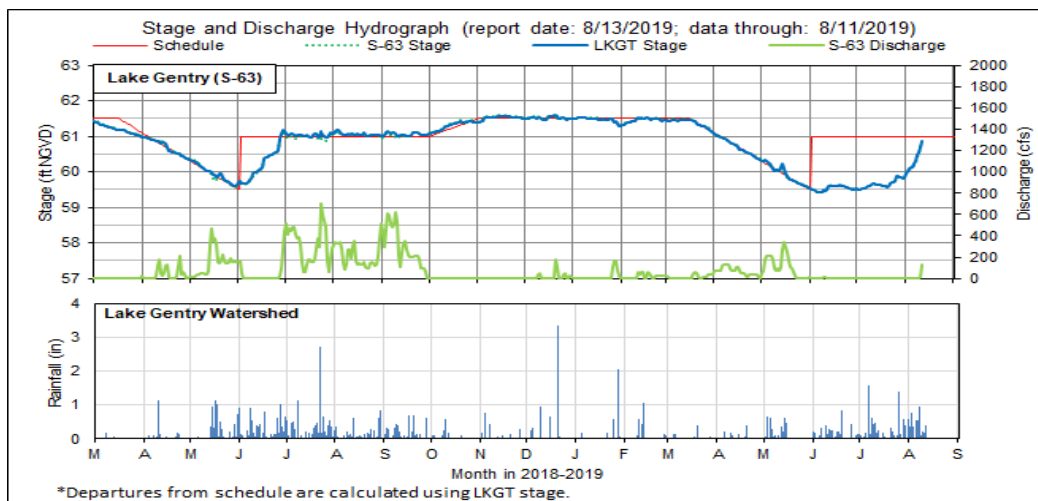


Figure 7.

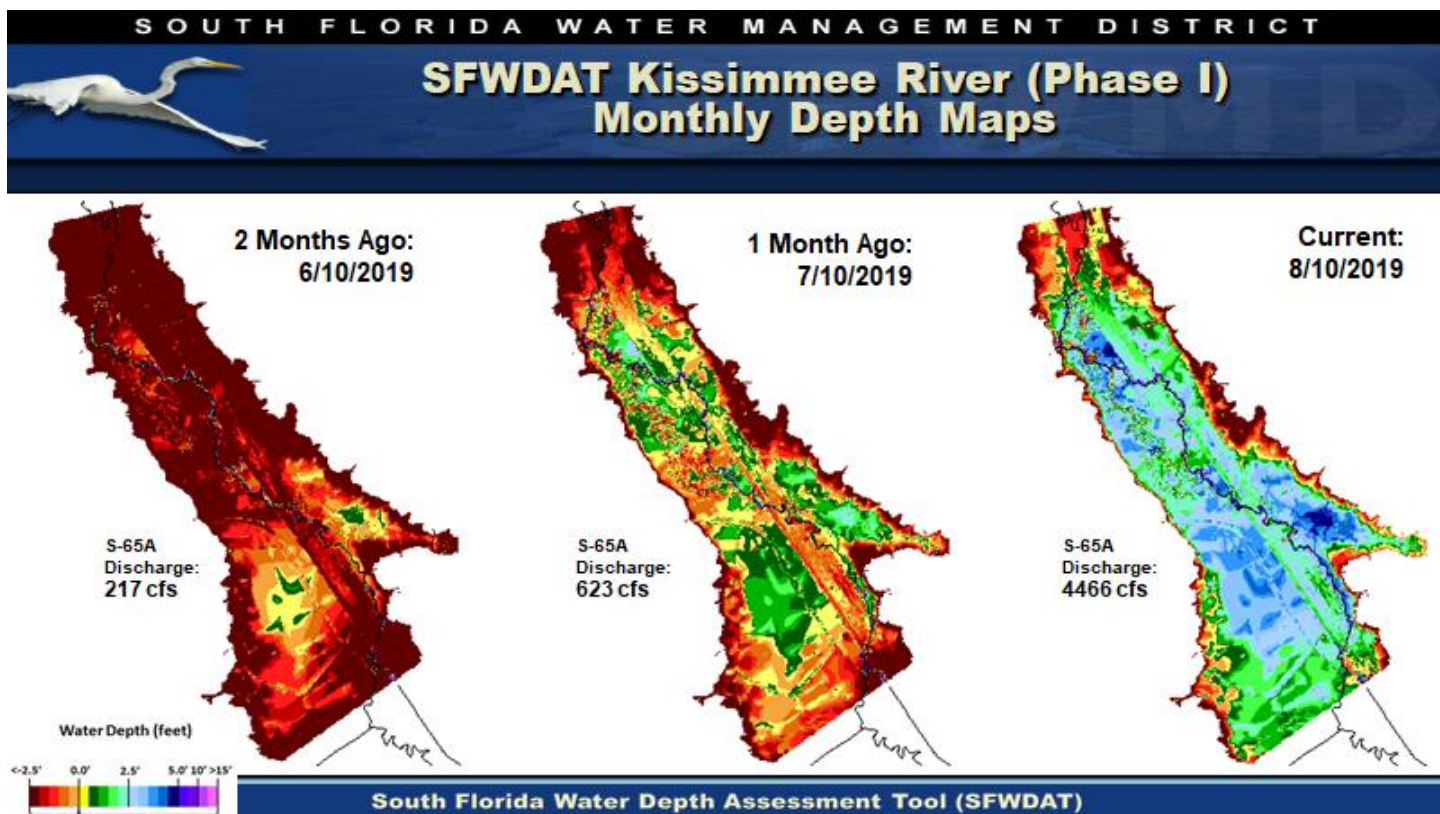


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

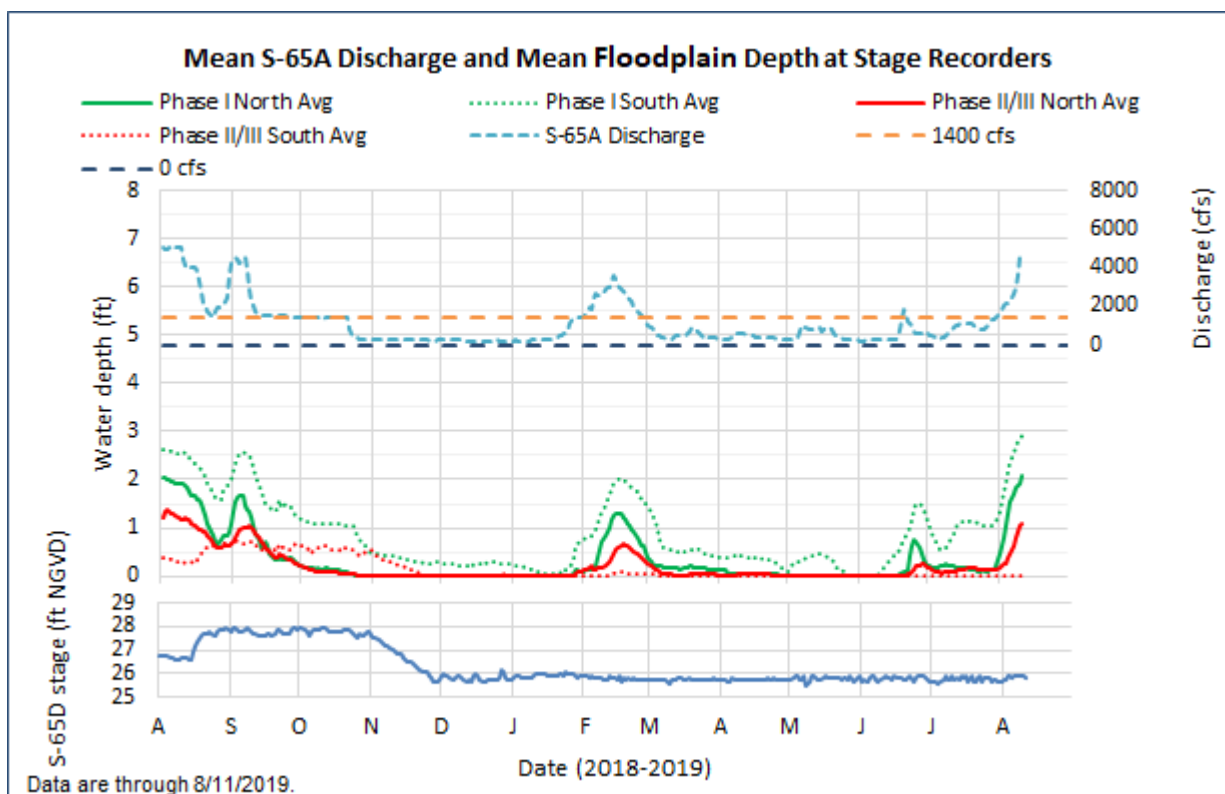
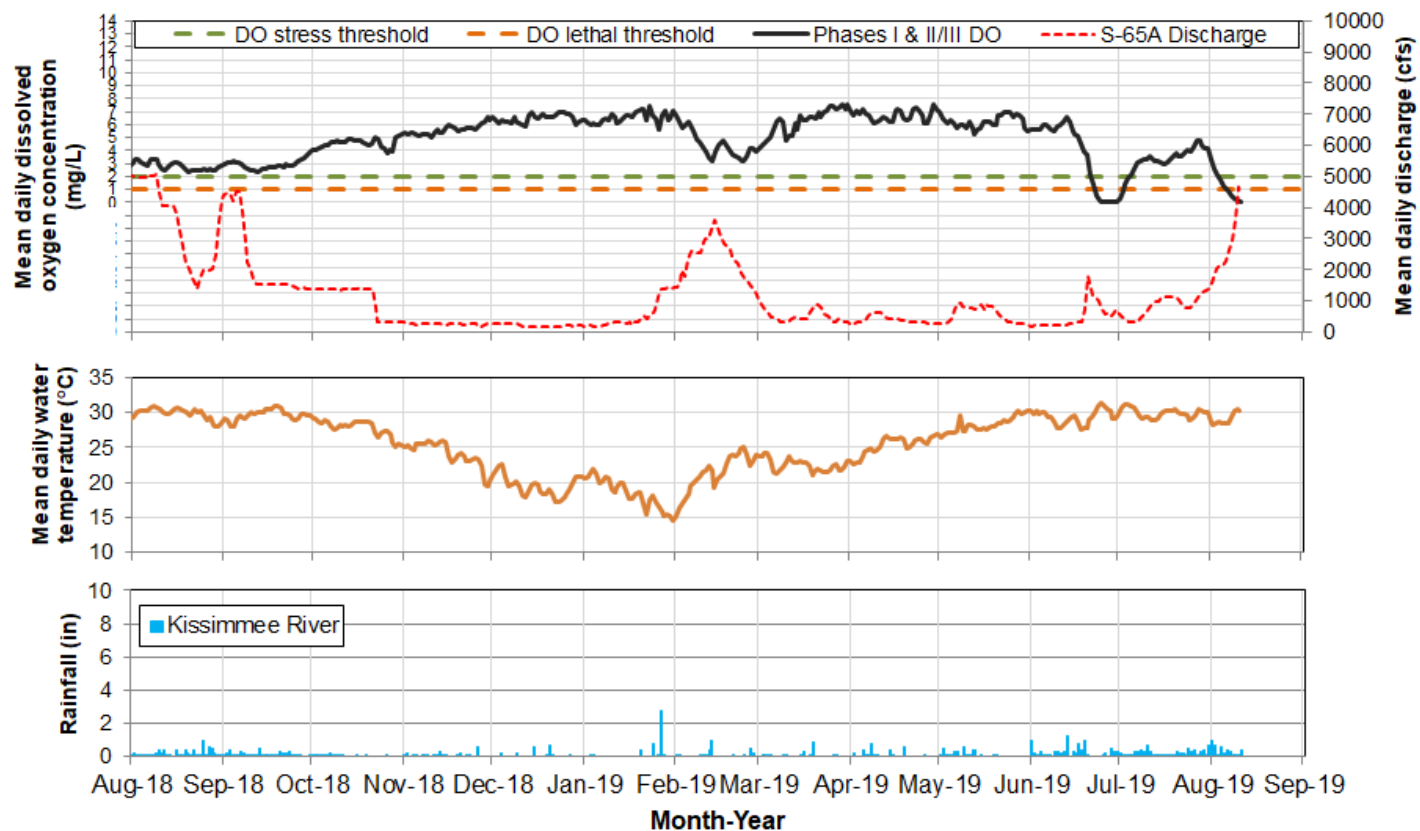


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.



Report Date: 8/13/2019; data are through: 8/11/2019.

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

Water Management Recommendations

Kissimmee Basin Adaptive Recommendations and Operational Actions

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
8/7/2019	Manage discharge at S-65 and S-65A to control rising stage in KCH.	Switch to flood control operations as stage in KCH reaches the regulation line.	Implemented	KB Ops	8/13/2019
8/2/2019	a) Attempt to hold flow at S-65A steady during the rain forecast over the weekend. b) If it is necessary to increase discharge further, try to follow the discharge rate of change criteria to reduce effects on dissolved oxygen in the Kissimmee River c) Address stage rise in Pool A by reducing S-65 discharge. d) Stage in KCH will likely rise faster than the requested rate due to the need to control stage rise in Pool A. However, try to minimize the magnitude and duration of the exceedance after rainfall subsides.	Balance competing objectives while considering flood control in Pool A in light of the forecast for heavy cumulative rainfall.	Implemented	SFWMD Water Management/KB Ops	8/6/2019
7/24/2019	Maintain flow of at least 750-800 cfs or higher at S65A until the effects of forecast rainy period are known.	Manage stage in KCH while maintaining moderate discharge from S65A.	Implemented	KB Ops	7/30/2019
7/18/2019	a) Hold KCH stage steady until the risk of an exceedance of the 0.5 ft max rise per 14 days is past OR stage starts to decline. b) If KCH stage starts to decline, ramp down at 150 cfs/day over several days to 750 cfs. If this doesn't stop the decline we will regroup to discuss options.	Balance rate of rise in KCH against reduction of flow at S65A to avoid reducing flow to minimum until it is necessary.	Implemented	KB Ops/SFWMD Water Management	7/23/2019
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

Kissimmee Basin 2019 Wet Season

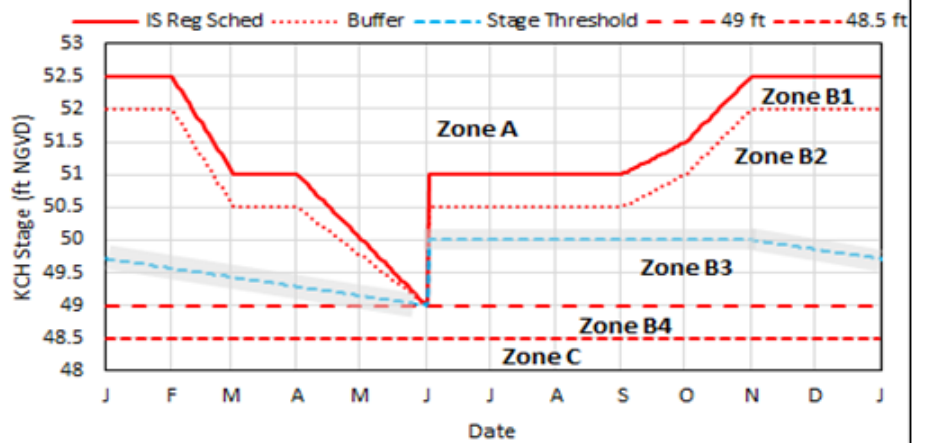
Stage and Discharge Guidance for Wet Season 2019.		
Zone	KCH Stage (ft NGVD)	S-65/S-65A Discharge*
A	Above regulation schedule line.	Flood control releases as needed with no limits on the rate of discharge change.
B1	In flood control buffer zone (0.5 ft below the schedule line).	Adjust S-65 discharge so that S-65A discharge is between 1400 cfs at the buffer zone line and 3000 cfs at the schedule line.
B2	Between the Flood Control Buffer and the 50.0 ft line.	Adjust S-65 discharge to maintain at least 1400 cfs at S-65A. Use ± 0.2 ft buffer (gray band) above and below the 50.0 ft line to decide when to begin ramping up to 1400 cfs or down to 300 cfs; do not continue reducing discharge if stage rises back to or above the threshold stage line.
B3	Between the 50.0 ft line and 49 ft.	Adjust S-65 discharge to maintain at least 300 cfs at S-65A.
B4	Between 48.5 ft to 49 ft.	Adjust S-65 discharge to maintain S-65A discharge between 0 cfs at 48.5 ft and 300 cfs at 49 ft.
C	Below 48.5 ft.	0 cfs.

*Changes in discharge should not exceed limits in inset table below.

Discharge Rate of Change Limits for S65/S65A (revised 7/13/18).		
Q (cfs)	Maximum rate of increase (cfs/day)	Maximum rate of decrease (cfs/day)
0-300	50	-50
301-650	75	-75
651-1400	150	-150
1401-3000	300	-600
>3000	1000	-2000

Revised 5/18/2019

Preferred Discharge Plan for S-65/S-65A (IS-14-50.0)



Other Considerations

- When possible, limit lake ascension rate in the Jun 1 - Aug 15 window to 0.5 ft per 14 days in Lakes Kissimmee, Cypress, Hatchineha (S-65), East Toho (S-59) and Toho (S-61).
- If outlook is for extreme dry conditions meet with KB staff to discuss modifications to this plan.

8

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

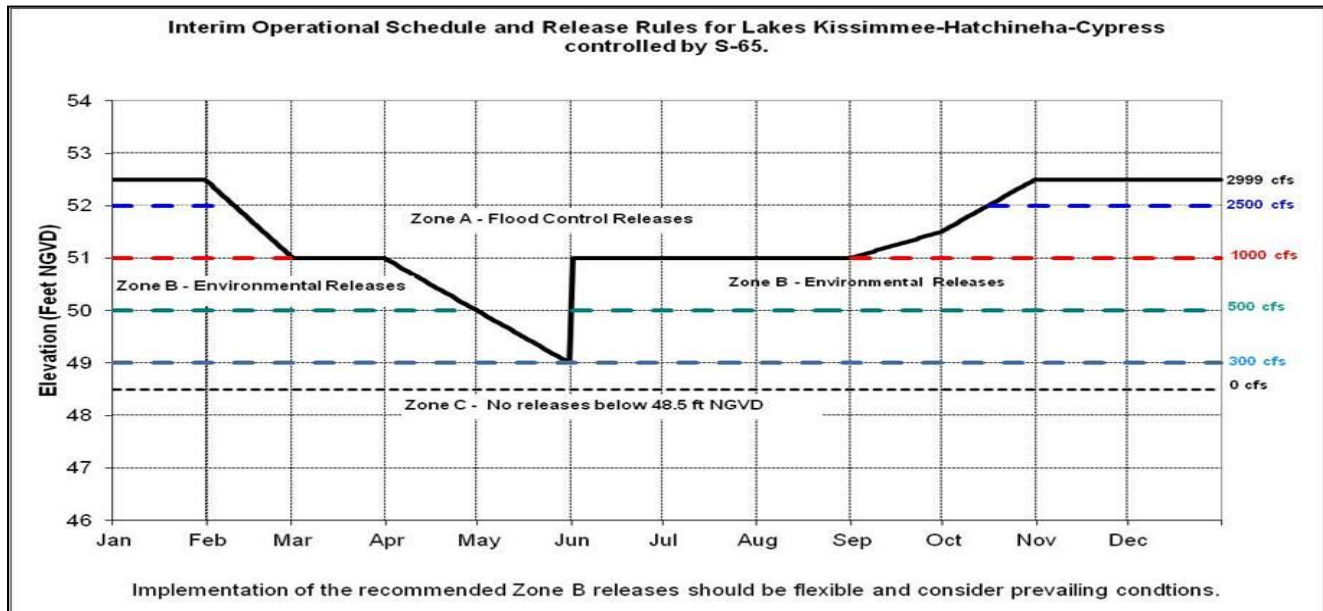


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

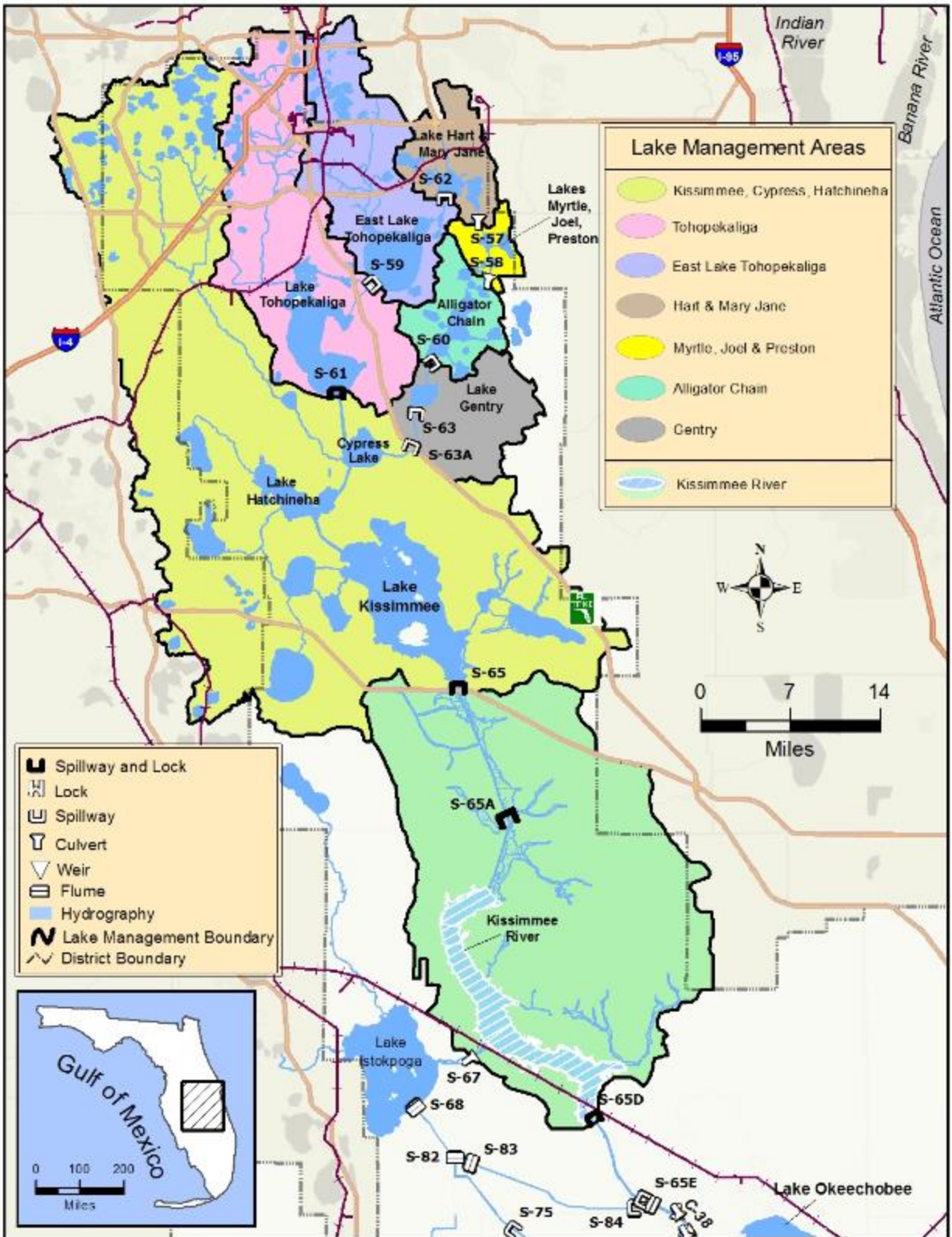


Figure 13. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 12.38 feet NGVD for August 12, 2019 increasing 0.38 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), though the station L005 has been inactive for several weeks. The Lake is now 0.95 feet higher than a month ago and 2.14 feet lower than a year ago (Figure 1) when stages were about a foot above the top of the preferred ecological envelope (Figure 2). The Lake dropped into the Water Shortage sub-band on July 19, 2019 but moved back into the Beneficial Use sub-band in the previous week and is headed toward the Base-Flow sub-band (Figure 3). Lake stages are now higher for this time of year than they were in 2011, 2012, and 2015 (Figure 4). According to RAINДАР, during the week of August 06 to August 12, 2019, 2.13 inches of rain fell directly over the Lake, compared to 2.74 inches the previous week. Most of the watershed received similar amounts of rainfall, between 1.5 – 3.0 inches (Figure 5).

The average daily inflows (minus rainfall) to the Lake increased again from the prior week, going from 3,317 cfs to 5,568 cfs. The inflows from the Kissimmee River (S-65E) doubled, going from 1,616 cfs to 3,258 cfs, while those from Lake Istokpoga (via S-84 and S71) increased from 1,147 cfs to 1,484 cfs. C-44 canal stages were regulated through the S-308 structure, resulting in an average daily backflow of 295 cfs into the lake, down from 462 cfs the previous week. Passive backflow from the L8 at Canal Point (via CLV10A) was unchanged at 124 cfs, while pumping from the various S-100 pumps increased from 307 cfs to 595 cfs (Table 1).

Outflows from the Lake were negative, as noted above through the S-308 structure. There were no releases from the Lake. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation increased from the previous week to 0.22 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 (August 11, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel 3(a&b) OLCI sensor data showed bloom potential may remain elevated in northern portions of the lake (Figure 7), but more likely just in the northeast. Concurrent water quality sampling found no evidence of visible blooms, dominant cyanobacteria taxon, or toxin in any of the western and north areas sampled, despite overlapping with relatively high estimates of cyanobacteria density predicted from the satellite imagery. Low lake stages and resulting clearer water along the shorelines of the lake are likely causing greater light penetration and algal growth at greater depths than usually occurs on the Lake, so high estimates from satellite imagery may only be reflective of higher Chlorophyll-a counts in general. The shorelines of the Lake may be more similar to imagery from other lakes like Istokpoga or Kissimmee, suggesting there may need to be refinements to how the imagery is compared from center to shoreline, as well as from year to year, based on water clarity, water color, and distribution of algal cells.

Water Management Recommendations

Lake Okeechobee stage is 12.38 feet NGVD, increasing 0.38 feet from the previous week and 0.75 feet over the previous two weeks. The Lake dropped into the Water Shortage Band on July 19, 2019, moved back into the Beneficial Use sub-band last week, and may enter the Base Flow sub-band next week. The lake has also moved back into the ecological envelope, which varies seasonally from 12.5 – 15.5 feet NGVD (+/- 0.5 feet), after spending about 215 days below. Lake stage ascension rates remain important to the continued recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone; continued high ascension rates will stress newly established plants and could reduce the beneficial effects that recent low lake stages have had on these communities. The latest estimate of cyanobacteria bloom potential on the lake (August 11) shows elevated potential in the northern areas, though concurrent water quality samples suggest there is no visible bloom, usually no dominant taxon, and usually no microcystin toxin; except for samples in the northeast. The satellite density estimates may be overestimating cyanobacteria presence along the NW shoreline where Chlorophyll-a values are elevated, and water has less suspended solids but is colored.

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	1616	3258	1.5
S-71 & S-72	190	642	0.3
S-84 & S-84X	957	842	0.4
Fisheating Creek	128	197	0.1
S-154	34	99	0.0
S-191	99	218	0.1
S-133 P	102	156	0.1
S-127 P	14	77	0.0
S-129 P	15	21	0.0
S-131 P	11	19	0.0
S-135 P	32	5	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	119	124	0.1
Rainfall	5840	4616	2.1
Total	9157	10274	4.7

OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-77	0	0	0.0
S-308	-462	-295	-0.1
S-351	0	0	0.0
S-352	0	0	0.0
S-354	0	0	0.0
L-8 Outflow			
ET	1507	3343	1.5
Total	1045	3048	1.4

Provisional Data

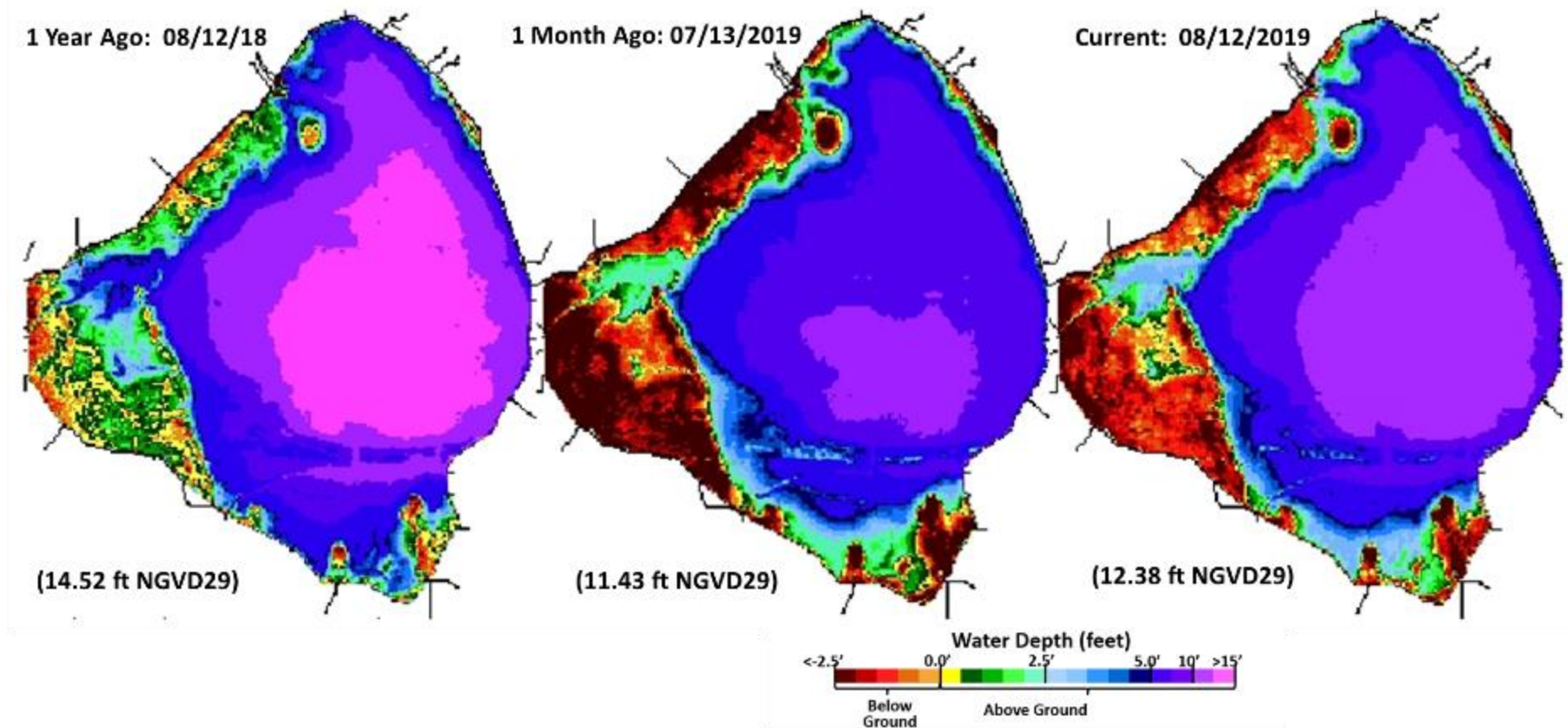


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

Lake Okeechobee Stage vs Ecological Envelope

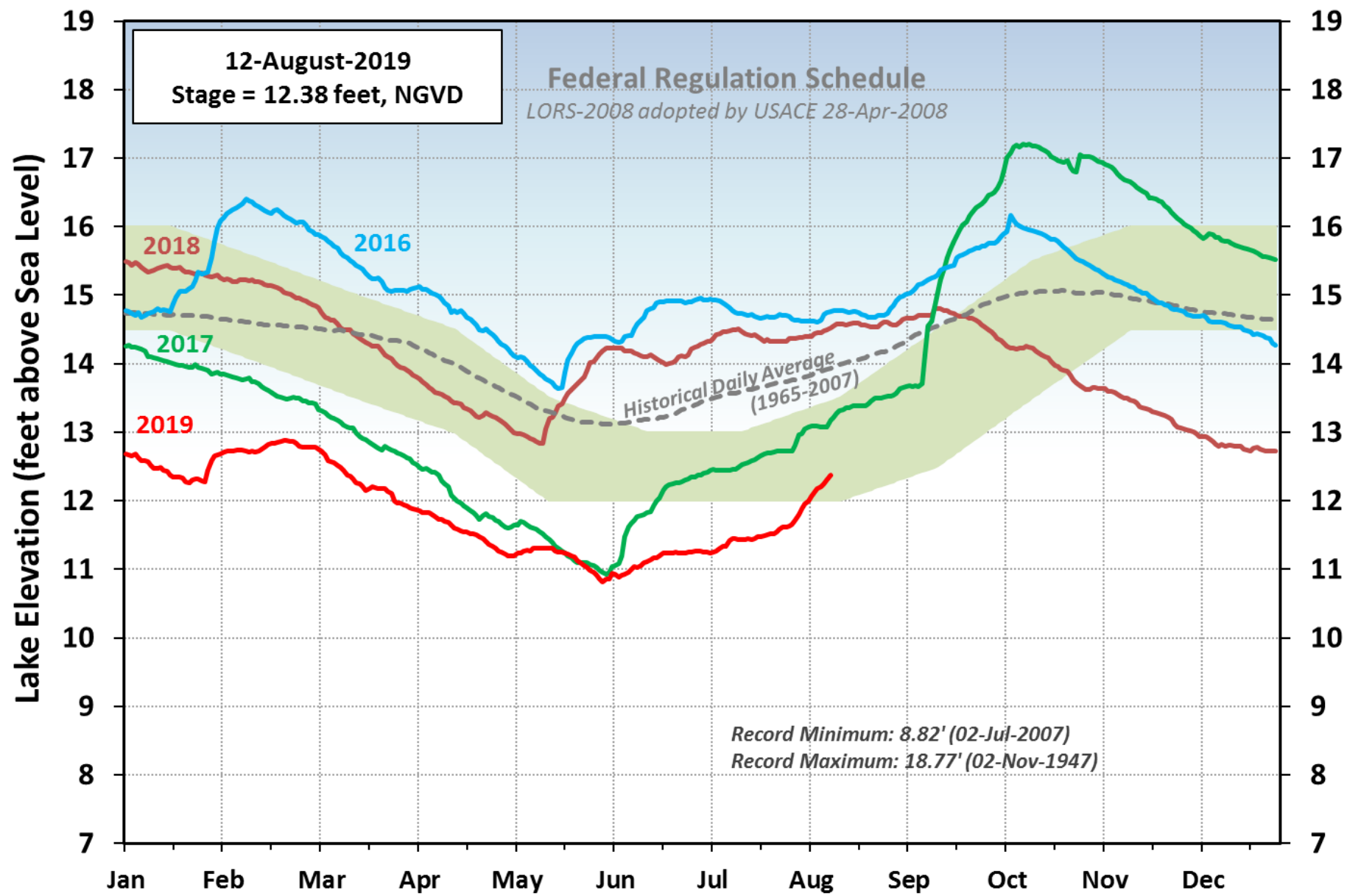
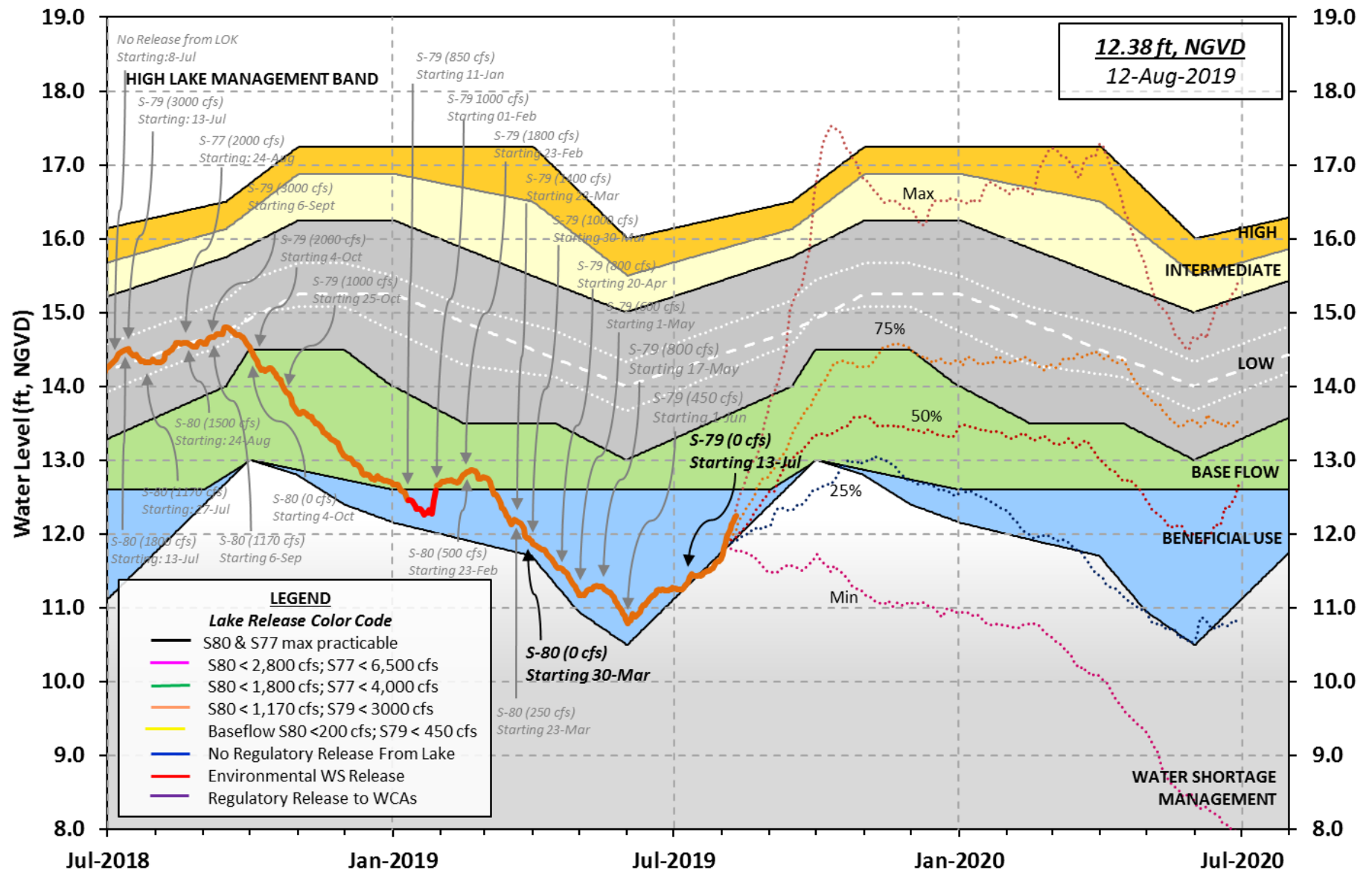


Figure 2. Select annual stage hydrographs for Lake Okeechobee in comparison to the Ecological Envelope.

Lake Okeechobee Water Level History and Projected Stages



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

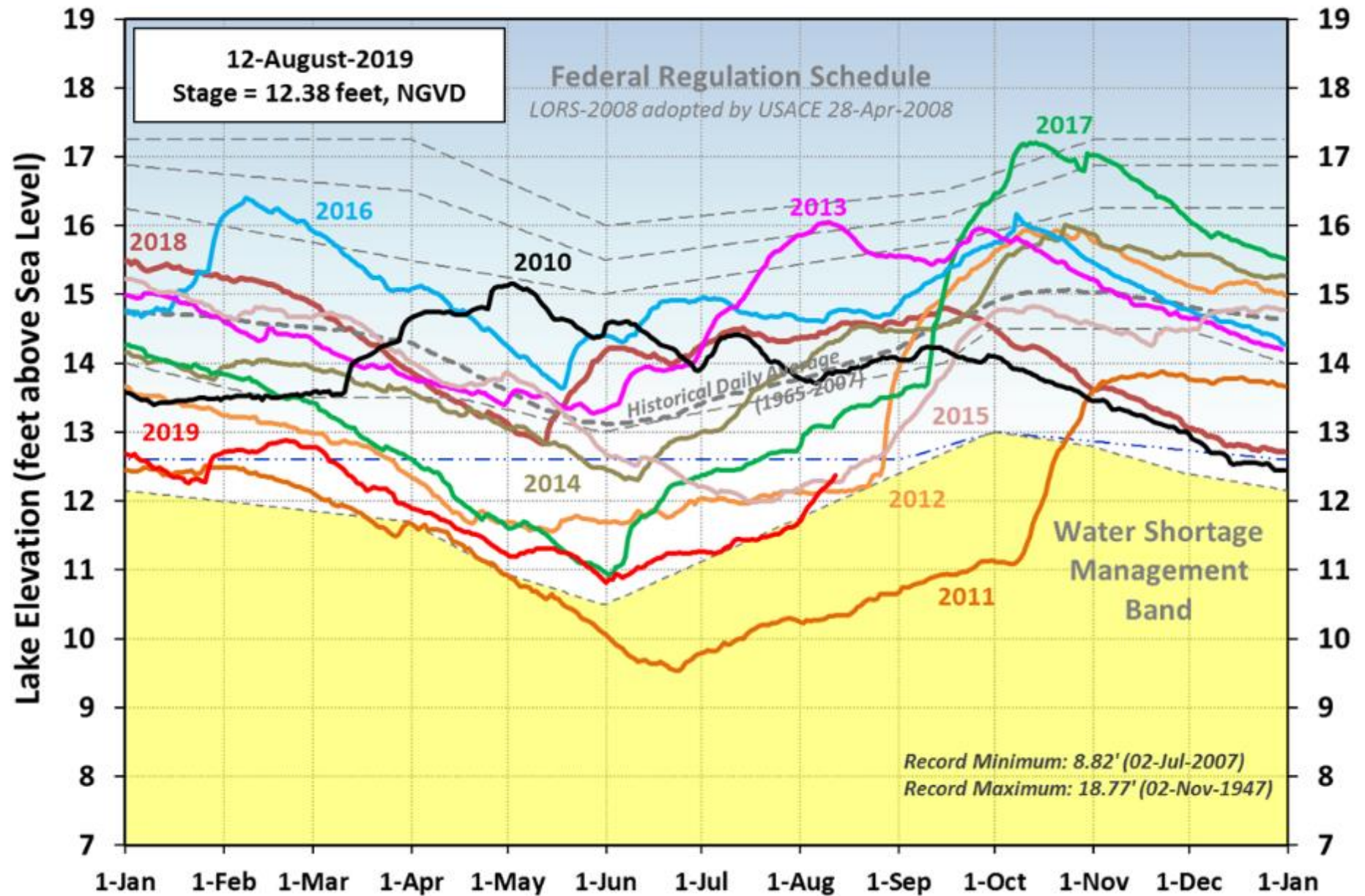


Figure 4. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES

FROM: 0530 EST, 08/06/2019 THROUGH: 0530 EST, 08/13/2019

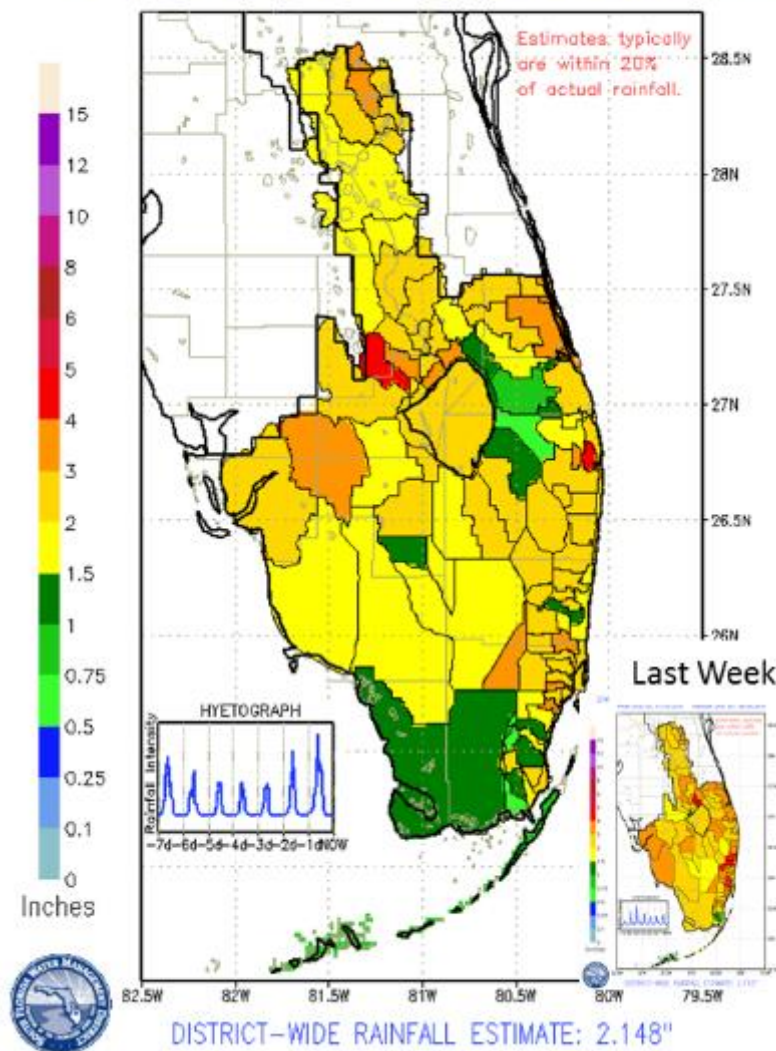


Figure 5. Rainfall estimates by basin.

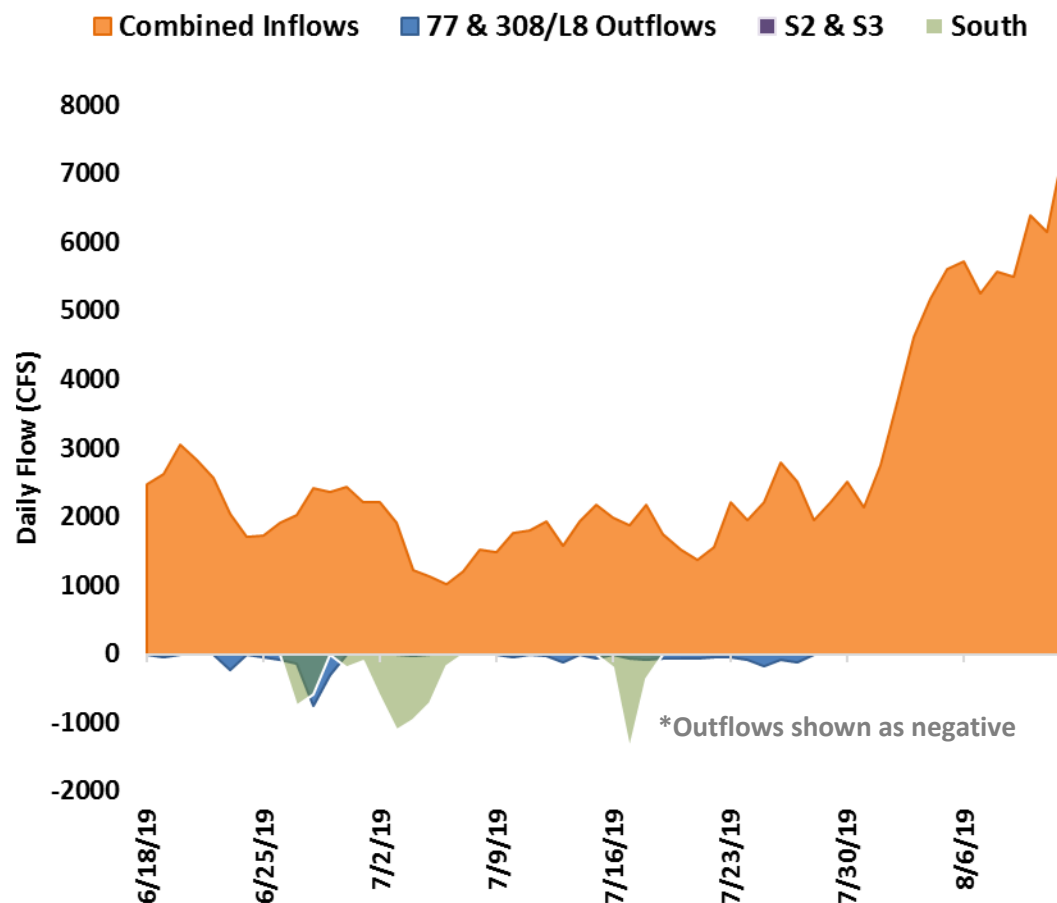


Figure 6. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive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

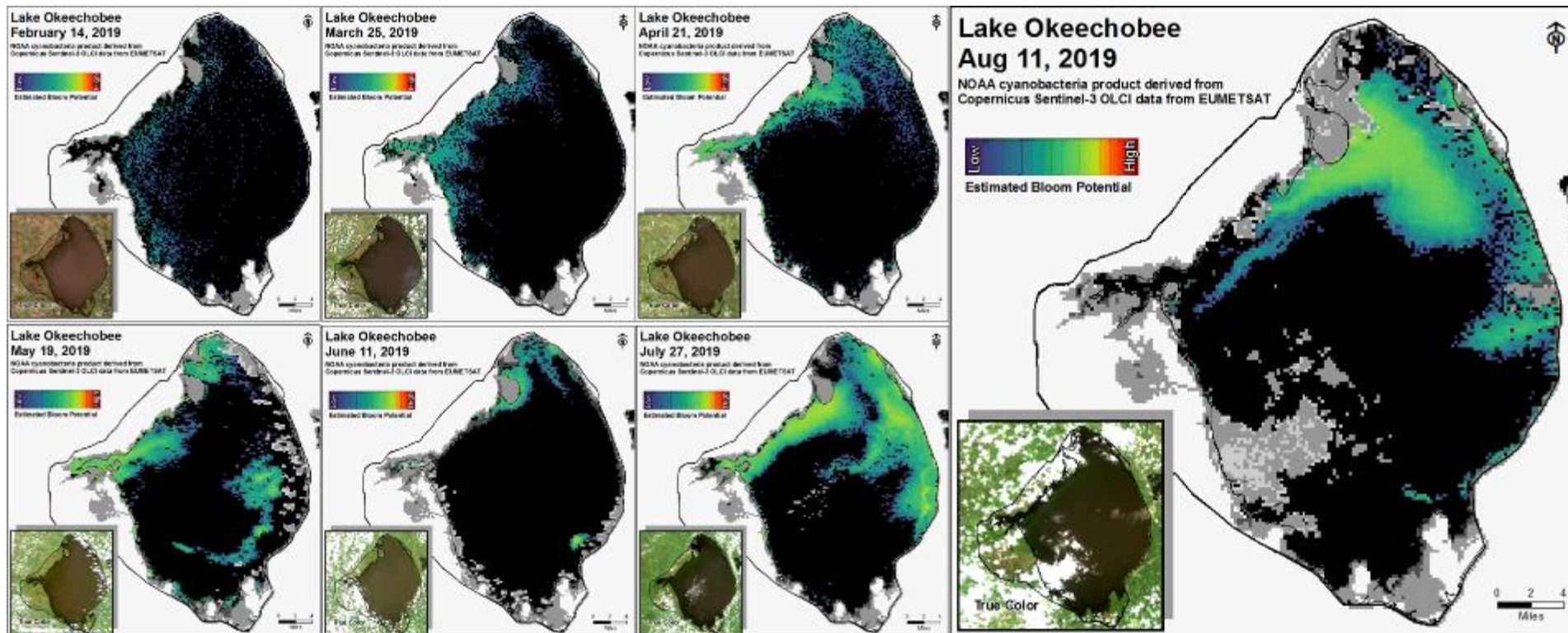


Figure 7. Potential for cyanobacterial blooms on Lake Okeechobee in 2019, based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 1,768 cfs (Figures 1 and 2) and last month inflow averaged about 1,158 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	1127
S-80	0
S-308	-295
S-49 on C-24	256
S-97 on C-23	143
Gordy Rd. structure on Ten Mile Creek	242

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 13.6. 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)	6.6 (12.8)	13.8 (18.2)	NA ¹
US1 Bridge	11.8 (18.8)	14.5 (19.8)	10.0-26.0
A1A Bridge	20.2 (26.4)	EM² (~28.9)	NA ¹

¹Envelope not applicable and ²Equipment Malfunction.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 6,952 cfs (Figures 5 and 6) and last month inflow averaged about 4,404 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	1225
S-79	4953
Tidal Basin Inflow	1999

Over the past week, salinity decreased throughout the estuary (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 in the poor range at Cape Coral (Figure 9). The 30-day moving average surface salinity is 0.2 at Val I-75 and 0.6 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass.

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

Sampling Site	Surface	Bottom	Envelope
S-79 (Franklin Lock)	0.2 (0.2)	0.2 (0.2)	NA ¹
Val I75	0.2 (0.3)	0.2 (0.3)	0.0-5.0 ²
Ft. Myers Yacht Basin	0.2 (0.4)	0.3 (0.4)	NA
Cape Coral	1.0 (~6.5)	EM (~8.1)	10.0-30.0
Shell Point	EM ³ (EM)	15.1 (22.6)	10.0-30.0
Sanibel	23.3 (26.9)	25.7 (28.5)	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 0.3 to 0.3 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 1,800 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	1800	0.3	0.3
B	300	1800	0.3	0.3
C	450	1800	0.3	0.3
D	650	1800	0.3	0.3
E	800	1800	0.3	0.3

Red tide

The Florida Fish and Wildlife Research Institute reported on August 2, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from Lee, St. Lucie, Martin, or Palm Beach counties (no samples from Broward or Miami-Dade counties).

Water Management Recommendations

Lake stage is in the Beneficial Use sub-band of 2008 LORS. Tributary hydrological conditions are wet. 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.

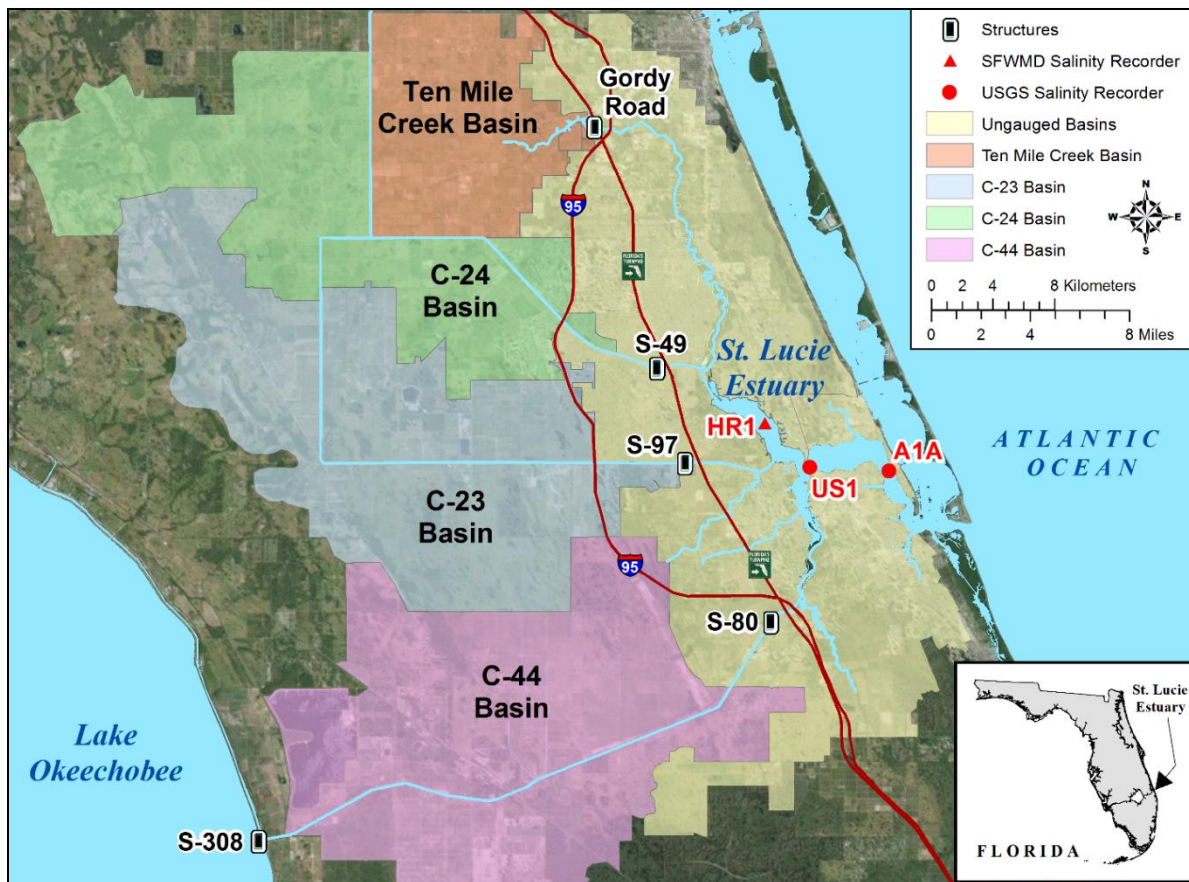


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

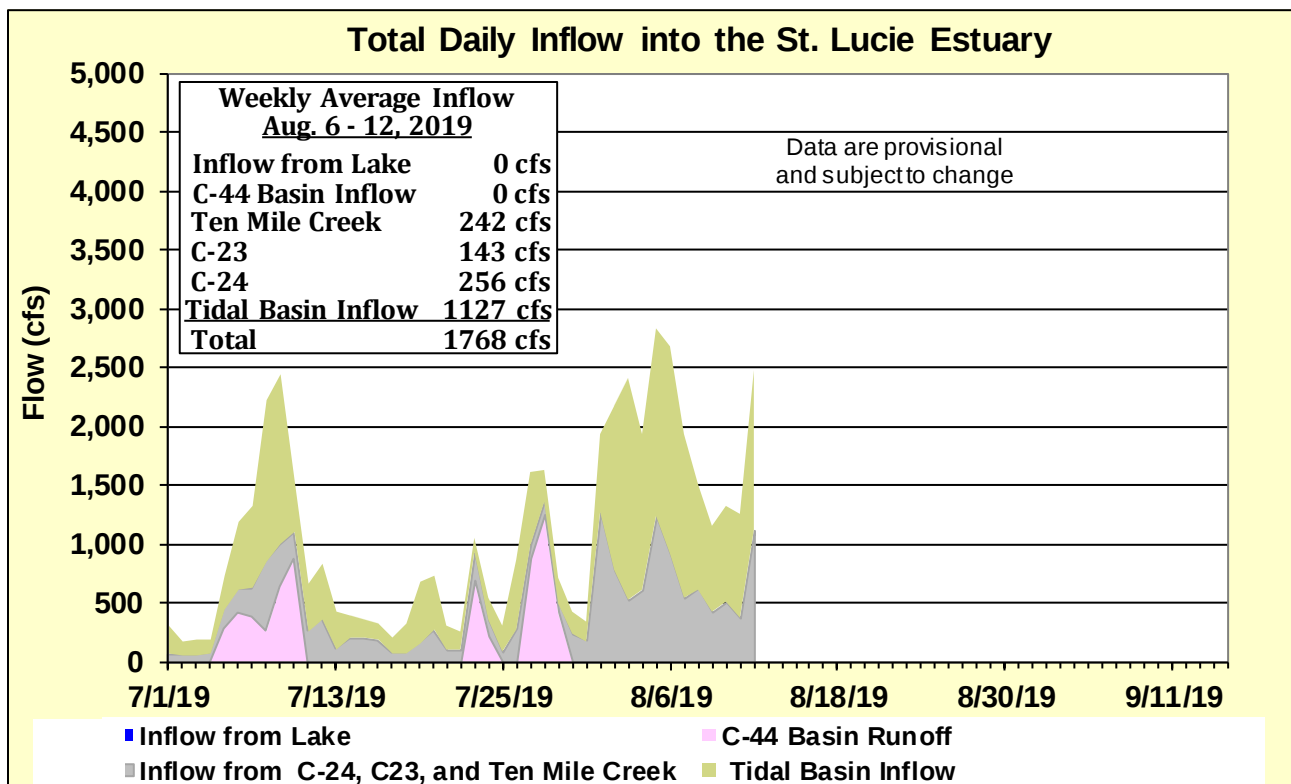


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

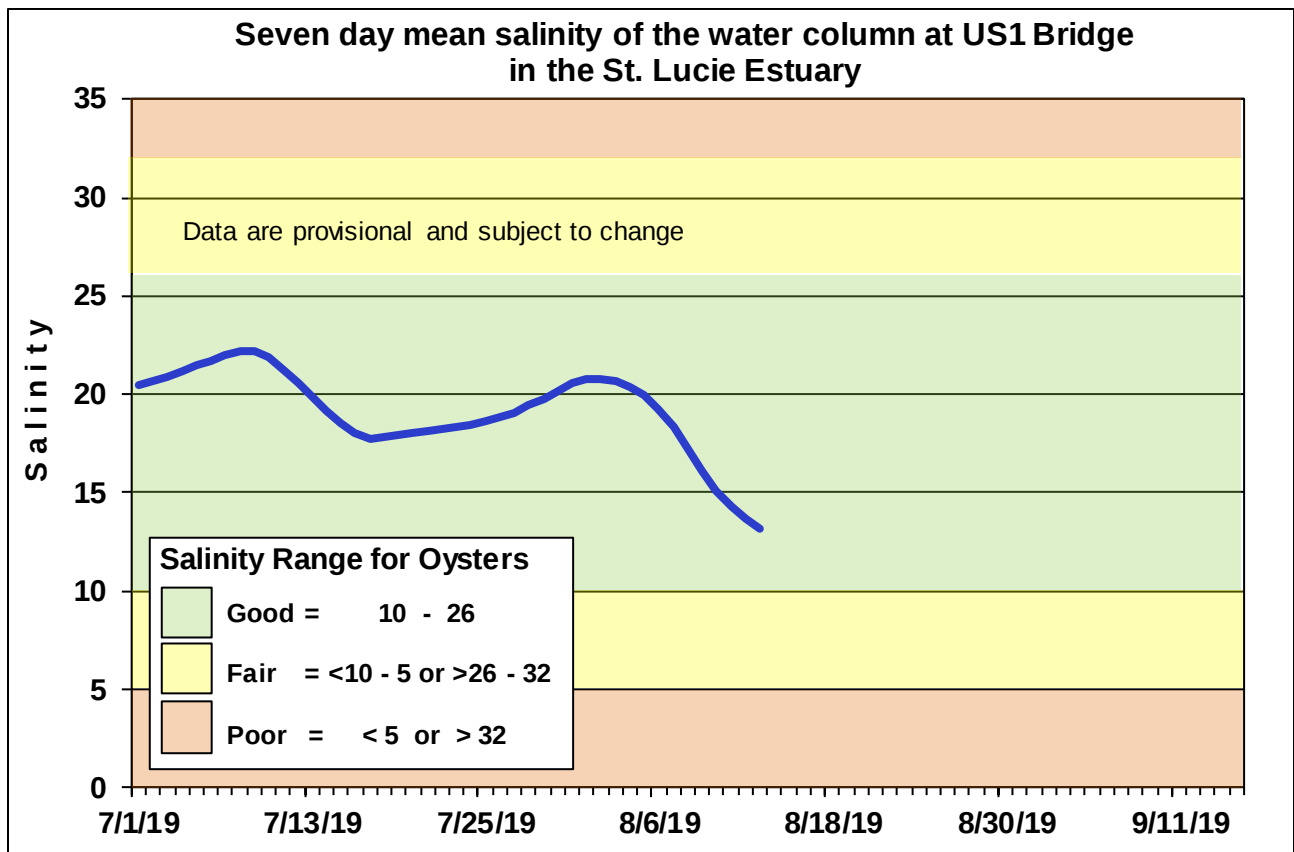


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

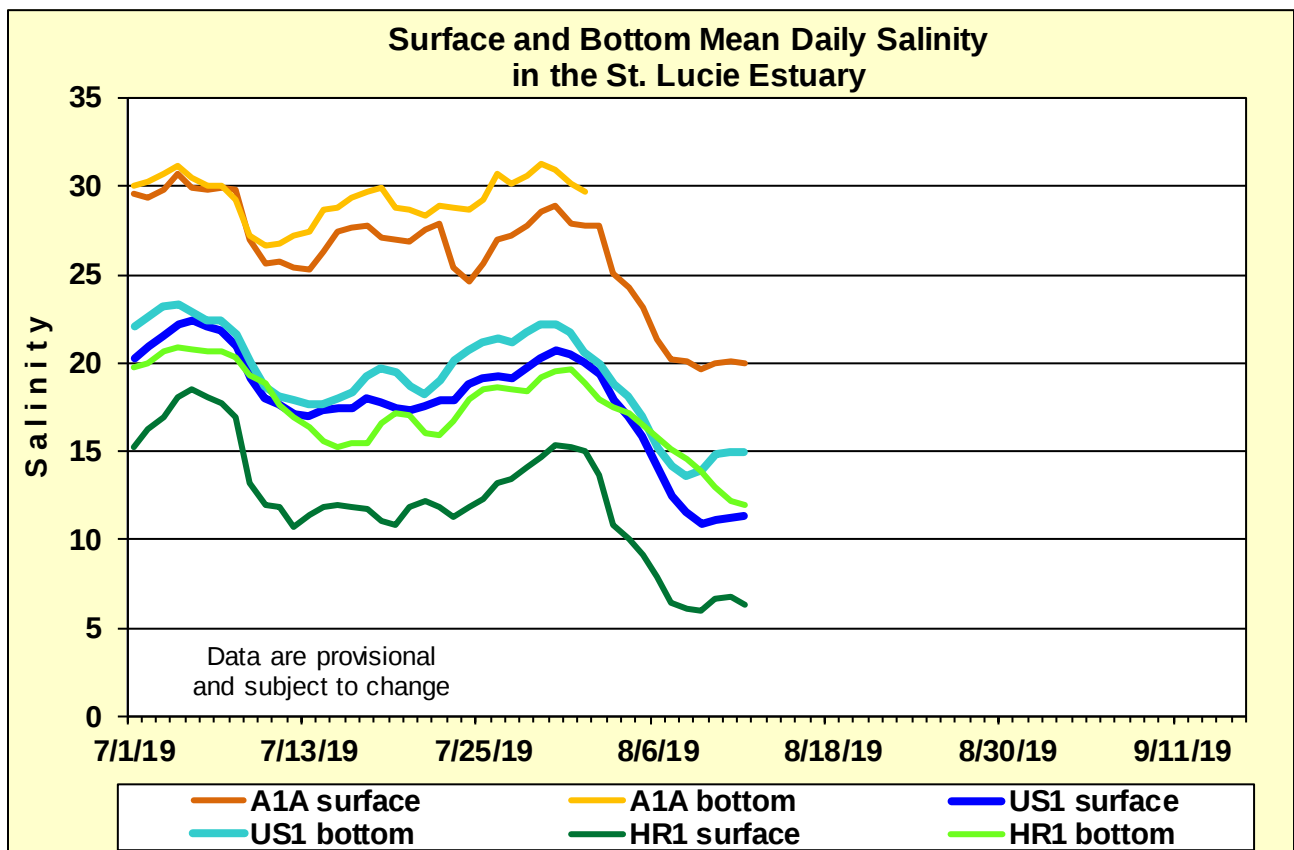


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

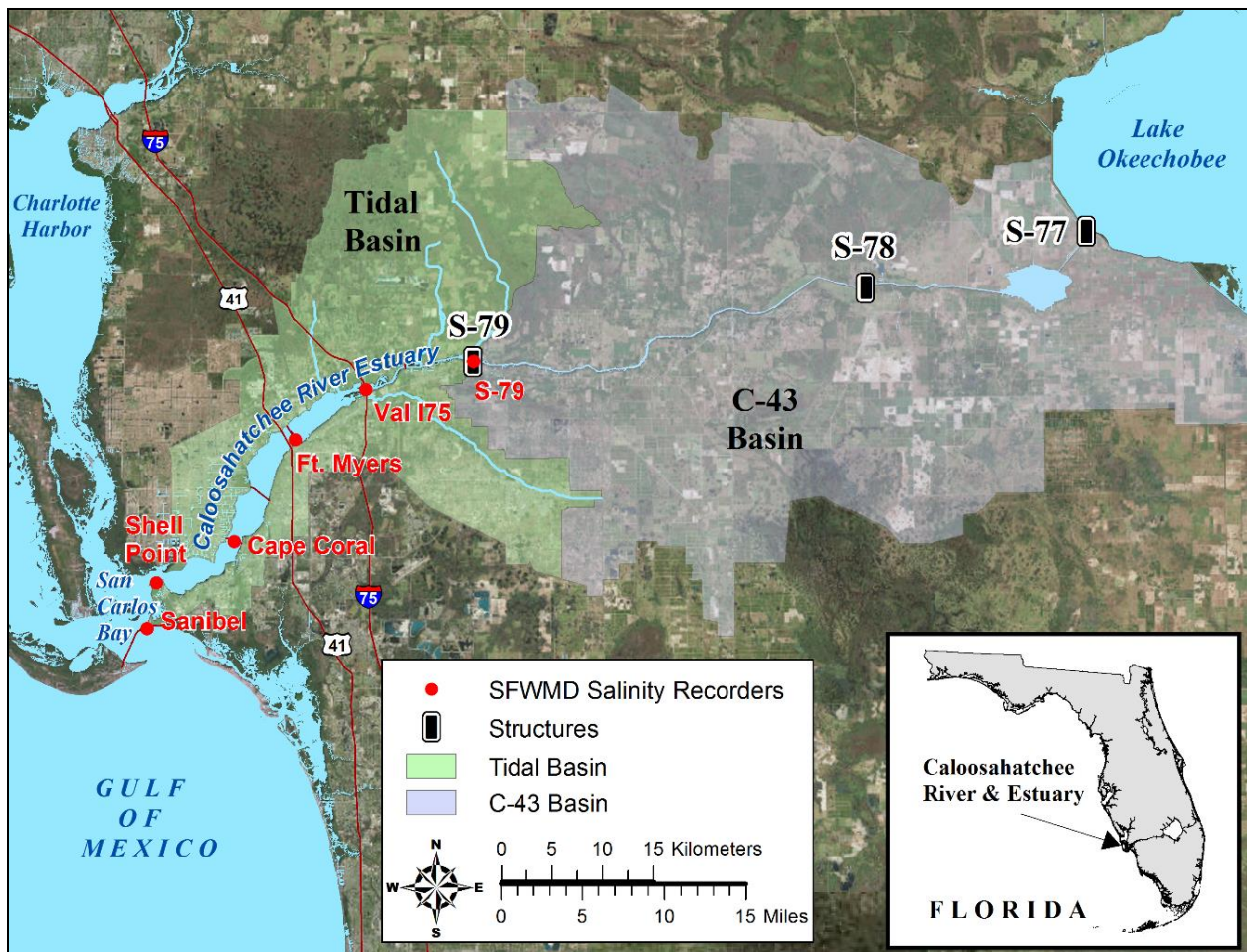


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

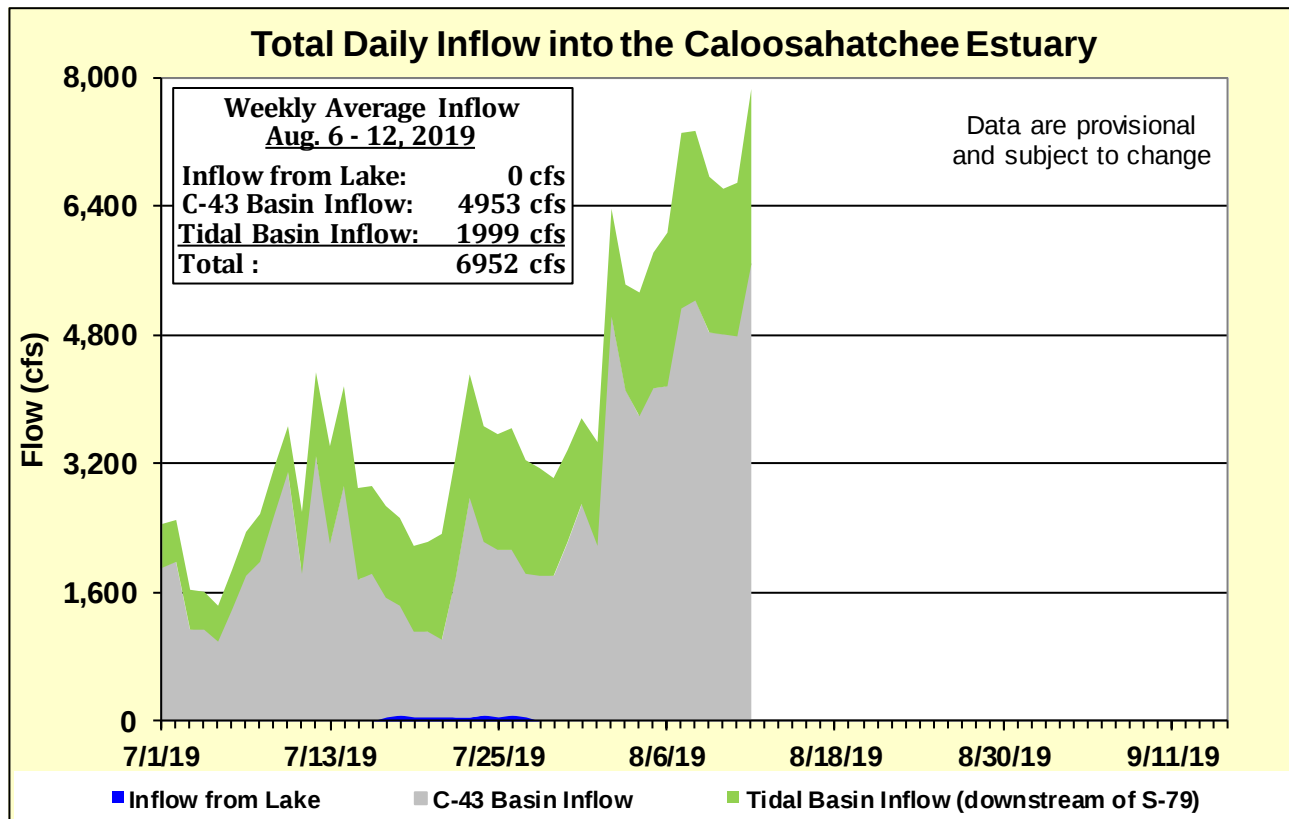


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in

the tidal basin into the Caloosahatchee River Estuary.

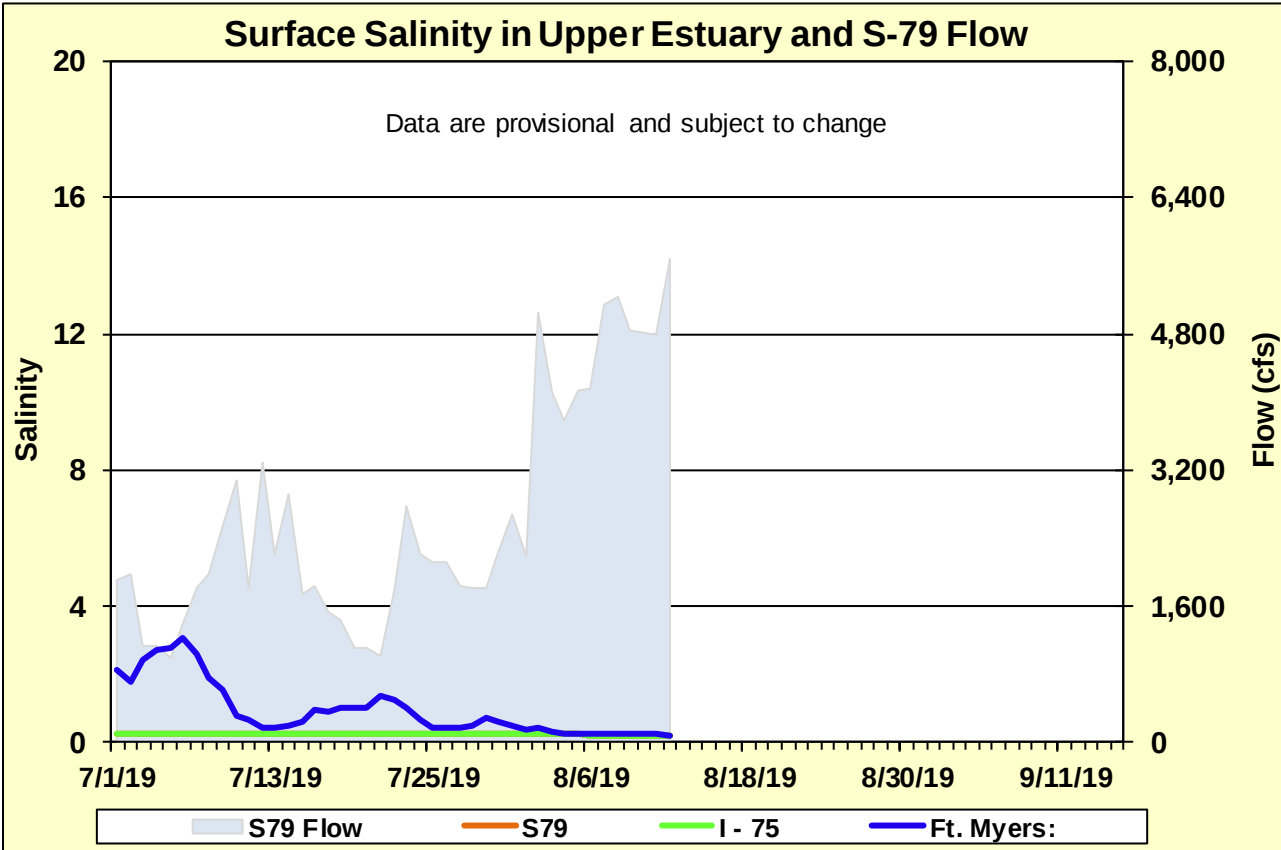


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

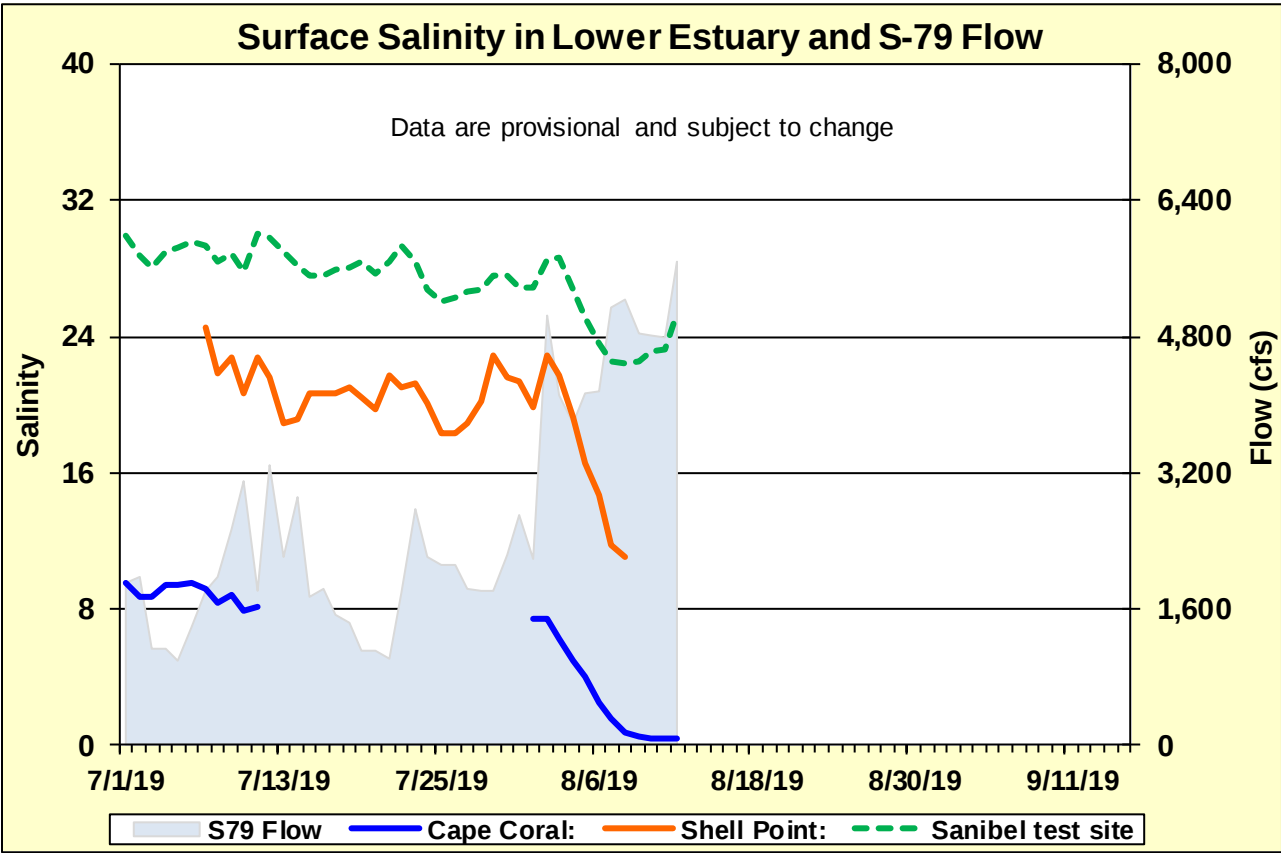


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

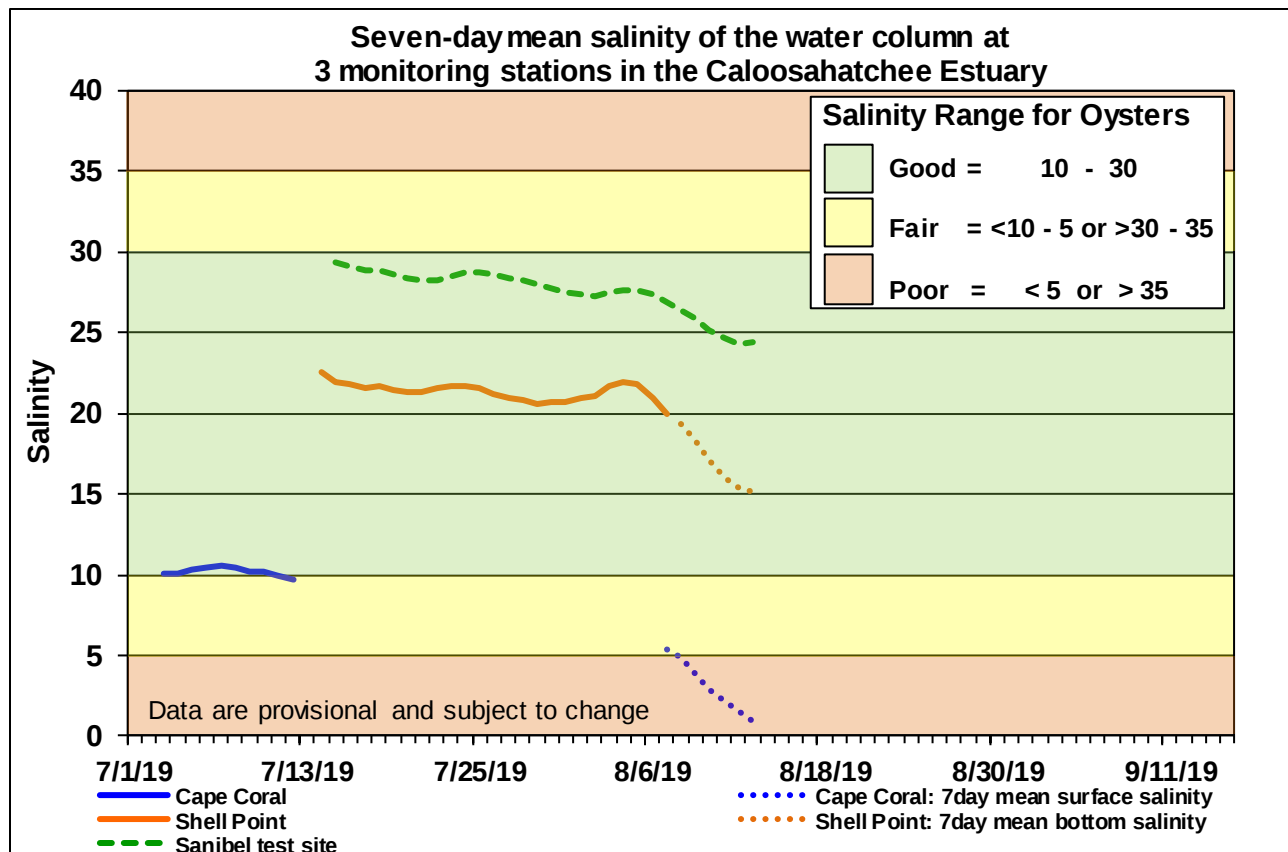


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

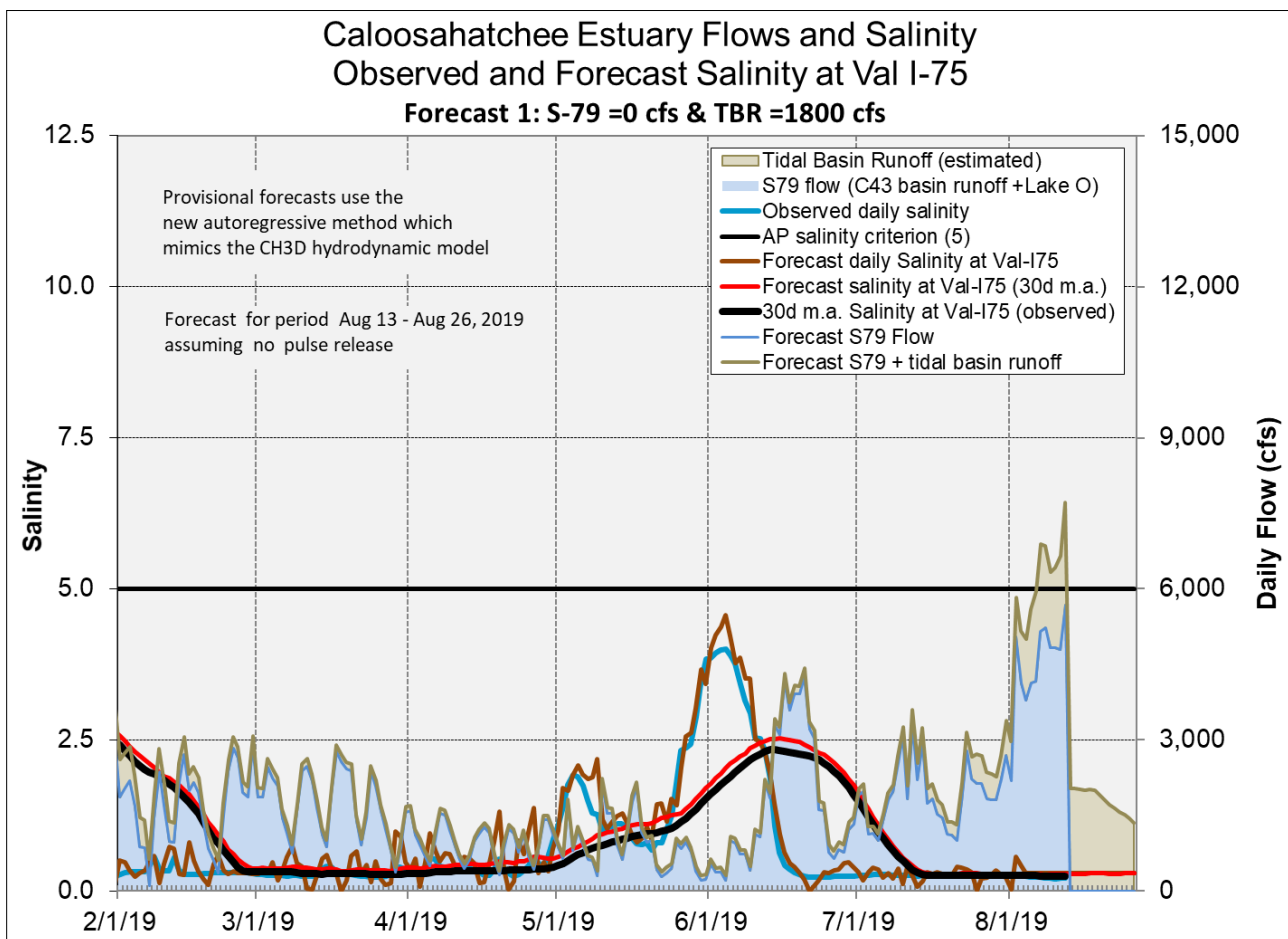
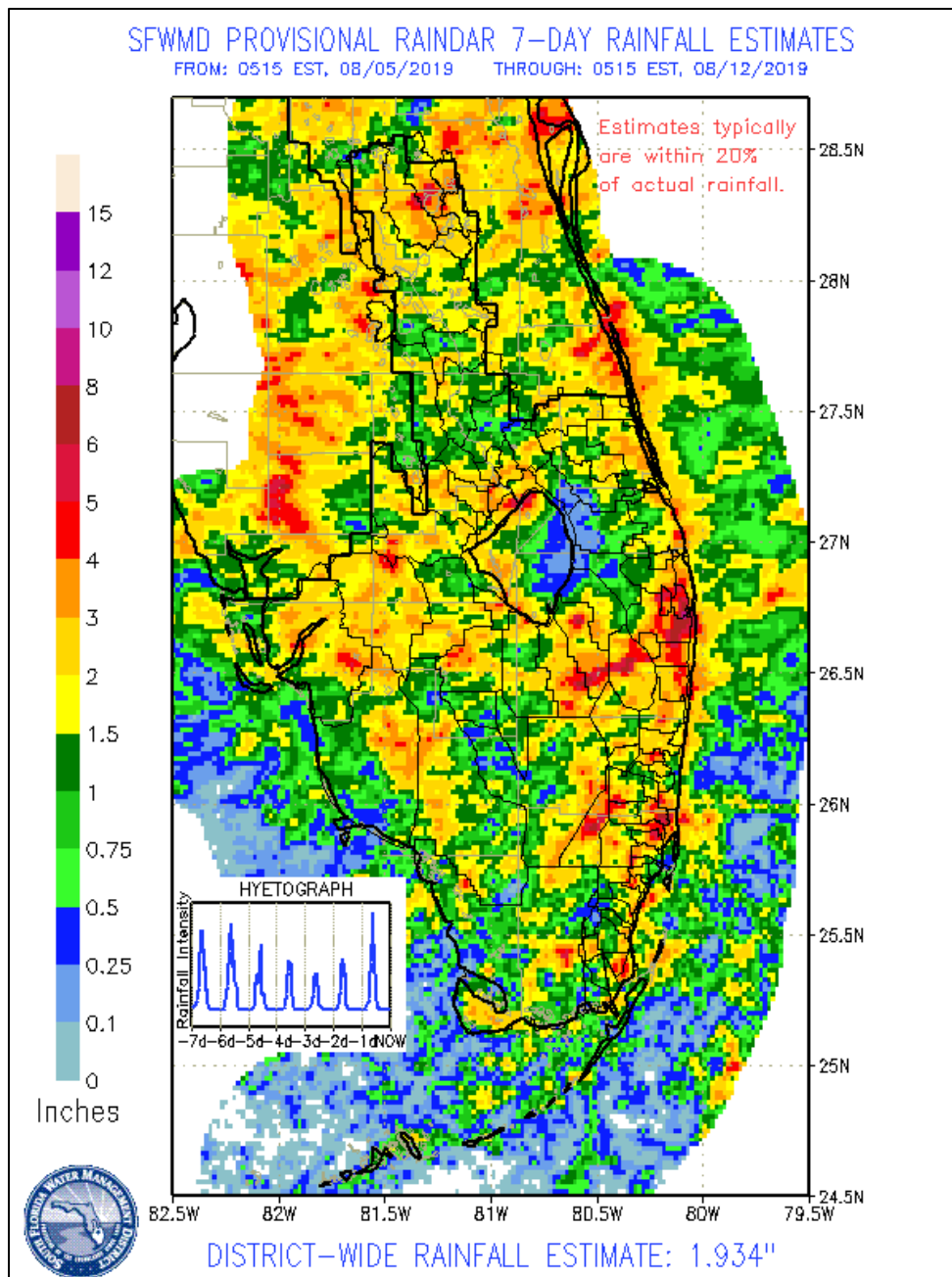


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

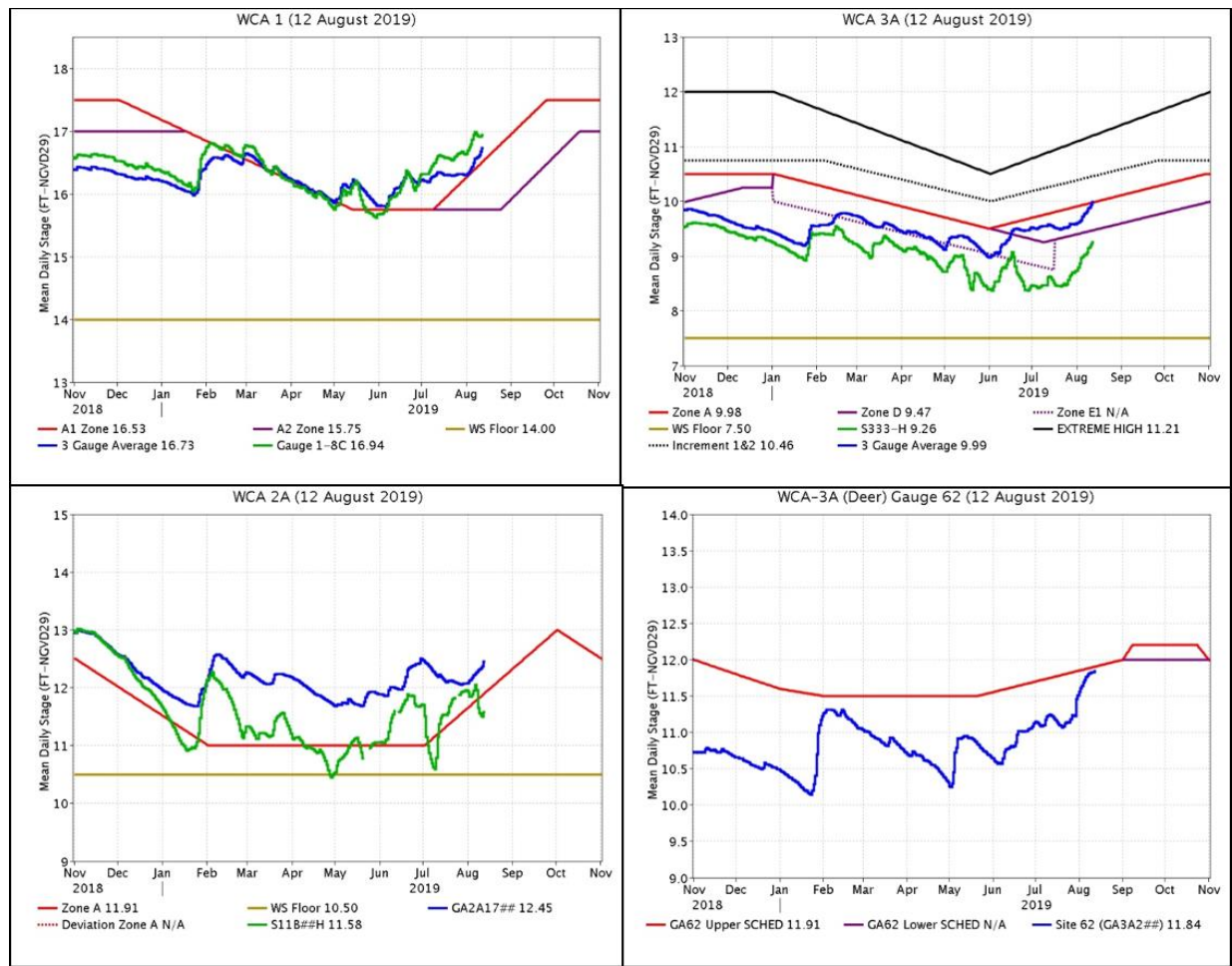
EVERGLADES

Across the WCAs above average rainfall (in some places well above average) brought stages up 0.23 feet on average. Within WCA-1 the local maxima were 7.93 inches for the week and gauge 1-7 there rose 0.44 feet last week. Pan evaporation was estimated at 1.46 inches and the Rainfall Plan calls for the maximum release (up from 1,700 cfs last week).

Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	3.17	+0.29
WCA-2A	2.00	+0.20
WCA-2B	1.96	+0.22
WCA-3A	1.52	+0.26
WCA-3B	3.24	+0.17
ENP	1.28	-0.04



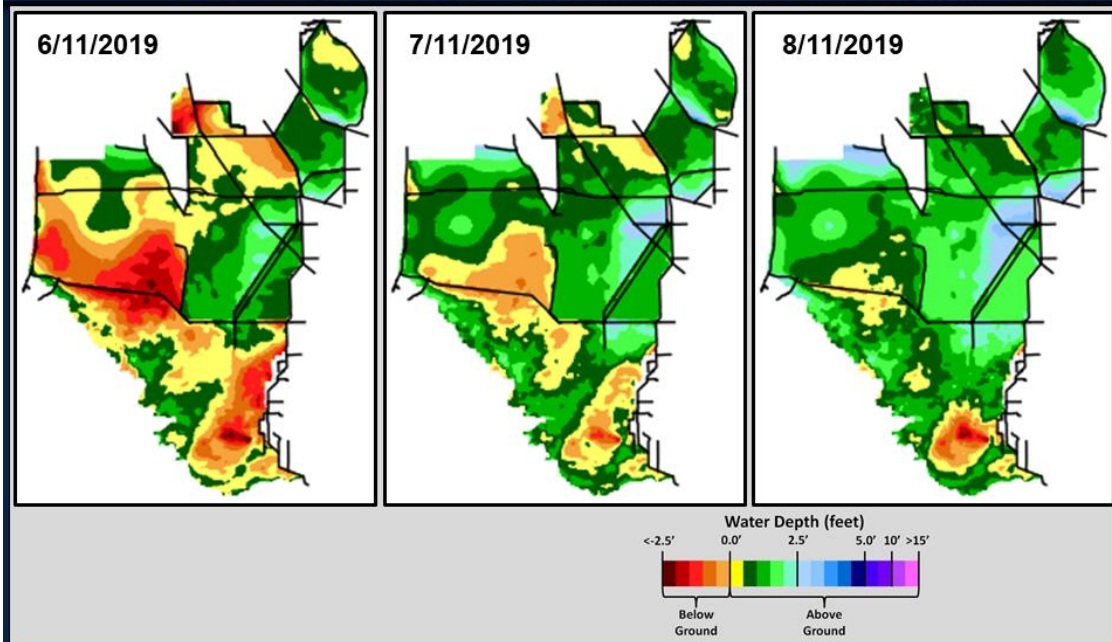
Regulation Schedules: WCA-1: The three-gauge average now trending slightly higher than the Zone A1 line, currently 0.20 feet above the A1 Zone regulation line. WCA-2A: Gauge 2A-17 remains above the Zone A regulation line, at 0.54 feet above this week. WCA-3A: The three-gauge average stage is now 0.01 above Zone A line just above the desired operational band. WCA-3A at gauge 62 (northwest corner) remains just below schedule at 0.07 feet below the upper schedule and paralleling the line.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate stages in northeastern WCA-3A have risen above ground in the last month, protecting the peat soils there. The sloughs within Everglades National Park seem to be showing impacts of recent projects with increased water depths and connectivity within Lostman's, SRS and Taylor Sloughs. Ponding has increased at the southern end of WCA-1, WCA-2B and along the L67 levees in WCA-3A South. WDAT difference maps indicate that southern WCA-1, western WCA-2A and most of WCA-3A has increased in stage during the last month. In general stage conditions are slightly deeper with the most significant differences in stage over the last month are shown in the southern end of WCA-1. WCA-3A and WCA-2A are mostly drier than last year at this time when the area was under a high-water emergency order for conditions in WCA-3A. Notable exceptions to this is the southern end of WCA-1.



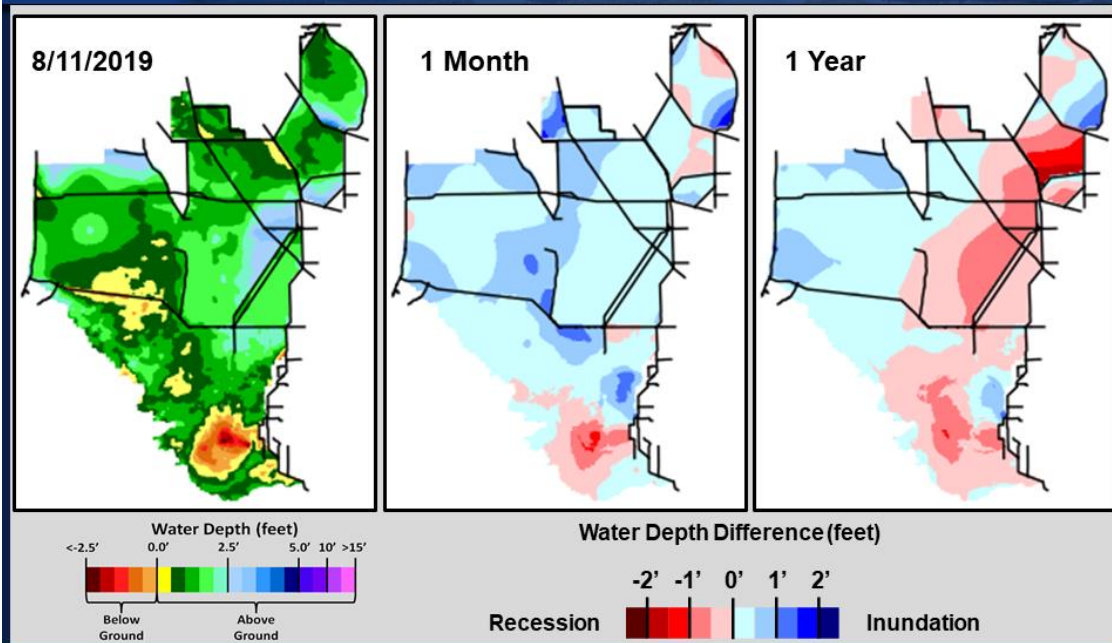
SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)



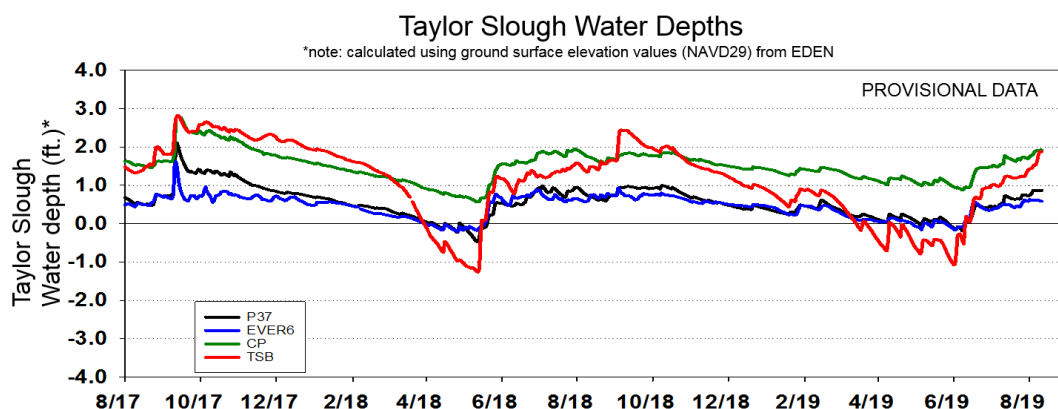
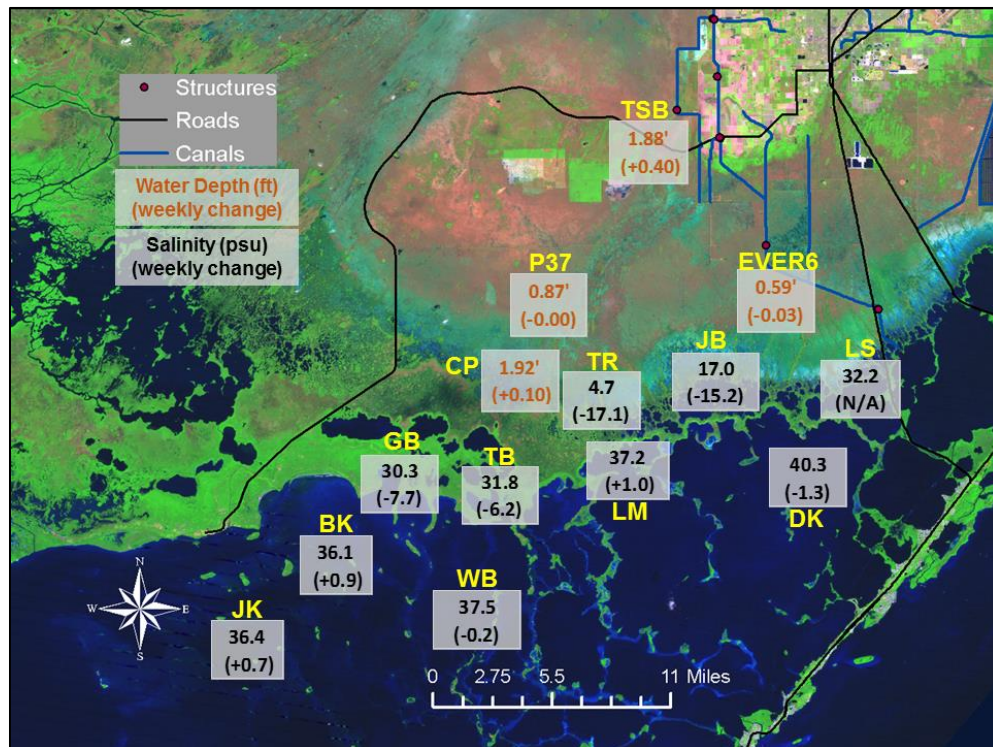
SFWDAT Everglades Difference Maps (Present – Past)

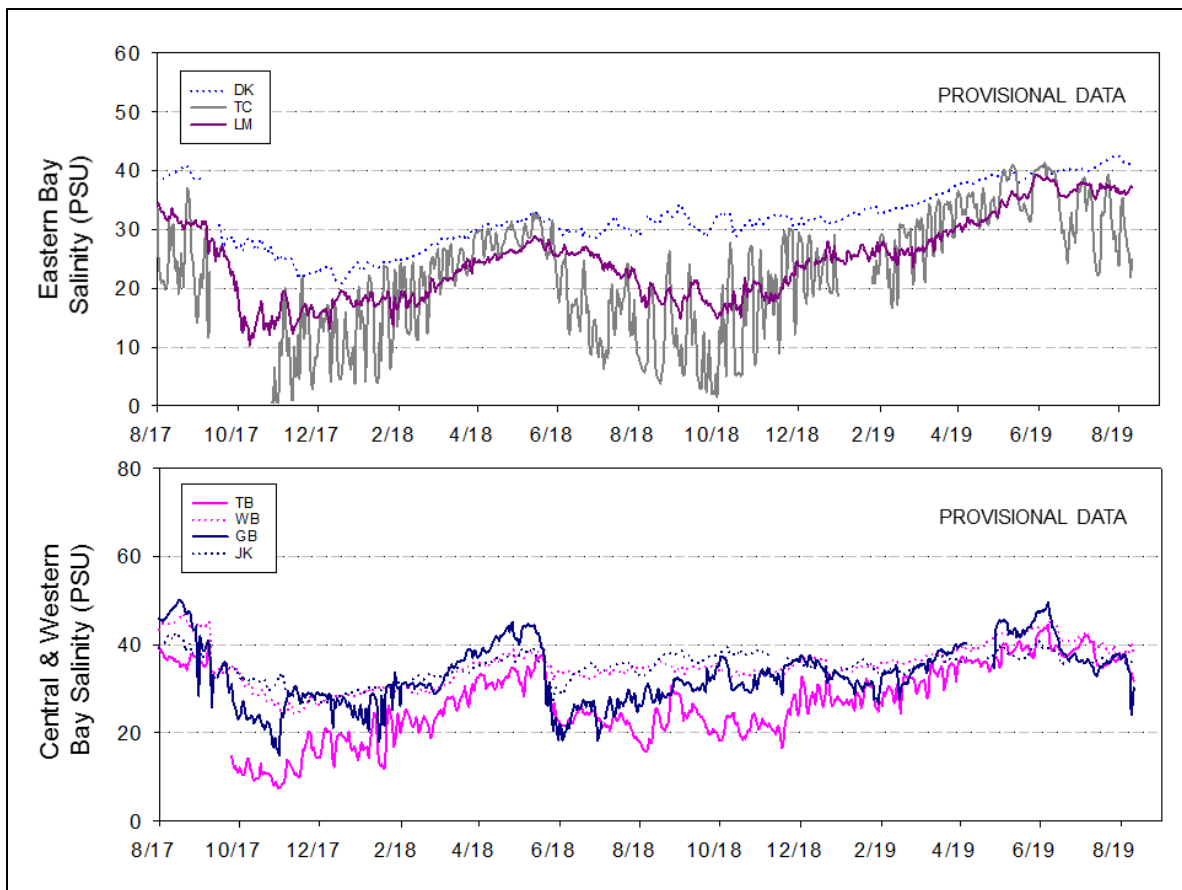


South Florida Water Depth Assessment Tool (SFWDAT)

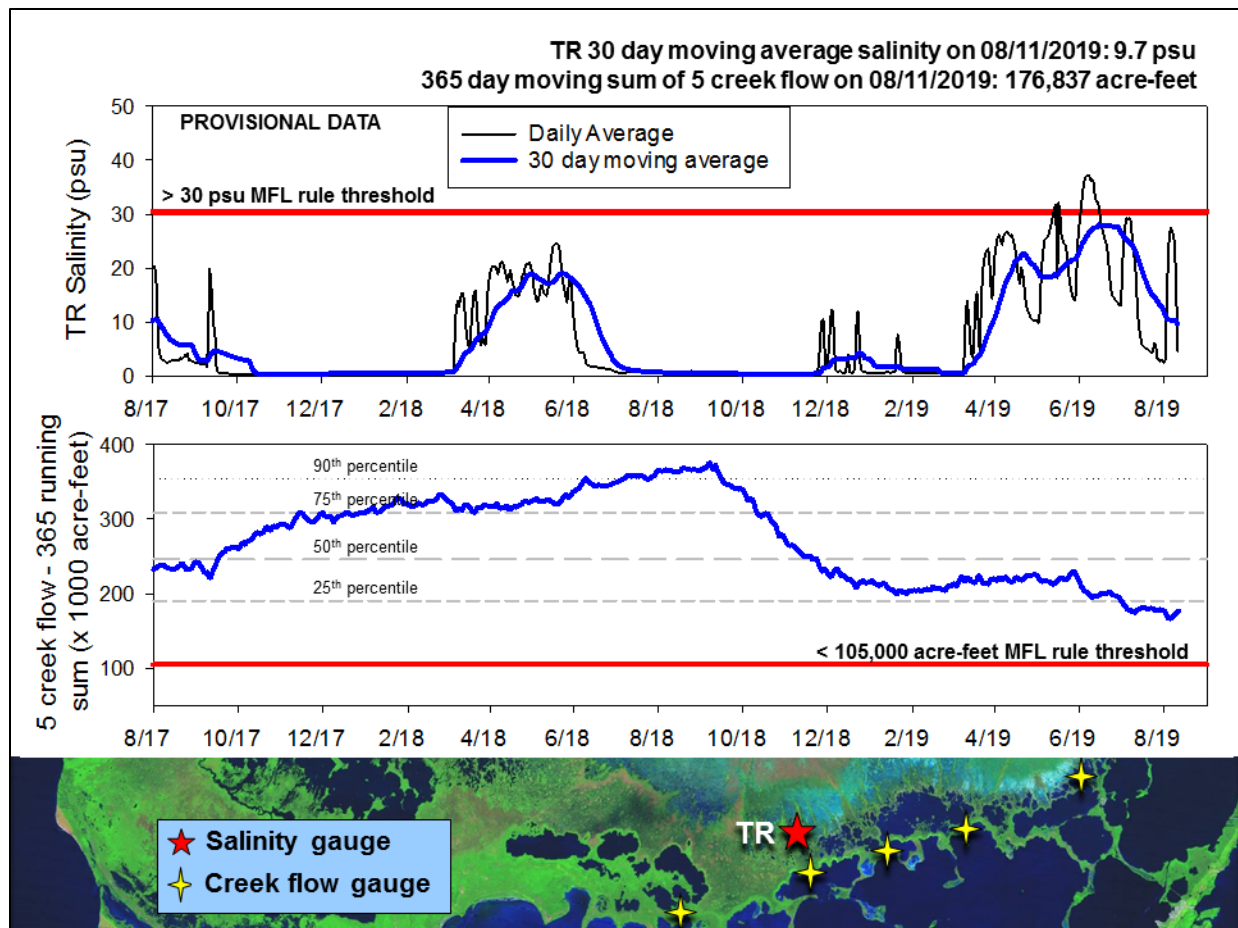
Taylor Slough Water Levels: An average of 1.05 inches of rain fell over Taylor Slough and Florida Bay this past week, and stages in the marsh and mangrove zone increased 1.4 inches as a result. The middle region of Taylor Slough decreased by -0.02 feet. Stages are still 4 inches higher than average for this time of year.

Florida Bay Salinities: Average salinity in Florida Bay was 33 psu, down 4 psu from last week. The nearshore area is still elevated with most stations in the 30-37 psu range which is 4 to 14 psu above average for this time of year. However, these stations also averaged a 7 psu decrease over the last week suggesting that the freshening is beginning.





Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) increased to 27 psu before decreasing to 5 psu to end the weekend. The 30-day moving average decreased 0.8 psu to end at 9.7 psu on Sunday. The weekly flow from the 5 creeks feeding Florida Bay was approximately 14,700 acre-feet, double the historical average for this time of year, but that flow also includes the return of the saline Bay water after the upstream flows from last week. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) increased 6,000 acre-feet to end the week at 176,837 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. Over the last two weeks WCA-2B stage increases exceed the recommended rate. It is likely that this rate will be exceeded in WCA-1 next week. While perhaps less than desirable operationally the current slightly elevated stage in WCA-3A could prove beneficial ecologically. The entirety of the marsh within that basin is inundated (even the northeast corner), the 2.5-foot threshold at Gauge 65 which indicates flooding stress to tree islands has not been exceeded and steady discharges from WCA-3A are making it into the major sloughs of the ENP. 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 as nearshore salinities remain elevated. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, August 13th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage increased by 0.29'	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 apple snail reproduction.
WCA-2A	Stage increased by 0.20'	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. Protect conditions for apple snail reproduction.
WCA-2B	Stage increased by 0.22'	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. Protect conditions for apple snail reproduction.
WCA-3A NE	Stage increased by 0.39'	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 apple snail reproduction.
WCA-3A NW	Stage increased by 0.14'	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.	
Central WCA-3A S	Stage increased by 0.29'	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 apple snail reproduction.
Southern WCA-3A S	Stage increased by 0.22'		
WCA-3B	Stage increased by 0.17'	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. Protect conditions for apple snail reproduction.
ENP-SRS	Stage decreased by 0.04'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from -0.03' to +0.40'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions.
FB- Salinity	Salinity changes ranged -15.2 to +1.0 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.