

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: October 2, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

There are increasing rain prospects over the coming week with above average rainfall forecast to occur next week. Northeasterly winds will continue to bring some areas of moisture and fast-moving showers focused along the east coast today. An upper level trough sitting across the northern Bahamas and western Cuba is forecast to interact with a westward-moving tropical wave passing to the south of Cuba and begin lifting moisture northward over the Florida Straits and the southern end of the peninsula Wednesday and Thursday. This moisture should help fuel shower develop over the southern portion of the District Wednesday through Friday. Daytime heating should keep a daily cycle of mainly daytime showers and thunderstorms going Saturday, Sunday, and Monday. A deepening trough over the Gulf of Mexico would then be expected to bring a wet period beginning the middle part of next week and continuing into next weekend.

Kissimmee

Tuesday morning stages were 56.4 feet NGVD (0.6 feet below schedule) in East Lake Toho, 53.8 feet NGVD (0.2 feet below schedule) in Toho, and 50.3 feet NGVD (1.2 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.5 feet NGVD at S-65A and 25.7 feet NGVD at S-65D. Tuesday morning discharges were 414 cfs at S-65, 330 cfs at S-65A, 610 cfs at S-65D and 603 cfs S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 5.9 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.32 feet. There are no new recommendations for this week.

Lake Okeechobee

Lake Okeechobee stage is 13.56 feet NGVD, decreasing 0.18 feet from the previous week, and 0.18 feet lower than last month. The Lake moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it remains this week. The Lake moved back into the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) at the start of August, after spending about 215 days below the envelope. Lake stage ascension rates remain important to the continued recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone and although there is a continued reversal this week a rapid increase in lake stage in the future could stress young plants and could reduce the beneficial effects that recent low lake stages have had on these communities. The latest estimate of cyanobacteria bloom potential (September 30, 2019) shows only a low bloom potential in the western portion of the Lake.

Estuaries

Total inflow to the St. Lucie Estuary averaged 228 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinity increased in the estuary. Salinity at the US1 Bridge is in the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 225 cfs over the past week with no flow coming from the Lake. Salinity increased throughout the estuary. The 30-day moving average surface salinity is 1.0 at Val I-75 and 3.3 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 Cape Coral, Shell Point and fair range at 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, approximately 300 acre-feet of Lake Okeechobee water was delivered to the FEBs/STAs. The total amount of Lake releases sent to the FEBs/STAs in WY2020 (since May 1, 2019) is approximately 58,400 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 733,000 acre-feet. All STA cells are at or near target depths. 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-1W Northern Flow-way related to STA-1W Expansion #1 startup activities, in STA-5/6 Flow-way 1 to facilitate the Restoration Strategies grading project in Flow-way 2, 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-1E, STA-2 and A-1 FEB/STA-3/4.

Everglades

Stages moderately descended within the WCAs. Depths in WCA-1 remain well below the regulation line; WCA-2A's stage change is at a more ecologically desired rate compared to the rapid decline over the last two weeks; and WCA-3A depths at the northern gauges fell into the desired operational stage range as the rate of descent slowed, but depths increased in the south. 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 (probably the last week of this recommendation). Any depth change that exceeds this rate either on the ascent or descent is ecologically undesirable. This rate change was exceeded in NE WCA-3A (-0.69 over the last two weeks) in an unseasonable descent. Taylor Slough and Florida Bay received a little patchy rainfall this past week, and stages fell below average in Taylor Slough. Salinities increased across Florida Bay and at the nearshore, moving in the wrong direction for this time of year.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.02 inches of rainfall in the past week and the Lower Basin received 0 inches (SFWMD Daily Rainfall Report 9/30/2019).

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: 10/1/2019

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)						
							9/29/19	9/22/19	9/15/19	9/8/19	9/1/19	8/25/19	8/18/19
Lakes Hart and Mary Jane	S-62	0	LKMJ	59.9	R	60.0	-0.1	-0.1	0.0	0.0	-0.2	-0.1	0.0
Lakes Myrtle, Preston, and Joel	S-57	0	S-57	60.9	R	61.0	-0.1	0.0	0.0	0.0	-0.2	-0.1	0.0
Alligator Chain	S-60	0	ALLI	63.0	R	63.2	-0.2	-0.1	-0.1	0.0	-0.2	0.0	0.0
Lake Gentry	S-63	0	LKGT	60.8	R	61.0	-0.2	-0.1	-0.1	0.0	-0.2	0.0	-0.2
East Lake Toho	S-59	0	TOHOE	56.4	R	57.0	-0.6	-0.4	-0.2	-0.2	-0.2	0.0	0.3
Lake Toho	S-61	0	TOHOW, S-61	53.8	R	54.0	-0.2	-0.1	0.1	0.0	-0.1	-0.1	0.1
Lakes Kissimmee, Cypress, and Hatchineha	S-65	507	KUB011, LKIS5B	50.3	R	51.5	-1.2	-0.9	-0.4	-0.1	0.0	0.5	0.6

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: 10/1/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days ¹							
		9/29/2019	9/29/19	9/22/19	9/15/19	9/8/19	9/1/19	8/25/19	8/18/19	8/11/19	8/4/19
Discharge (cfs)	S-65	417	507	1,337	1,443	2,135	5,414	5,640	3,852	2,198	783
Discharge (cfs)	S-65A ²	300	423	1,248	1,412	2,676	5,795	6,547	5,681	3,248	1,665
Discharge (cfs)	S-65D ²	640	1,189	1,780	2,976	5,734	6,983	8,207	5,917	3,167	1,618
Headwater Stage (feet NGVD)	S-65D ²	26.11	26.64	26.78	27.00	27.56	27.48	27.42	26.50	25.88	25.77
Discharge (cfs)	S-65E ²	533	1,070	1,766	2,988	5,615	6,932	8,155	5,871	3,000	1,495
Discharge (cfs)	S-67	0	0	0	28	17	31	24	34	46	85
DO (mg/L) ³	Phases I & II/III river channel	6.6	5.9	4.6	2.3	1.9	0.8	0.3	0.7	0.7	3.2
Mean depth (feet) ⁴	Phase I floodplain	0.32	0.44	0.72	1.07	2.18	2.82	3.25	2.71	1.73	0.77

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)

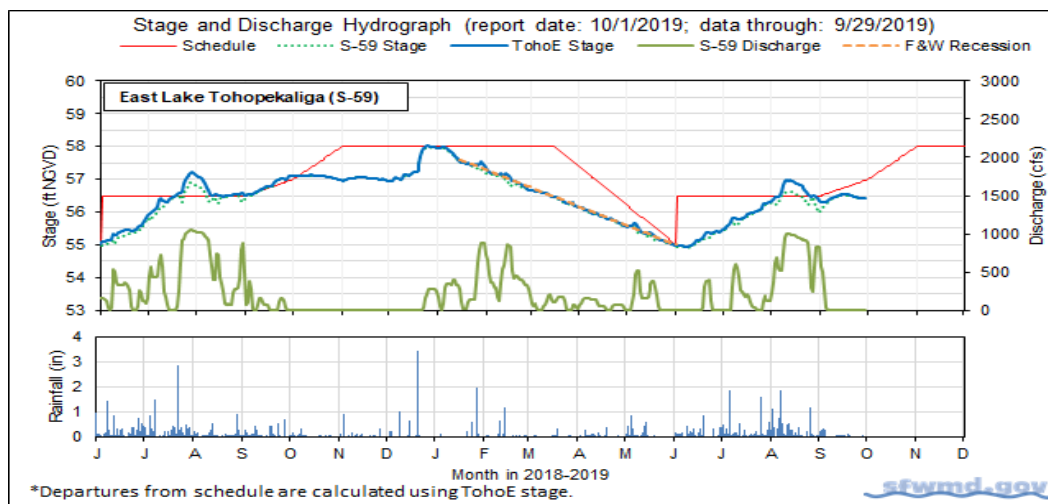


Figure 1.

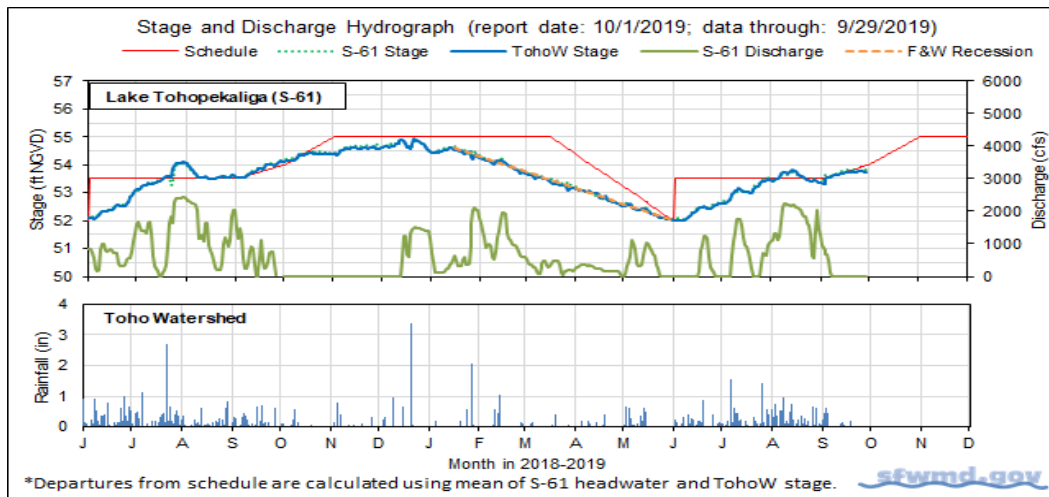


Figure 2.

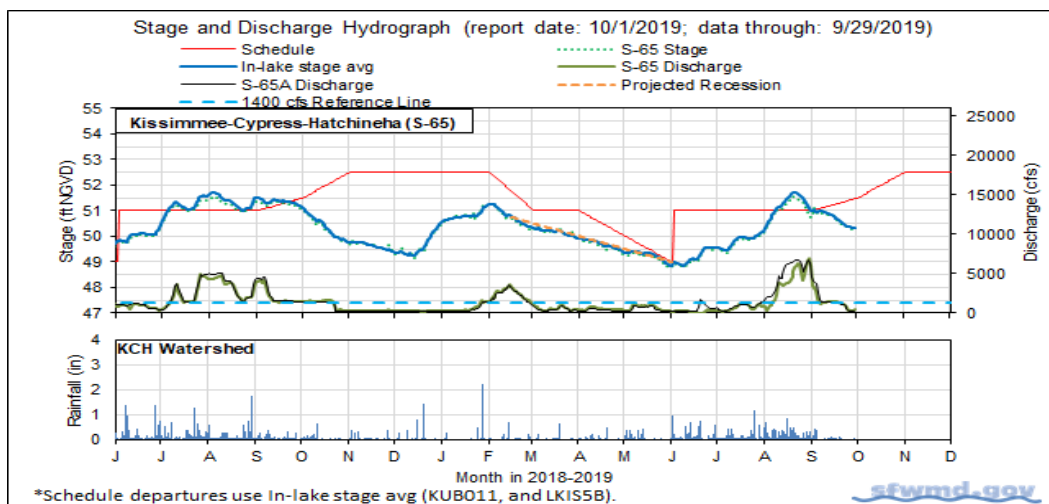


Figure 3.

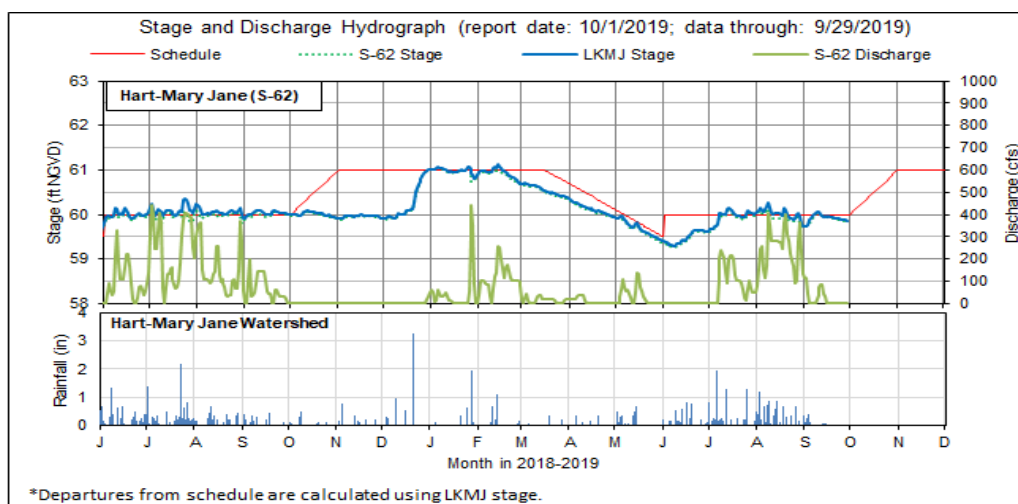


Figure 4.

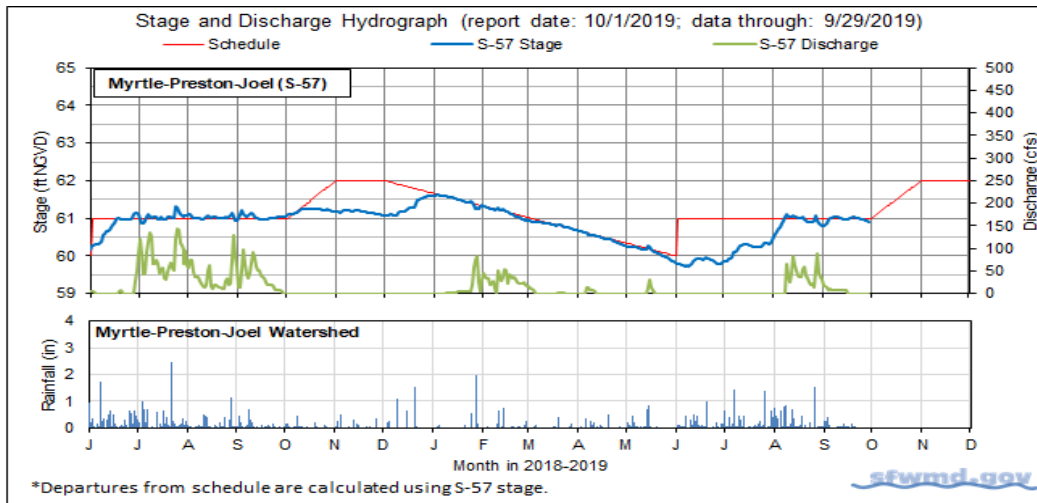


Figure 5.

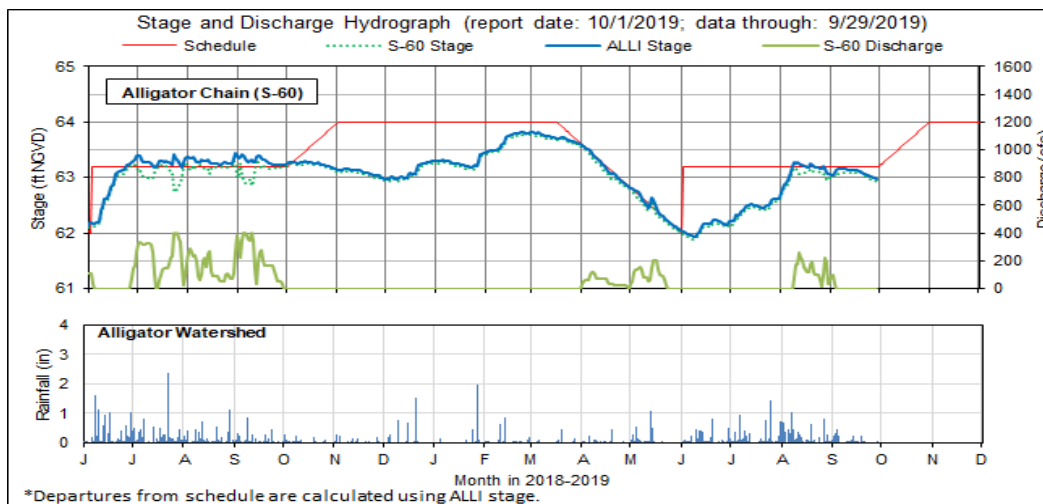


Figure 6.

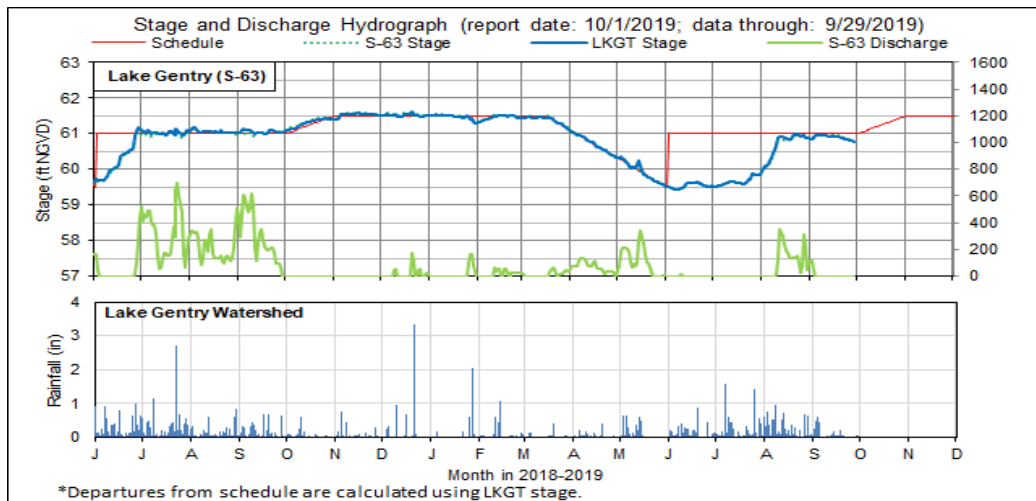


Figure 7.

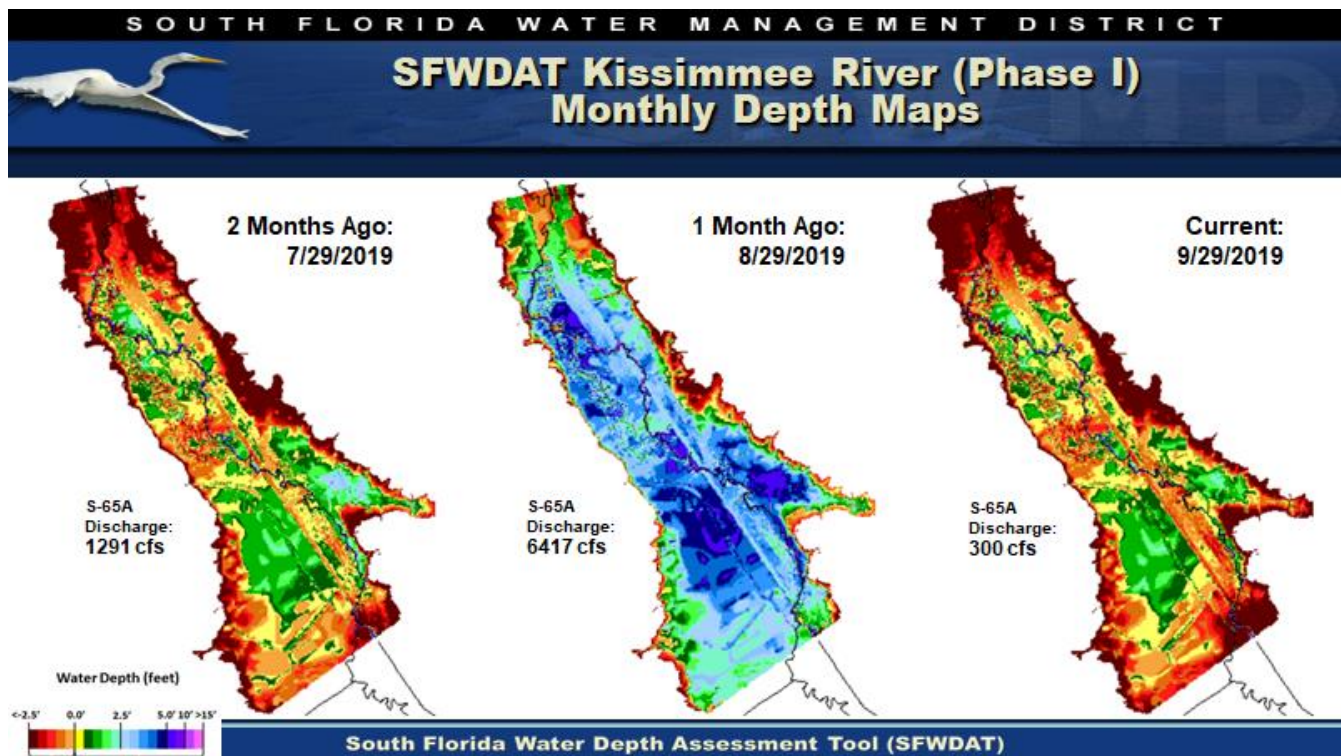


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

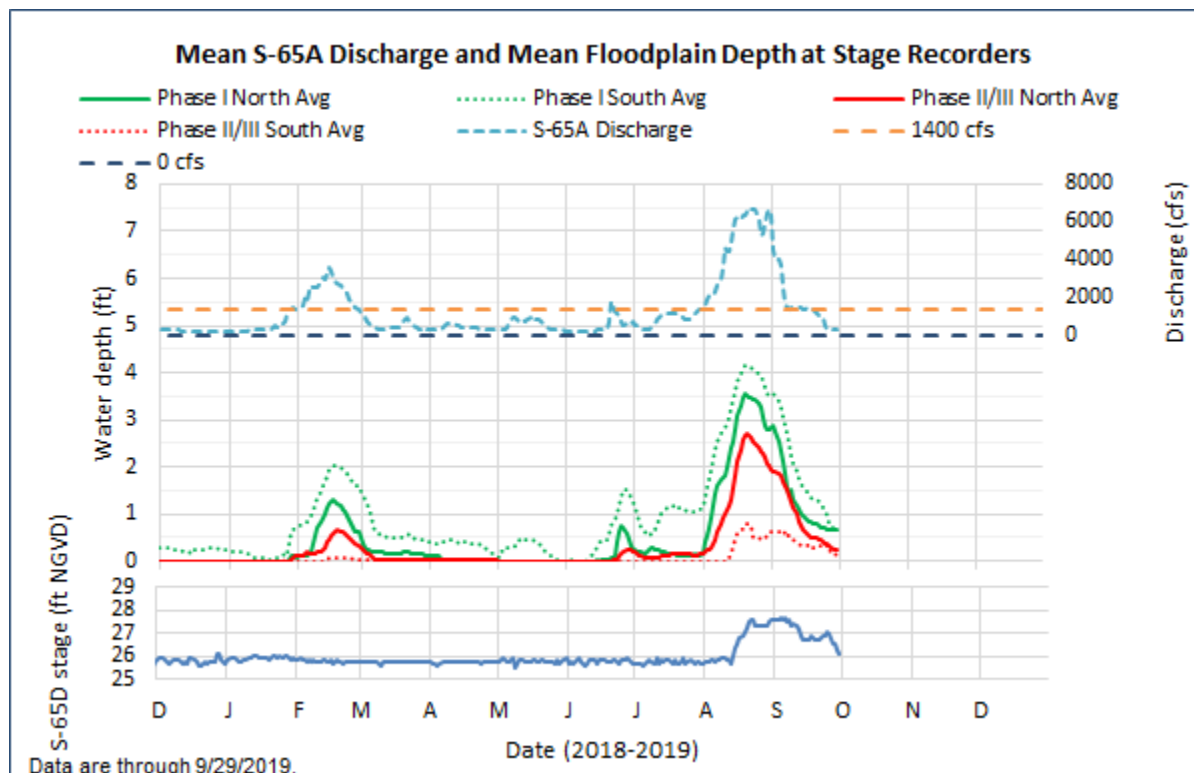
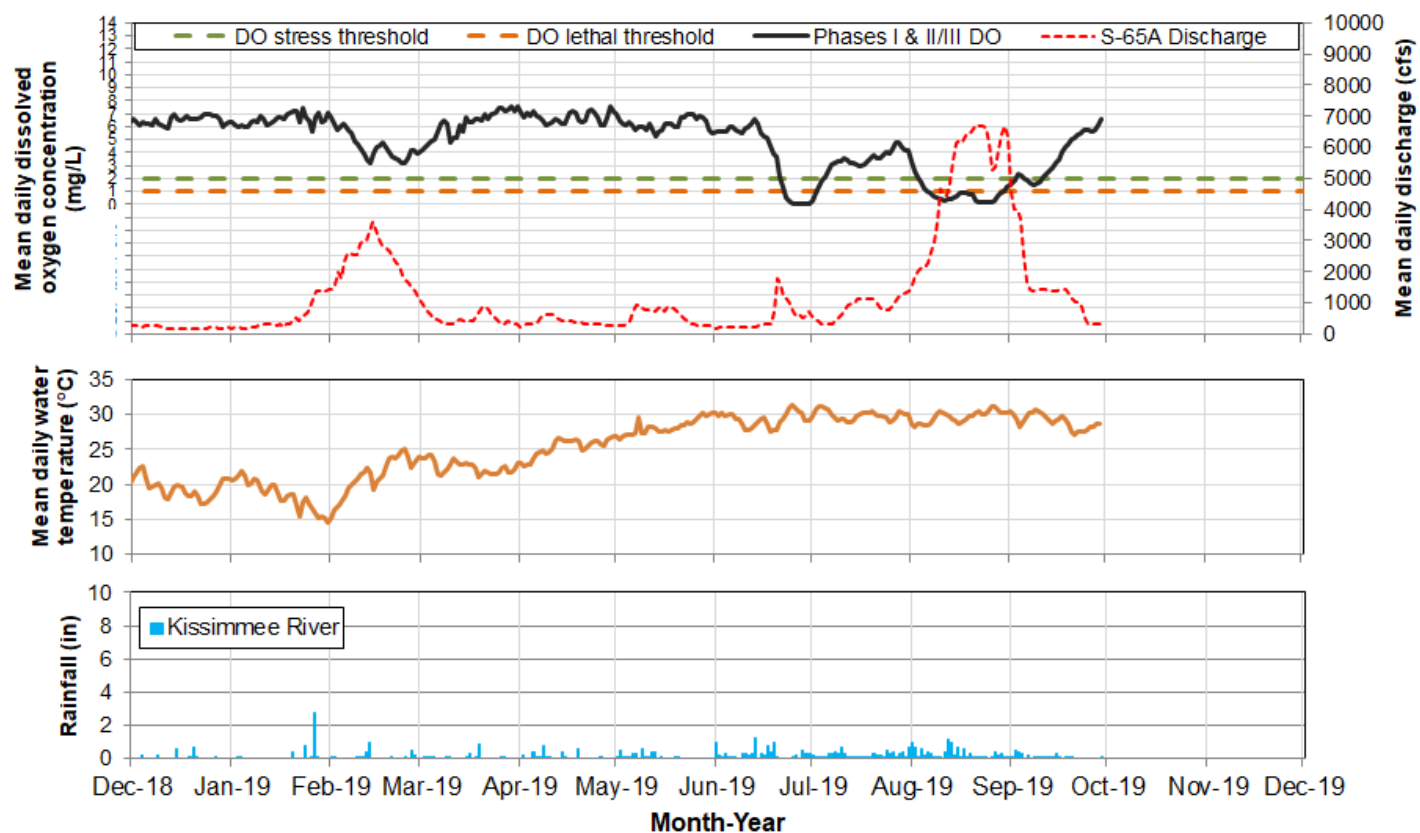


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.



Report Date: 10/1/2019; data are through: 9/29/2019.

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
9/30/2019	No new recommendations.		N/A		10/1/2019
9/23/2019	Reduce flow at S-65/S-65A by 300 cfs/day until minimum flow (300 cfs) is reached on Wednesday 9/25.	Reduce outflow from Kissimmee-Cypress-Hatchineha to slow the stage decline.	TBD	KB Ops	9/24/2019
9/17/2019	Continue S65A discharge of at least 1,400 cfs while stage in Lakes Kissimmee, Cypress and Hatchineha is above 50.0 feet NGVD, in accordance with the 2019 wet season IS-14-50 discharge plan.	Continue KR floodplain inundation.	TBD	KB Ops	9/17/2019
9/10/2019	Continue S65A discharge of at least 1,400 cfs while stage in Lakes Kissimmee, Cypress and Hatchineha is above 50.0 feet NGVD, in accordance with the 2019 wet season IS-14-50 discharge plan.	Continue KR floodplain inundation.	Implemented	KB Ops	9/10/2019
9/5/2019	Reduce S65A flow by another 400 cfs today 9/5, then make two 300 cfs reductions tomorrow 9/6, to arrive at 1400 cfs late in the day on 9/6. Continue S65A discharge of at least 1,400 cfs while stage in Lakes Kissimmee, Cypress and Hatchineha is above 50.0 feet NGVD, in accordance with the 2019 wet season IS-14-50 discharge plan.	Reduce discharge to 1400 cfs (bankfull) gradually to avoid stranding fish/snails/other organisms as floodplain stage declines.	Implemented	KB Ops	9/10/2019
9/3/2019	No new recommendations.		N/A		9/4/2019
8/26/2019	No new recommendations.		N/A		8/27/2019
8/19/2019	No new recommendations.		N/A		8/20/2019
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

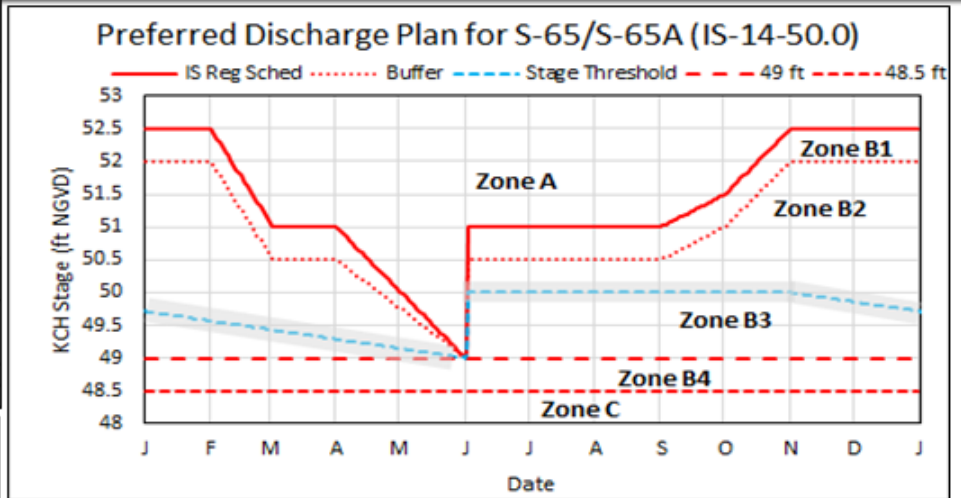
Kissimmee Basin 2019 Wet Season

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

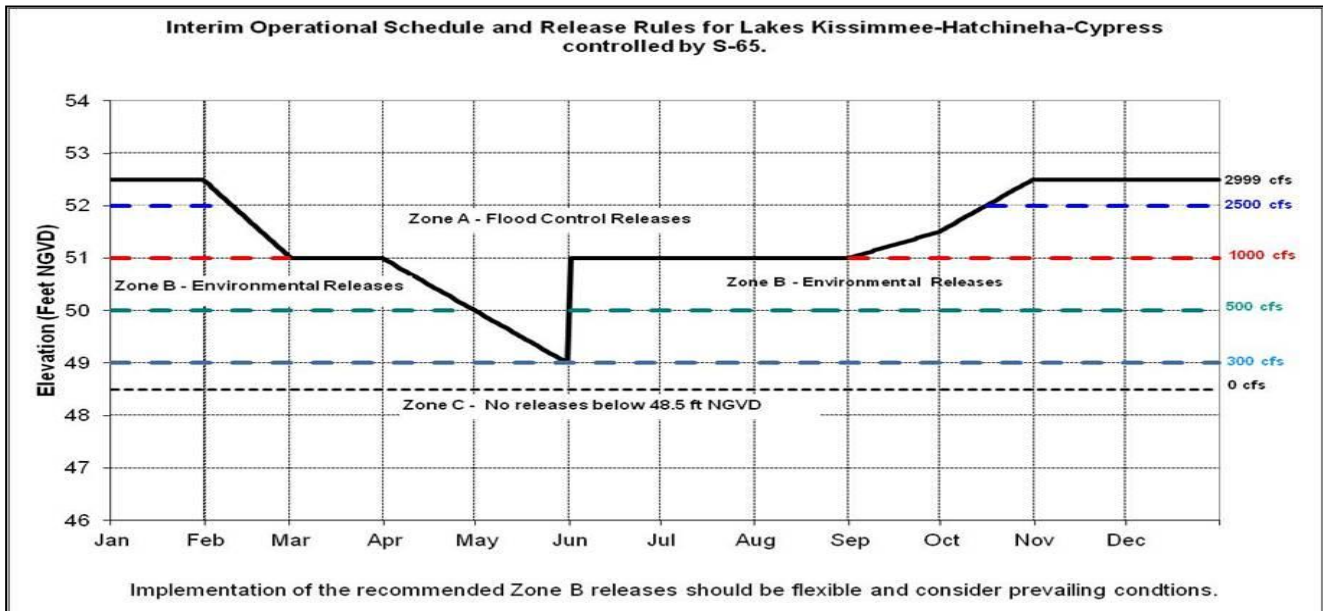


Other Considerations

- 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.

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



Implementation of the recommended Zone B releases should be flexible and consider prevailing conditions.

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

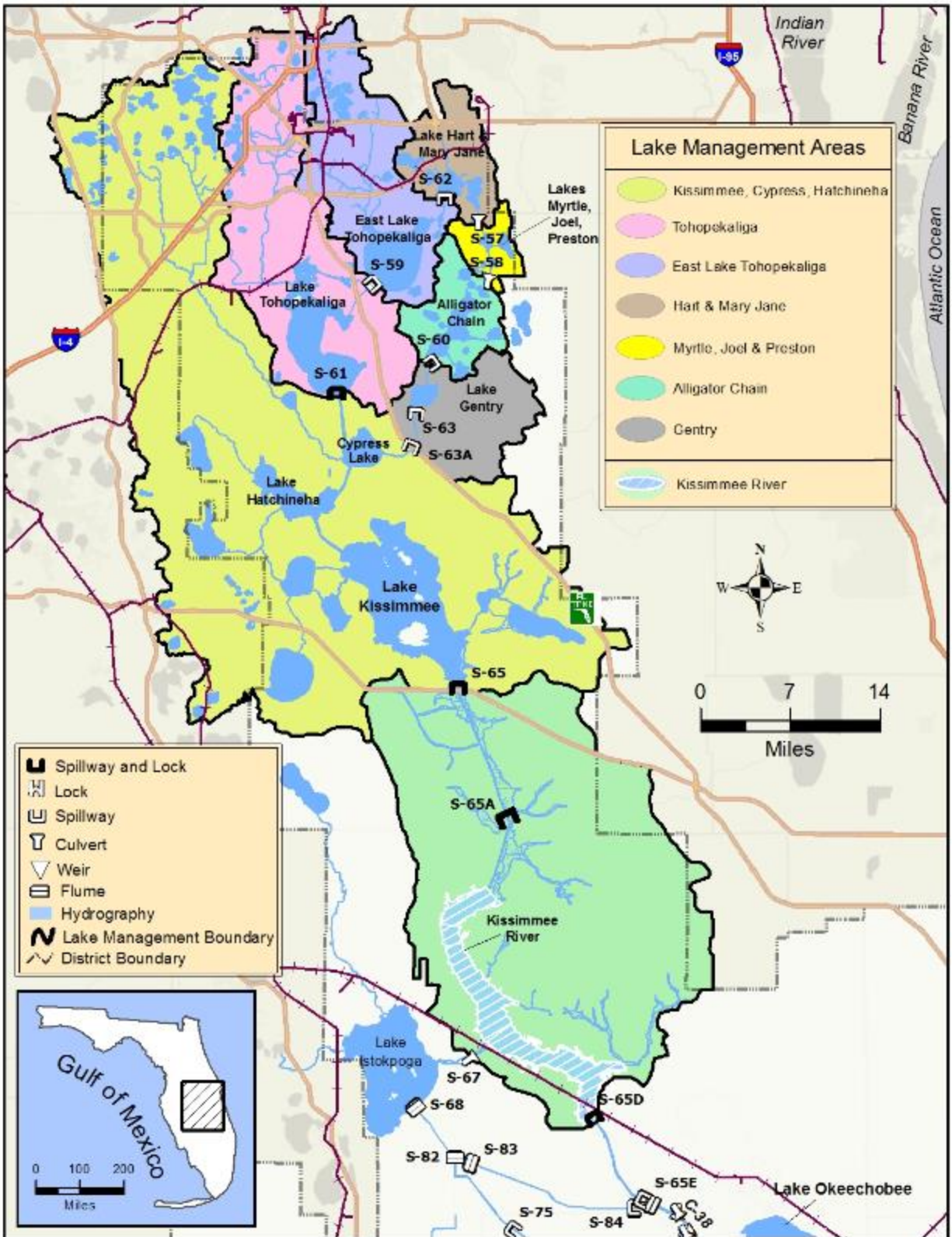


Figure 13. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 13.56 feet NGVD for September 30, 2019 decreasing 0.18 feet from the previous week. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and four perimeter stations (S-308, S-352, S-4 and S-133). The Lake is now 0.18 feet lower than a month ago and 0.97 feet lower than a year ago (Figure 1) when stages were in the upper portion of the preferred ecological envelope (Figure 2). The Lake moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it remains this week (Figure 3). With the recent reversal, lake stage is now just slightly lower than, and paralleling, the 2010 levels (Figure 4). According to RAINДАР, during the week of September 24 to September 30, 2019, only 0.07 inches of rain fell directly over the Lake, compared to 0.19 inches the previous week. During that same time period, an estimated 0.05 inches of rain fell District-wide, compared to 0.24 inches the previous week. This week, all of the watershed received less than 0.5 inches of rain (Figure 5).

The average daily inflows (minus rainfall) to the Lake decreased for the fourth consecutive week going from 1,754 cfs to 1,006 cfs. All source inflows decreased with the Kissimmee River (S-65E & S-65EX1) going from 1,651 cfs to 940 cfs, those from Lake Istokpoga (via S-84 and S71) going from 26 cfs to 13 cfs, inflows from Fisheating Creek decreased from 63 cfs to 51 cfs and flow from the various S-100 structures was almost zero. No passive backflow from the L-8 at Canal Point (via CLV10A) occurred this week (Table 1).

Outflow (minus evapotranspiration) increased from 1,566 cfs to 2,533 cfs with 2,378 cfs going south through the S-350 structures and the L-8 at Canal Point (via CLV10A) for water supply and 155 cfs released west through S-77. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation increased from the previous week going from 1.02 inches to 1.16 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 (September 30, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel 3 OLCI sensor data had some cloud cover over the eastern half of the Lake but appears to show low bloom potential in the west (Figure 7).

Water Management Recommendations

Lake Okeechobee stage is 13.56 feet NGVD, decreasing 0.18 feet from the previous week, and 0.18 feet lower than last month. The Lake moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it remains this week. The Lake moved back into the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) at the start of August, after spending about 215 days below the envelope. Lake stage ascension rates remain important to the continued recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone and although there is a continued reversal this week a rapid increase in lake stage in the future could stress young plants and could reduce the beneficial effects that recent low lake stages have had on these communities. The latest estimate of cyanobacteria bloom potential (September 30, 2019) shows only a low bloom potential in the western portion of the Lake.

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	1651	940	0.4
S-71 & S-72	7	0	0.0
S-84 & S-84X	19	13	0.0
Fisheating Creek	63	51	0.0
S-154	15	0	0.0
S-191	0	2	0.0
S-133 P	0	0	0.0
S-127 P	0	0	0.0
S-129 P	0	0	0.0
S-131 P	0	0	0.0
S-135 P	0	0	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			
Rainfall	448	163	0.1
Total	2203	1170	0.5

OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-77	69	155	0.1
S-308	0	0	0.0
S-351	573	1015	0.4
S-352	462	609	0.3
S-354	440	539	0.2
L-8 Outflow	21	215	0.1
ET	2403	2691	1.2
Total	3969	5224	2.2

Provisional Data

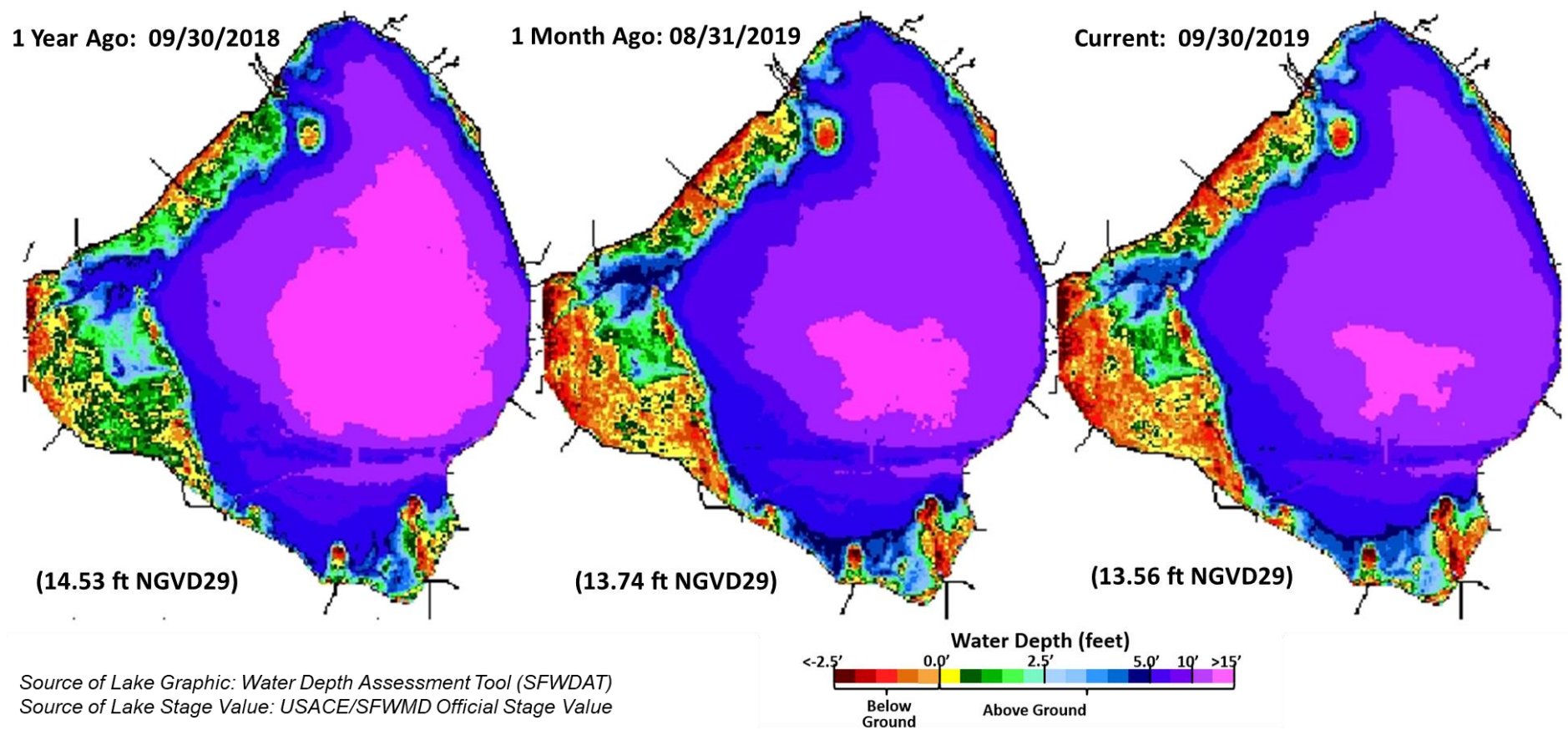


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

Lake Okeechobee Stage vs Ecological Envelope

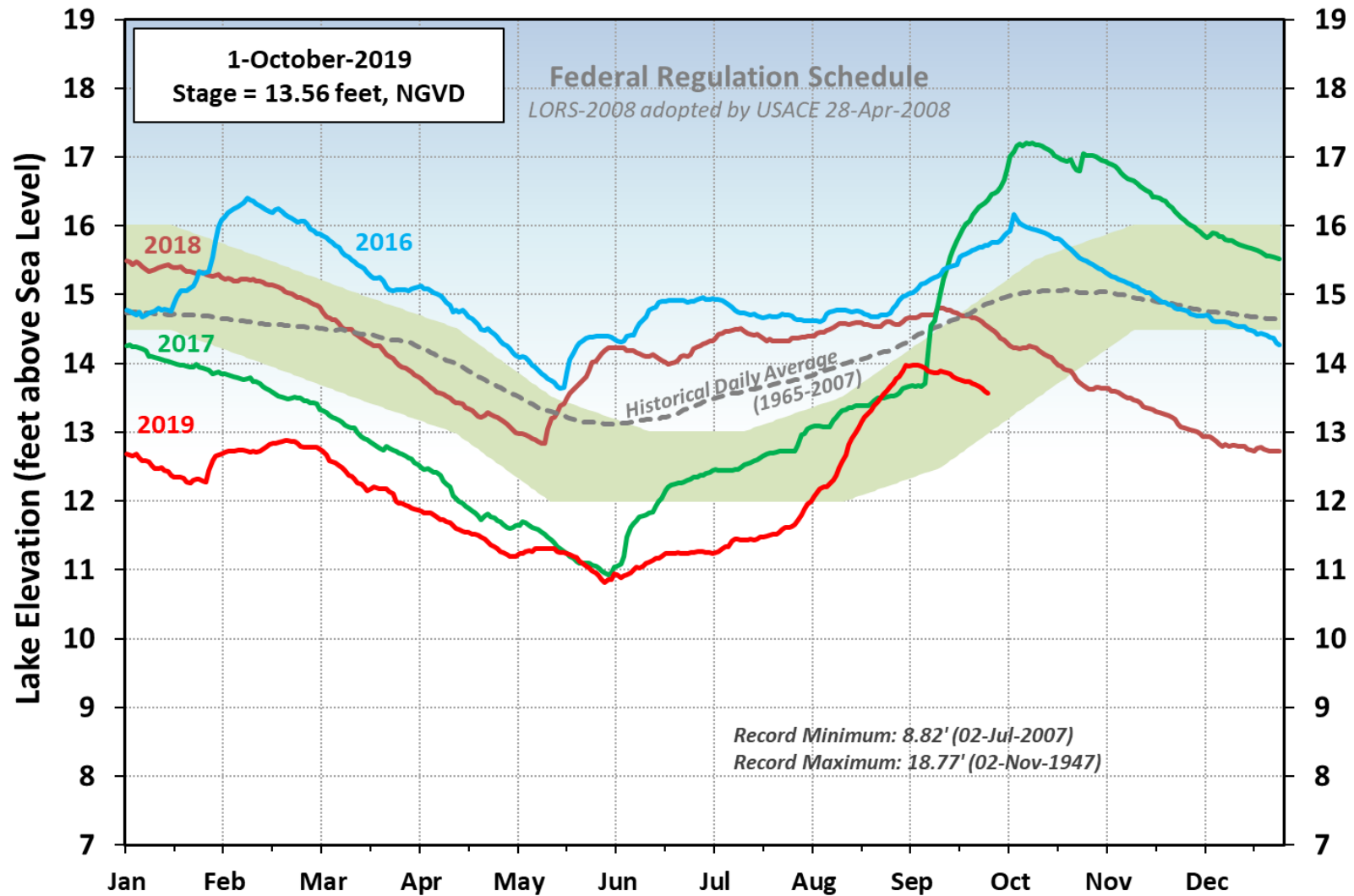
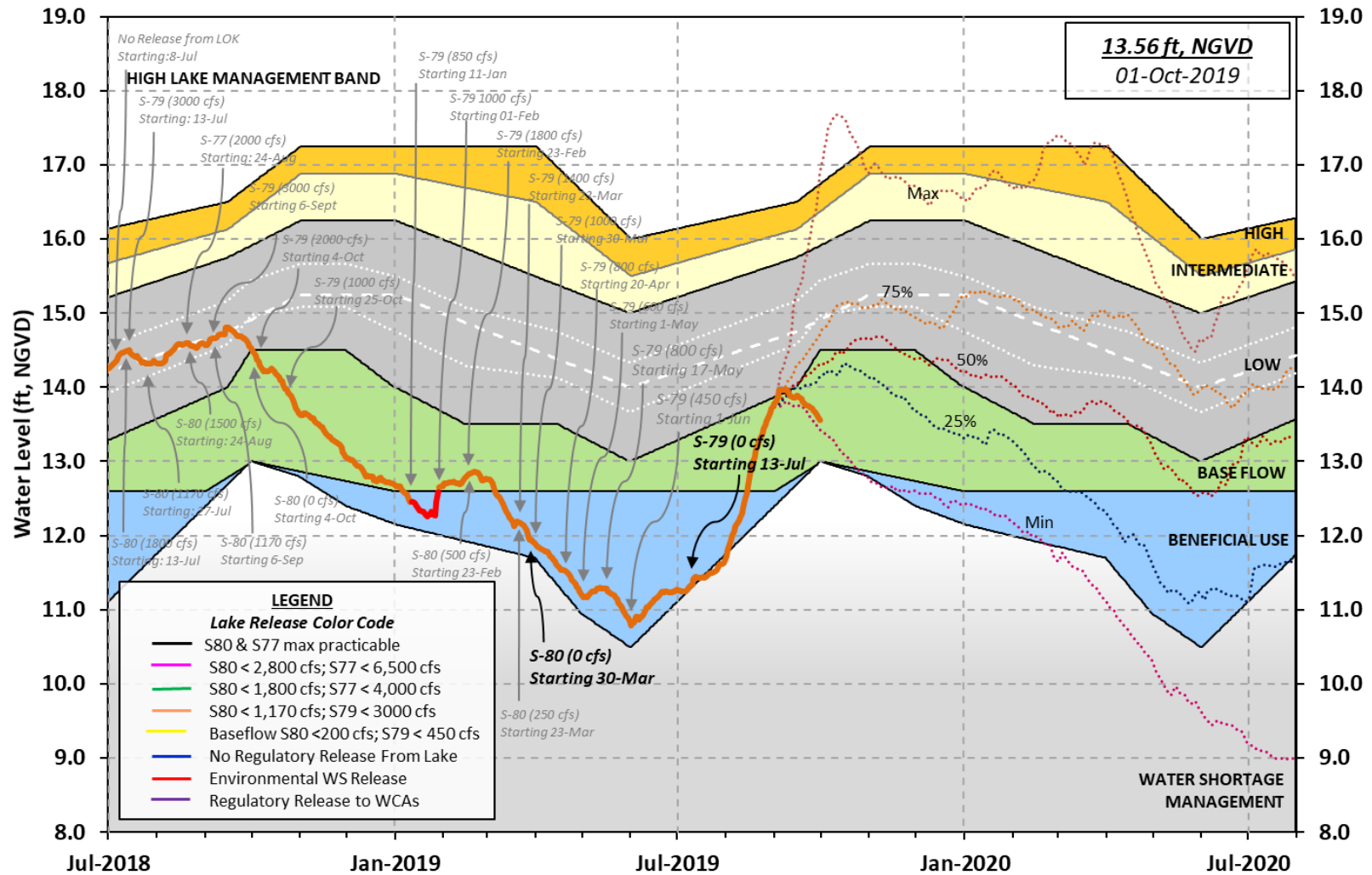


Figure 2. Select annual stage hydrographs for Lake Okeechobee in comparison to the Ecological Envelope.

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

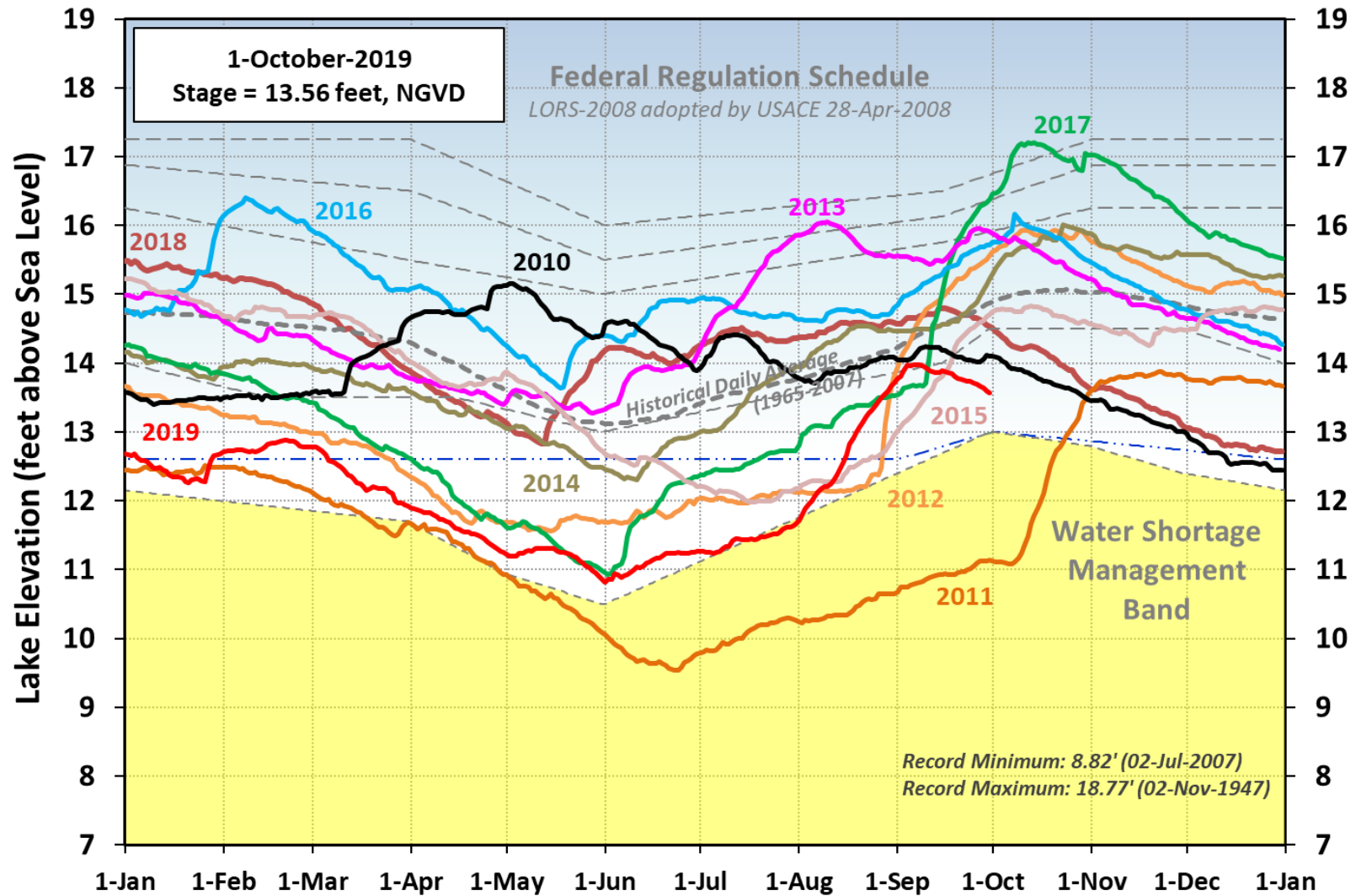


Figure 4. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

SFWMD PROVISIONAL RAINFALL 7-DAY BASIN RAINFALL ESTIMATES
FROM: 0530 EST, 09/24/2019 THROUGH: 0530 EST, 10/01/2019

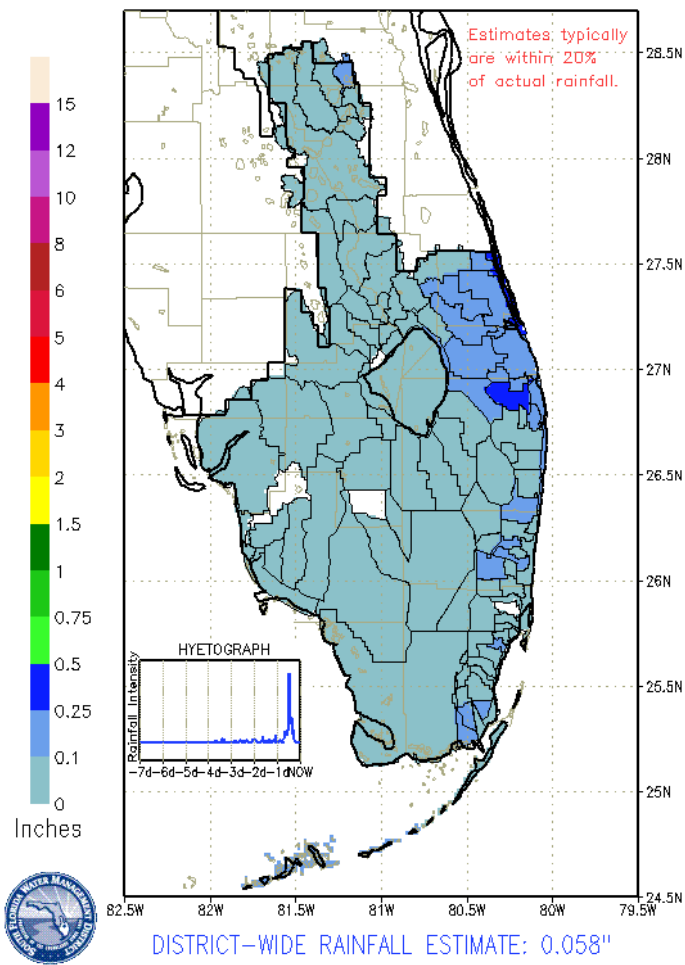


Figure 5. Rainfall estimates by basin.

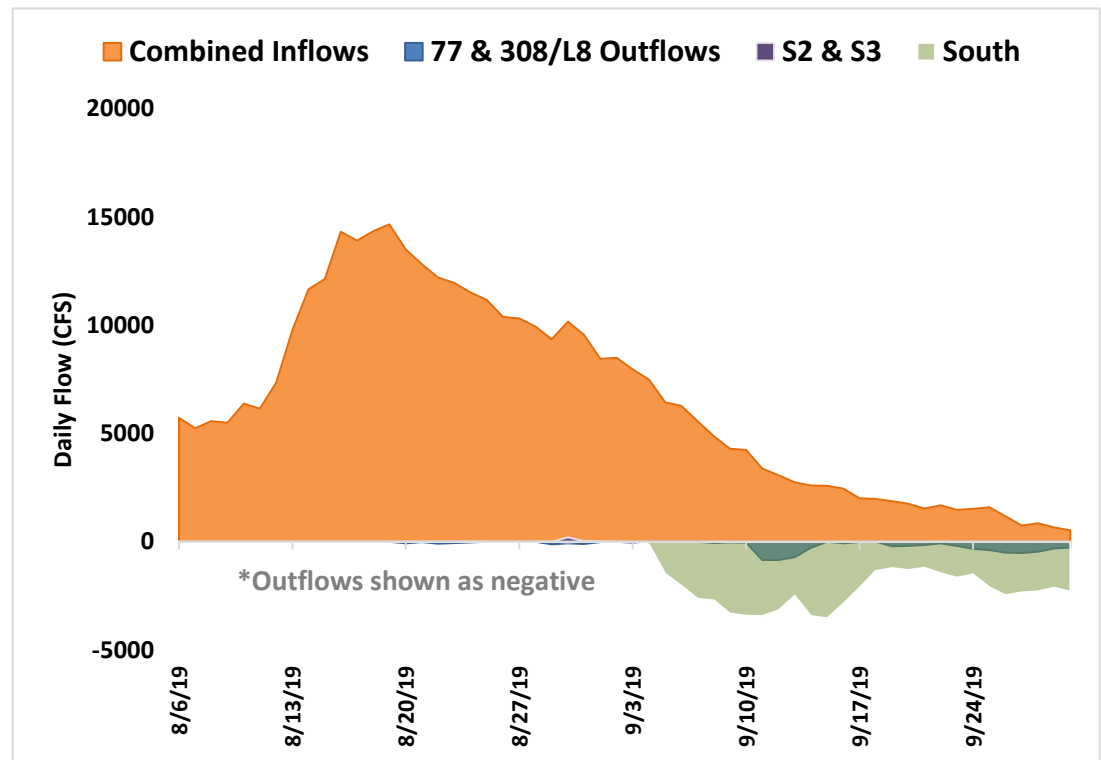


Figure 6. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the Lake. All inflows and outflows are shown as positive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

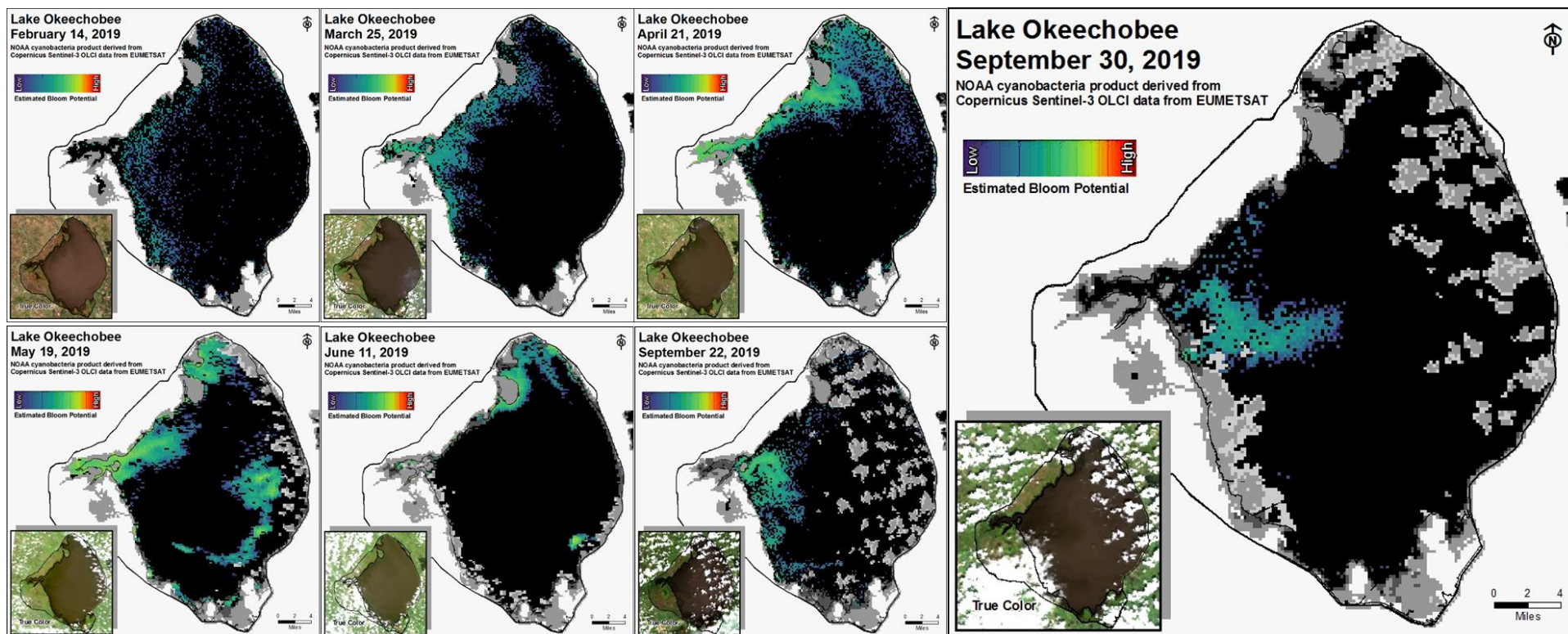


Figure 7. Potential for cyanobacterial blooms on Lake Okeechobee in 2019, based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 228 cfs (Figures 1 and 2) and last month inflow averaged about 972 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	135
S-80	0
S-308	0
S-49 on C-24	0
S-97 on C-23	0
Gordy Rd. structure on Ten Mile Creek	93

Over the past week, salinity increased 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 12.9. Salinity conditions in the middle estuary are within the good range for adult eastern oysters (Figure 3).

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

Sampling Site	Surface	Bottom	Envelope
HR1 (North Fork)	10.1 (9.4)	13.4 (13.1)	NA ¹
US1 Bridge	9.0 (8.5)	16.7 (15.5)	10.0-26.0
A1A Bridge	25.6 (25.0)	EM ² (EM)	NA ¹

¹Envelope not applicable and ²Equipment Malfunction.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 225 cfs (Figures 5 and 6) and last month inflow averaged about 1,116 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	155
S-78	0
S-79	19
Tidal Basin Inflow	206

Over the past week, salinity increased throughout the estuary (Table 4, Figures 7 & 8). The seven-day average salinity values within the good range for adult eastern oysters at Cape Coral, Shell Point and Sanibel (Figure 9). The 30-day moving average surface salinity is 1.0 at Val I-75 and 3.3 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)	3.4 (0.3)	4.8 (0.3)	NA ¹
Val I75	3.2 (0.6)	5.6 (1.0)	0.0-5.0 ²
Ft. Myers Yacht Basin	8.9 (3.6)	11.4 (4.7)	NA
Cape Coral	15.2 (9.4)	17.7 (11.6)	10.0-30.0
Shell Point	26.8 (22.6)	27.3 (23.8)	10.0-30.0
Sanibel	30.7 (27.9)	31.0 (28.9)	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 2.8 to 7.5 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 140 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	140	7.5	3.7
B	300	140	6.2	3.4
C	450	140	5.0	3.1
D	650	140	3.6	2.7
E	800	140	2.8	2.4

Red tide

The Florida Fish and Wildlife Research Institute reported on September 27, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background to low concentrations in four samples collected from or offshore of Lee County. *Karenia brevis* was not observed in samples collected from St. Lucie, Martin, Palm Beach or Miami-Dade Counties (no samples were analyzed this week from Broward County).

Water Management Recommendations

Lake stage is in the Base Flow sub-band. Tributary conditions are normal. 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.

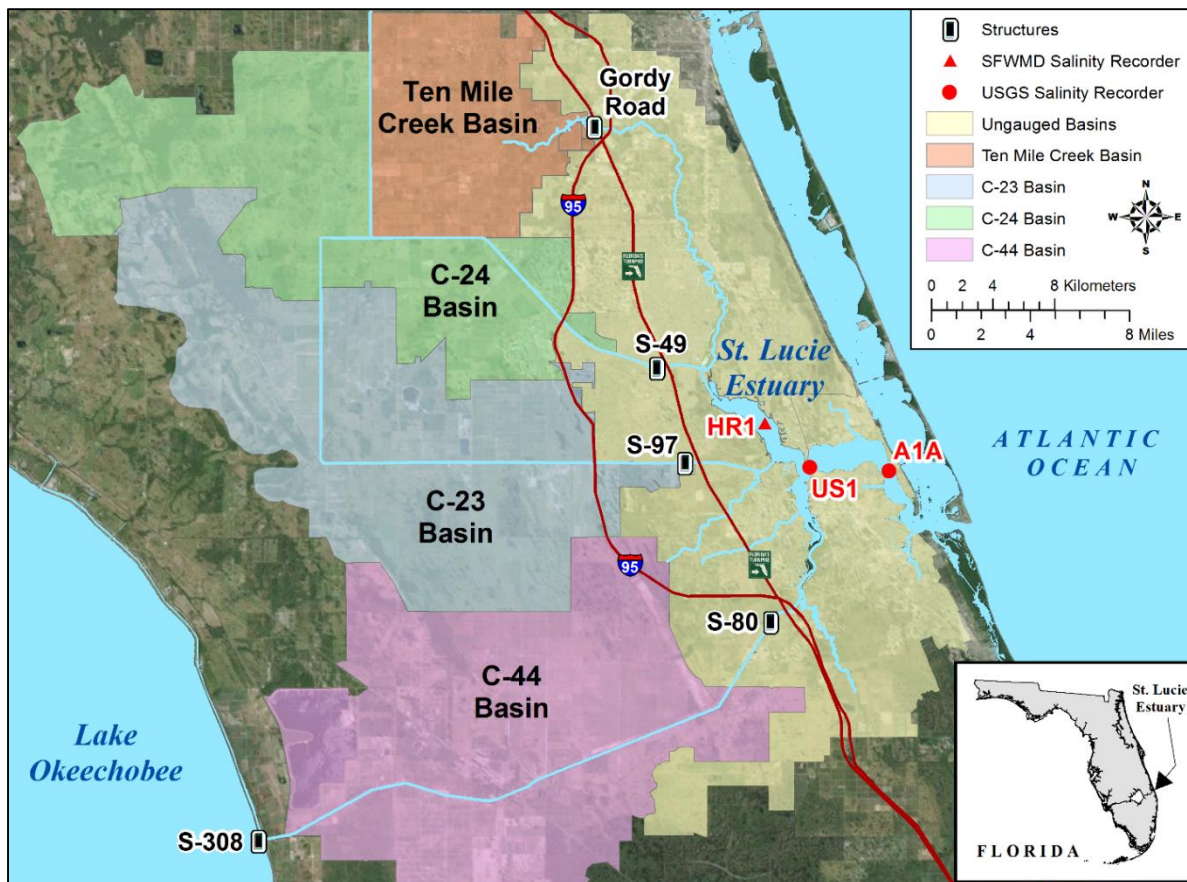


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

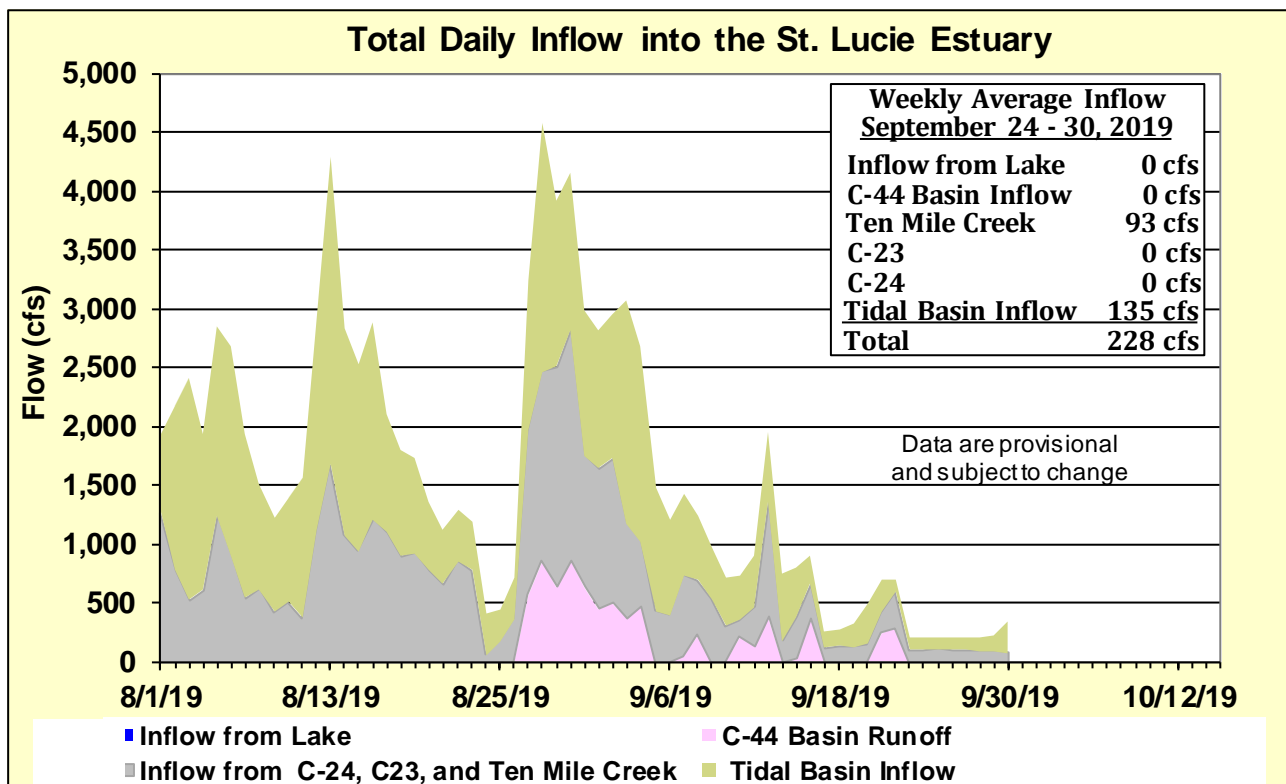


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

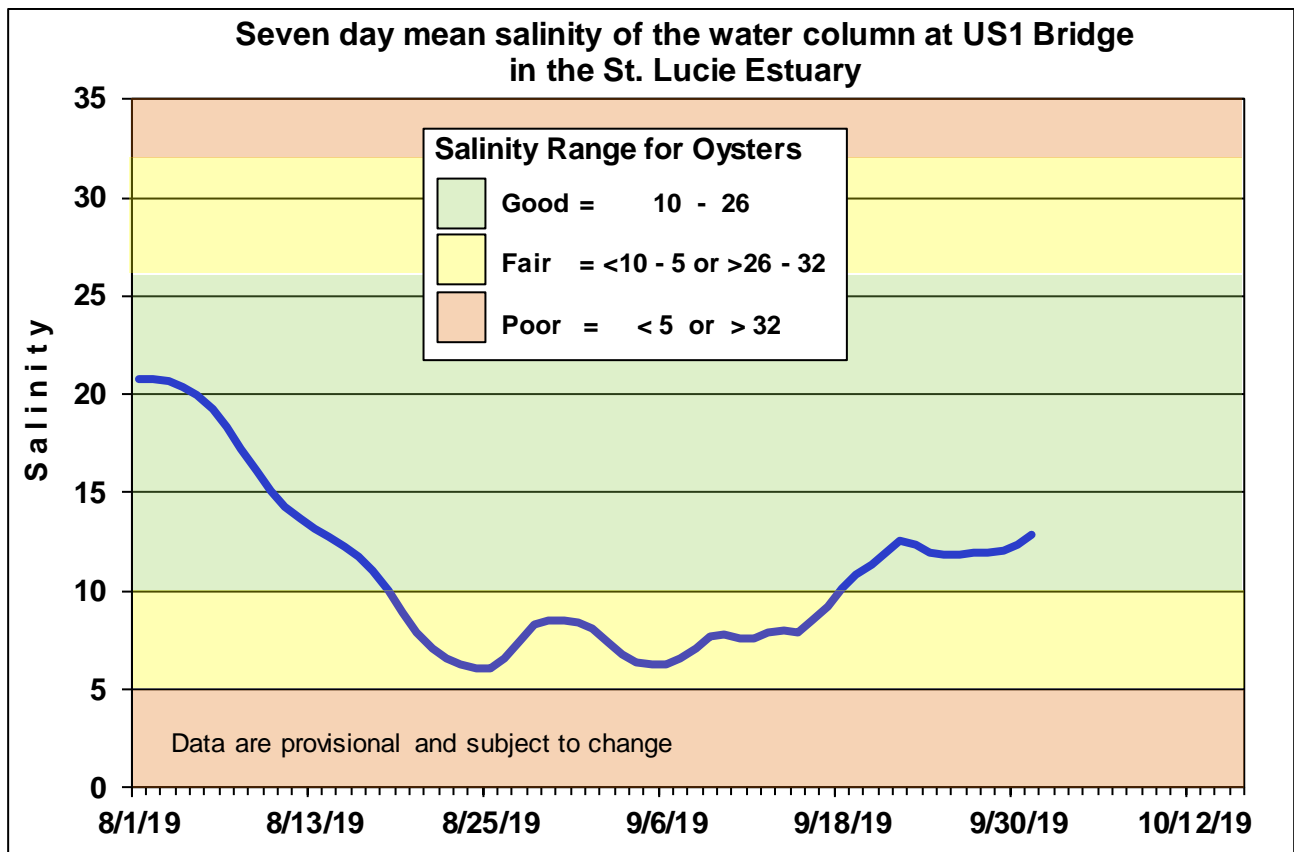


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

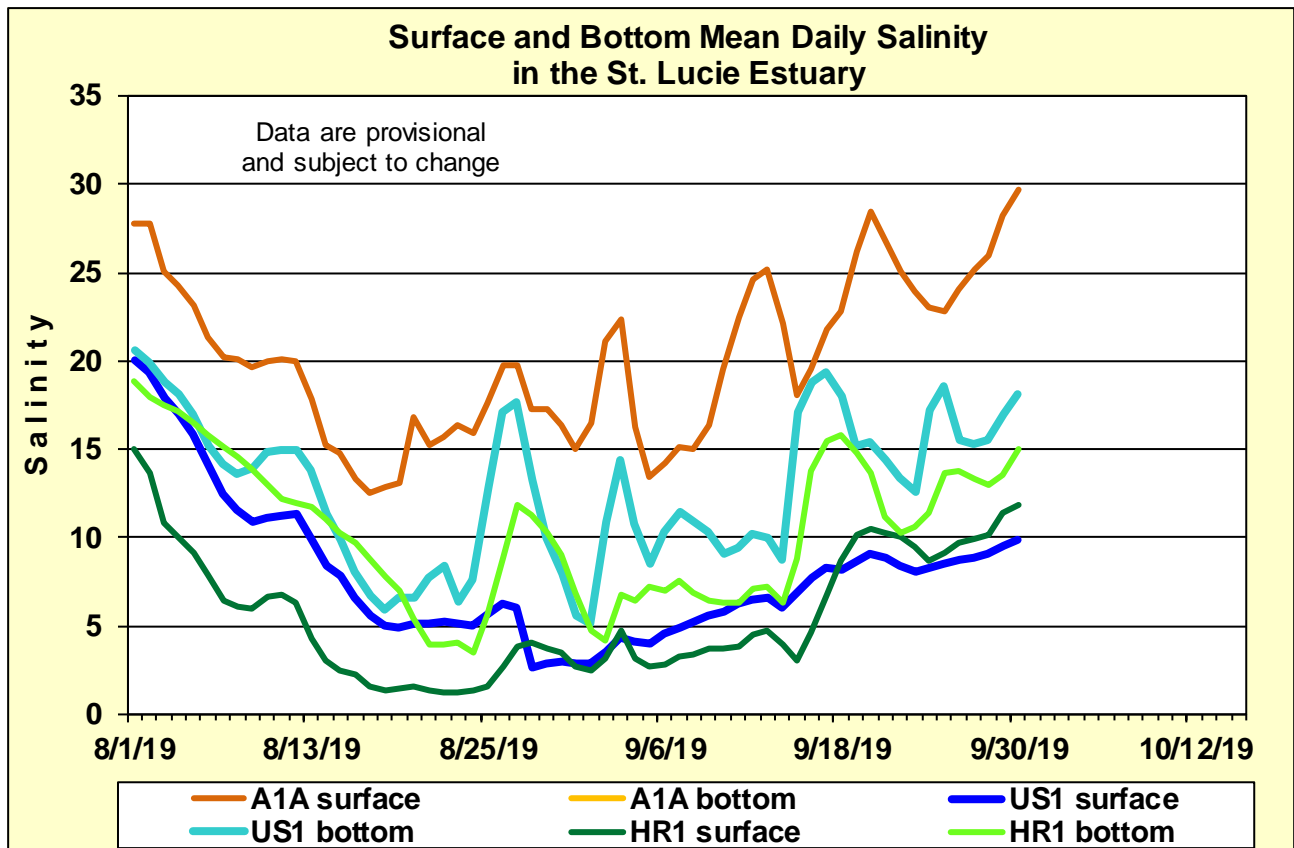


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

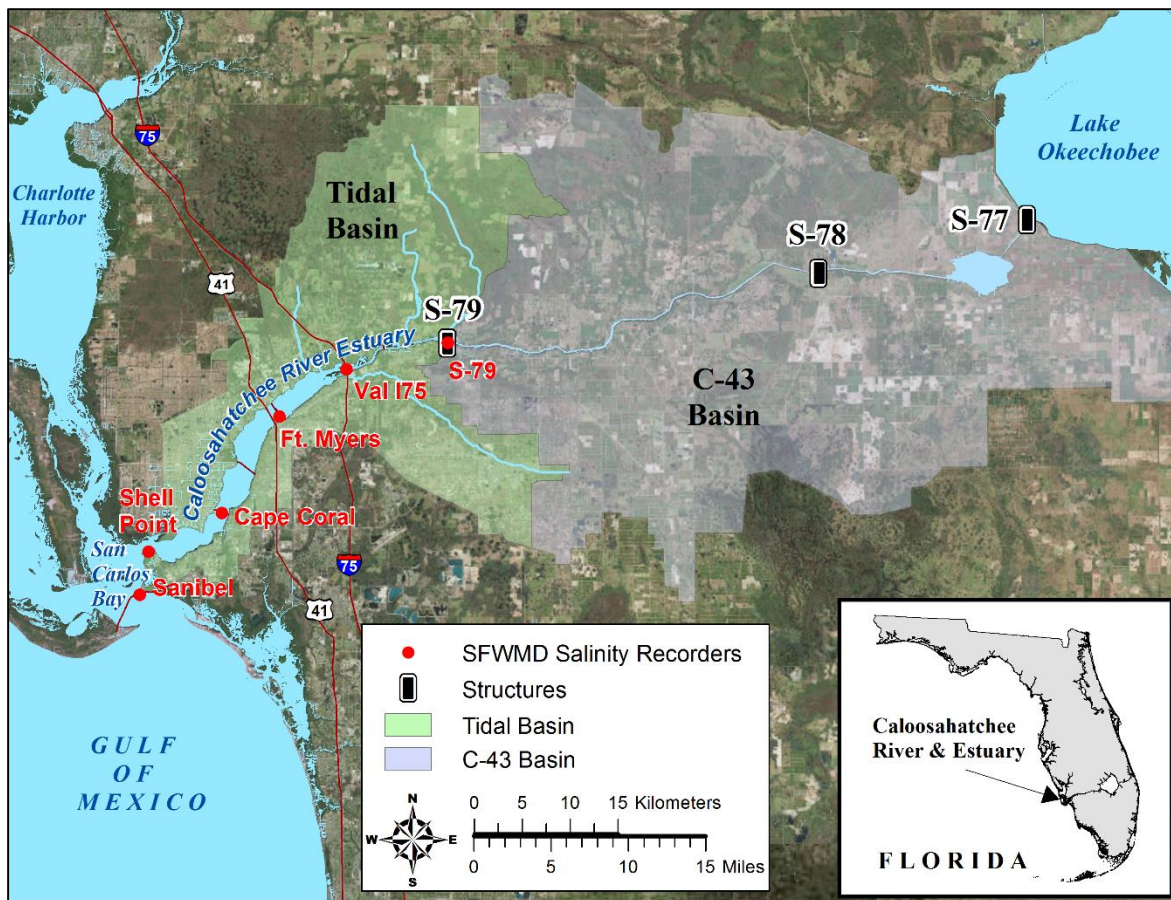


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

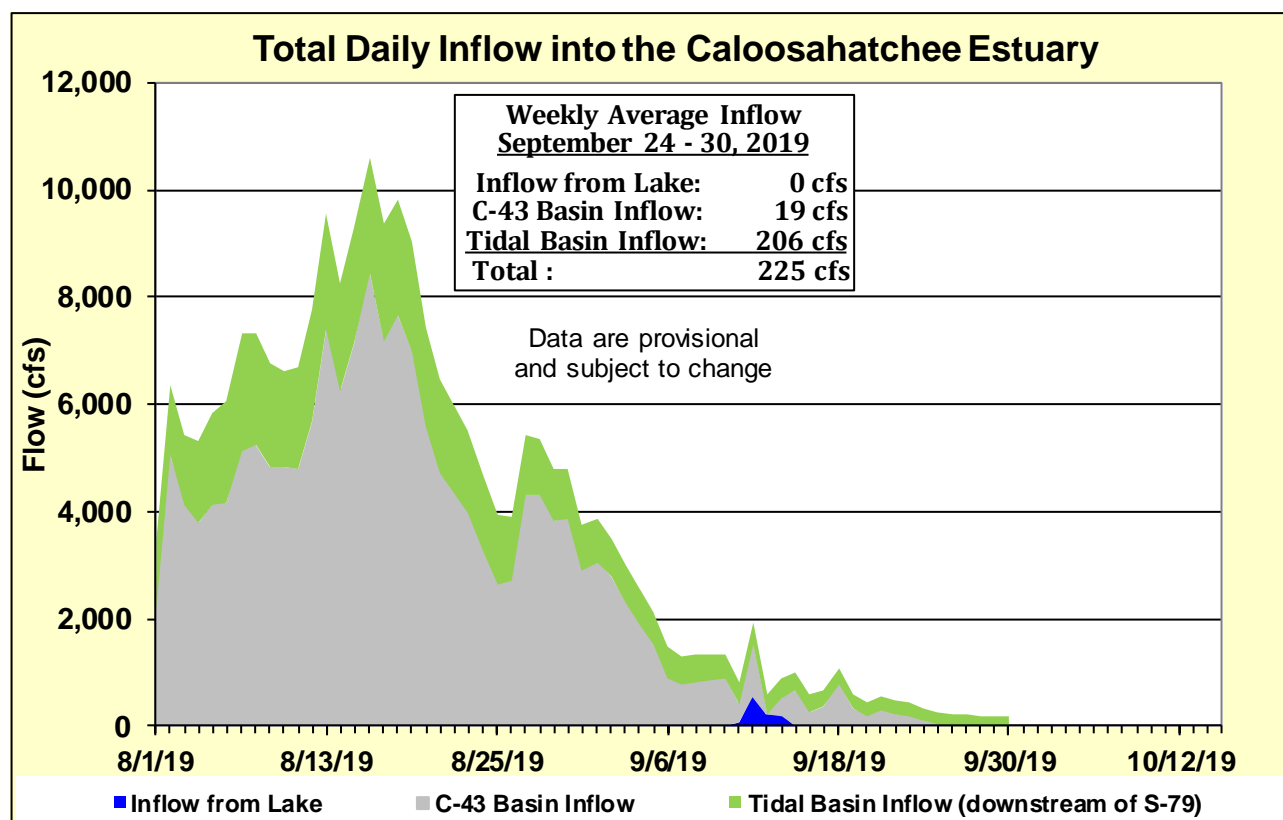


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

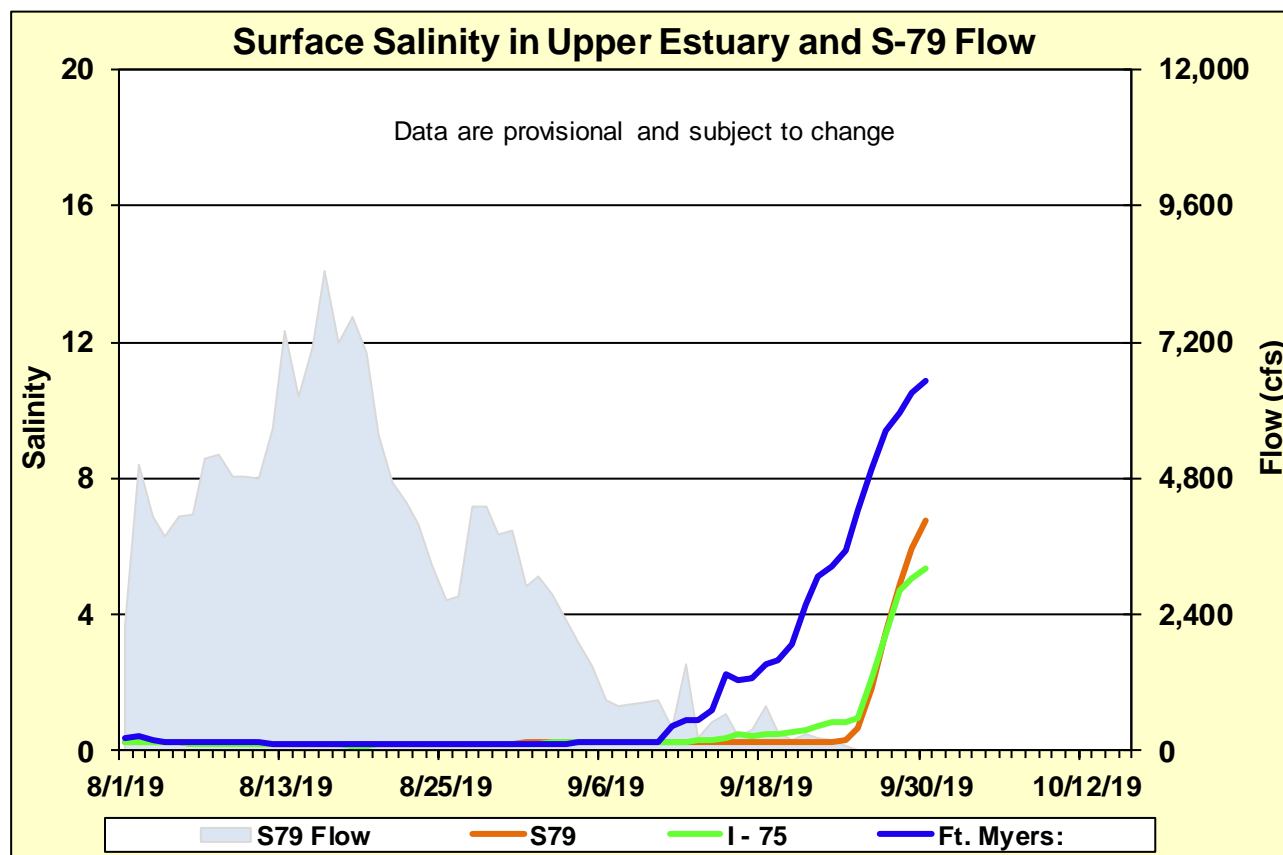


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

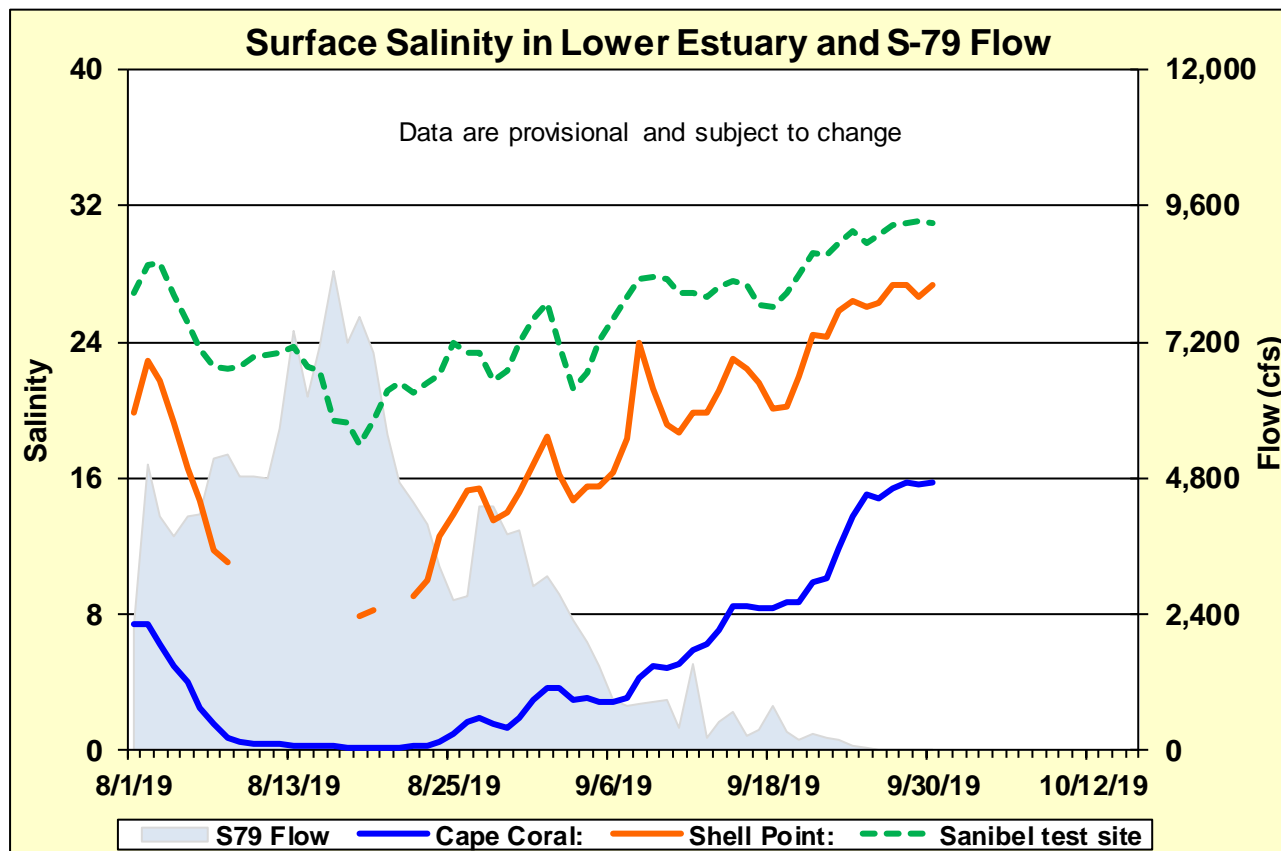


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

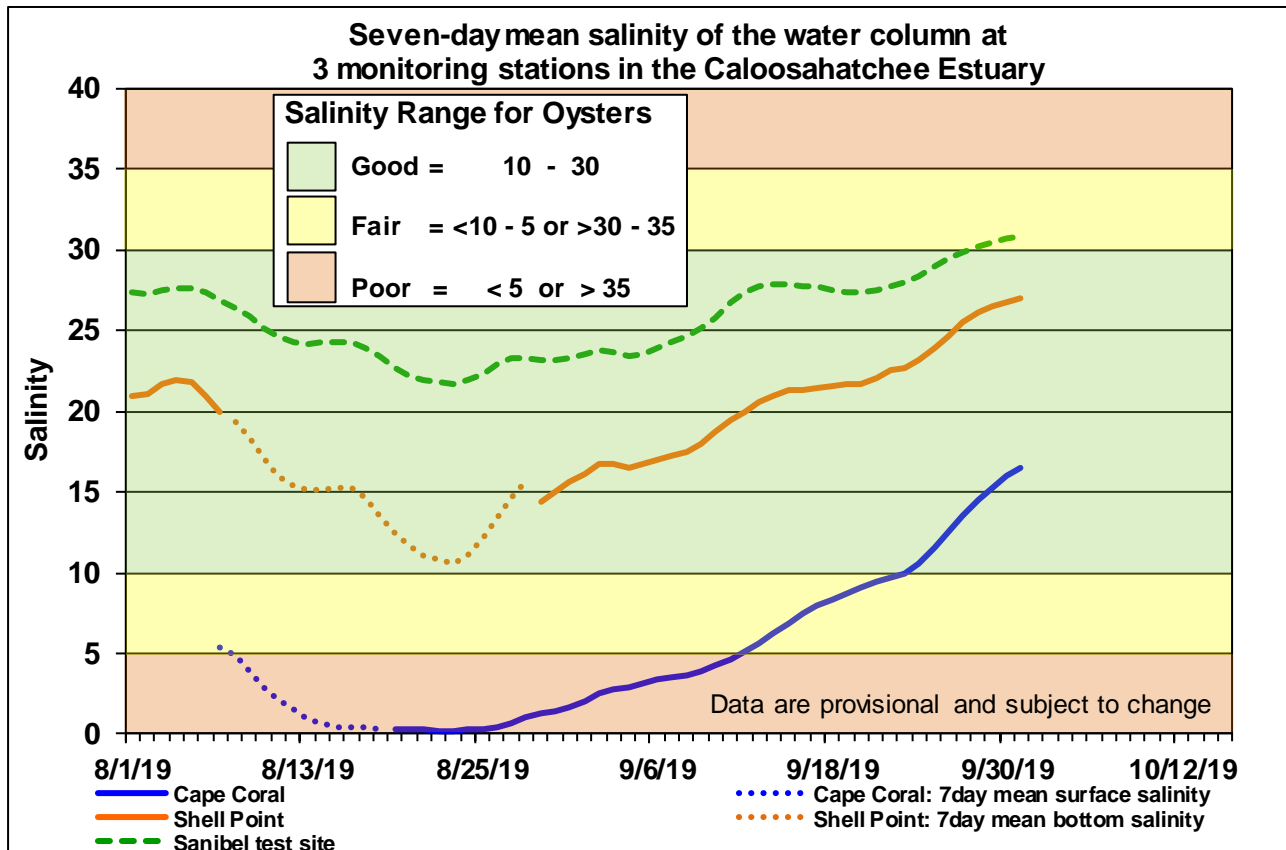


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

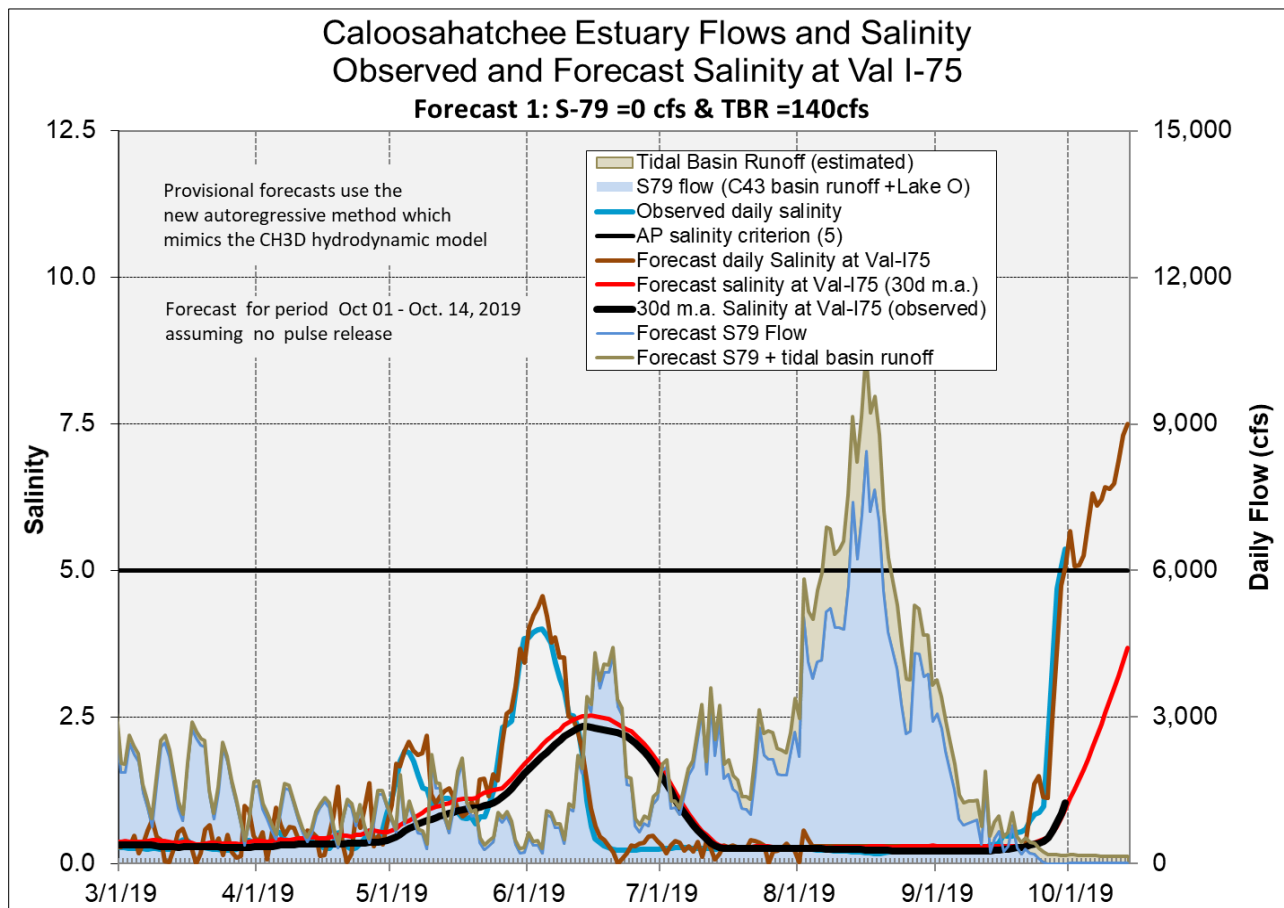


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

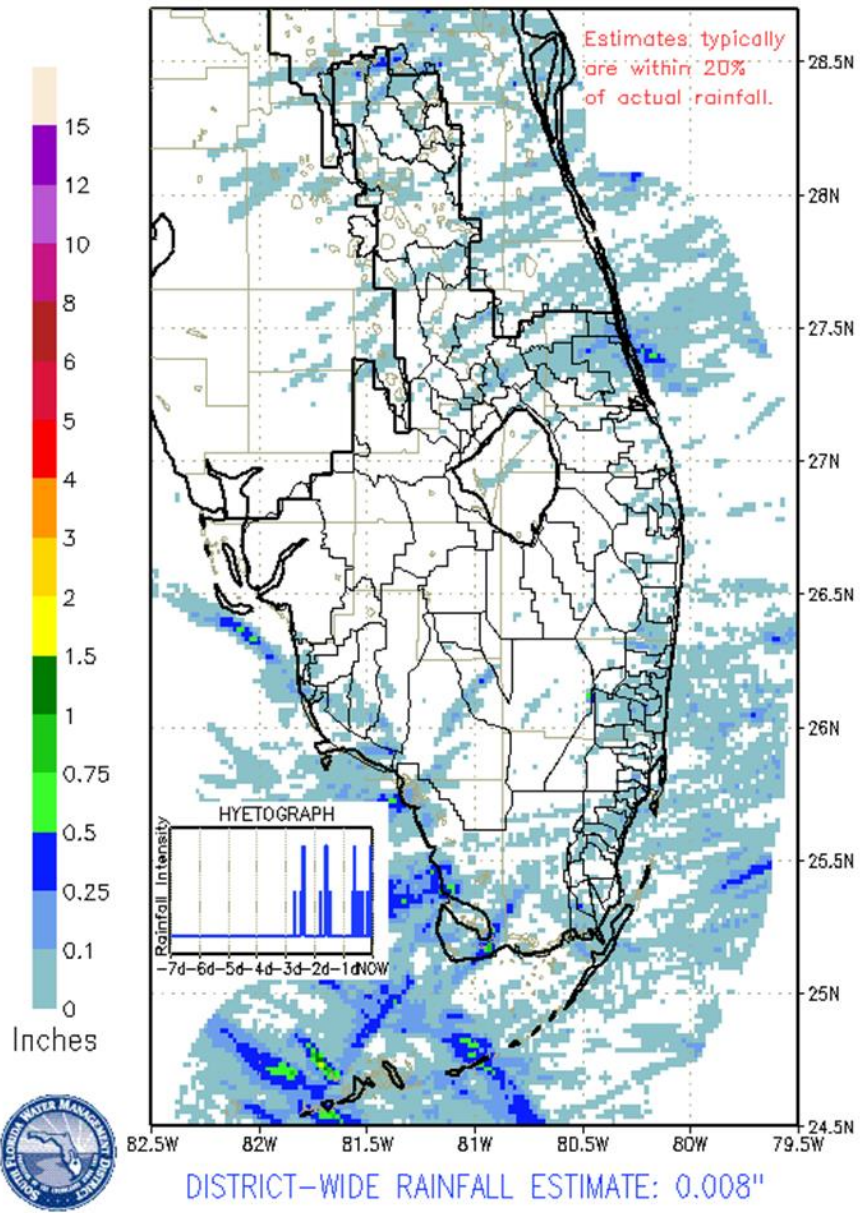
EVERGLADES

Rainfall was near zero across all the WCAs, with some appreciable precipitation falling in Everglades National Park. The average stage across all the gauges monitored for this report fell 0.13, nearly the same as the week prior. Pan evaporation was estimated at 1.64 inches and the Rainfall Plan calls for a release of 2,362 cfs from WCA-3A.

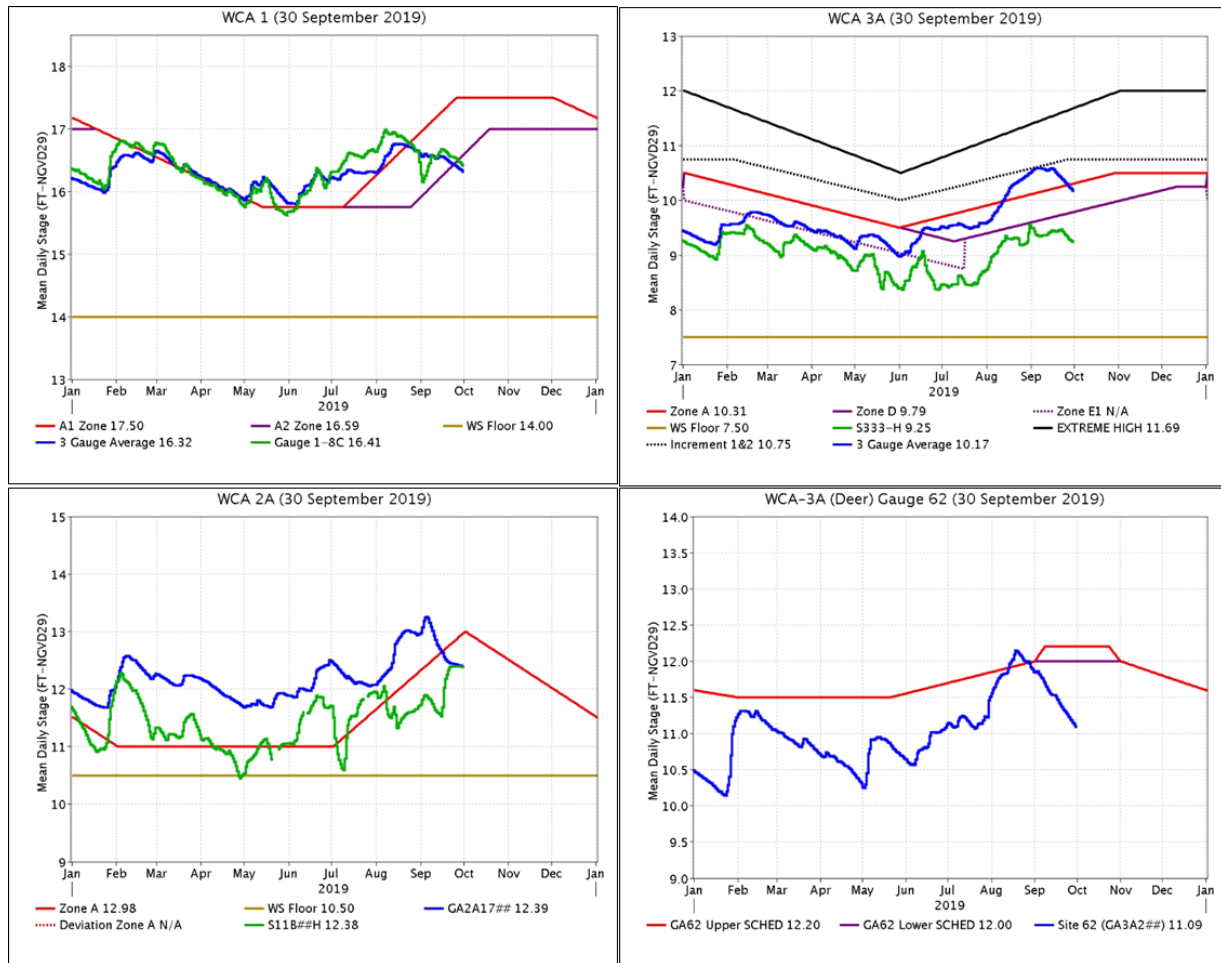
Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	<0.01	-0.11
WCA-2A	<0.01	-0.05
WCA-2B	<0.01	-0.17
WCA-3A	<0.01	-0.21
WCA-3B	<0.01	-0.08
ENP	0.04	-0.03

SFWMD PROVISIONAL RAINDAR 7-DAY RAINFALL ESTIMATES

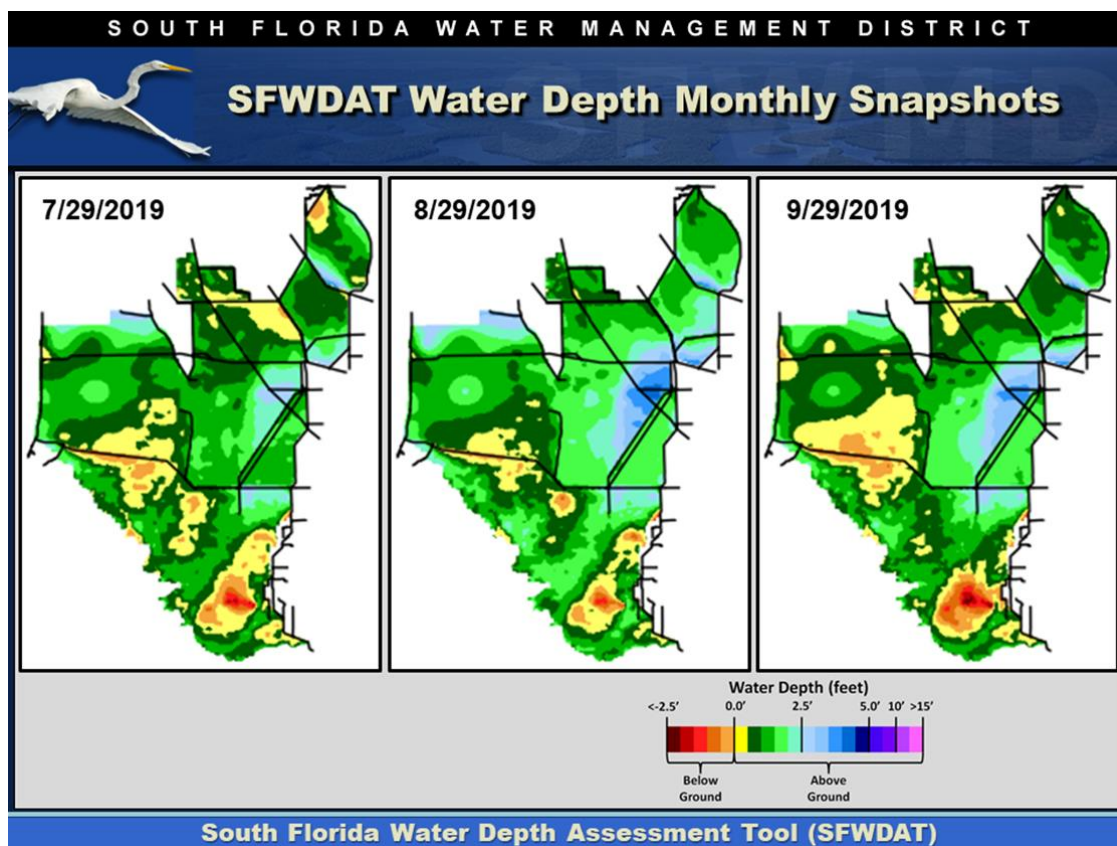
FROM: 0530 EST, 09/23/2019 THROUGH: 0530 EST, 09/30/2019



Regulation Schedules: WCA-1: The three-gauge average is now below the Zone A2 line falling away from the rising limb, currently at 0.27 feet below the regulation line. WCA-2A: Gauge 2A-17 rate of descent has slowed and equalized with canal levels, now 0.59 feet below the Zone A regulation line. WCA-3A: The three-gauge average stage fell below the rising Zone A regulation line this week, now at 0.12 feet below. WCA-3A at gauge 62 (northwest corner) continues to drop sharply at 1.11 feet below the upper schedule.

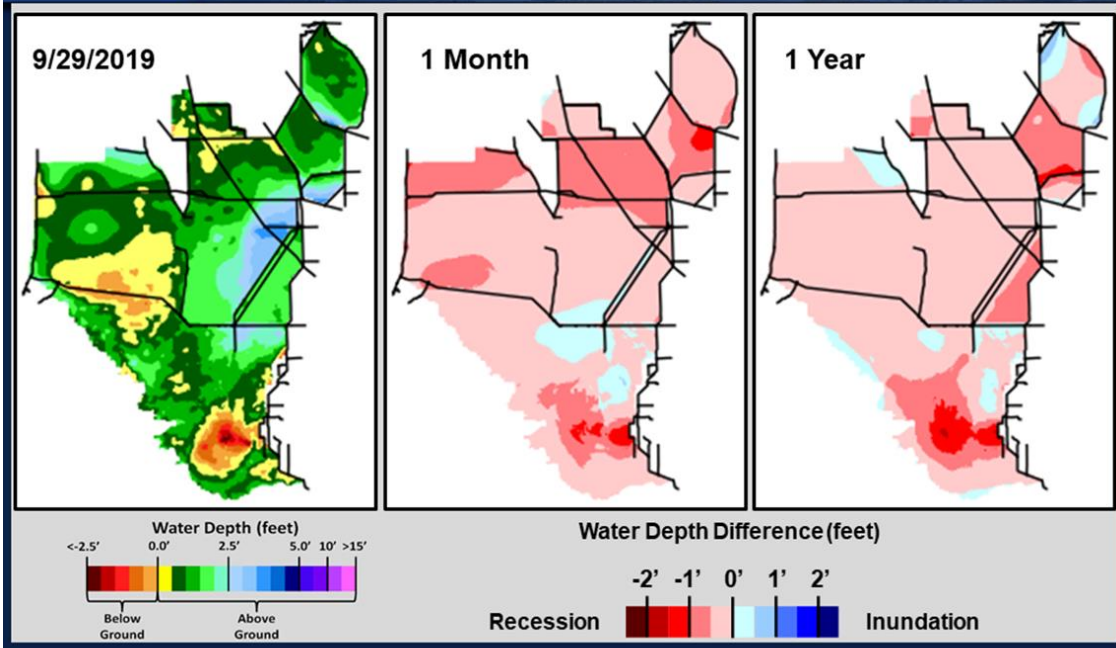


Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate conditions may have peaked and are now drying down. There is potential for depths at ground surface along the northern stretches of the Miami and L3-L4 Canal in WCA-3A North; the spatial extent of ponding along the L-67 canal in WCA-3A has diminished. Hydrologic connectivity has diminished but remains through the major slough of ENP. WDAT difference maps indicate that, in general, conditions are consistently shallower within all the WCAs compared to a month ago, significantly so in WCA-3A North and eastern WCA-2A. At this time last year, the WCAs were nearing the end of a high-water emergency order due to conditions in WCA-3A. Compared to last year at this time, stages are significantly lower in southern WCA-2A and WCA-3B. Stage changes are mixed within WCA-1 and seem to be associated with inflow and outflow from that basin.





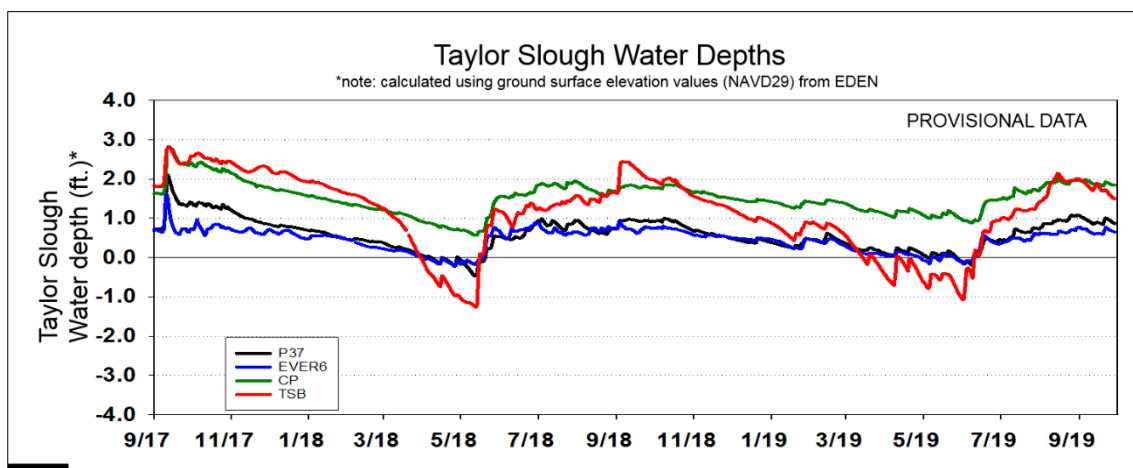
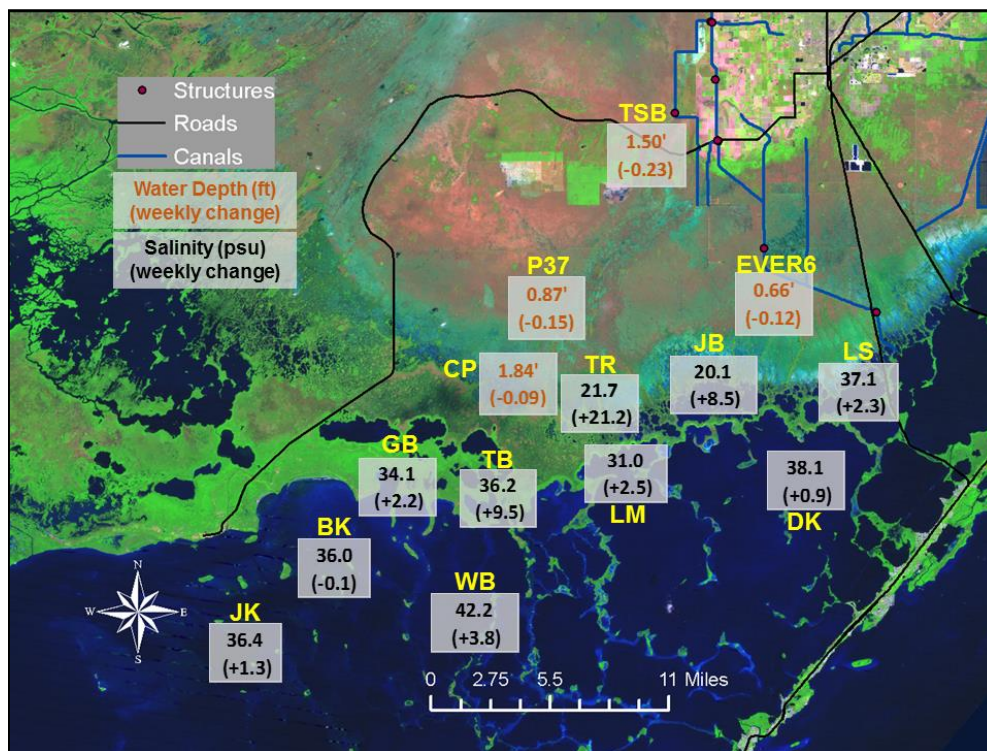
SFWDAT Everglades Difference Maps (Present - Past)

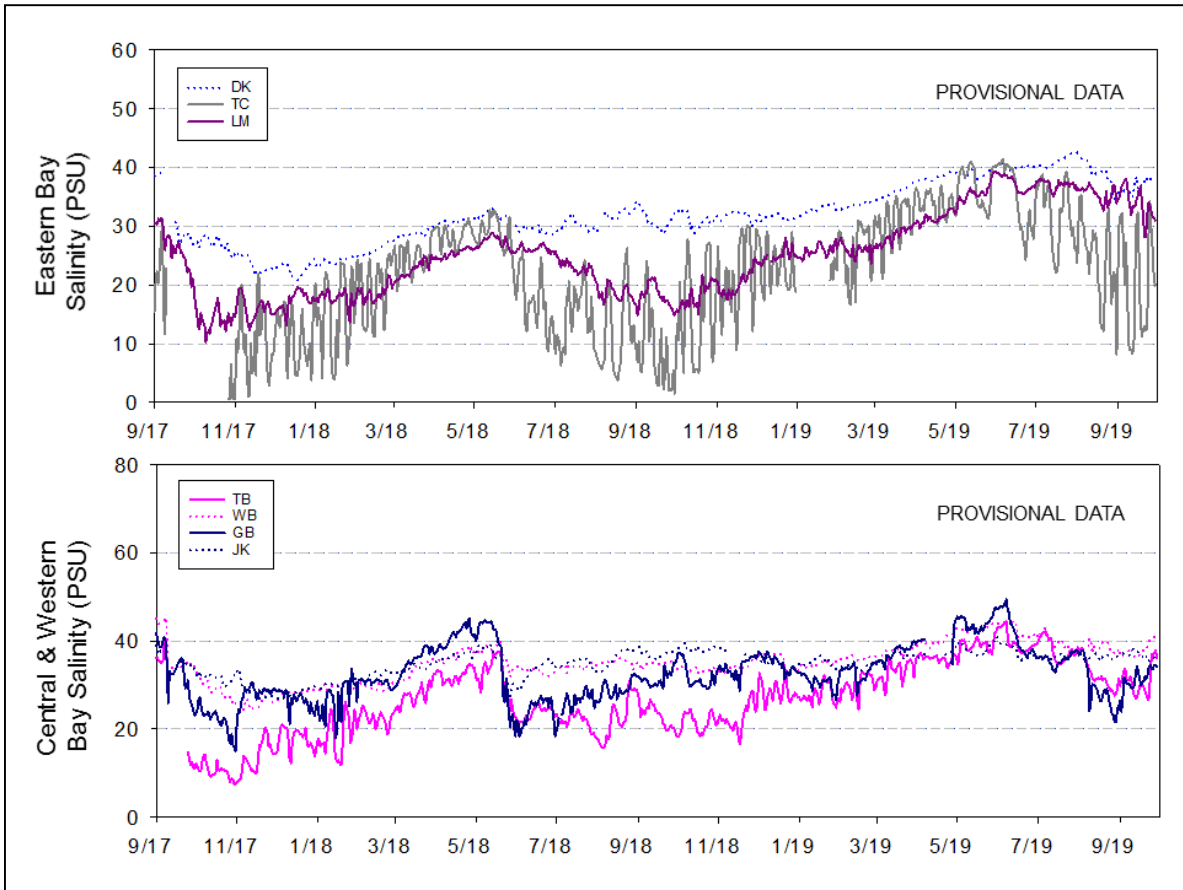


South Florida Water Depth Assessment Tool (SFWDAT)

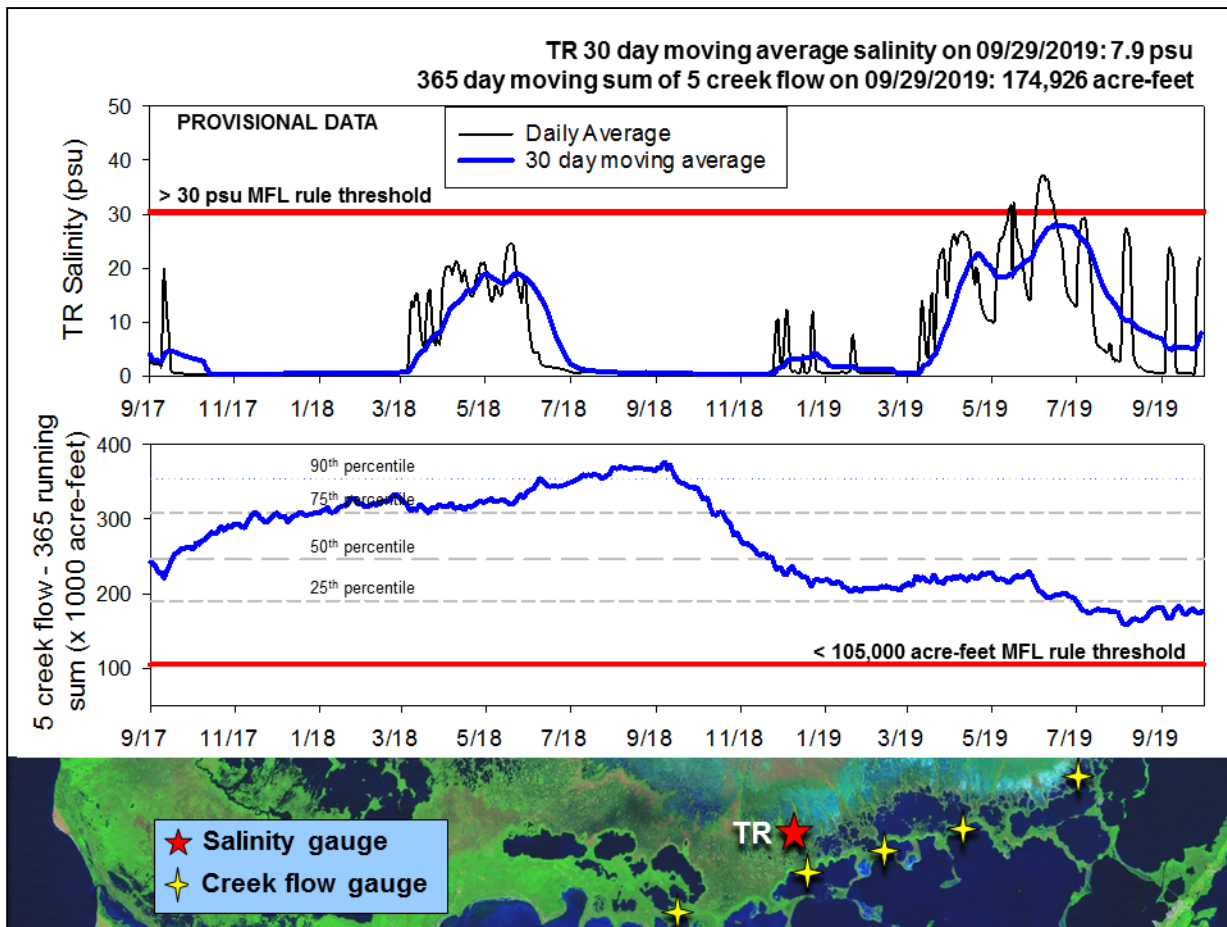
Taylor Slough Water Levels: An average of 0.08 inches of rain fell over Taylor Slough and Florida Bay this past week with the highest amount of 0.27 inches at Joe Bay (JB) near the northeastern Florida Bay shoreline. Stage changes ranged -0.09 feet to -0.23 feet with the largest decreases in the north. Stages now average an inch less than the historical averages for this time of year.

Florida Bay Salinities: Average salinity in Florida Bay was 35 psu, 4 psu higher than last week. The average for the northern shoreline has increased to 34 psu which is the wrong direction for this time of year. Conditions are 10 psu above average for this time of year.





Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) increased to 22 psu this week. The 30-day moving average also increased 2.7 psu to 7.9 psu. Weekly flow from the 5 creeks identified by yellow stars on the map totaled 6,800 acre-feet this past week which is half the historical average for this time of year. Stronger positive flows in the eastern most creeks helped to mask the upstream flow in the west. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) decreased 5,000 acre-feet to 174,926 acre-feet and continues to hover under the 25th percentile (190,165 acre-feet). Creek flow are provisional USGS data.



Water Management Recommendations

Stages are relatively low compared to average. Allowing current stages to run higher in all the WCAs may have ecological value; deeper water during the wet season allows the prey base to build to optimal densities prior to the dry season and wading bird nesting season. Deeper dry season depths also mean that the seasonal drawdown that concentrates prey for easier foraging can extend throughout the nesting season. WCA-3A North has a high potential for good wading bird foraging this year as a fire in that basin, near the Alley North colony, may have opened the sloughs making it easier for wading birds to forage for prey in that critical region. Overall conserving water within the WCAs, allowing stages to ascend to peak conditions and moving low nutrient water south has many ecological benefits. Water flowing through isn't ponding, flows towards Taylor Slough and Florida Bay, and reduces salinity conditions within the nearshore areas of Florida Bay where elevated salinities are currently creating stressful conditions for seagrasses and fauna in the nearshore. A potential indicator of stress in the Taylor Slough mangrove zone is the minimum that the 30-day moving average salinity reaches during the peak of the wet season. Compared to minimum 30-day moving average salinities of one and two years ago, current conditions are elevated. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, October 1st, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage decreased by 0.11'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths. Manage for a rate of change 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 decreased by 0.05'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths. Manage for a rate of change 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 decreased by 0.17'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths. Manage for a rate of change 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 decreased by 0.29'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths. Manage for a rate of change 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 decreased by 0.22'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths. Manage for a rate of change less than +0.25' per week, or less than +0.5 per 2 weeks.	
Central WCA-3A S	Stage decreased by 0.21'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths. Manage for a rate of change 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 decreased by 0.13'		
WCA-3B	Stage decreased by 0.08'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths. Manage for a rate of change 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 0.03'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from -0.09' to -0.23'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions.
FB- Salinity	Salinity changes ranged -0.1 to +9.5 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.