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, Assistant Executive Director, Executive Office Staff

FROM: SFWMD Staff Environmental Advisory Team

DATE: December 11, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Surface high pressure extending from the central Atlantic to Florida this morning will shift slowly eastward as a cold front arrives over the Florida Panhandle this evening. A southeasterly to southerly wind flow between the high-pressure area and the approaching front will transport an increasing supply of moisture and warm temperatures across the District today. However, a lack of instability and the presence of dry mid-level air should suppress much in the way of rains until very late afternoon or evening, when some shower and thunderstorm activity could begin to develop over parts of the interior of the District. The short-range models indicate that there could be an evening maximum of activity north and west of Lake Okeechobee through parts of the Kissimmee Valley and some increase in east coast showers this evening through the overnight. While not much, some measurable total District rainfall is expected during the next 24 hours but probably not more than a few hundredths of an inch. The cold front entering the Florida Panhandle this evening will push into north-central Florida by daybreak on Wednesday, to just north of Lake Okeechobee by the early afternoon and around or just south of the Lake by Wednesday evening, where it should stall. The 'lift' of the front, a deep layer of moisture and greater instability on Wednesday should result in a significant increase of rains District wide and what will likely be the greatest single-day rains since 24 November. The rains will probably be aided by a fast-moving upper-level impulse crossing the Gulf of Mexico, which could help to extend the favorability of rains into the evening in some areas and along the east coast during the evening/overnight. The stationary front will begin to lift slowly northward as a warm front on Thursday, but its continued presence across the central and northern part of the District should result in additional enhanced rains over a large area but especially in the northeastern part of the District. The conducive large-scale conditions on Wednesday and Thursday imply that isolated significant rainfall accumulations are possible area wide but mainly north and east of Lake Okeechobee on Thursday. By Friday, a quick-moving upper-level impulse crossing the Mississippi Valley will cause the warm front to move north of the District, which should result in a large decrease of total District rainfall. Isolated or widely scattered 'warm sector' rains are still forecast to contribute to at least some measurable total District rainfall on Friday, but it should be noted that many solutions are now showing little to no rainfall. The upper-level disturbance in the Mississippi Valley should 'lift out' of the eastern United States between Friday and Saturday but not before causing a weak frontal boundary to push southward through the District. Without much 'forcing' associated with this system, the trend in the models seen yesterday of showing much less rain ahead of the front on Saturday has continued, and if anything, the most recent model runs are showing even less. A drying is expected to begin by late Saturday with perhaps a marginal cooling to follow (at least at night), and there is high confidence of no measurable total District rainfall on Sunday. The weekend front could return as a warm front from the Florida Straits on Monday, and that would potentially cause some increase of rains along/near the east coast. On Tuesday a strong weather system crossing the Mississippi Valley has the potential to greatly increase rains across the District as it moves into the eastern United States, with what could be a strong cold front to follow on Wednesday. For the week ending next Tuesday morning, the deterministic total

quantitative precipitation forecast (QPF) is close to 100% of normal, most of which should come with the rains on Wednesday and Thursday. The probabilistic model output shows a median total District rainfall very near the deterministic forecast, bounded by 25th and 75th percentiles that are about 25-30% below and above the long-term average for the second week of December.

Kissimmee

Tuesday morning stages were 55.0 feet NGVD (3.0 feet below schedule) in East Lake Toho, 54.7 feet NGVD (0.3 feet below schedule) in Toho, and 50.7 feet NGVD (1.8 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 382 cfs at S-65, 317 cfs at S-65A, 344 cfs at S-65D and 208 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 9.3 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.10 feet. Recommendations: 12/10/2019- Continue S65-A discharge of at least 250 cfs. The purpose is to maintain minimum flow to the Kissimmee River.

Lake Okeechobee

Lake Okeechobee stage was 12.91 feet NGVD on December 9, 2019, down 0.16 feet from the previous week and 0.42 feet from the previous 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 has remained since. Water levels moved below the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) on October 15, 2019 and are currently 1.59 feet below the bottom of the envelope. Low Lake stages continue to benefit recovering SAV communities, but also stress higher elevation marshes; areas with elevations greater than approximately 14 feet NGVD have now been dry since late October of last year. The first survey of wading bird foraging on the Lake showed approximately 700 individuals, about a tenth of those seen last year at this time despite identical Lake stages. Low stages throughout 2019 likely limited prey production in the marsh and is likely to impact wading bird use of the Lake in the 2020 breeding season.

Estuaries

Total inflow to the St. Lucie Estuary averaged 175 cfs over the past week with no flow coming from Lake Okeechobee. Salinities increased slightly in the estuary. Salinity at the US1 Bridge is in the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 767 cfs over the past week with 522 cfs coming from the Lake. Salinity decreased slightly in the estuary over the past week. Salinities are in the good range at Val I-75 for Tape Grass and in the fair range at Ft. Myers. Salinities are in the good range for adult eastern oysters at Cape Coral and Shell Point and in the fair range at Sanibel.

Lake stage is in the Base Flow sub-band of 2008 LORS. Tributary hydrological conditions are dry. The forecast of 30-day moving average of surface salinity at Val I-75 would exceed 5 over the next two weeks if there is no release. SFWMD's Lake Okeechobee Adaptive Protocol's Release Guidance suggests up to 450 cfs @ S-79 and S-77 baseflow release to supplement as needed.

Stormwater Treatment Areas

Over the past week, 3,900 ac-ft 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 69,000 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 801,000 acre-feet. Most STA cells are at or near target depths except STA-5/6 cells which are below target. STA-5/6 Flow-ways 2 and 3 are offline for the Restoration Strategies project to grade non-effective treatment areas, and STA-1E Western Flow-way is offline for West Distribution Cell levee repairs and the Restoration Strategies project to fill and grade Cells 5 and 7. Operational restrictions are in place in STA-1W Northern Flow-way related to STA-1W Expansion #1 startup activities, and in STA-1E Central

Flow-way, STA-2 Flow-way 3, and STA-2 Flow-way 4 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 or A-1 FEB/STA-3/4.

Everglades

Current stages in the WCAs, particularly in WCA-3A North, are low for this time of year and salinities are high in Florida Bay. Conserving fresh water in the Everglades, distributing it to where depths are low and allowing it to flow south has important ecological benefit. As wading bird foraging begins in the Everglades, ecological recommendations move towards moderating recession rates where and when possible. Generally, this time of year rates from -0.05 to -0.09 feet per week are desirable to optimize conditions for prey concentration and capture. However, given the uniquely low stages at the start of this season it remains ecologically desirable to conserve as much water as possible. Florida Bay and Taylor Slough received very little rainfall last week and stages fell, most quickly in the northern reaches of Taylor Slough. Salinity conditions remain well above average for this time of year, and flow from the 5 creeks is less than is typical for this time of year.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.00 inches of rainfall in the past week and the Lower Basin received 0.01 inches (SFWMD Daily Rainfall Report 12/9/2019).

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: 12/10/2019

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)						
							12/8/19	12/1/19	11/24/19	11/17/19	11/10/19	11/3/19	10/27/19
Lakes Hart and Mary Jane	S-62	0	LKMJ	60.6	R	61.0	**-0.4**	-0.4	-0.4	-0.5	-0.5	-0.6	-0.5
Lakes Myrtle, Preston, and Joel	S-57	0	S-57	61.4	R	61.9	**-0.5**	-0.5	-0.5	-0.6	-0.5	-0.6	-0.5
Alligator Chain	S-60	0	ALLI	62.9	R	64.0	**-1.1**	-1.1	-1.0	-1.0	-1.0	-1.0	-0.9
Lake Gentry	S-63	2	LKGT	60.8	R	61.5	**-0.7**	-0.7	-0.7	-0.6	-0.6	-0.7	-0.6
East Lake Toho	S-59	203	TOHOE	55.0	R	58.0	**-3.0**	-2.8	-2.5	-2.4	-2.2	-2.0	-1.5
Lake Toho	S-61	315	TOHOW, S-61	54.7	R	55.0	**-0.3**	-0.2	-0.1	-0.1	0.0	0.0	0.1
Lakes Kissimmee, Cypress, and Hatchineha	S-65	359	KUB011, LKIS5B	50.7	R	52.5	**-1.8**	-1.9	-1.9	-1.9	-2.0	-2.1	-2.1

[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: **12/10/2019**

Metric	Location	1-Day Average	Average for the Preceeding 7-Days[1]								
		12/8/2019	12/8/19	12/1/19	11/24/19	11/17/19	11/10/19	11/3/19	10/27/19	10/20/19	10/13/19
Discharge (cfs)	S-65	353	**359**	358	356	323	335	332	318	354	408
Discharge (cfs)	S-65A[2]	316	**318**	315	319	276	281	279	263	286	327
Discharge (cfs)	S-65D[2]	345	**346**	347	330	290	338	382	368	379	441
Headwater Stage (feet NGVD)	S-65D[2]	25.87	**25.88**	25.90	25.84	25.76	25.77	25.74	25.83	25.78	25.81
Discharge (cfs)	S-65E[2]	332	**307**	330	345	244	208	365	405	367	425
Discharge (cfs)	S-67	0	**0**	0	0	0	0	0	0	0	0
DO (mg/L)[3]	Phases I & II/III river channel	9.5	**9.3**	8.4	8.1	7.2	7.2	6.4	6.4	6.6	6.7
Mean depth (feet)[4]	Phase I floodplain	0.10	**0.11**	0.14	0.13	0.15	0.17	0.22	0.24	0.20	0.24

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

[2]S-65A discharge combines S-65A with auxillary strucutures; 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.

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

[4]1-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)

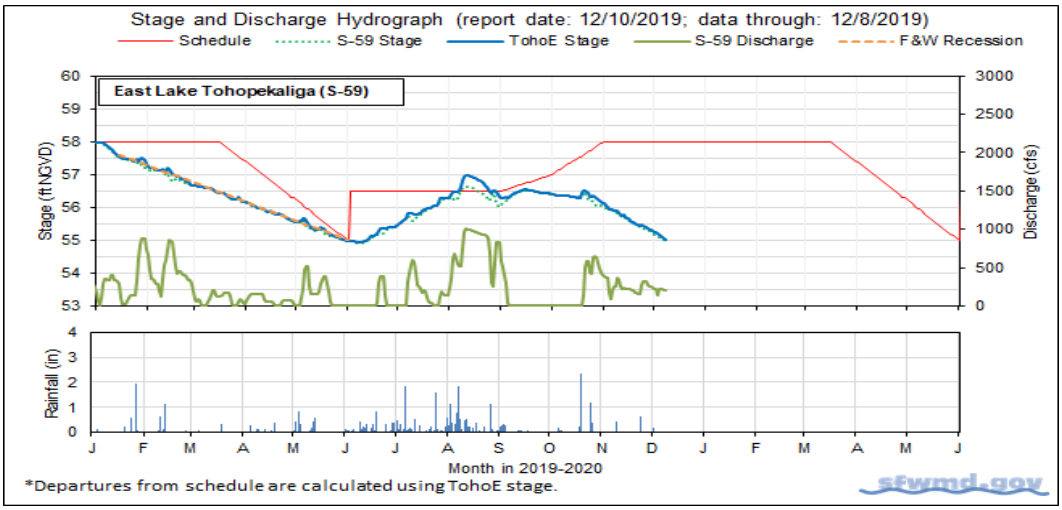


Figure 1.

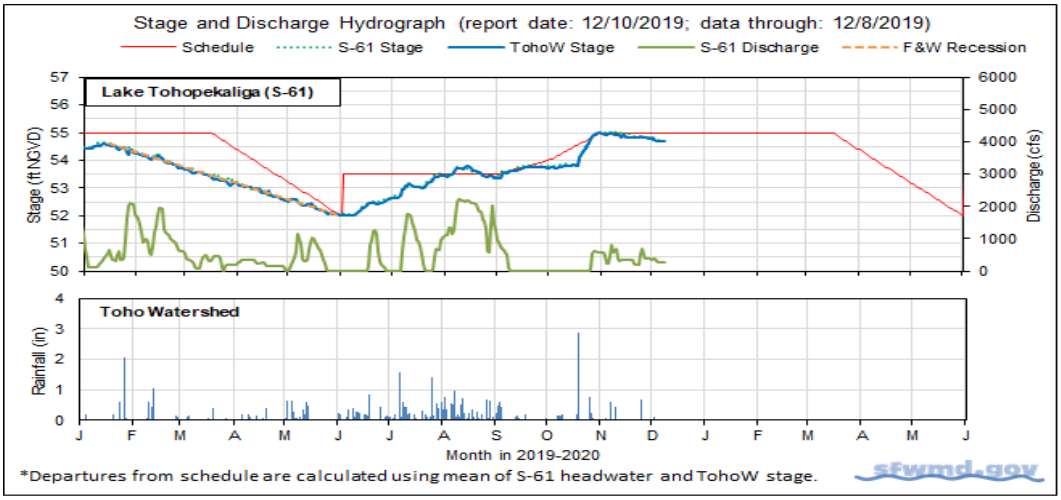


Figure 2.

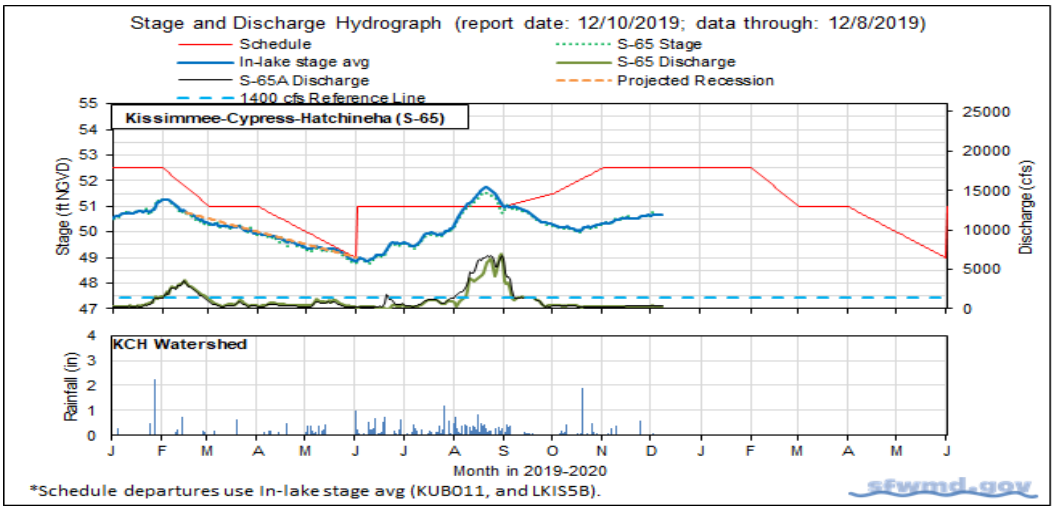


Figure 3.

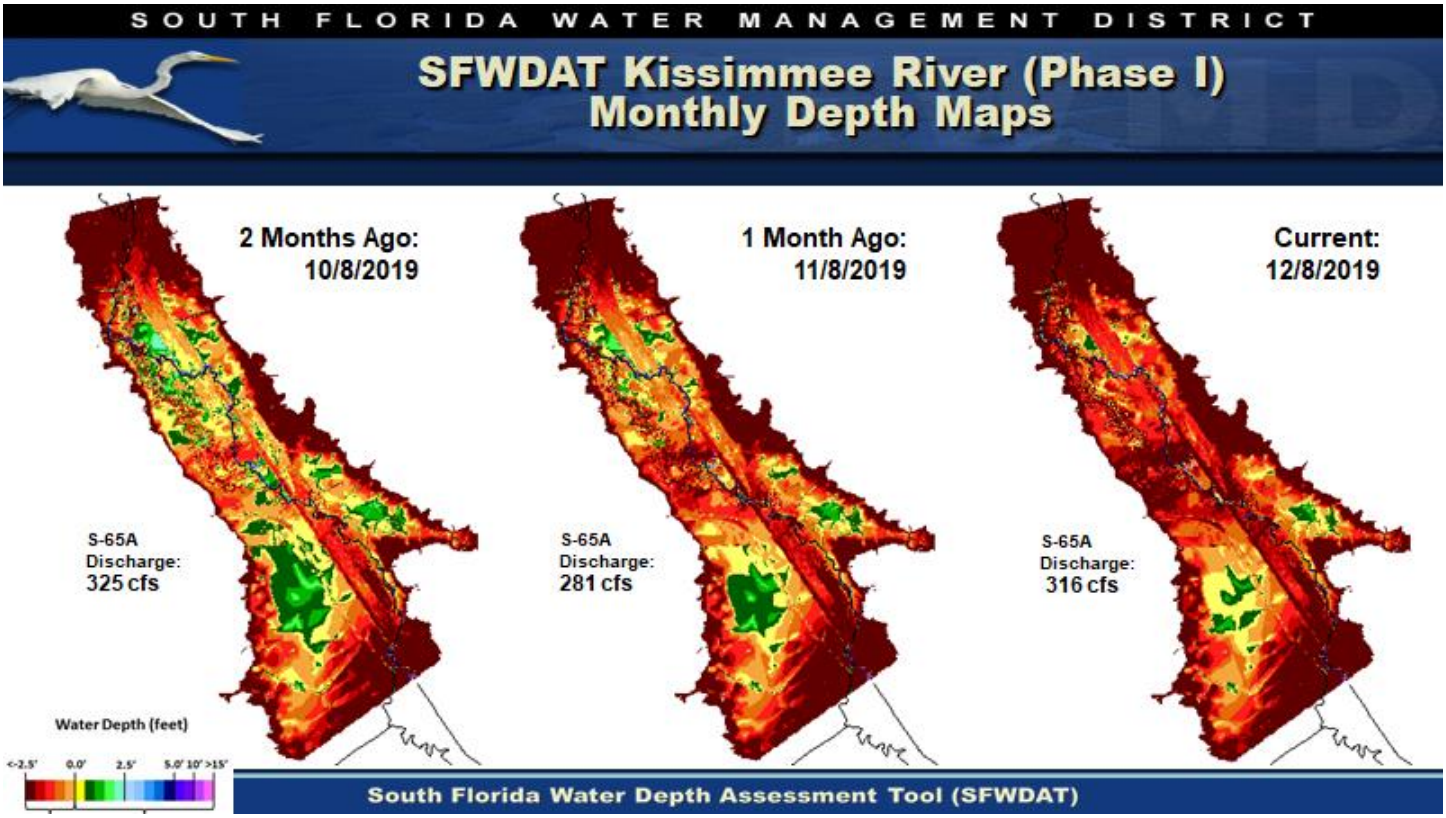


Figure 4. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

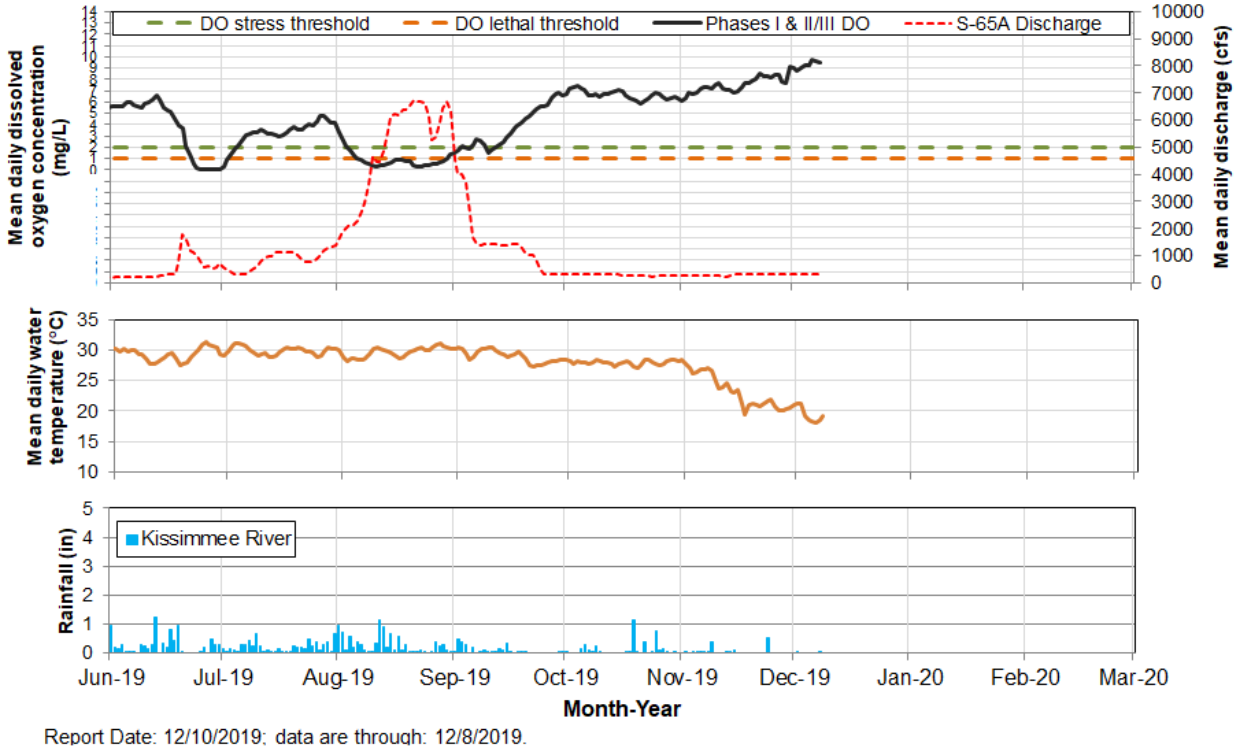


Figure 5. Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phases I/II/III river channel.

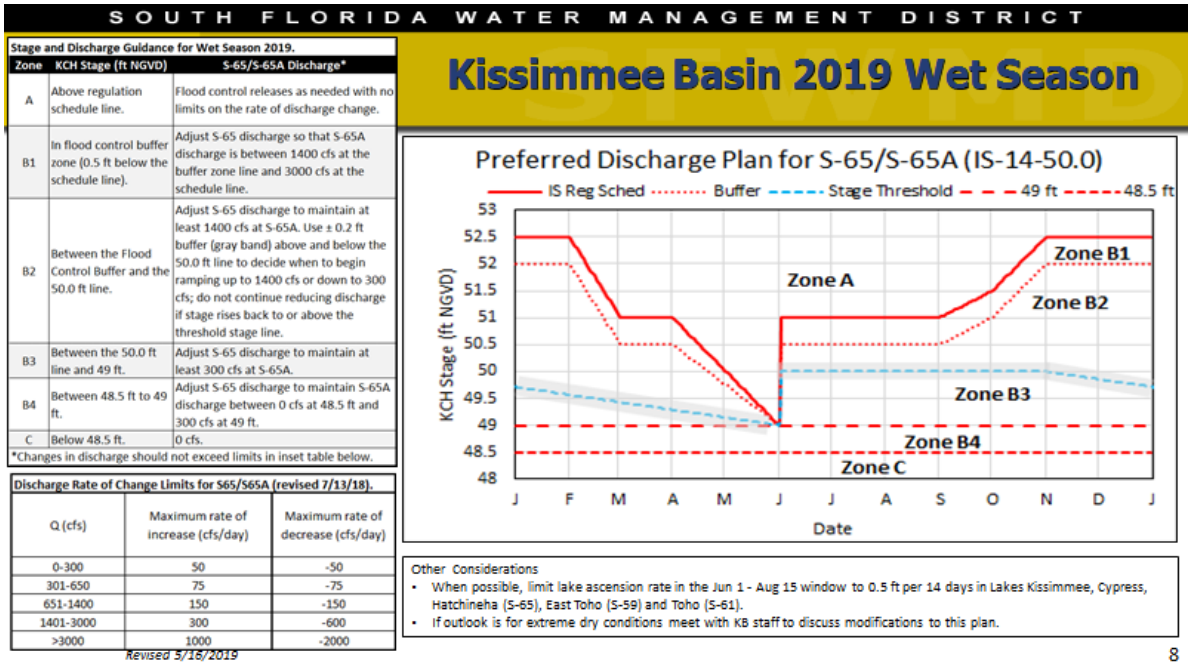


Figure 6. The 2019 Wet Season Discharge Plan for S-65/S-65A.

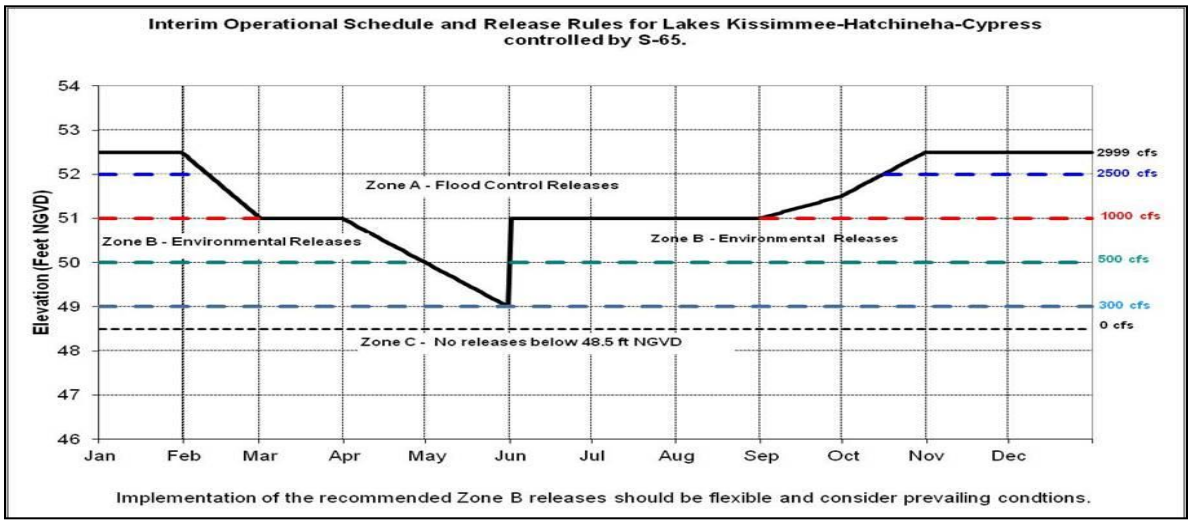


Figure 7. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

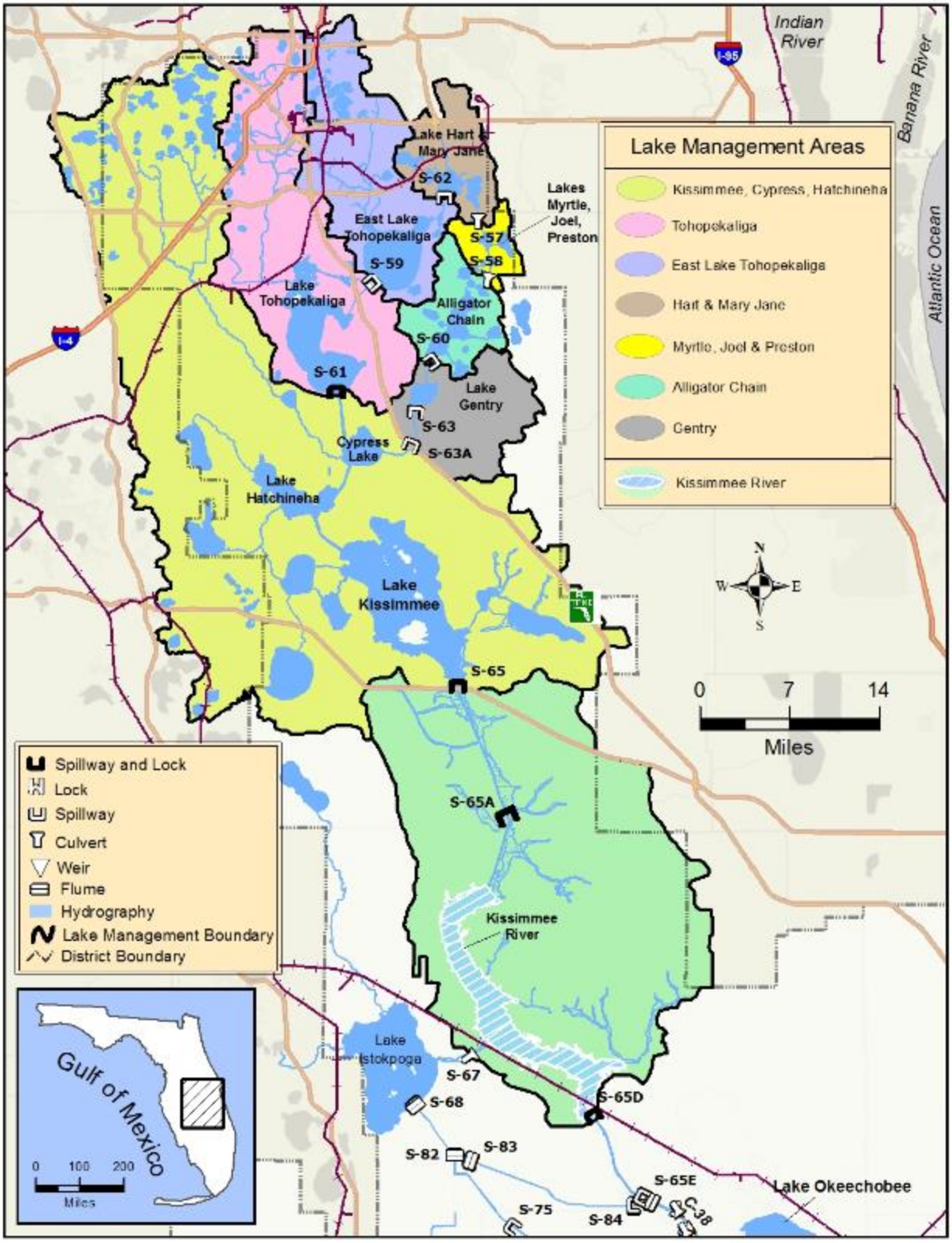


Figure 8. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage was at 12.91 feet NGVD for December 9, 2019 decreasing 0.16 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 0.42 feet lower than a month ago and the same stage as a year ago (Figure 1). The Lake is currently 1.59 feet below the preferred ecological envelope (Figure 2). Lake stages 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 has remained since (Figure 3). Lake stage has exhibited a gradual, steady decline since early September (Figure 4). According to RAINDAR, during the week of December 3 to December 9, 2019, no rain fell directly over the lake or most of the watershed, similar to the less than 0.1 inches that fell over much of the watershed last week (Figure 5).

The average daily inflows (minus rainfall) to the Lake were similar to the previous week, at 320 cfs. Most of the inflow came from the Kissimmee River (S-65E & S-65EX1), which also had similar flows as the previous week (306 cfs vs 324 cfs last week). Fisheating Creek averaged just 15 cfs, down from 24 cfs the prior week (Table 1).

Outflow (minus evapotranspiration) increased from the previous week, going from 1,289 cfs to 2,713 cfs. Flows west through the S-77 increased from 521 cfs to 840 cfs, flows east through the S-308 increased from 38 cfs to 122 cfs, while flows south through the S-350 structures increased from 585 cfs the previous week to 1,590 cfs this past week. Outflows to the L-8 canal via Culvert 10A were similar to the previous week at 160 cfs. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation decreased slightly from the previous week to 0.47 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 first wading bird survey of the 2020 breeding season (conducted December 5, 2019) reported just 700 foraging wading birds on the lake, compared to over 7,000 at the same time last year and at similar lake stages (Figure 7). Due to the low lake stages throughout 2019, there was likely limited prey production in the marsh, which is expected to affect wading bird foraging and nesting on the Lake throughout the 2020 breeding season.

A review of water quality samples collected May – September over the past 6 years (2013 – 2019) showed an improvement in 2019 summer values compared to recent years in the nearshore zone, similar to or better than pre-hurricane conditions (Table 2). Reductions in Chlorophyll *a*, Dissolved Inorganic Nitrogen (DIN), Soluble Reactive Phosphorus (SRP, orthophosphate), Total Phosphorus (TP), and turbidity were all evident in the nearshore zone, while the TP and turbidity still remain elevated in the pelagic region compared to several pre-hurricane years. The elevated turbidity and associated TP in the pelagic may be indicative of continued sediment disruption from Hurricane Irma in late 2017 or may be related to lower lake stages that can increase the depth at which wave disturbance can reach sediments.

Water Management Recommendations

Lake Okeechobee stage was 12.91 feet NGVD on December 9, 2019, down 0.16 feet from the previous week and 0.42 feet from the previous 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 has remained since. Water levels moved below the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) on October 15, 2019 and are currently 1.59 feet below the bottom of the

envelope. Low lake stages continue to benefit recovering SAV communities, but also stress higher elevation marshes; areas with elevations greater than approximately 14 feet NGVD have now been dry since late October of last year. The first survey of wading bird foraging on the Lake showed approximately 700 individuals, about a tenth of those seen last year at this time despite identical lake stages. Low stages throughout 2019 likely limited prey production in the marsh and is likely to impact wading bird use of the Lake in the 2020 breeding season.

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	324	306	0.1
S-71 & S-72	0	0	0.0
S-84 & S-84X	0	0	0.0
Fisheating Creek	24	15	0.0
S-154	0	0	0.0
S-191	0	0	0.0
S-133 P	0	0	0.0
S-127 P	0	0	0.0
S-129 P	5	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	22	0	0.0
Total	**376**	**320**	**0.1**

OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-77	521	840	0.4
S-308	38	122	0.1
S-351	321	802	0.4
S-352	96	360	0.2
S-354	168	428	0.2
L-8 Outflow	144	160	0.1
ET	1226	1061	0.5
Total	**2514**	**3774**	**1.7**

Provisional Data

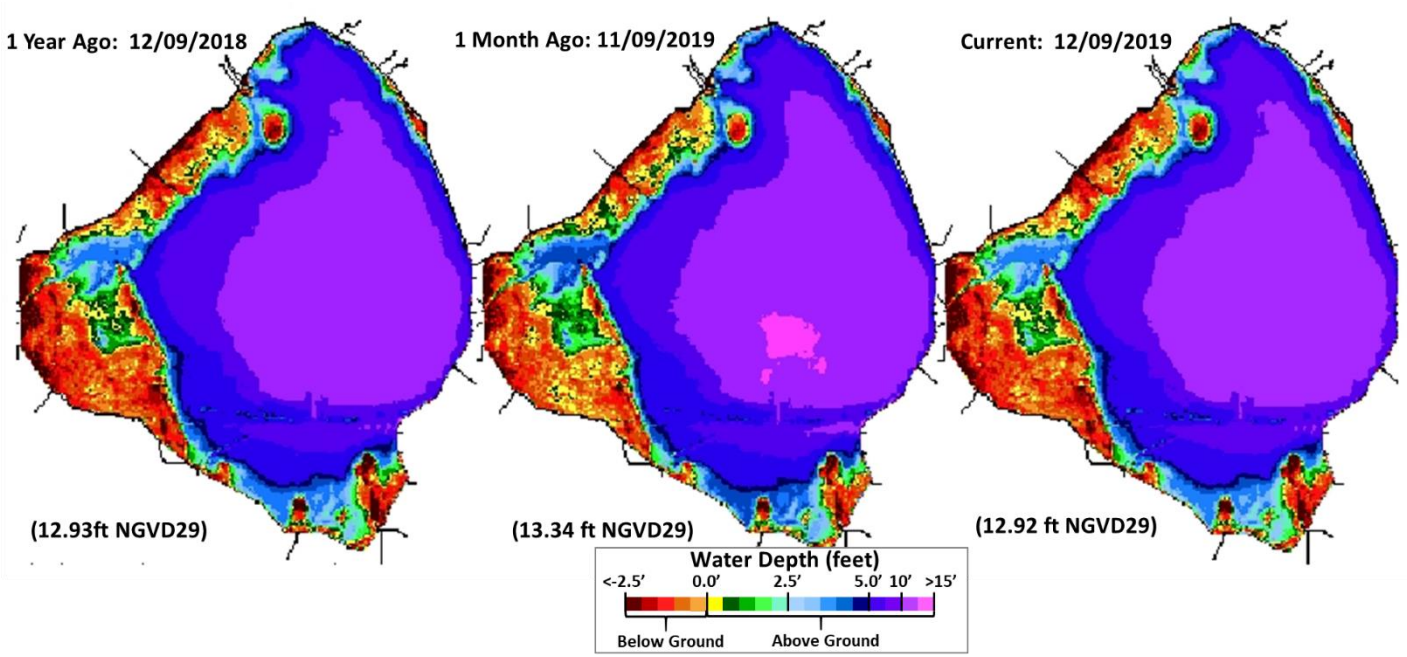


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

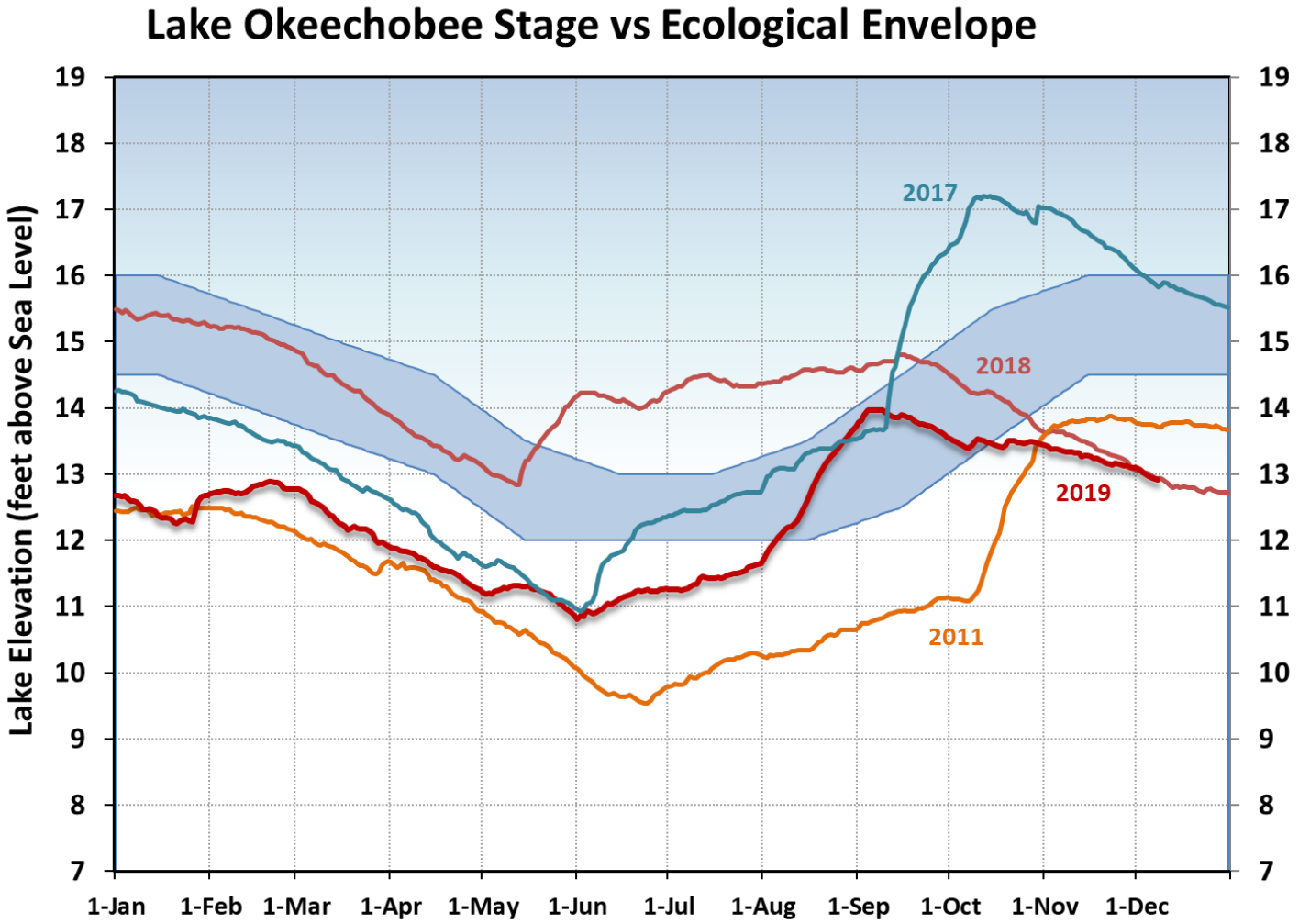


Figure 2. Select annual stage hydrographs for Lake Okeechobee in comparison to the Ecological Envelope.

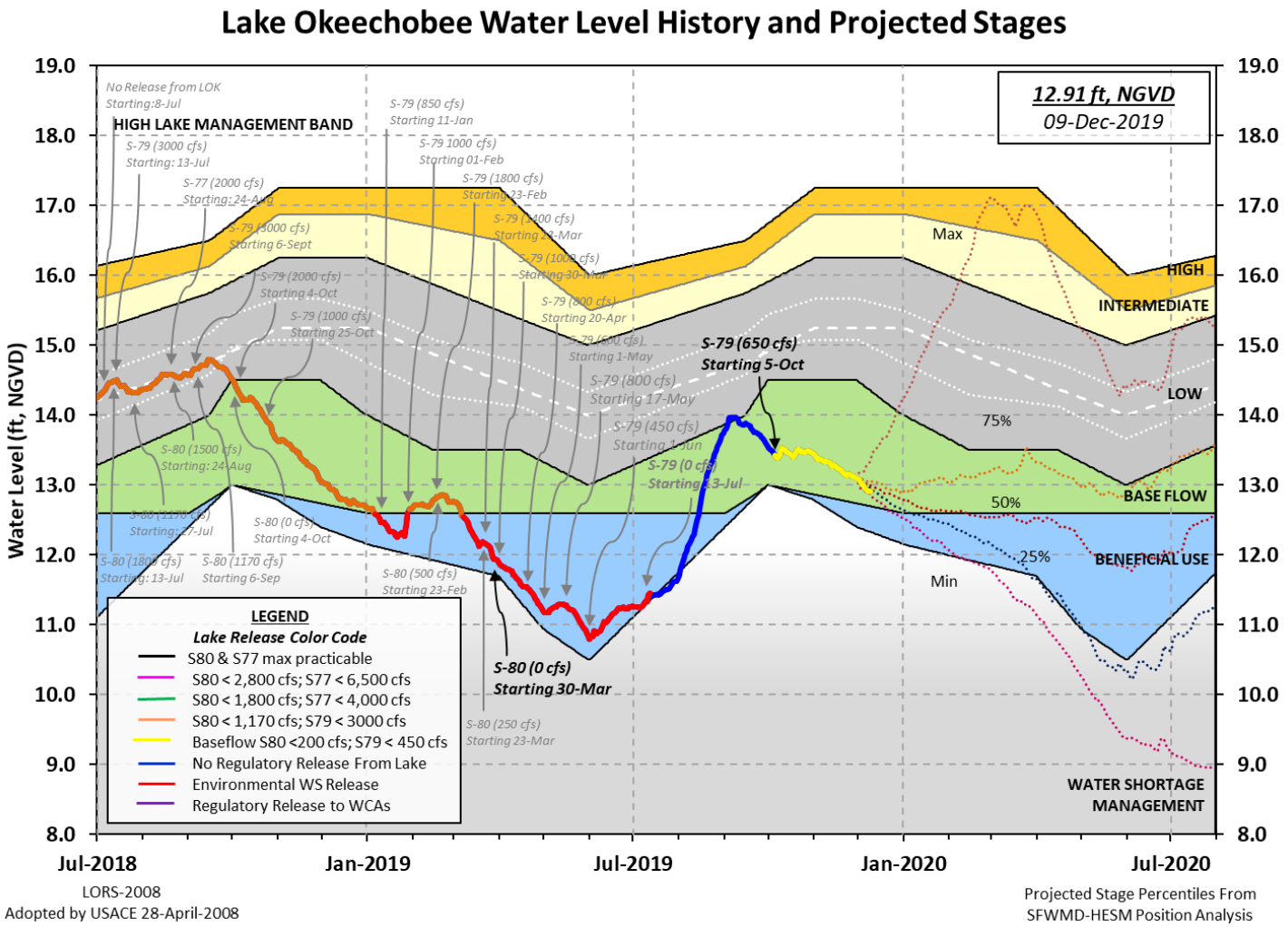


Figure 3. Recent Lake Okeechobee stage and releases, with projected stages based on a dynamic position analysis.

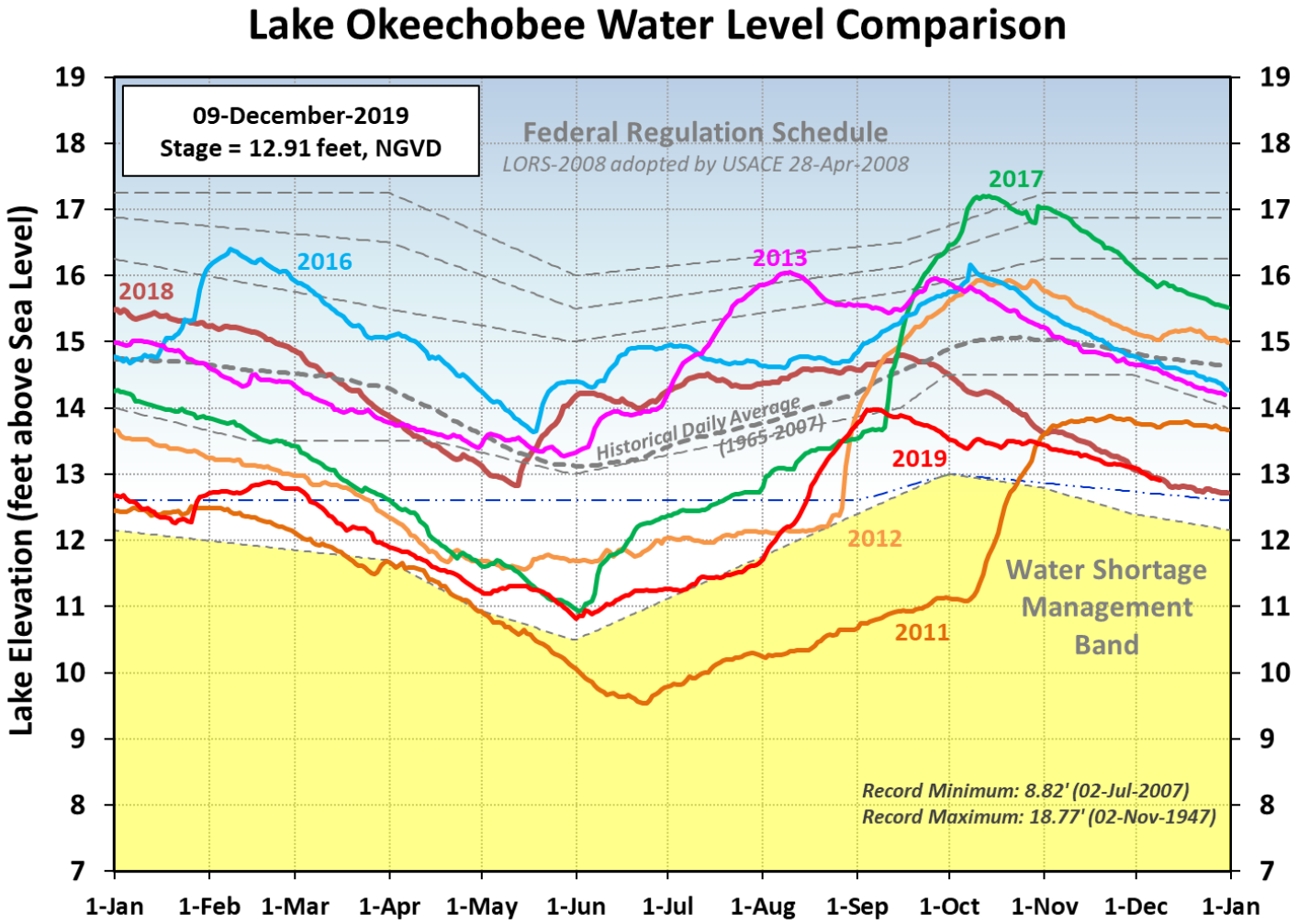


Figure 4. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

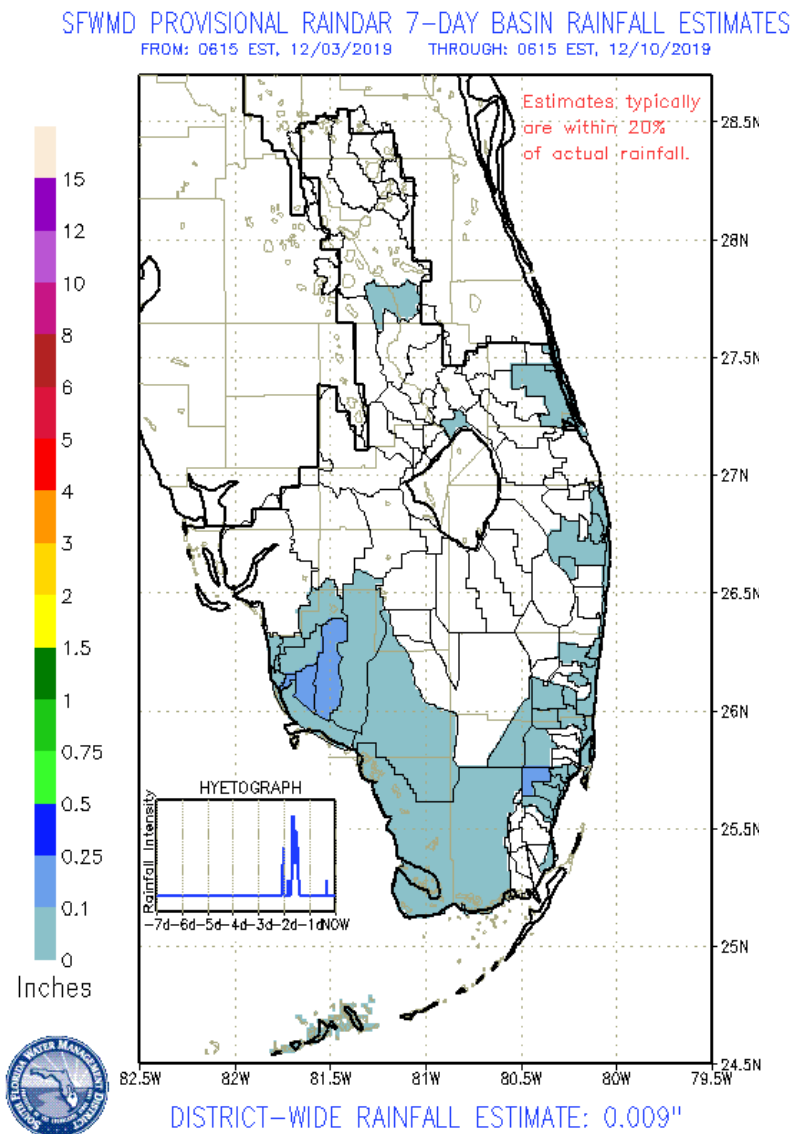


Figure 5. Rainfall estimates by basin.

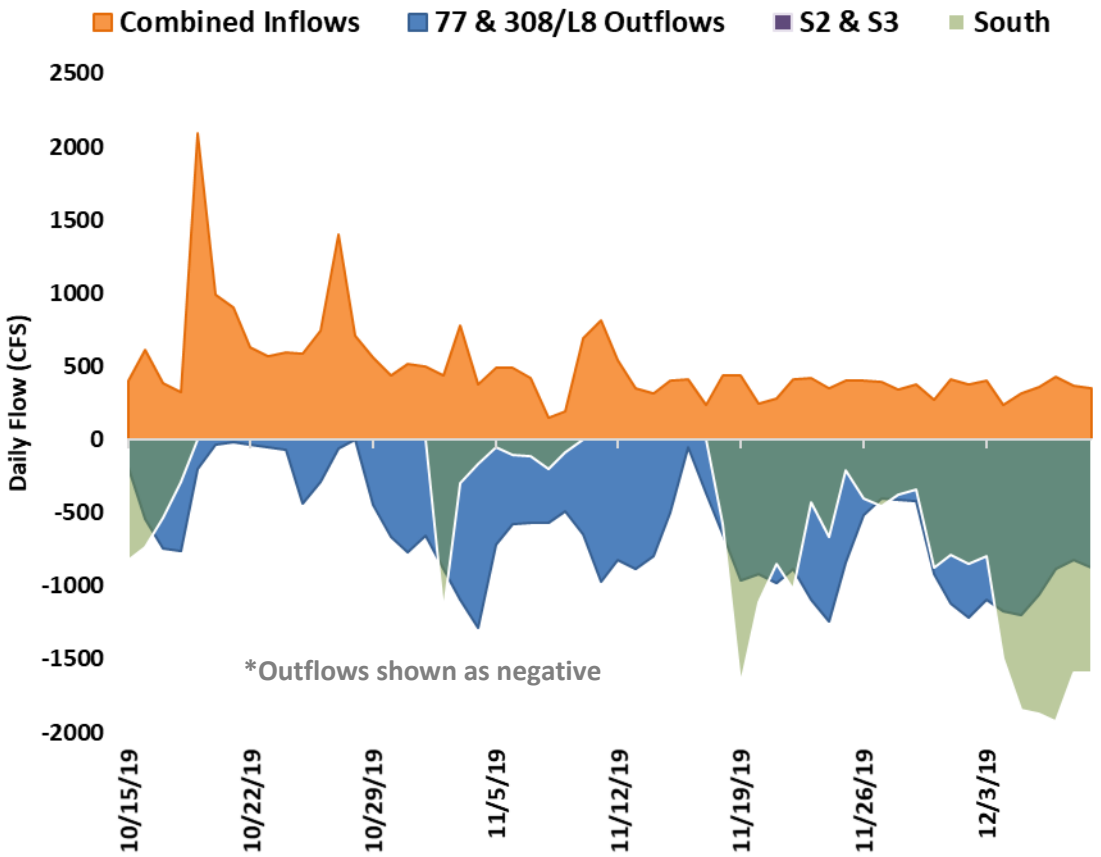
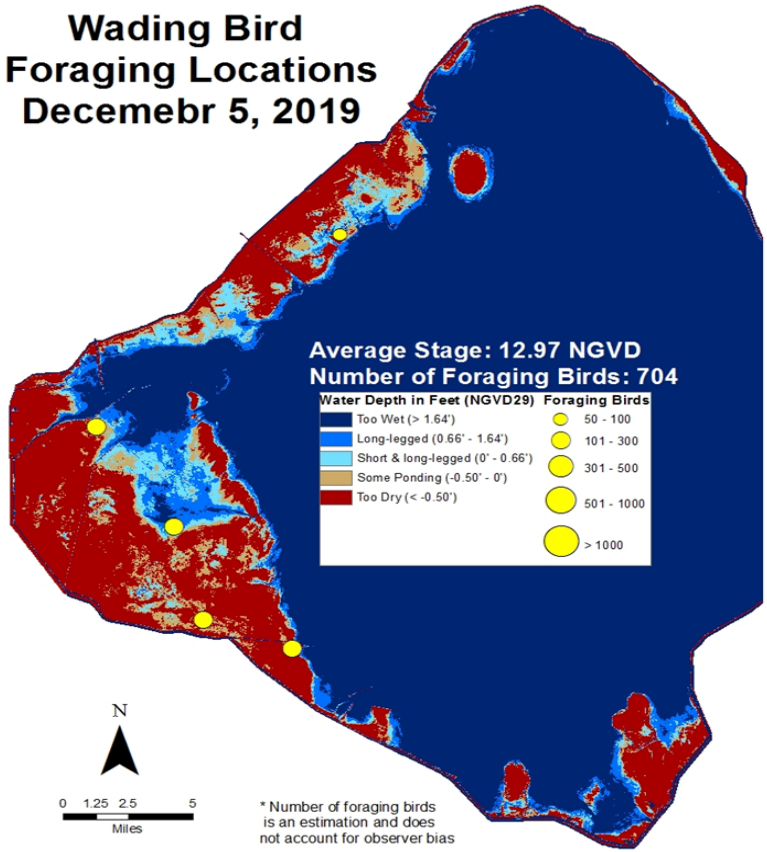


Figure 6. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive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



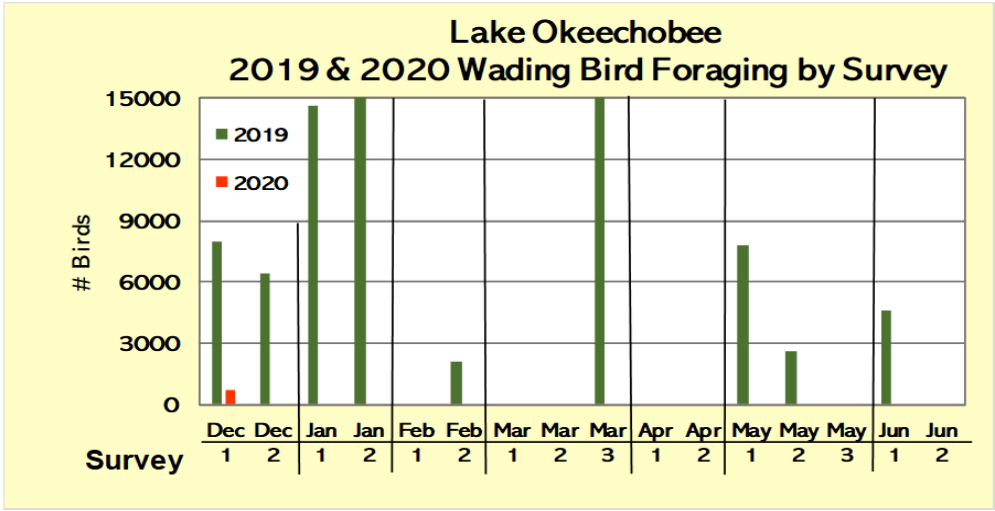


Figure 7. Locations of foraging flocks of wading birds observed during a monitoring flight on December 5, 2019 are shown in yellow, with circle sizes representing the size of the flocks. Previous survey totals from last year's breeding season are compared in the bar graph.

Table 2. Select water quality parameters averaged across nearshore (n=9) and pelagic (n=8) monitoring stations for the summer months (May – September) that tend to have peak algal bloom conditions, compared across the previous six years (2013 – 2019). Measured parameters are Chlorophyll *a* (Chla), Dissolved Inorganic Nitrogen (NH4 and NOx), Soluble Reactive Phosphorus (SRP = OPO4), Total Phosphorus (TP), and turbidity. Data are provisional.

Location	Year	Avg Chla (ug/L)	Avg DIN (mg/L)	Avg SRP (ug/L)	Avg TP (ug/L)	Avg Turbidity (NTU)
Nearshore	2013	41.03	0.089	16.8	77.5	9.1
	2014	31.39	0.138	20.9	82.0	10.3
	2015	26.68	0.087	10.3	71.6	10.7
	2016	38.42	0.129	18.9	93.9	14.9
	2017	25.71	0.295	61.8	150.8	24.3
	2018	20.97	0.144	56.4	136.7	18.4
	2019	19.24	0.048	22.5	73.4	8.8
Pelagic	2013	12.77	0.141	49.4	114.6	22.5
	2014	21.18	0.112	45.0	126.5	28.0
	2015	17.82	0.133	38.7	115.5	24.8
	2016	27.15	0.137	44.4	141.9	30.4
	2017	15.10	0.305	56.6	161.0	45.6
	2018	16.50	0.219	80.2	176.5	40.4
	2019	15.67	0.108	46.2	132.4	32.7

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 175 cfs (Figures 1 and 2) and last month inflow averaged about 285 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	107
S-80	0
S-308	122
S-49 on C-24	0
S-97 on C-23	0
Gordy Rd. structure on Ten Mile Creek	68

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 23.2. Salinity conditions in the middle estuary are estimated to be 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)	**18.8** (17.3)	**22.2** (20.0)	NA[1]
US1 Bridge	**22.7** (20.2)	**23.9** (21.4)	10.0-26.0
A1A Bridge	**28.2** (27.1)	**29.8** (28.9)	NA[1]

[1]Envelope not applicable

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 767 cfs (Figures 5 and 6) and last month inflow averaged about 784 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	840
S-78	593
S-79	672
Tidal Basin Inflow	95

Over the past week, surface salinity decreased throughout the estuary (Table 4, Figures 7 & 8). The seven-day average salinity values are within the good range for adult eastern oysters at Cape Coral and at Shell Point and in the fair range at Sanibel (Figure 9). The seven-day average surface salinities (Table 4) are in the good range for Tape Grass at Val I-75 and in the fair range at Ft. Myers.

Table 4. Seven-day average salinity at six monitoring stations in the Caloosahatchee Estuary. Current average is in bold, previous average in parentheses. The envelope reflects the preferred salinity range for associated sampling sites.

Sampling Site	Surface	Bottom	Envelope
S-79 (Franklin Lock)	**5.7** (5.9)	**5.8** (6.1)	NA[1]
Val I75	**6.2** (7.4)	**8.6** (9.3)	0.0-5.0[2]
Ft. Myers Yacht Basin	**12.2** (13.5)	**15.2** (14.9)	NA
Cape Coral	**18.8** (19.6)	**20.6** (21.3)	10.0-30.0
Shell Point	**27.9** (29.2)	**28.2** (29.5)	10.0-30.0
Sanibel	**31.1** (31.7)	**31.1** (31.6)	10.0-30.0

[1]Envelope not applicable and [2]Envelope is based on a 2-week forecast 30-day average (see Table 5 below).

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 4.8 to 10.0 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 80 cfs. The 30-day moving average surface salinity at Val I-75 is forecast to be between 5.9 and 7.8 within two weeks (Table 5). This and the current salinity conditions at Val I-75 outside the envelope of salinity 0.0-5.0 for this site (Table 4) indicate that the estuary would benefit from additional water.

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	80	10.0	7.8
B	300	80	8.0	7.0
C	450	80	6.5	6.5
D	650	80	5.0	6.0
E	800	80	4.8	5.9

Red tide

The Florida Fish and Wildlife Research Institute reported on December 6, 2019, that *Karenia brevis,* the Florida red tide dinoflagellate, was observed at background to medium concentrations in 16 samples collected from and/or offshore of Lee County. *Karenia brevis* was not observed in samples collected from Palm Beach County (no samples were analyzed this week from St. Lucie, Martin, Broward or Miami-Dade counties). Respiratory irritation and reports of fish kills were received in Lee County.

Water Management Recommendations

Lake stage is in the Base Flow sub-band. Tributary conditions are dry. The 30-day moving average of surface salinity at Val I-75 is predicted to exceed 5 over the next two weeks. SFWMD's Lake Okeechobee Adaptive Protocol's Release Guidance suggests up to 450 cfs @ S-79 and S-77 baseflow release to supplement as needed.

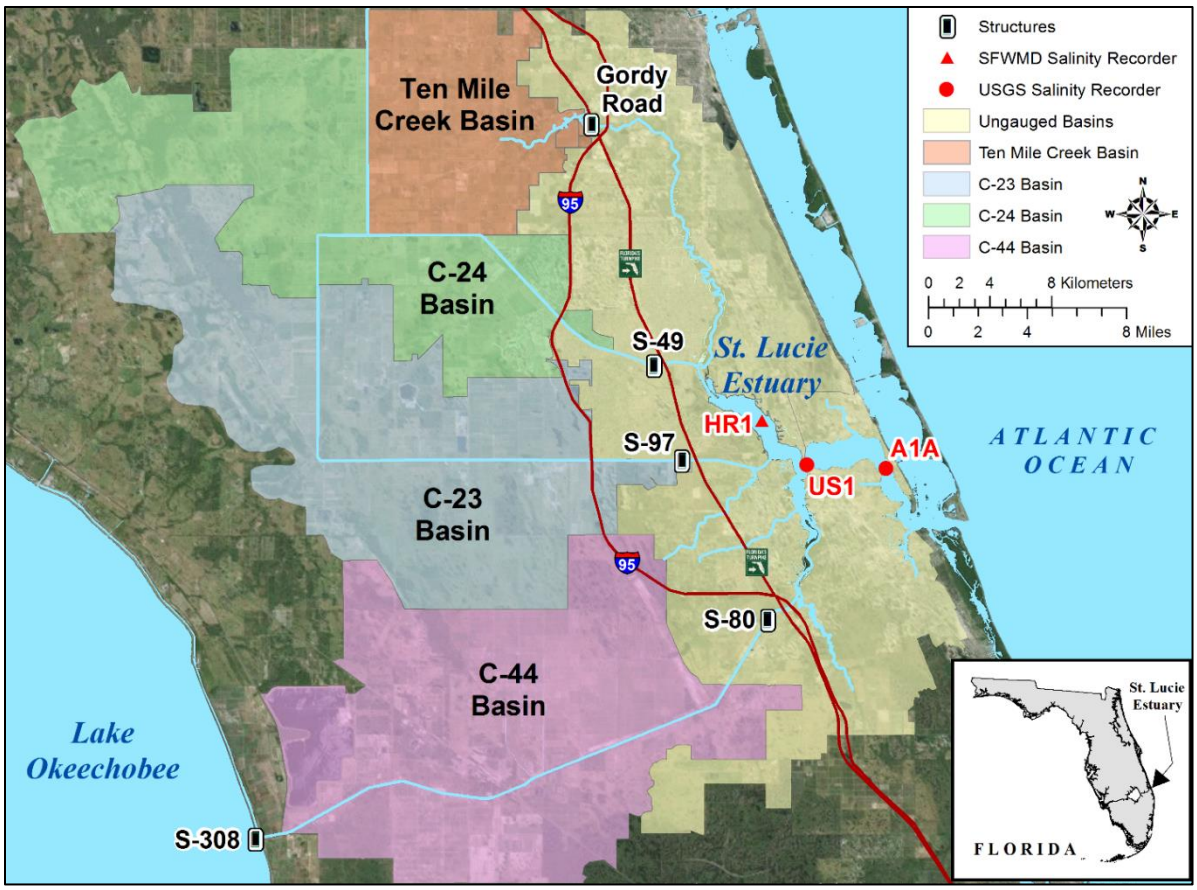


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

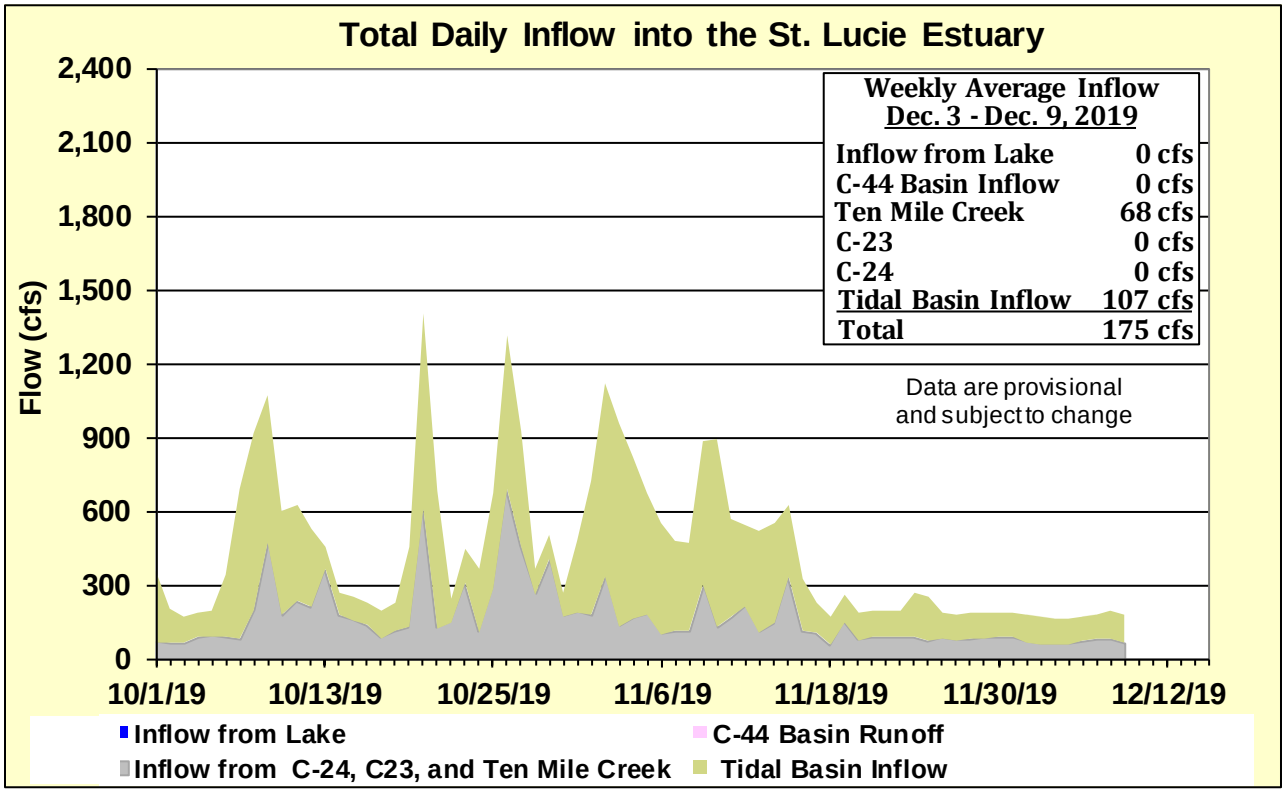


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basin into the St. Lucie Estuary.

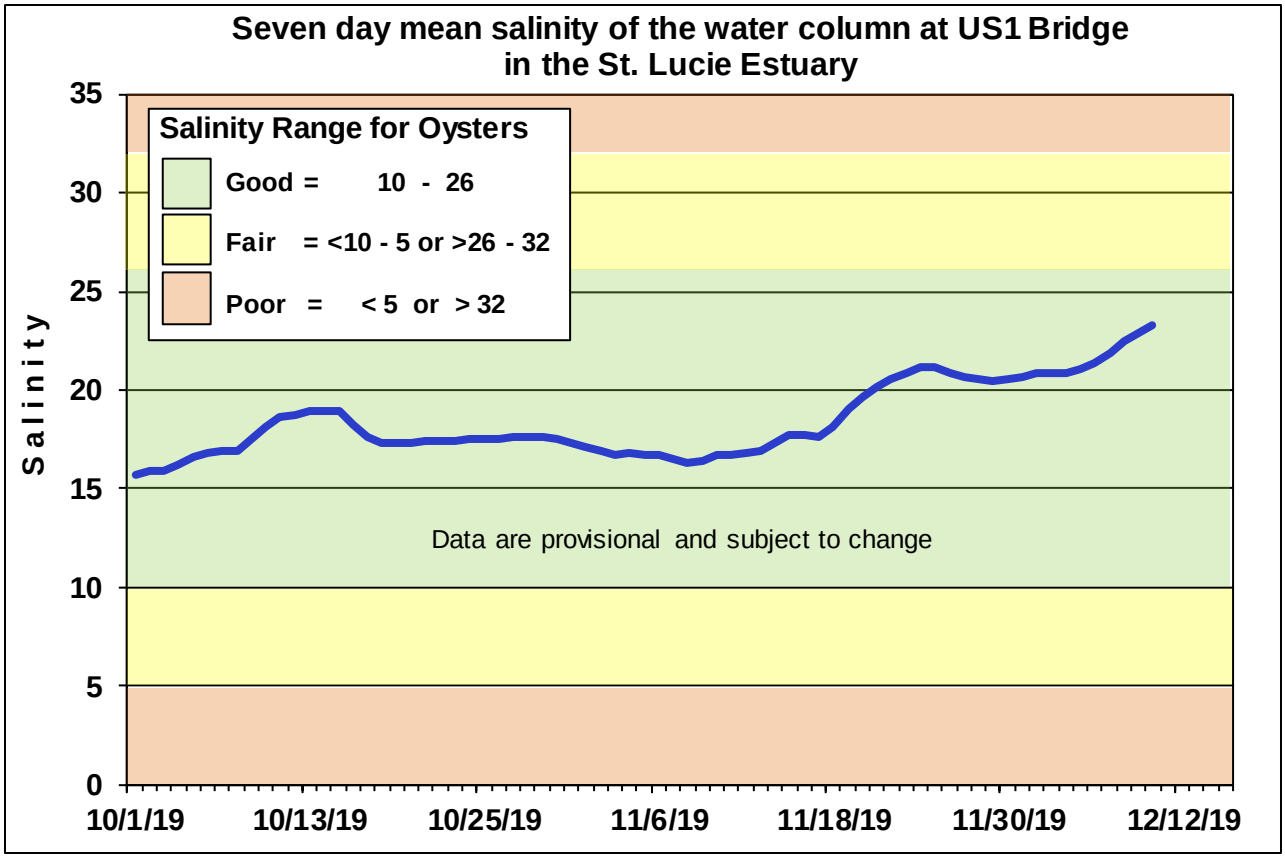


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

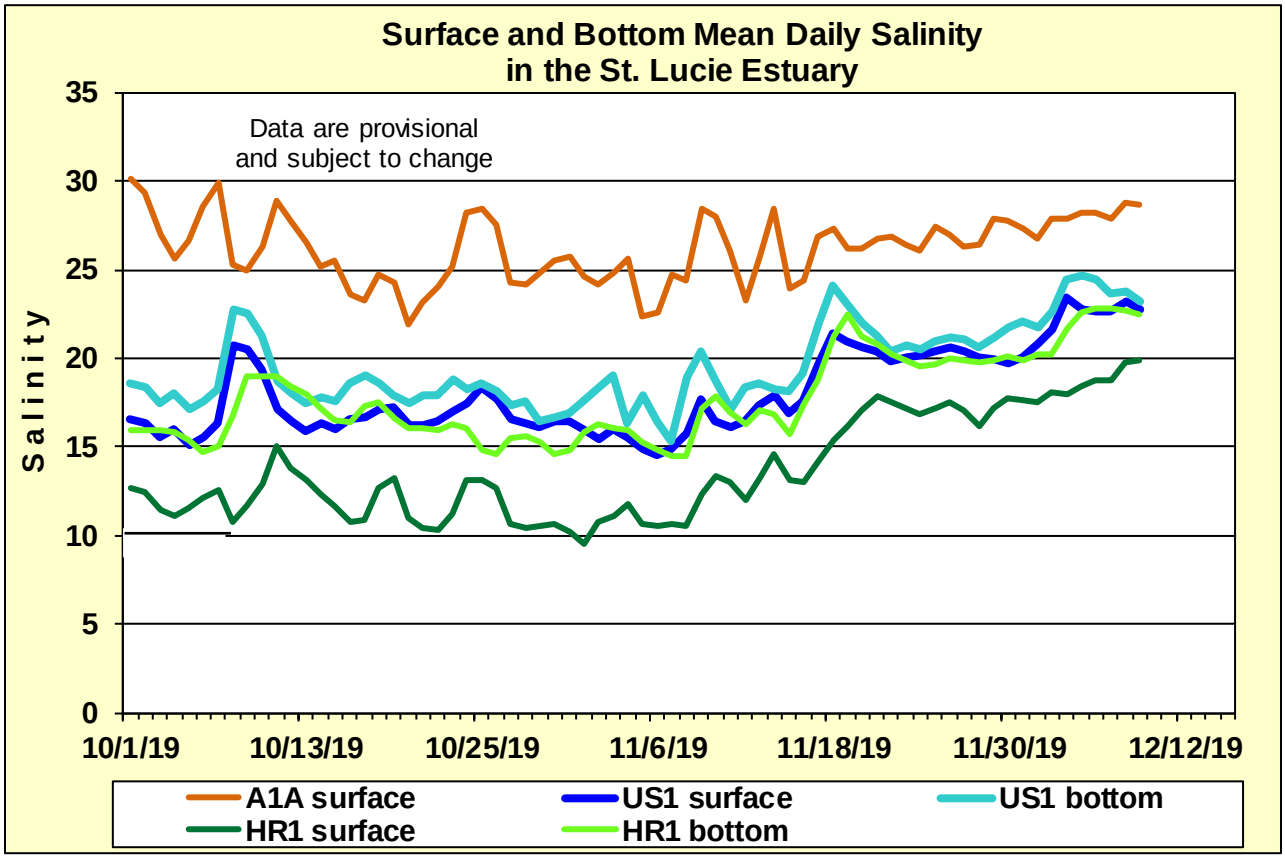


Figure 4. Daily mean salinity at the A1A, US1, and HR1 stations.

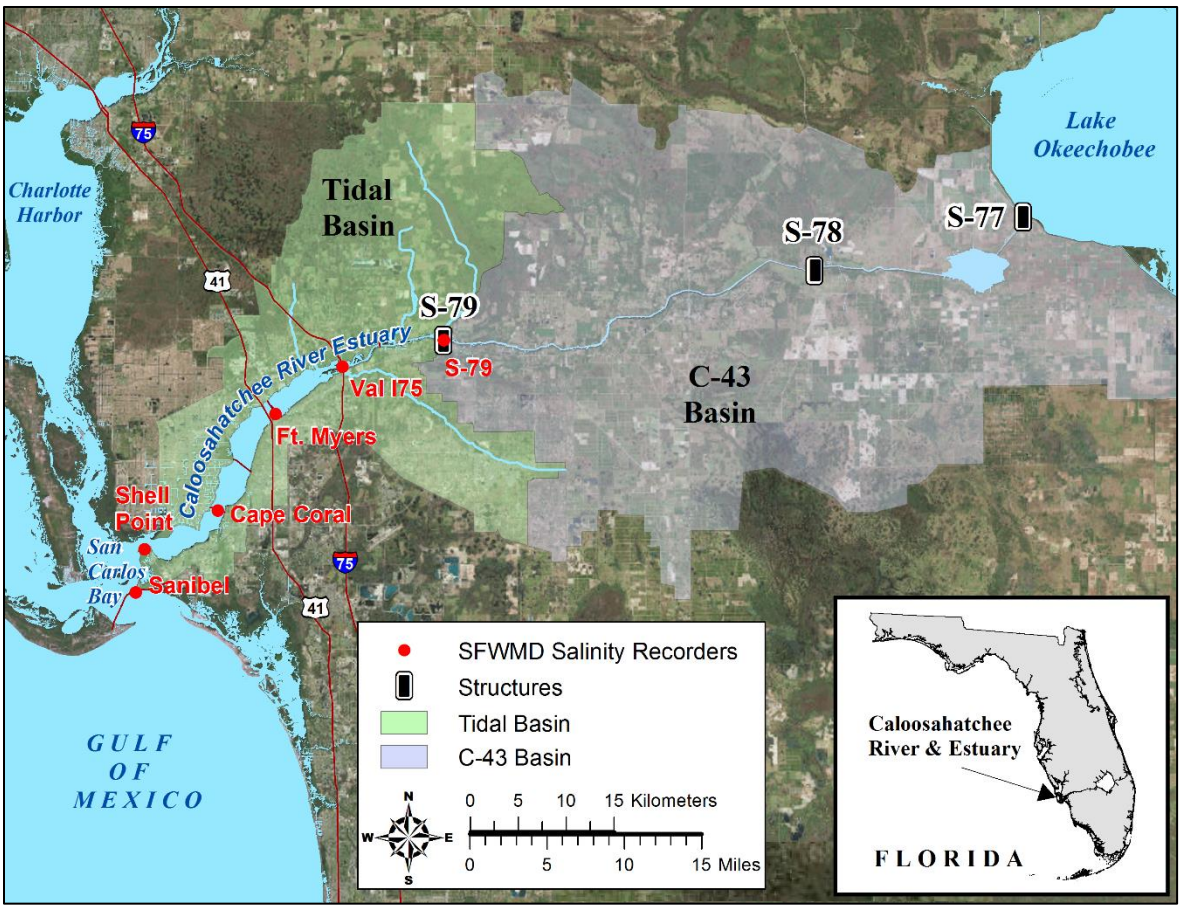


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

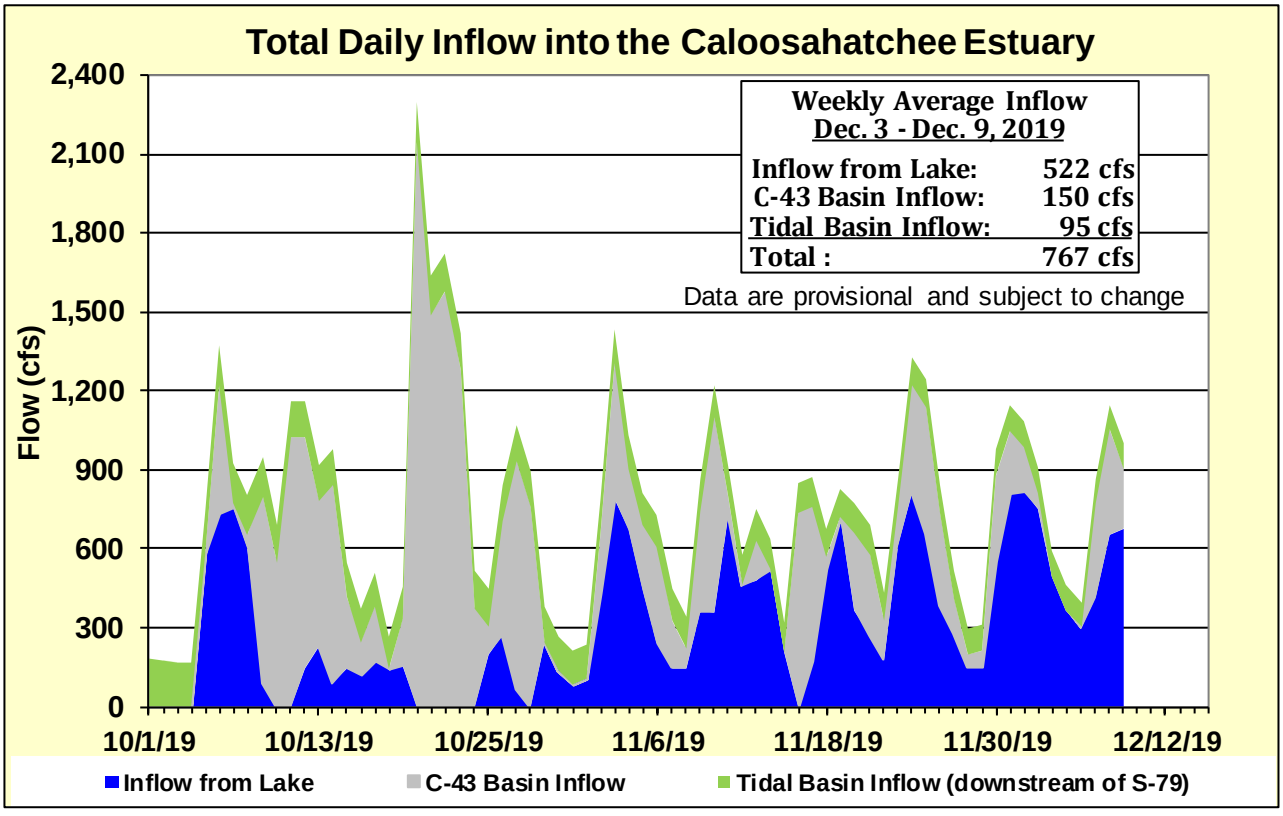


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

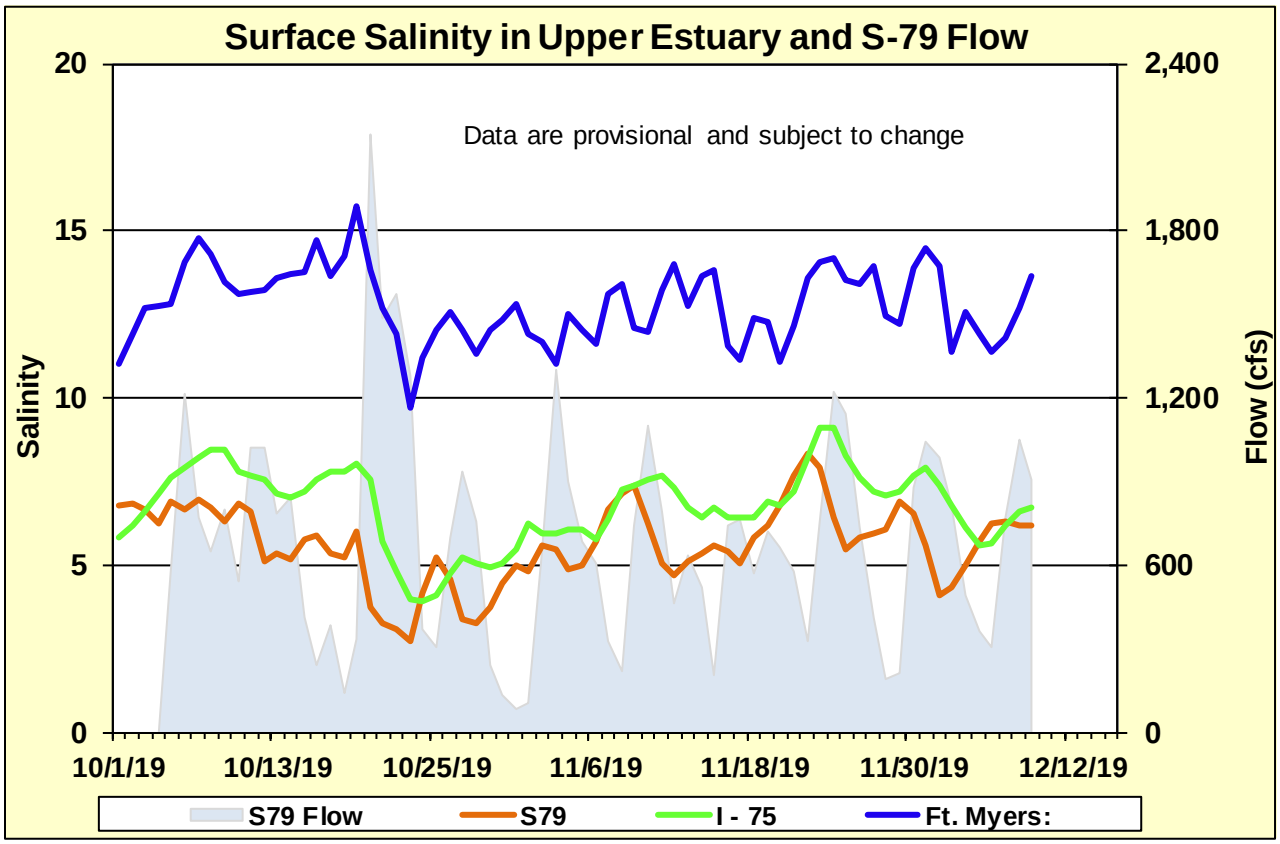


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

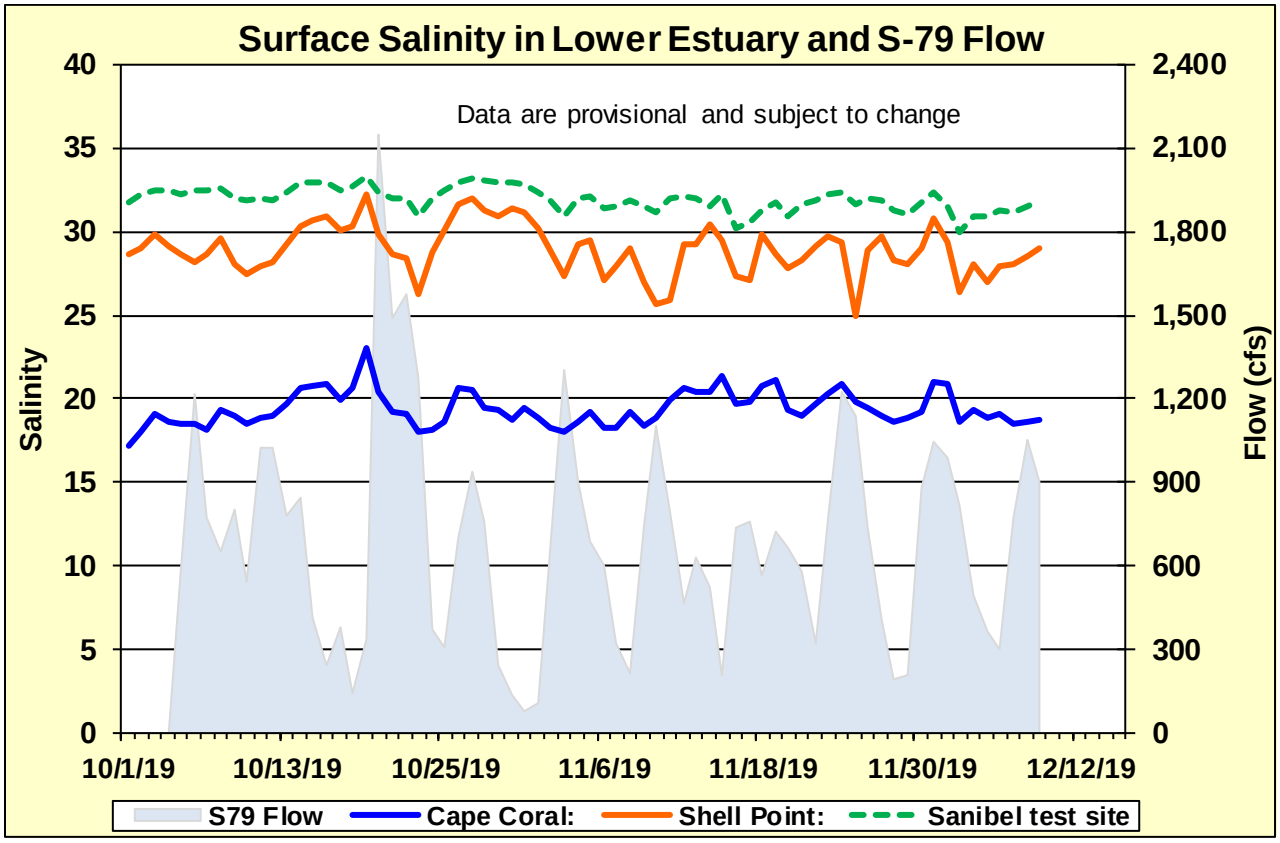


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

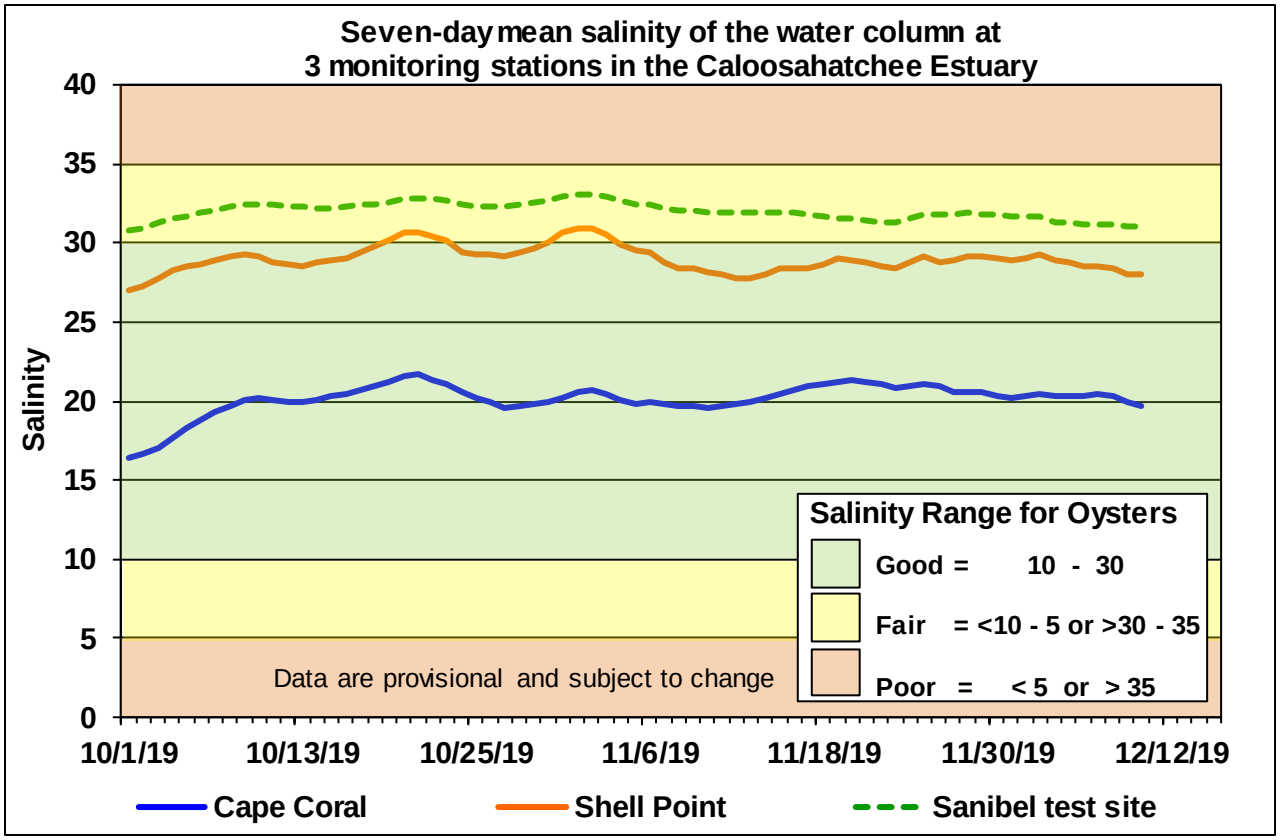


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

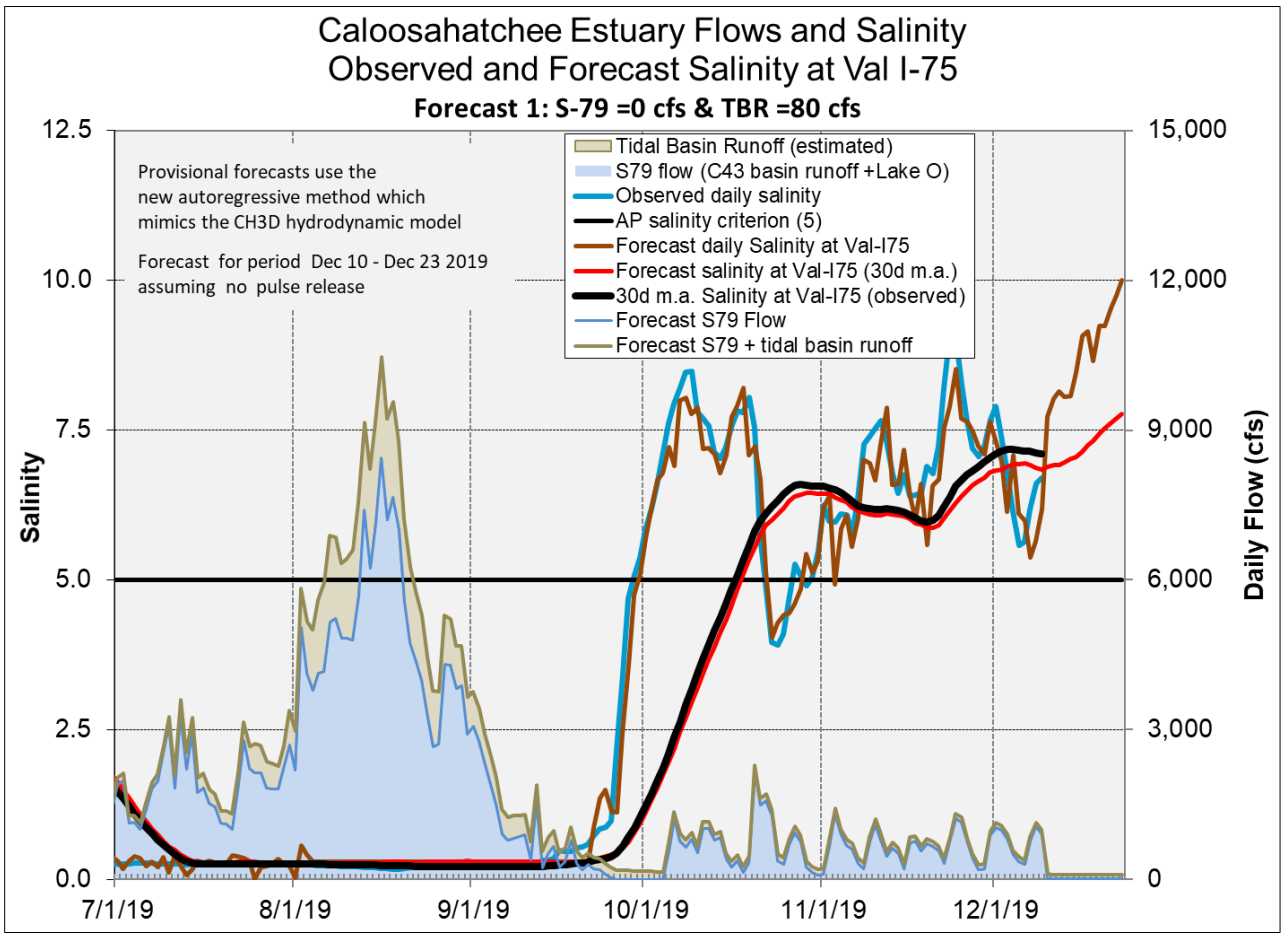


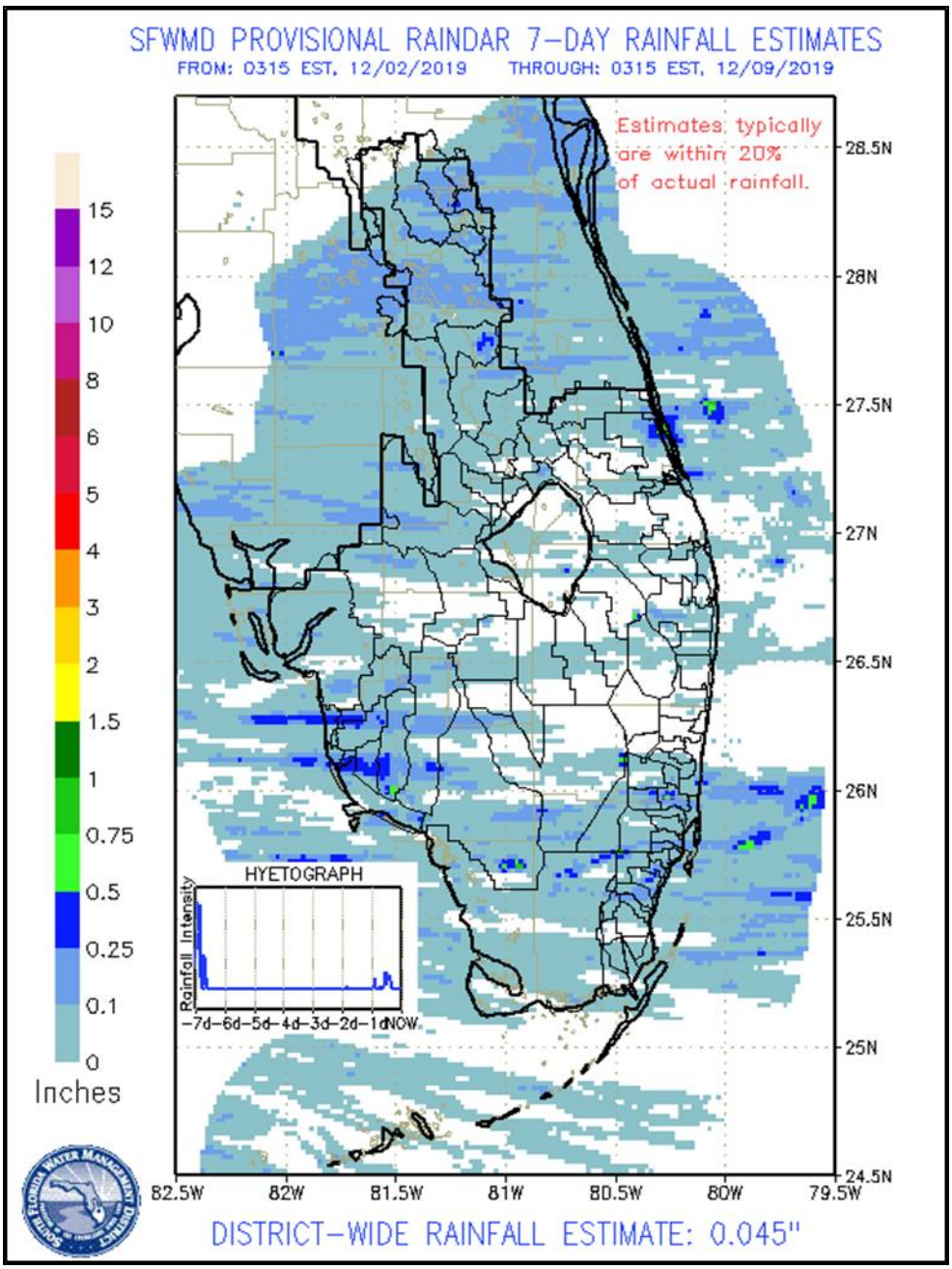
Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

EVERGLADES

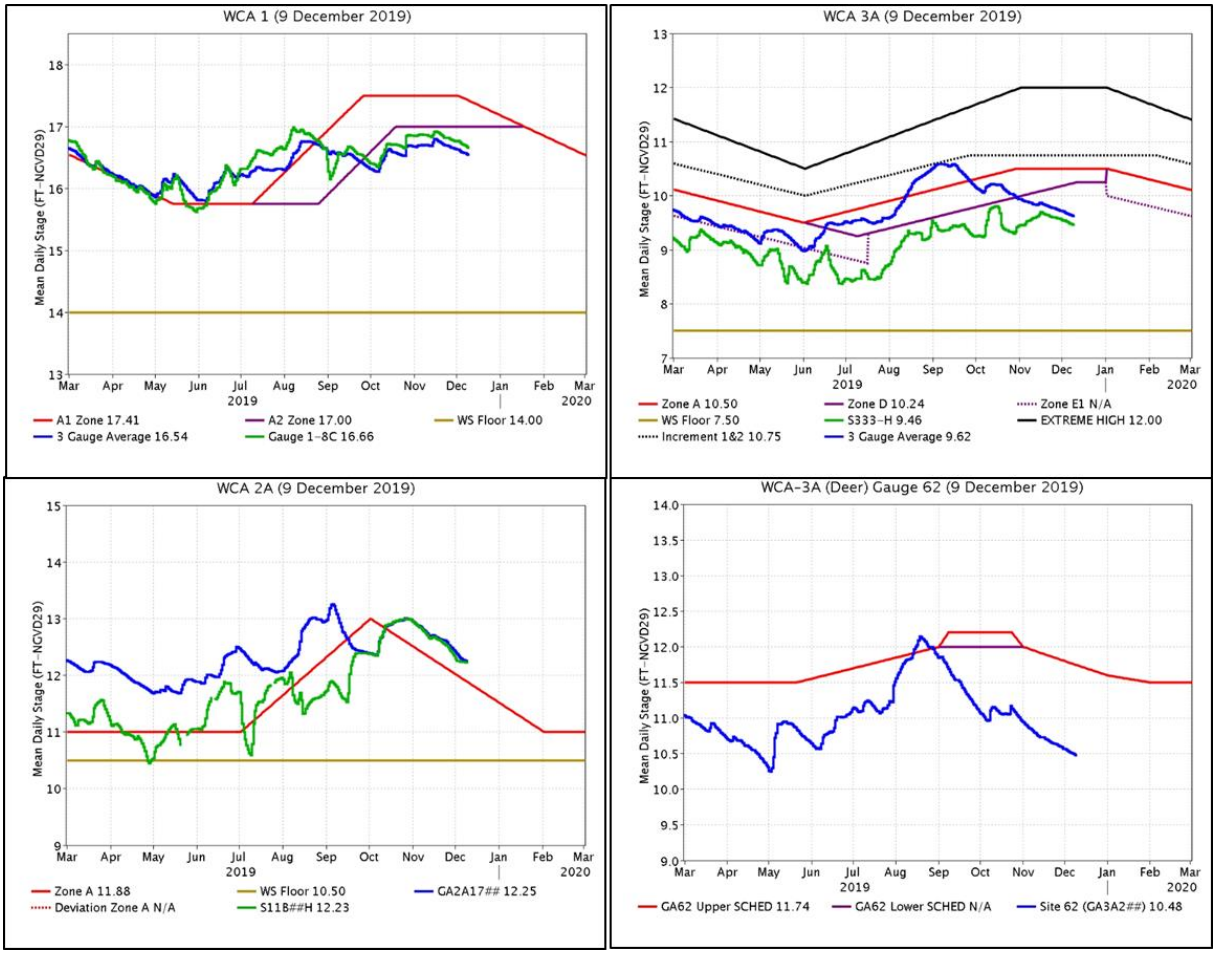
Almost no rainfall occurred within the Everglades for the second week in a row, however most regions receded at an optimal rate for wading bird foraging. Pan evaporation was estimated at 0.95 inches.

Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.01	−0.07
WCA-2A	0.00	−0.14
WCA-2B	<0.01	−0.11
WCA-3A	0.03	−0.08
WCA-3B	0.07	−0.08
ENP	0.04	−0.14

Good
Fair
Poor



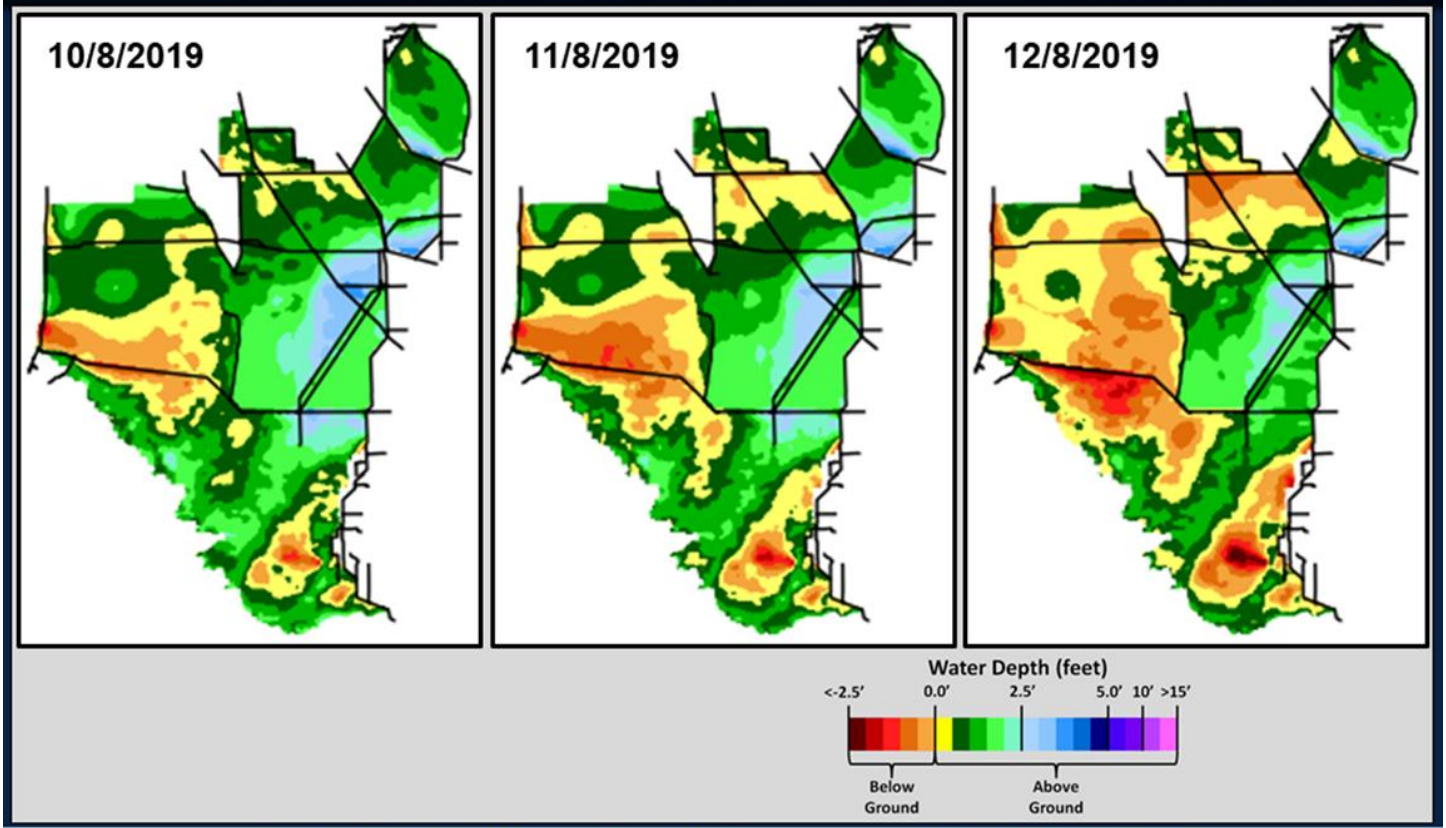
Regulation Schedules: WCA-1: The three-gauge average continues to trend away from the flat Zone A2 regulation line, currently 0.46 feet below and trending slightly downward. WCA-2A: The marsh stage at gauge GA2A17 continues to recede parallel to the falling Zone A regulation line, now 0.37 feet above. WCA-3A: The three-gauge average stage trends downward away from schedule over last week, currently 0.62 feet below the rising Zone D regulation line. WCA-3A: At gauge 62 (northwest corner) continues to trend away from the falling upper schedule at 1.26 feet below.



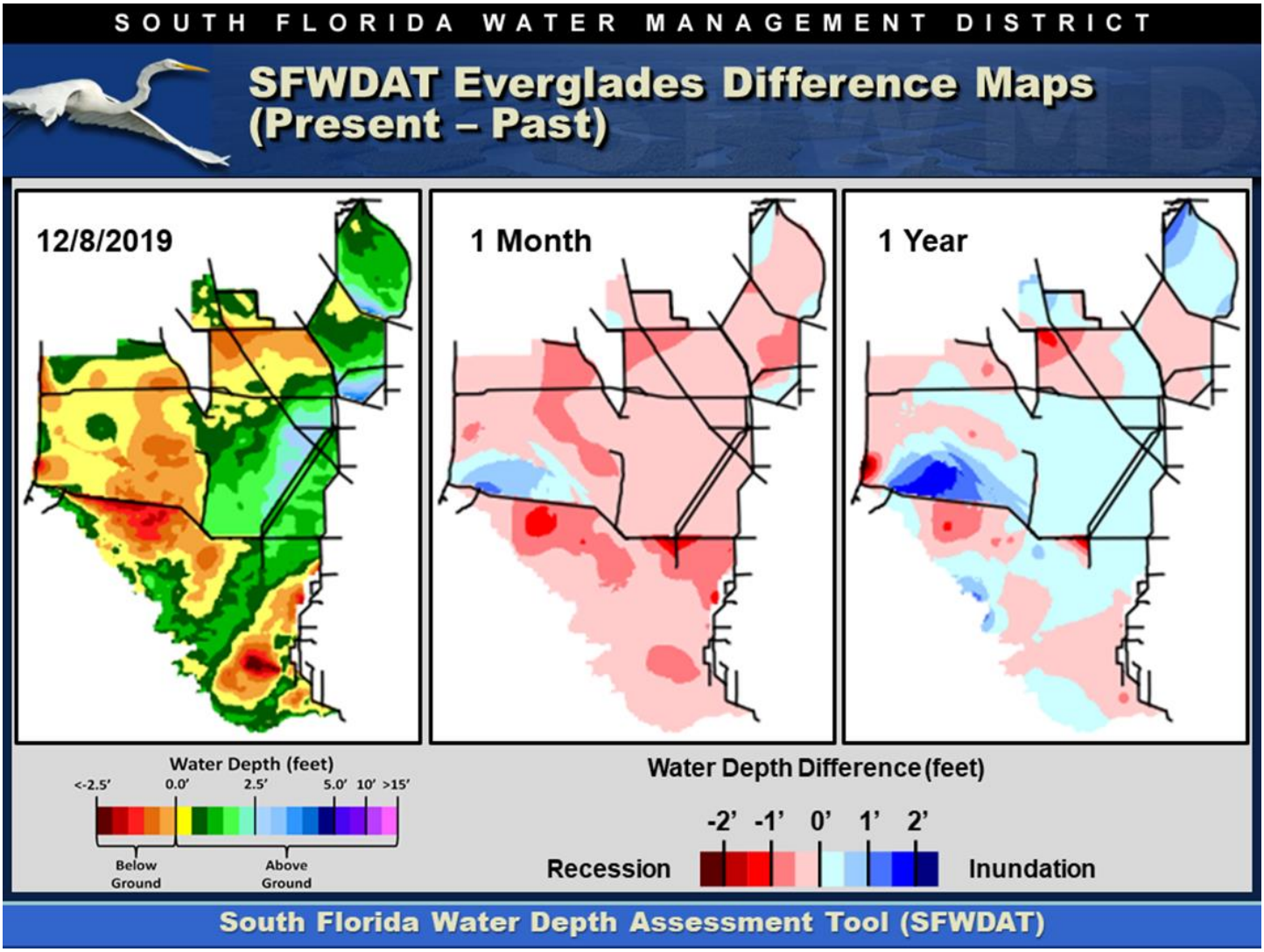
Water Depths: The WDAT tool for spatial interpolation of depth monthly snapshots indicate depths at or below ground across most of WCA-3A North, and new this week in that basin depths have reached more than 0.5' below ground along the Miami canal. Depths exceed 4 feet across parts of WCA-2B. Comparing WDAT water levels from present, water depths over the last month are lower across most of the Everglades and western basins, with the exception being 2B which is significantly wetter. Substantial recessions nearing -1.0 feet occurred in northwest WCA-3A and northern WCA-2A. Looking back one year the stage differences are mixed in WCA-3A with the northwest corner significantly drier and the rest of the basin slightly wetter. WCA-1 is significantly wetter especially in the northern region and WCA-2A is slightly drier. December of 2018 was a relatively dry time with below average stages and rainfall. ** model output in Everglades National Park and western basins is suspect due to datum issues.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

SFWDAT Water Depth Monthly Snapshots

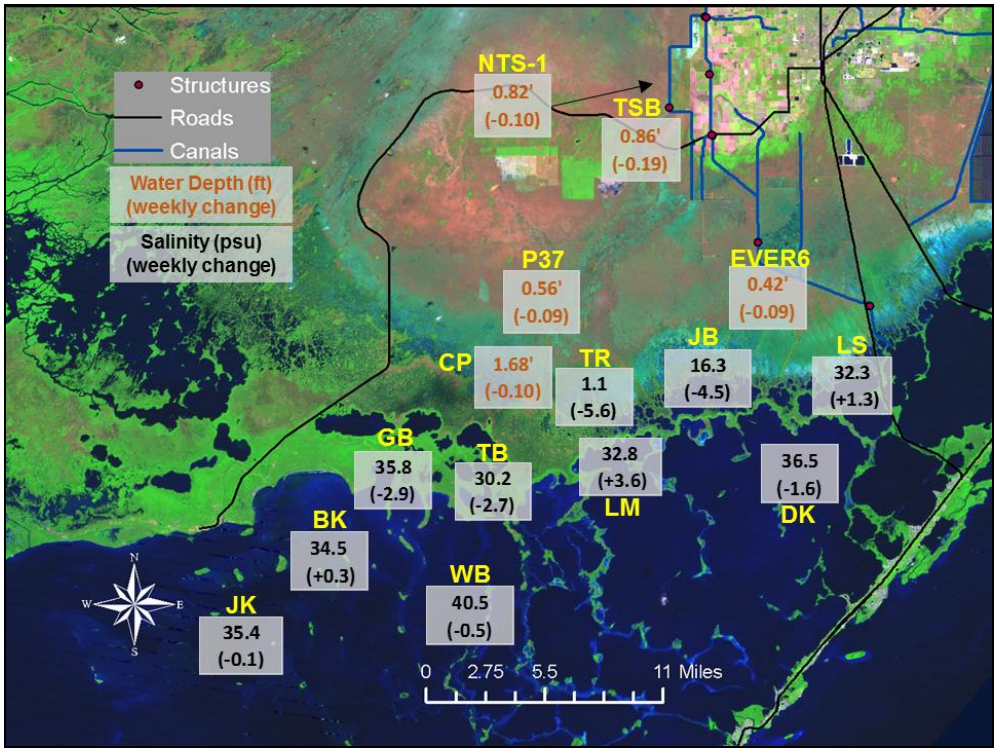


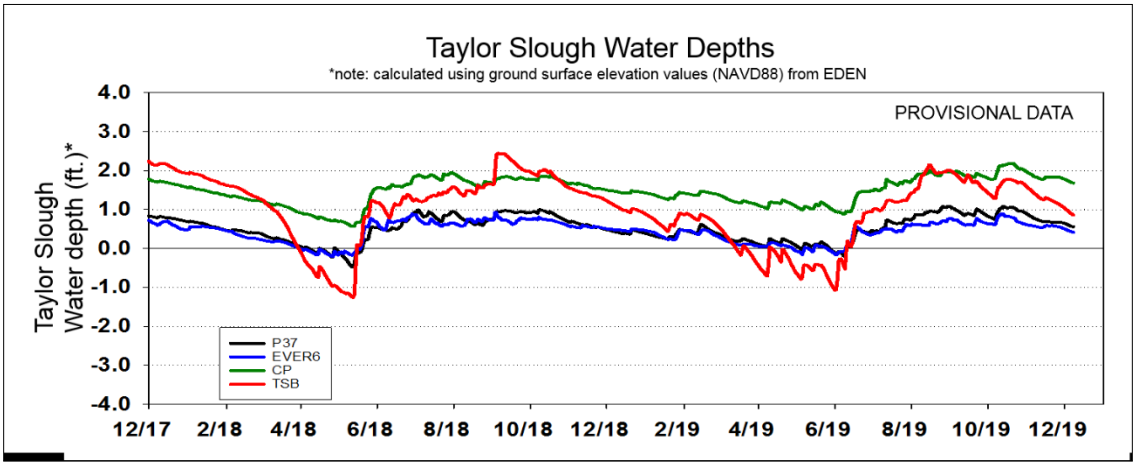
South Florida Water Depth Assessment Tool (SFWDAT)

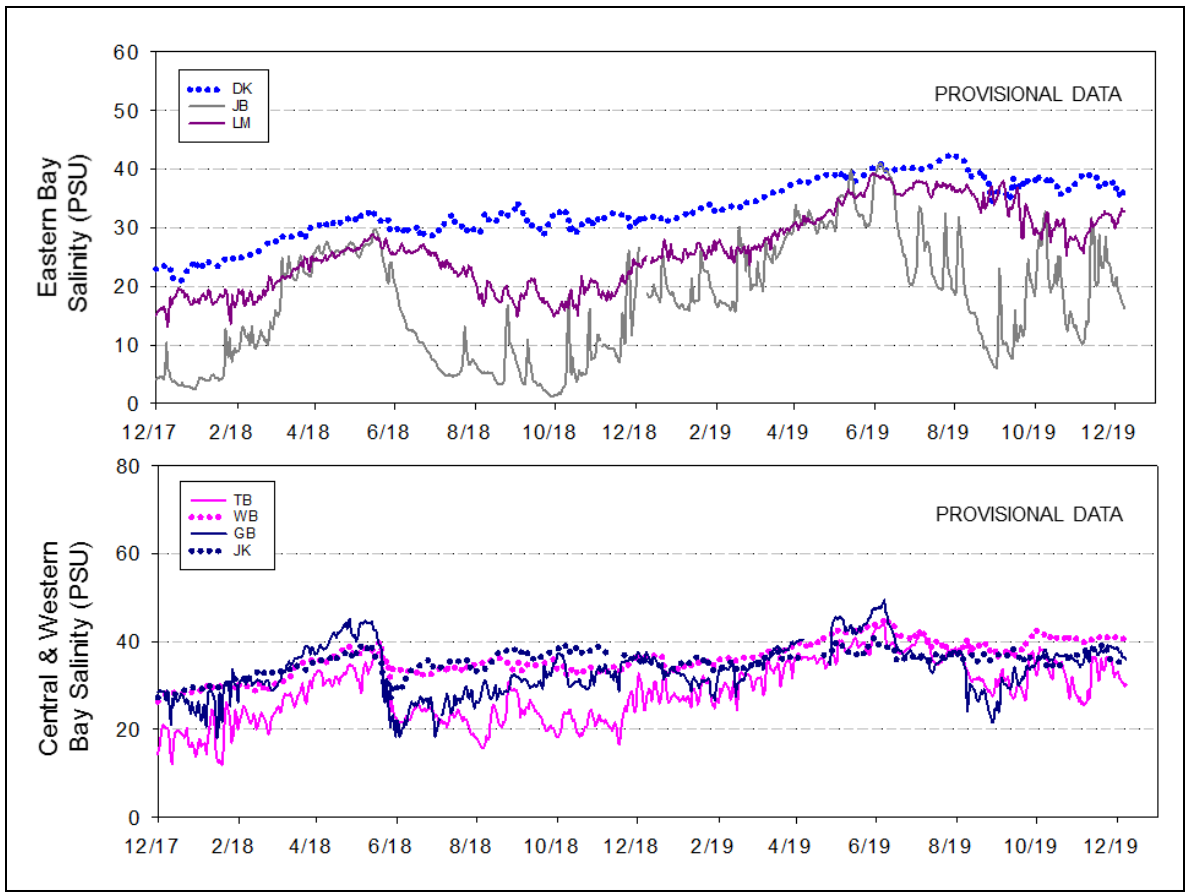


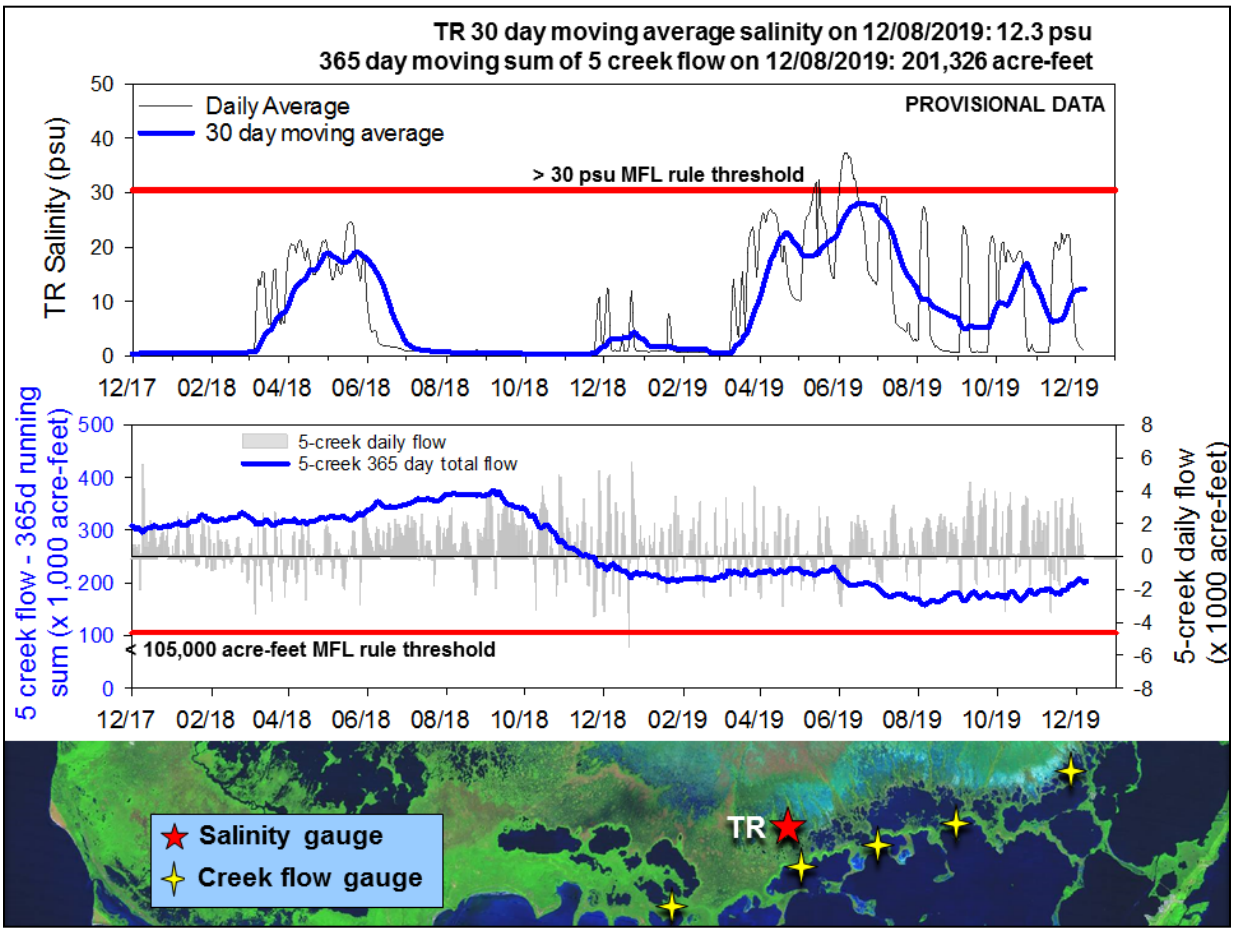
Taylor Slough Water Levels: An average of 0.04 inches of rain fell over Taylor Slough and Florida Bay this last week. Stages in Taylor Slough averaged a decrease of 0.11 feet this past week. Fastest recession was in the northern areas of the slough, averaging a decrease of 0.13 feet/week for the last month. If this continues, the northern area of the slough would dry out a month earlier than the historical average.

Florida Bay Salinities: Average salinity in Florida Bay was 33 psu, 1 psu lower than last week. The average shoreline salinity (33 psu) continues to be 12 psu higher than average. Elsewhere in the bay, conditions are 9 psu above average for this time of year which is displeasing.


Structures
Roads
Canals
Water Depth (ft)
(weekly change)
Salinity (psu)
(weekly change)
NTS-1
0.82'
(-0.10)
TSB
0.86'
(-0.19)
P37
0.56'
(-0.09)
EVER6
0.42'
(-0.09)
CP
1.68'
(-0.10)
TR
1.1
(-5.6)
JB
16.3
(-4.5)
LS
32.3
(+1.3)
GB
35.8
(-2.9)
TB
30.2
(-2.7)
32.8
(+3.6)
LM
36.5
(-1.6)
DK
BK
34.5
(+0.3)
WB
40.5
(-0.5)
JK
35.4
(-0.1)
N
W
E
S
0 2.75 5.5 11 Miles


Taylor Slough Water Depths
*note: calculated using ground surface elevation values (NAVD88) from EDEN
PROVISIONAL DATA
Taylor Slough Water depth (ft.)*
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
12/17
2/18
4/18
6/18
8/18
10/18
12/18
2/19
4/19
6/19
8/19
10/19
12/19
P37
EVER6
CP
TSB


Eastern Bay Salinity (PSU)
DK
JB
LM
PROVISIONAL DATA
60
50
40
30
20
10
0
12/17
2/18
4/18
6/18
8/18
10/18
12/18
2/19
4/19
6/19
8/19
10/19
12/19
Central & Western Bay Salinity (PSU)
TB
WB
GB
JK
PROVISIONAL DATA
80
60
40
20
0


TR 30 day moving average salinity on 12/08/2019: 12.3 psu
365 day moving sum of 5 creek flow on 12/08/2019: 201,326 acre-feet
TR Salinity (psu)
Daily Average
30 day moving average
PROVISIONAL DATA
> 30 psu MFL rule threshold
50
40
30
20
10
0
12/17
02/18
04/18
06/18
08/18
10/18
12/18
02/19
04/19
06/19
08/19
10/19
12/19
5 creek flow - 365d running sum (x 1,000 acre-feet)
5-creek daily flow
5-creek 365 day total flow
< 105,000 acre-feet MFL rule threshold
500
400
300
200
100
0
8
6
4
2
0
-2
-4
-6
-8
5-creek daily flow (x 1000 acre-feet)
Salinity gauge
Creek flow gauge
TR

Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) decreased from 6 psu to 1 psu over the past week. The 30-day moving average ended at 12.3 psu (0.3 psu higher than last week). Weekly flow from the 5 creeks identified by yellow stars on the map totaled about 6,800 with this past week showing consistent positive (but lower volume as is typical for this time of year) flows for most of the week. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) was 201,326 acre-feet, rising above the 25th percentile (190,165 acre-feet). Creek flow are provisional USGS data.

Water Management Recommendations

Current stages in the WCAs are low for this time of year and salinities are high in Florida Bay. Conserving water within the WCAs and moving low nutrient water south has water has many ecological benefits. Maintaining saturated soils in over-drained portions of the Everglades conserves peat and lowers the risk of muck fires. Flows towards Taylor Slough and Florida Bay 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, December 10th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage decreased by 0.07'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2A	Stage decreased by 0.14'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect tree islands, upstream/downstream habitat and wildlife.
WCA-2B	Stage decreased by 0.11'	Conserving water in this basin has benefit as current water depths are below seasonal averages.	Protect within basin habitat and wildlife.
WCA-3A NE	Stage decreased by 0.09'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect stage conditions conducive to wading bird foraging and peat soil conservation.
WCA-3A NW	Stage decreased by 0.08'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	
Central WCA-3A S	Stage decreased by 0.08'	Conserving water in this basin has ecological benefit as current water depths are below seasonal averages.	Protect upstream/downstream habitat and wildlife.
Southern WCA-3A S	Stage decreased by 0.08'		
WCA-3B	Stage decreased by 0.08'	Conserving water in this basin has benefit as current water depths are below seasonal averages.	Protect tree islands, upstream/downstream habitat and wildlife.
ENP-SRS	Stage decreased by 0.14'	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 −0.19'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions.
FB- Salinity	Salinity changes ranged −4.5 to +3.6 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.