

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, Chief, Operations, Engineering and Construction Bureau
Paul Linton, Chief, Operations Section

FROM: SFWMD Staff Environmental Advisory Team

DATE: January 29, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Cool, high pressure across north-central Florida this morning should keep dry conditions in place across the District through this afternoon. The area of high pressure should shift eastward into the western Atlantic as a cold front pushing through the Florida Panhandle reaches the far northwestern portion of the District during the early morning hours on Monday. A lack of moisture ahead of the front should favor only isolated or even very isolated light showers from the west coast of Florida to north and west of Lake Okeechobee through the Kissimmee valley this evening through early Monday. The front should then settle southward and stall over extreme southern Florida and the Florida Keys Wednesday afternoon and evening and linger over the Florida Straits through Thursday. Easterly winds blowing off of the Atlantic behind the front should cause low-level moisture to gradually return, first over the southern half of the District on Wednesday and then over the remainder of the area on Thursday. The increase of moisture near and north of the nearby stationary frontal boundary should cause some shower activity to return along or near the lower and middle east coast on Wednesday and then more so over the southeastern third of the area and especially near or along the east coast on Thursday. A weak mid- to upper-level impulse moving rapidly across the Gulf of Mexico on Friday should help to lift the front over the Florida Straits northward as a warm front across southern Florida on Saturday and then north and east of the area on Sunday once the disturbance exits the Florida peninsula over the western Atlantic. Enhanced moisture, in combination with the front and some weak dynamical support associated with the perturbation aloft, should result in greater rain chances area wide from Friday through Saturday. The model guidance indicates that a median value of around two-tenths of an inch of total District rainfall is likely over these two days, with the focus of the rains on Friday possibly over the northern or northeastern two-thirds of the area north of the boundary and over the eastern half of the area on Saturday. Although some shower activity could persist into Sunday, overall rain chances and rain coverage should greatly diminish compared to Friday-Saturday period. Dry conditions with no measurable total District rainfall are forecast from Monday through at least Wednesday next week. Despite the projected rains on Friday and Saturday this week, total weekly District rainfall is still likely to fall below normal (climatological mean ~0.54"). The deterministic District QPF for the week ending next Tuesday morning is a quarter of an inch or about 45% of normal while the probabilistic model output indicates the likelihood of at least two tenths of an inch of total District rainfall, an even chance of just under four tenths of an inch, and an unlikely scenario of above normal total rainfall around 0.6". There is a moderate level of confidence that slightly below to below normal rainfall would extend through at least the first ten days of the month of February, given the current and forecast configuration of the large-scale weather pattern.

Kissimmee

Tuesday morning stages were 57.5 feet NGVD (0.5 feet below schedule) in East Lake Toho, 54.4 feet NGVD (0.6 feet below schedule) in Toho, and 51.1 feet NGVD (1.4 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.9 feet NGVD at S-65D. Tuesday morning discharges were 1502 cfs at S-65, 1406 cfs at S-65A, and 1001 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 6.2 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 0.22 feet. Recommendations for the week, 1/26/2019- Increase S65A discharge by a total of 350 cfs today. Continue to increase discharge as needed to moderate or stop the rise in Lakes KCH preemptively before forecast rainfall and provide capacity at S65A for S65A basin runoff.

Lake Okeechobee

Lake Okeechobee stage is 12.59 feet NGVD, rising 0.33 feet from the previous week and is now only 0.12 feet lower than 30 days ago. Lake stages are now just on the edge of the Beneficial Use and Baseflow sub-bands, but still nearly 2 feet below the bottom of the ecological envelope, which varies seasonally from 12.5 – 15.5 ft NGVD. Given potential for heavy rainfall associated with El Niño conditions this winter and the poor condition of SAV and EAV in the nearshore zone, these lower lake stages are ideal for vegetation recovery, but will reduce habitat for fish and wildlife in the near-term and encourage spread of invasive vegetation in the upper marsh.

ESTUARIES

Total inflow to the St. Lucie Estuary averaged 1,189 cfs over the past week with 0 cfs coming from Lake Okeechobee. Over the past week, salinity decreased in the upper part of the estuary and remained more or less the same in the lower part. The seven-day average salinity at the US1 Bridge is within the fair range for adult eastern oysters. Total inflow to the Caloosahatchee Estuary average 2,150 cfs over the past week with 168 cfs coming from the lake. Over the past week, surface salinity decreased throughout the estuary. The 30-day moving average surface salinity is 2.7 at Val 1-75 and 7.7 at Ft. Myers. Salinity conditions between Val 1-75 and Ft. Myers are good for tape grass. Salinity conditions are in the good range for adult eastern oysters at Cape Coral and Shell Point.

Stormwater Treatment Areas

Over the past week, the STAs received approximately 800 acre-feet of Lake releases. The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 1,260,000 acre-feet, which includes approximately 341,000 acre-feet of Lake releases. Most STA cells are at or above target depths except the emergent aquatic vegetation cells in STA-5/6 which are below target. STA-1W Northern Flow-way is offline for STA-1W Expansion project construction activities, STA-1E Western Flow-way is offline for initiation of levee repairs in West Distribution Cell, and STA-5/6 Flow-ways 2 and 3 are offline for Restoration Strategies project to grade non-effective treatment areas. This week, if Lake releases are sent to the WCAs and conditions allow, releases will be sent to STA-1E, STA-2 and STA-3/4.

Everglades

All the WCAs received similar amounts of rainfall and the stages across the Everglades rose in a consistent fashion, with the exception being northwestern WCA-3A where stages at the site 62 gauge rose 0.74 feet last week. Stages remain below regulation in the WCAs except WCA-2A being the exception as it remains above schedule and canal stages there have rebounded to nearly equalize with the marsh stage. Taylor Slough and Florida Bay received less rain than in the north this past week. Stages increased this week throughout Taylor Slough and are above average for this time of year with the greatest divergence in northern TS. The rainfall also lowered salinity in Florida Bay, and conditions there are average to 7 psu above average for this time of the year.

Supporting Information

KESSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 2.8 inches of rainfall in the past week and the Lower Basin received 3.2 inches (SFWMD Daily Rainfall Report 1/28/2018).

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: 1/29/2019

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)						
							1/27/19	1/20/19	1/13/19	1/6/19	12/30/18	12/23/18	12/16/18
Lakes Hart and Mary Jane	S-62	116	LKMJ	60.9	R	61.0	-0.1	0.0	0.0	0.0	0.0	-0.3	-0.9
Lakes Myrtle, Preston, and Joel	S-57	24	S-57	61.2	R	61.4	-0.2	0.0	0.1	0.0	-0.1	-0.3	-0.5
Alligator Chain	S-60	0	ALLI	63.3	R	64.0	-0.7	-0.8	-0.7	-0.7	-0.7	-0.7	-0.9
Lake Gentry	S-63	38	LKGT	61.4	R	61.5	-0.1	0.0	0.0	0.0	0.0	0.0	0.1
East Lake Toho	S-59	332	TOHOE	57.5	R	58.0	-0.5	-0.5	-0.4	0.0	0.0	-0.1	-0.8
Lake Toho	S-61	910	TOHOW, S-61	54.3	R	55.0	-0.7	-0.5	-0.4	-0.5	-0.5	-0.1	-0.2
Lakes Kissimmee, Cypress, and Hatchineha	S-65	950	KUB011, LKIS5B	51.0	R	52.5	-1.5	-1.7	-1.8	-1.8	-2.0	-2.6	-3.1

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 T = temporary schedule, R = USACE flood control schedule, S = temporary snail kite schedule, A = projected ascension line, N/A = not applicable or data not available.
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: 1/29/2019

Metric	Location	1-Day Average		Average for the Preceding 7-Days ¹								11/25/18
		1/27/2019	1/27/19	1/20/19	1/13/19	1/6/19	12/30/18	12/23/18	12/16/18	12/9/18	12/2/18	
Discharge (cfs)	S-65	1,638	950	392	343	273	277	253	301	330	337	346
Discharge (cfs)	S-65A ²	1,360	764	306	261	194	201	182	180	252	232	254
Discharge (cfs)	S-65D ²	1,044	621	341	261	241	242	238	253	298	276	315
Headwater Stage (feet NGVD)	S-65D ²	26.02	26.00	25.94	25.91	25.86	25.88	25.73	25.80	25.84	25.82	26.20
Discharge (cfs)	S-65E ²	1,279	606	309	261	215	218	266	242	292	302	335
Discharge (cfs)	S-67	0	0	0	0	0	0	0	0	0	0	0
DO (mg/L) ³	Phase I river channel	5.5	6.2	6.3	5.9	5.6	6.1	6.2	5.4	5.1	5.9	5.5
Mean depth (feet) ⁴	Phase I floodplain	0.22	0.12	0.07	0.08	0.09	0.11	0.12	0.10	0.10	0.12	0.10

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 PC62 and PC33.

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)

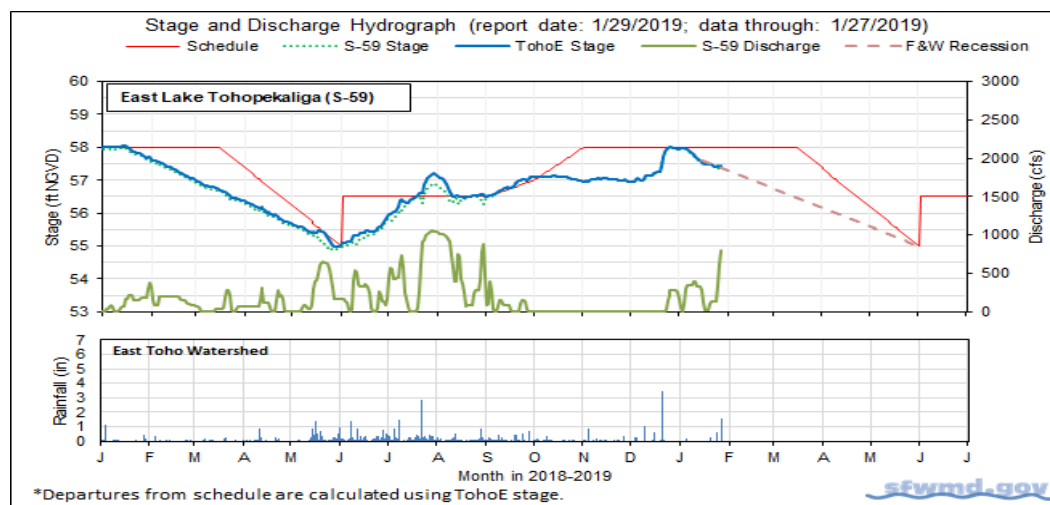


Figure 1.

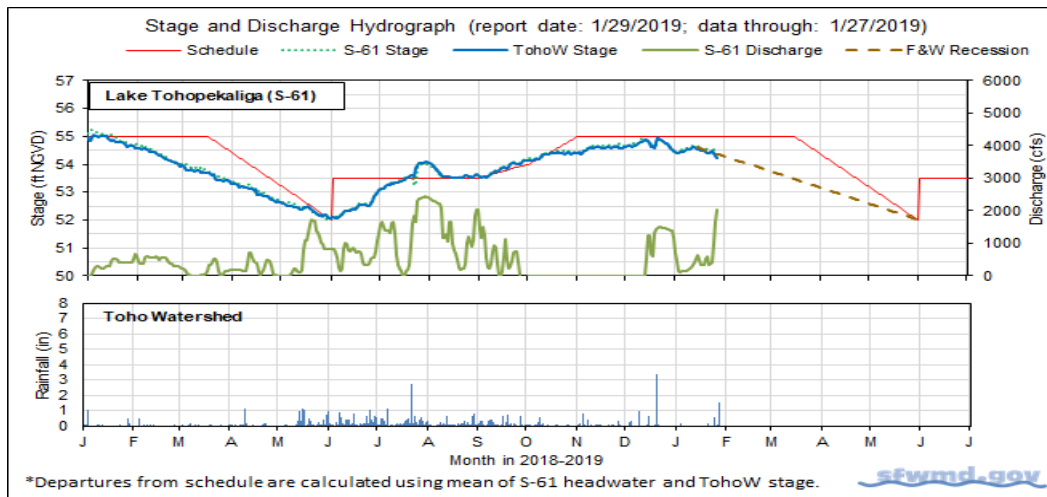


Figure 2.

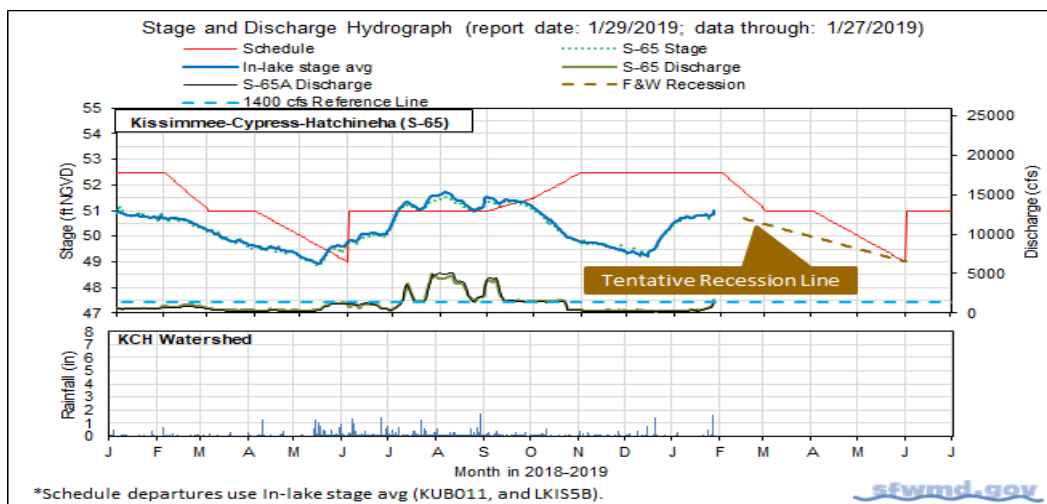


Figure 3.

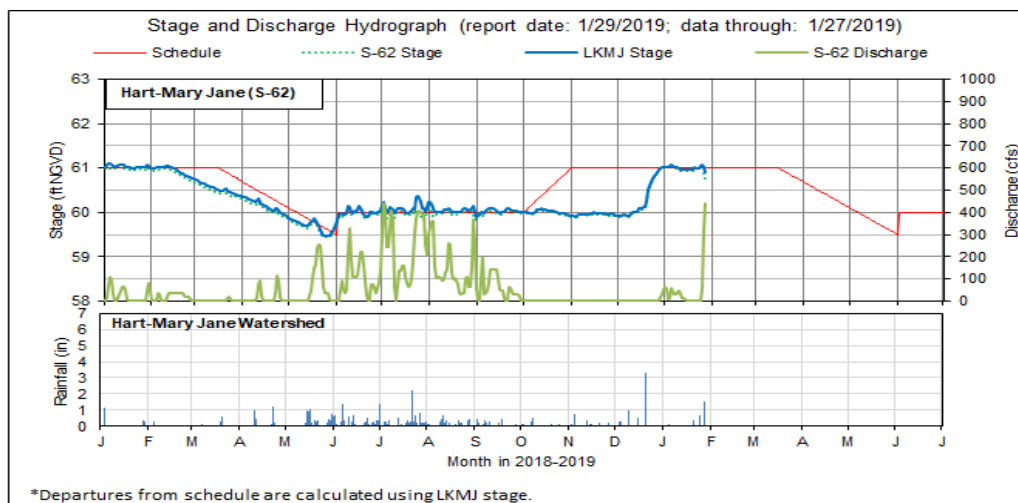


Figure 4.

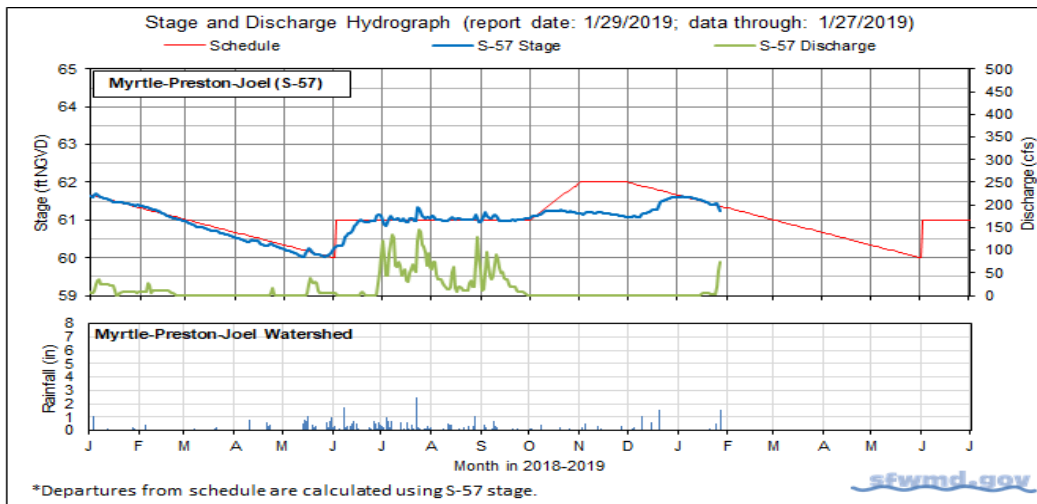


Figure 5.

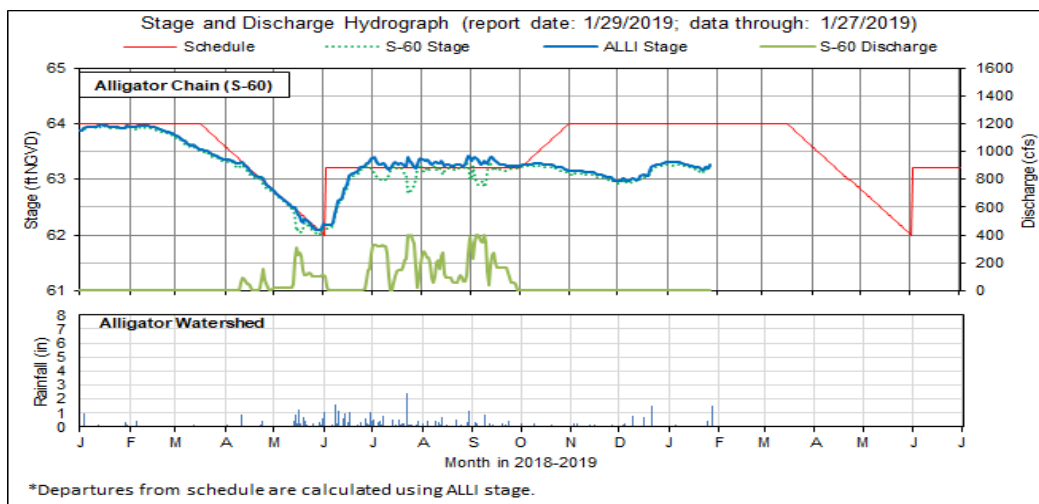


Figure 6.

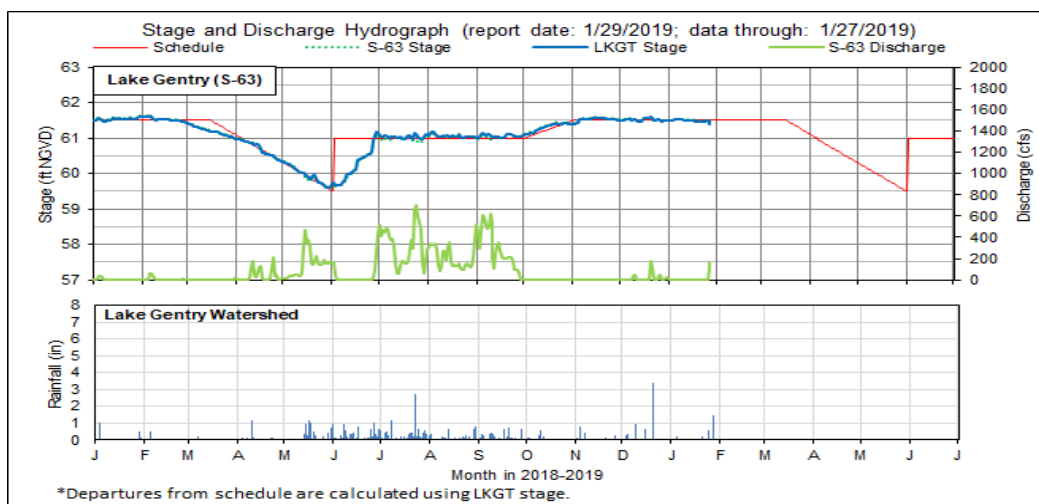


Figure 7.

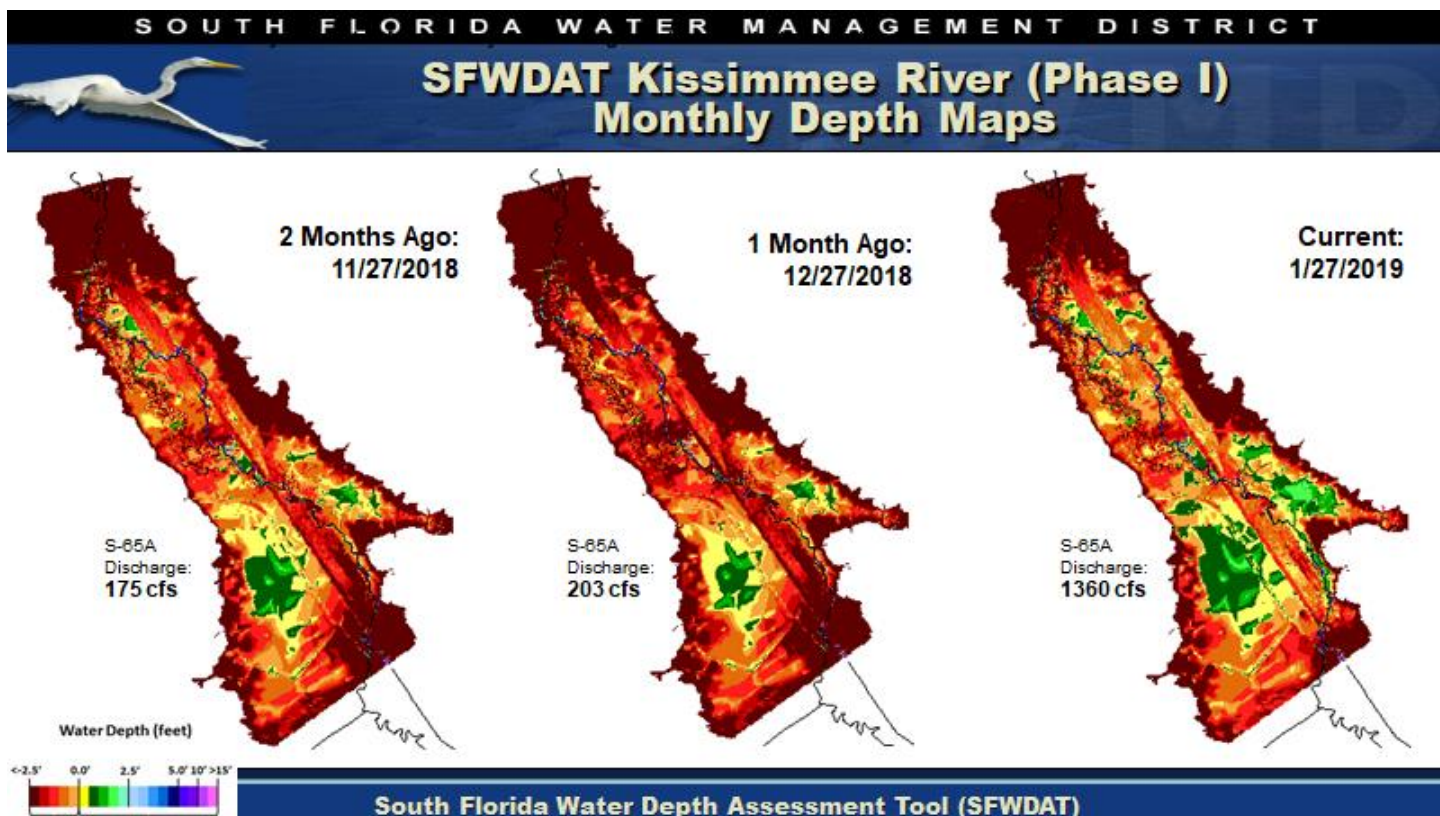


Figure 8. Phase I area floodplain water depths for this week, one month ago, and two months ago. Note that the WDAT color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

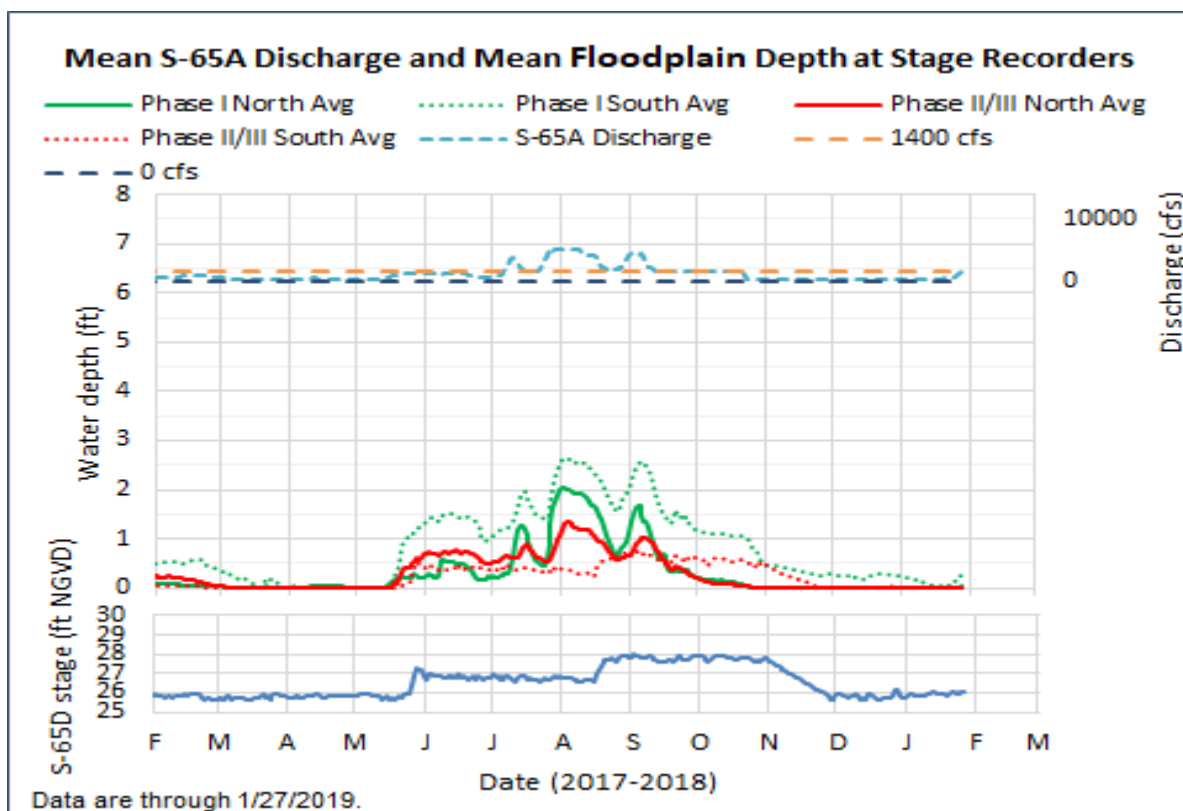
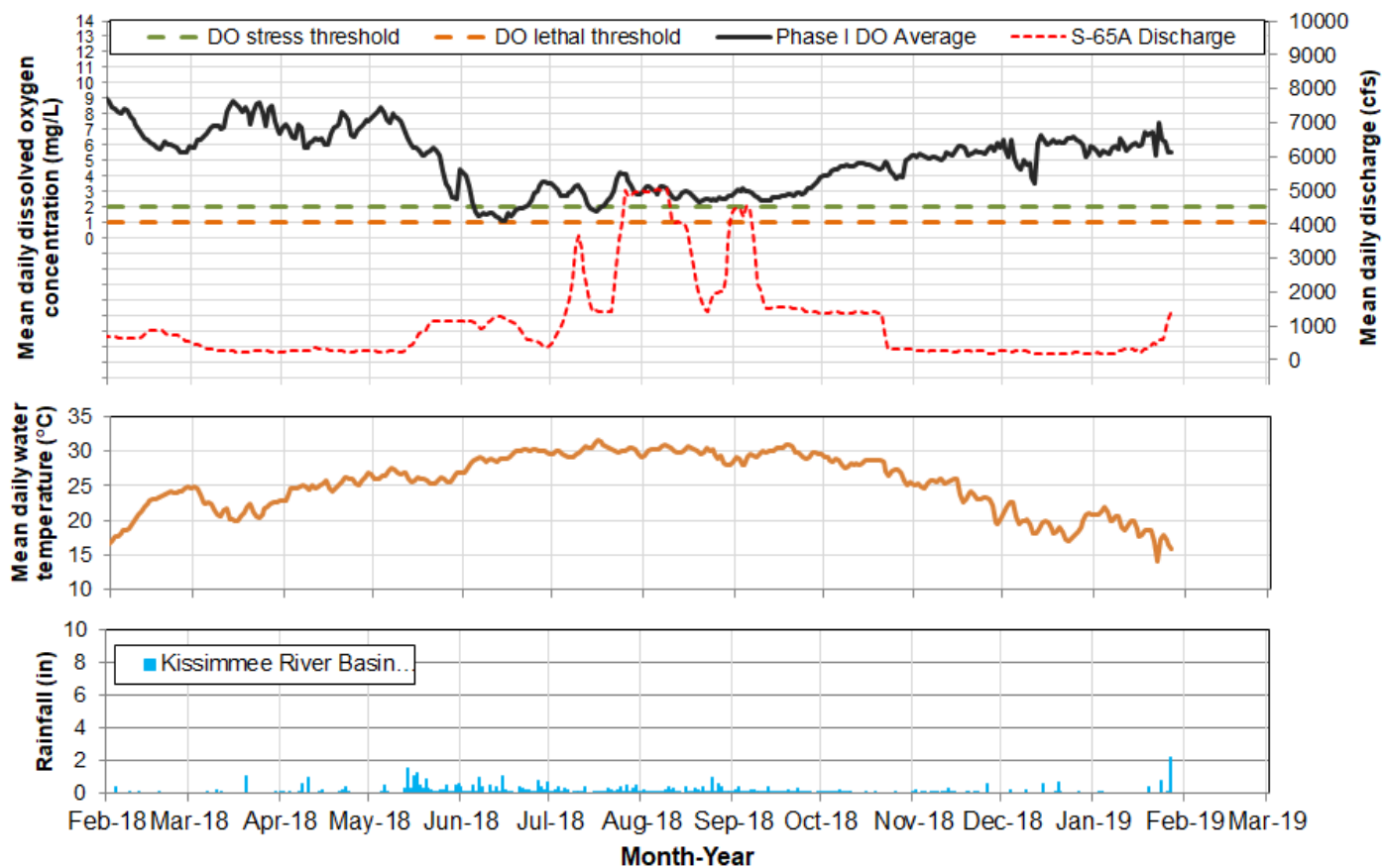


Figure 9. Mean water depth at stage recorders in the northern Phase I, southern Phase I, northern Phase II/III, and southern Phase II/III areas in relation to the S-65A discharge and S-65D headwater stage.



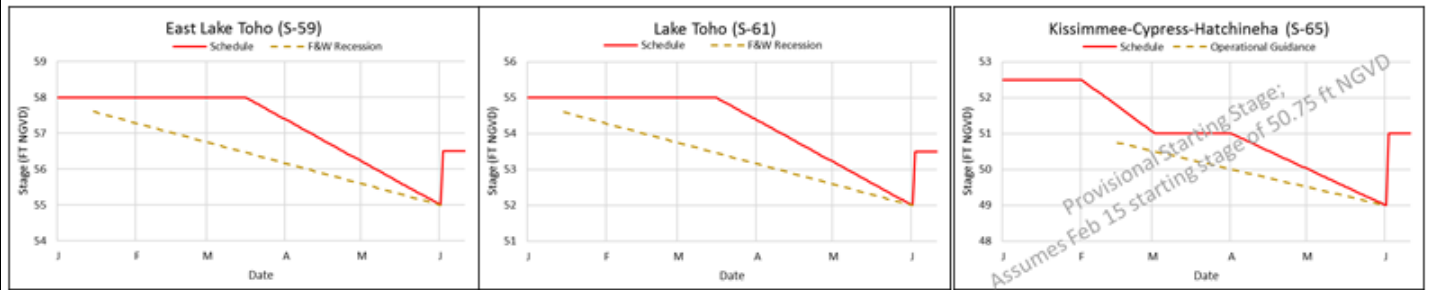
Report Date: 1/29/2019; data are through: 1/27/2019.

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

Water Management Recommendations

Recommendation Date	Recommendation	Purpose	Outcome	Source	Report Date
1/26/2019	Increase S65A discharge by a total of 350 cfs today, which will put S65A at 1,400 cfs. Continue to increase discharge as needed.	Moderate or stop the rise in Lake KCH preemptively before forecast rainfall and provide capacity at S65A for S65A basin runoff.	Implemented	SFWMD Water Mgt/KB Ops	1/29/2019
1/22/2019	No new recommendations.		N/A		1/22/2019
	Begin recessions on Lake Toho and East Lake Toho on Jan 15, with a continuous recession to the regulation dry season low (52.0 ft on Toho; 55.0 ft on East Lake) on May 31. The lines are represented graphically in the Dry Season Operations slides.				
1/15/2019	Tentatively plan on a recession in Kissimmee-Cypress-Hatchineha starting on February 15 with a continuous recession to the dry season low (49 ft) on May 31. A provisional diagram is included in the Dry Season Operations slides; however, starting stage may change depending on conditions.	Slow recession rates in East Toho, Toho, and KCH to benefit fish and wildlife; as possible limit flow volume at S-65D to facilitate KRR construction.	N/A	KB Ops	1/15/2019
	Discharge and reversal guidelines are provided in the Dry Season Operations slides.				
1/4/2019	Discontinue 54 foot stage reduction target in Lake Toho.	Lake Kissimmee has already risen by ~1.5 ft.	Implemented	SFWMD Water Mgt/KB Ops	1/8/2019
12/14/2018	Manage S-61 discharge to reduce stage in Lake Toho to 54 ft over the next 7-9 days.	Move water to KCH to reduce the rate of stage decline in KCH; reduce the head difference between S-61 headwater and tailwater.	N/A	SFWMD Water Mgt/KB Ops	12/18/2018
12/10/2018	Reduce S-65A discharge to 180 cfs.	Reduce rate of stage decline in lakes Kissimmee-Cypress-Hatchineha	N/A	SFWMD Water Mgt/KB Ops	12/11/2018
12/3/2018	No new recommendations.		N/A		12/4/2018
11/26/2018	No new recommendations.		N/A		11/27/2018
11/19/2018	No new recommendations.		N/A		11/20/2018
11/12/2018	No new recommendations.		N/A		11/13/2018
11/2/2018	Reduce S-65/S-65A discharge to approximately 250 cfs.	To conserve stage in Lake Kissimmee.	Implemented	SFWMD Water Mgt/KB Ops	11/6/2018
10/30/2018	No new recommendations.		N/A		10/30/2018
10/22/2018	Reduce S-65/S-65A discharge to approximately 300 cfs (minimum discharge) in one step of approximately 1100 cfs today.	Reduce rate of stage decline in lakes Kissimmee-Cypress-Hatchineha	Implemented	SFWMD Water Mgt/KB Ops	10/23/2018
10/16/2018	No new recommendations.		N/A		10/16/2018
10/9/2018	No new recommendations.		N/A		10/9/2018
10/2/2018	No new recommendations.		N/A		10/2/2018
9/25/2018	No new recommendations.		N/A		9/25/2018
9/18/2018	No new recommendations.		N/A		9/18/2018
9/11/2018	No new recommendations.		N/A		9/11/2018
9/4/2018	No new recommendations.		N/A		9/4/2018
8/28/2018	No new recommendations.		N/A		8/28/2018
8/21/2018	No new recommendations.		N/A		8/21/2018
8/14/2018	No new recommendations.		N/A		8/14/2018
8/7/2018	No new recommendations.		N/A		8/7/2018
7/23/2018-7/24/2018	Increase discharge from 1400 cfs to 3000 cfs, then 3200 cfs and 3500 cfs.	For flood control in Lake Kissimmee.	Implemented	SFWMD Water Mgt/KB Ops	7/31/2018
7/19/2018	Follow Revised (X2) 2018 Wet Season Discharge Plan to the extent possible, including 50 foot stage threshold and 0.5 foot flood control buffer.	To the extent possible, maintain sufficient discharge to keep areas under snail kites nests in Pool D hydrated until nests fledge, while avoiding large increases in discharge that might flood the nests.	N/A	KB Ops	7/24/2018

Dry Season Operations Slide 1 - 2018-2019 (NOTE revised discharge table)



Other Considerations

- KCH starting stage may vary; the maximum is 50.75 ft NGVD on Feb 15.
- Maintain S65/S65A discharge of at least 300 cfs.
- If outlook is for extreme dry conditions meet with KB staff to discuss modifications to this plan.

Version 1: January 14 2019

Discharge Rate of Change Limits for S65/S65A (revised 1/14/19).

Q (cfs)	Maximum rate of INCREASE (cfs/day)	Maximum rate of DECREASE (cfs/day)
0-300	100	-50
301-650	150	-75
651-1400	300	-150
1401-3000	600	-300
>3000	1000	-1000

Figure 11A. Slide 1 of the 2018-2019 Dry Season Operations Plan for S-59, S-61, and S-65/S-65A.

Dry Season Operations Slide 2 - 2018-2019

East Lake (ELT) and Toho (WLT)

- **East Toho and Toho Recessions:**
 - Make releases to begin recessions on Jan 15 with lake stage approximately 0.4 ft below winter pool and continue to follow straight line recessions through May 31st to the extent practical
- **East Toho and Toho Stage Reversals :**
 - Adjust discharge to bring stage back to the recession line within about a week
 - Pre-storm releases may be used to lower stage below the recession line and create storage of about half of the forecast rain volume
 - If stage cannot be brought back to the recession line within about a week, the recession line may need to be reset following discussion with partner agencies
 - In general, the water released from ELT and WLT basins will be released to KHC (to the extent that hydraulic capacity is available) without consideration for Lake KHC stage. However, the priority of KCH is subject to change if more nesting occurs in KCH than Toho or East

Kissimmee-Cypress-Hatchineha (KCH)

- **KCH Recession:**
 - Begin recession on February 15 (subject to change) starting no higher than 50.75 feet
 - To the extent feasible considering discharge constraints, make releases to follow a straight-line recession through May 31
 - In general, use the available storage in Lake KCH to keep flow at S-65D below 1,000 cfs; when possible keep flow below 600 cfs
- **KCH Stage Reversals :**
 - To address reversals, in general increase flow by 100 cfs for every 0.1 foot of rise above the recession line (e.g. from 300 cfs at the line to 800 cfs at 0.5 feet above the line)

Figure 11B. Slide 2 of the 2018-2019 Dry Season Operations Plan for S-59, S-61, and S-65/S-65A.

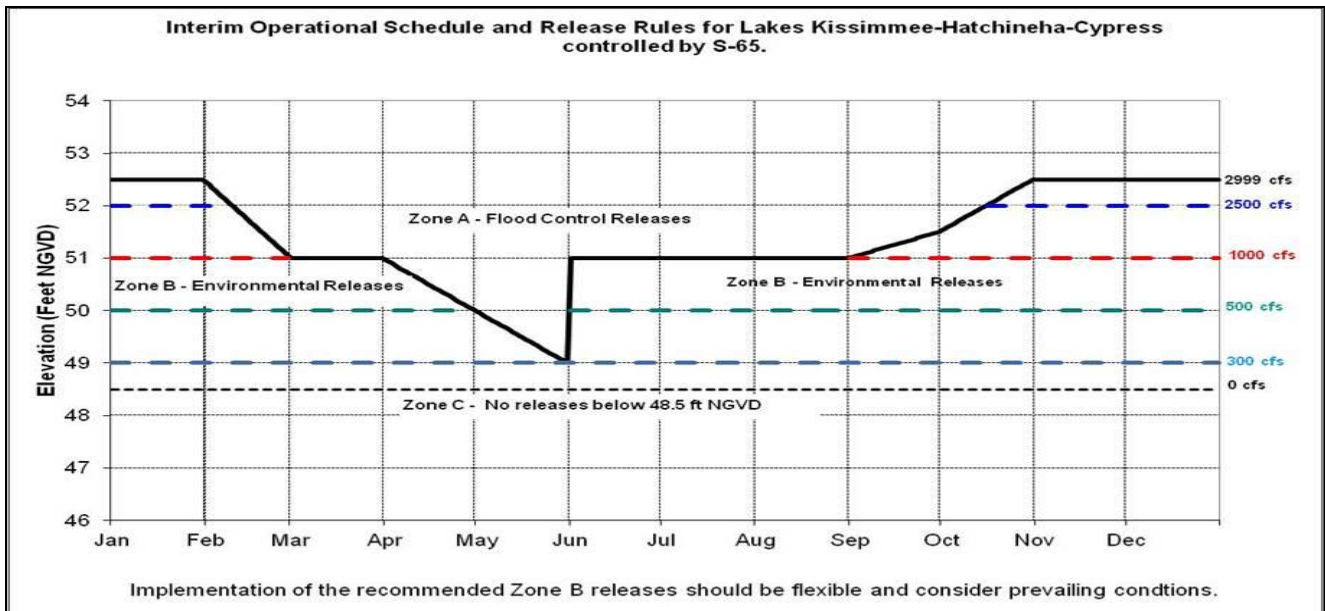


Figure 12. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.

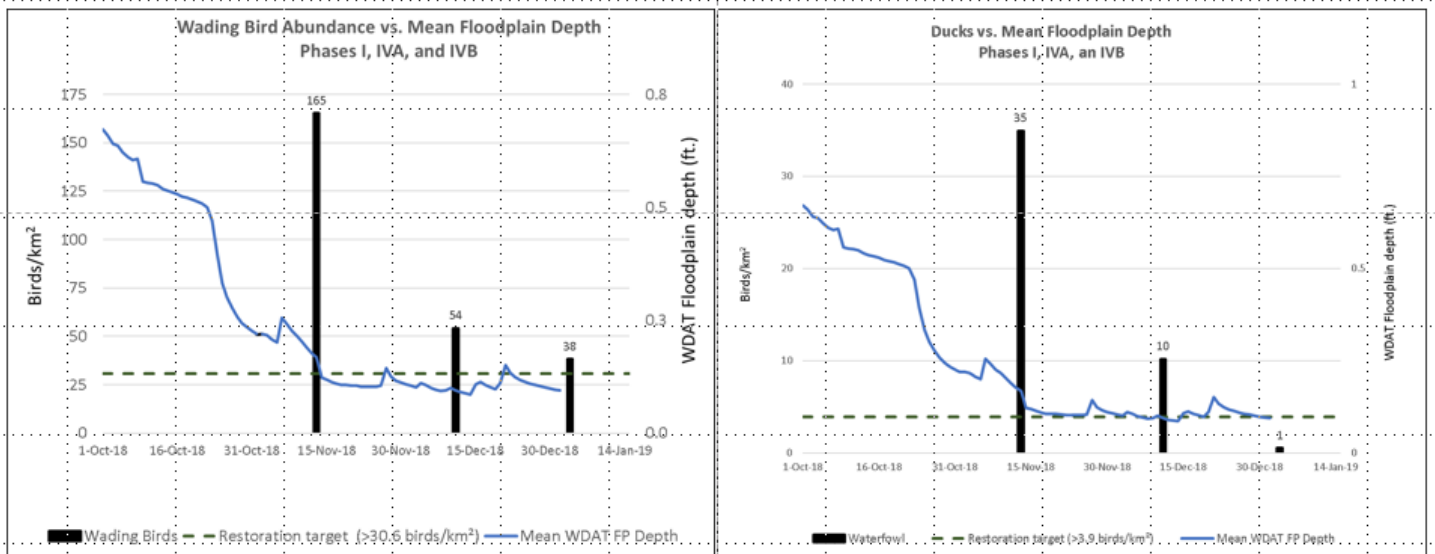


Figure 13. Kissimmee River Wading Bird and Waterfowl Surveys from November 2018 to January 2019.

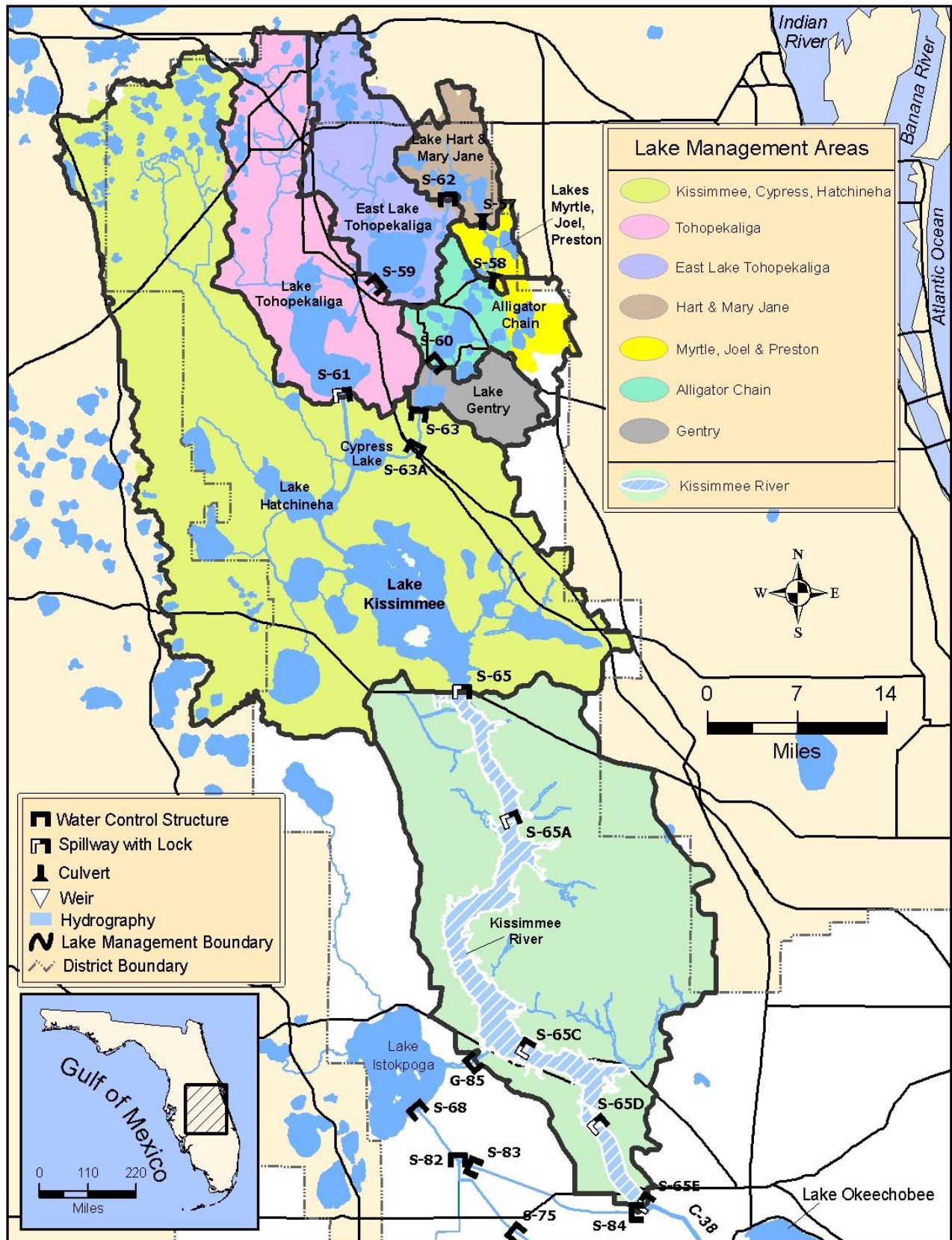


Figure 14. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee stage is at 12.59 feet NGVD for the period ending at midnight on January 28, 2019. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and three perimeter stations (S-308, S-4 and S-133). The Lake is now 0.12 feet lower than it was a month ago and 2.69 feet lower than a year ago when runoff from Hurricane Irma caused extreme high lake stages (Figure 1). The Lake is in the Beneficial Use sub-band but will be in the Baseflow sub-band within a day or less (Figure 2). The January 28 lake stage was the lowest for this time of year since 2011, having just exceeded that year's stages with this week's rain (Figure 3). According to RAINDAR, 3.69 inches of rain fell directly over the Lake during the week January 22, 2019 – January 28, 2019 (Figure 4). Most of the watershed received similar rainfall as well, and some of the southern watershed received between 4 – 5 inches.

Average daily inflows (minus rainfall) to the Lake rose slightly from the previous week with the majority occurring over the last few days, going from 320 cfs to 886 cfs, 703 cfs of which came from the Kissimmee River.

Total outflows (minus evapotranspiration) decreased substantially from the previous week as large amounts of rainfall fell in surrounding watersheds, going from 2,092 average daily cfs to just 200 cfs this past week (Table 1). Outflows west via S-77 fell from 790 cfs to just 215 cfs in the past week, and there were negative flows (flowing back into the lake) through the S308 and L8 (Culvert 10A) which averaged -79 daily cfs and -88 daily cfs, respectively, for the week. Outflows south through the S-350 structures also decreased substantially, from 1,199 average daily cfs the previous week to just 64 cfs this past week. The corrected average daily evapotranspiration value for the week based on the L006 weather platform solar radiation was 0.04 inches this week.

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 5 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 wading bird survey (January 22, 2019) reported just over 15,100 foraging wading birds on the lake, the most ever recorded in a single survey since they began in 2010. Most of the flocks were in Moonshine Bay and in canals and airboat trails (Figure 6) as many higher elevations are dry and unsuitable for foraging (Figure 7, red areas). However, the substantial rainfall and subsequent rise in lake stage may disperse prey enough to dramatically reduce wading bird use on the lake over the next few weeks. Without further rises in lake stage though, it is likely water levels will be too shallow to support much wading bird breeding effort on the lake this nesting season.

Water Management Recommendations

Lake Okeechobee stage is 12.59 feet NGVD, rising 0.33 feet from the previous week and is now only 0.12 feet lower than 30 days ago. Lake stages are now just on the edge of the Beneficial Use and Baseflow sub-bands, but still nearly 2 feet below the bottom of the ecological envelope, which varies seasonally from 12.5 – 15.5 ft NGVD. Given potential for heavy rainfall associated with El Niño conditions this winter and the poor condition of SAV and EAV in the nearshore zone, these lower lake stages are ideal for vegetation recovery. Recovery of vegetation in the nearshore zone from Hurricane Irma impacts and 2016 El Niño-associated rainfall will require lake stages in the lower portion of the ecological envelope or lower for extended periods, so efforts to prepare for such an event will help speed the rebound of this important community. However, low stages also encourage expansion of invasive vegetation in the upper marsh and temporarily reduce the quantity and quality of habitat for fish and wildlife.

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 Inflow cfs	Equivalent Depth Week Total (in)
S65E & S65EX1	303	703	0.3
S71 & 72	0	159	0.1
S84 & 84X	0	59	0.0
Fisheating Creek	17	23	0.0
S154	0	0	0.0
S191	0	0	0.0
S133 P	0	0	0.0
S127 P	0	0	0.0
S129 P	0	22	0.0
S131 P	0	9	0.0
S135 P	0	0	0.0
S2 P	0	0	0.0
S3 P	0	0	0.0
S4 P	0	0	0.0
L8 Backflow		-88	0.0
Rainfall	0.0	671	0.3
Total	320	1557	0.7

OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S77	790	215	0.1
S308	17	-79	0.0
S351	507	0	0.0
S352	444	64	0.0
S354	248	0	0.0
L8 Outflow	78		
ET	734	718	0.3
Total	2817	918	0.4

PROVISIONAL DATA

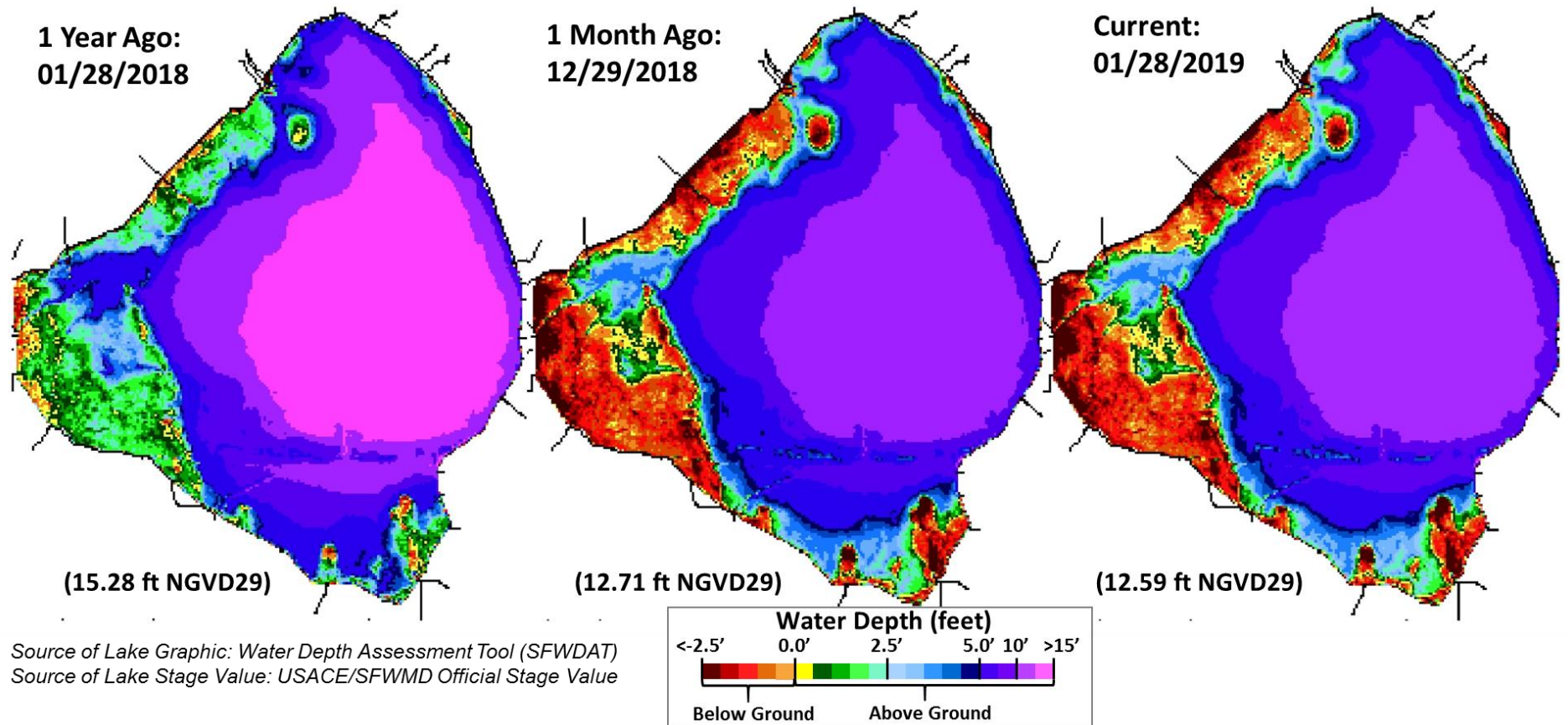
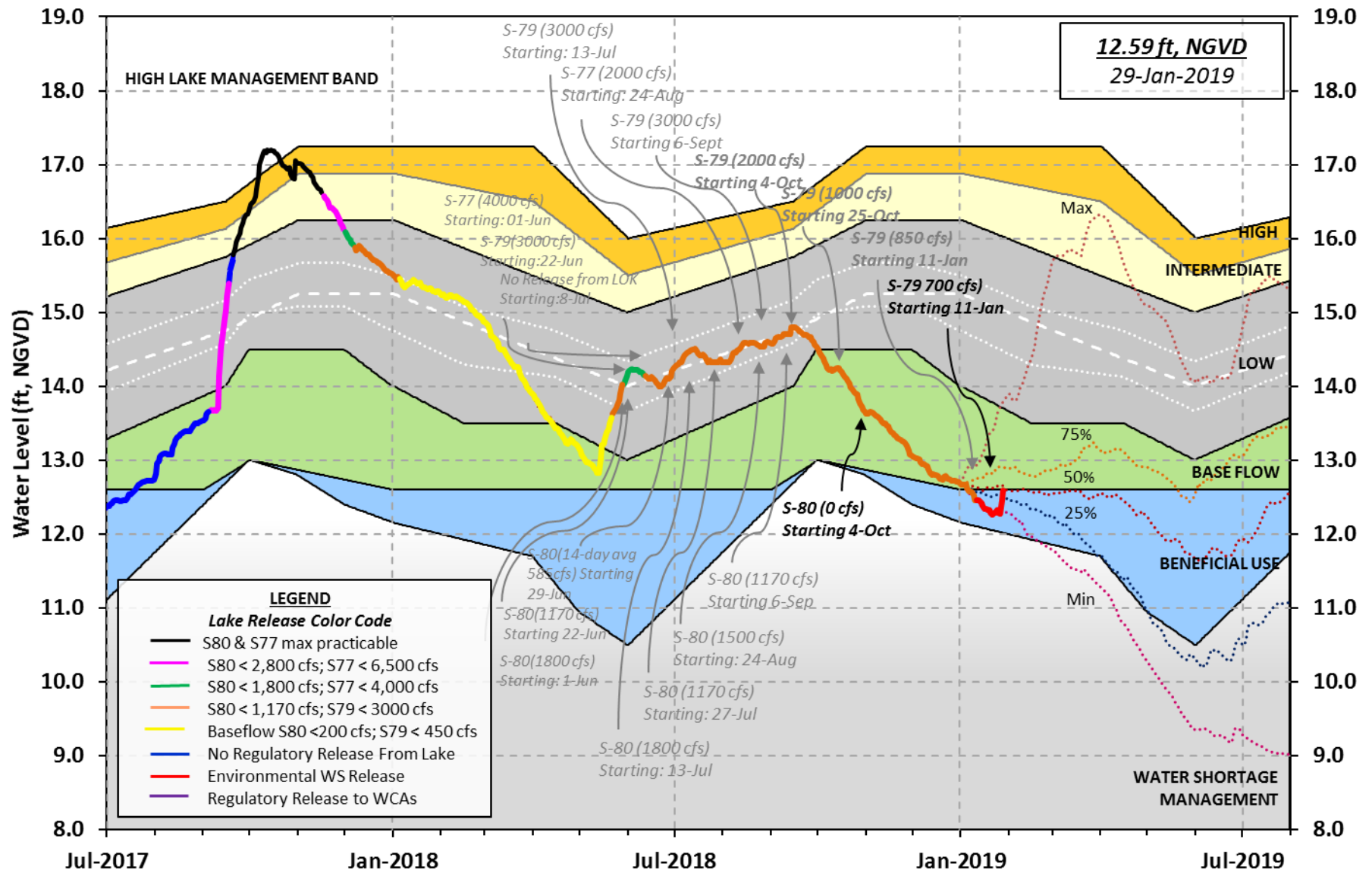


Figure 1. Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

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

Lake Okeechobee Water Level Comparison

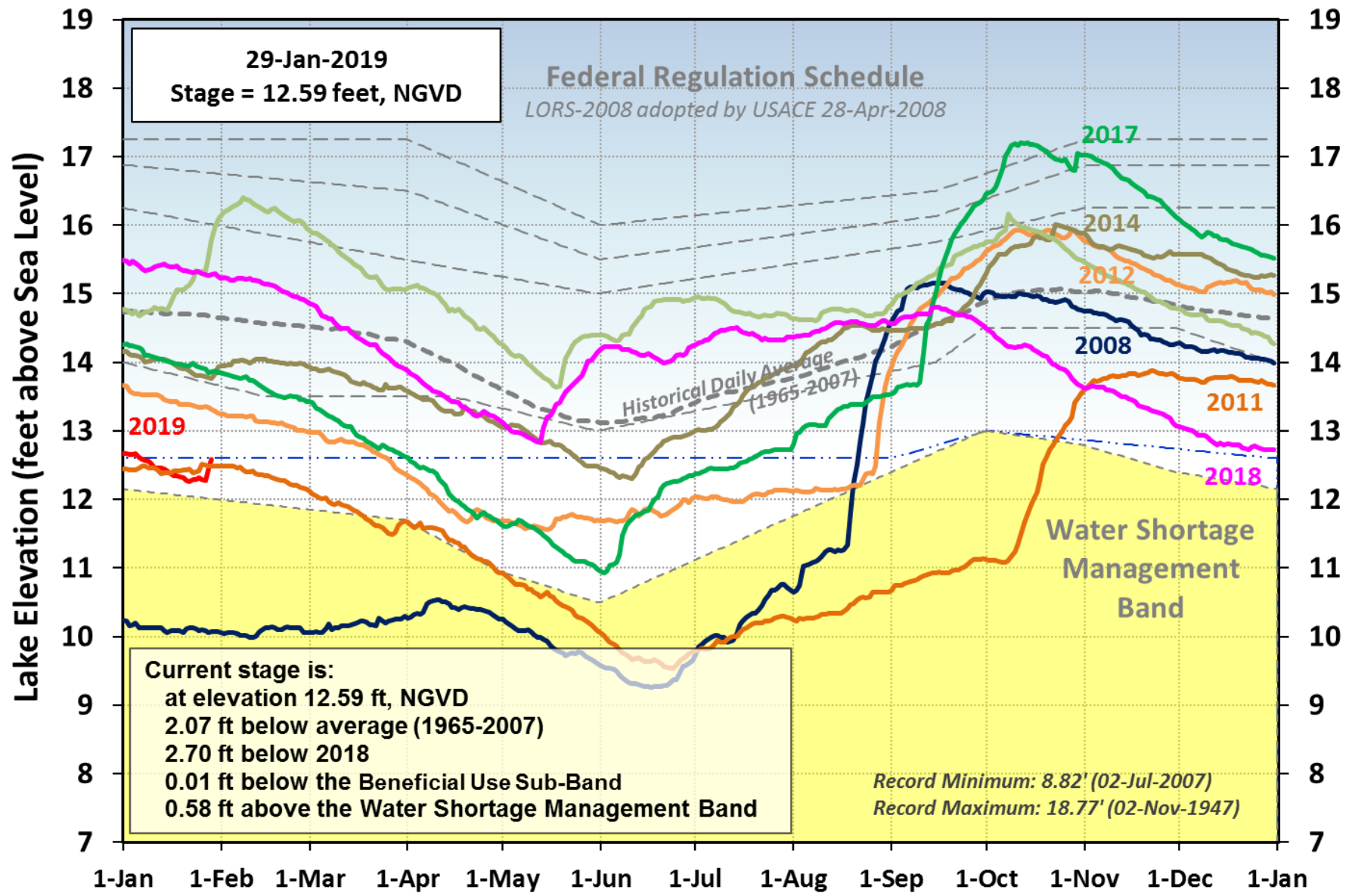


Figure 3. Select annual stage hydrographs for Lake Okeechobee from 2008 – 2019.

SFWMD PROVISIONAL RAINDAR 7-DAY BASIN RAINFALL ESTIMATES

FROM: 0630 EST, 01/22/2019 THROUGH: 0630 EST, 01/29/2019

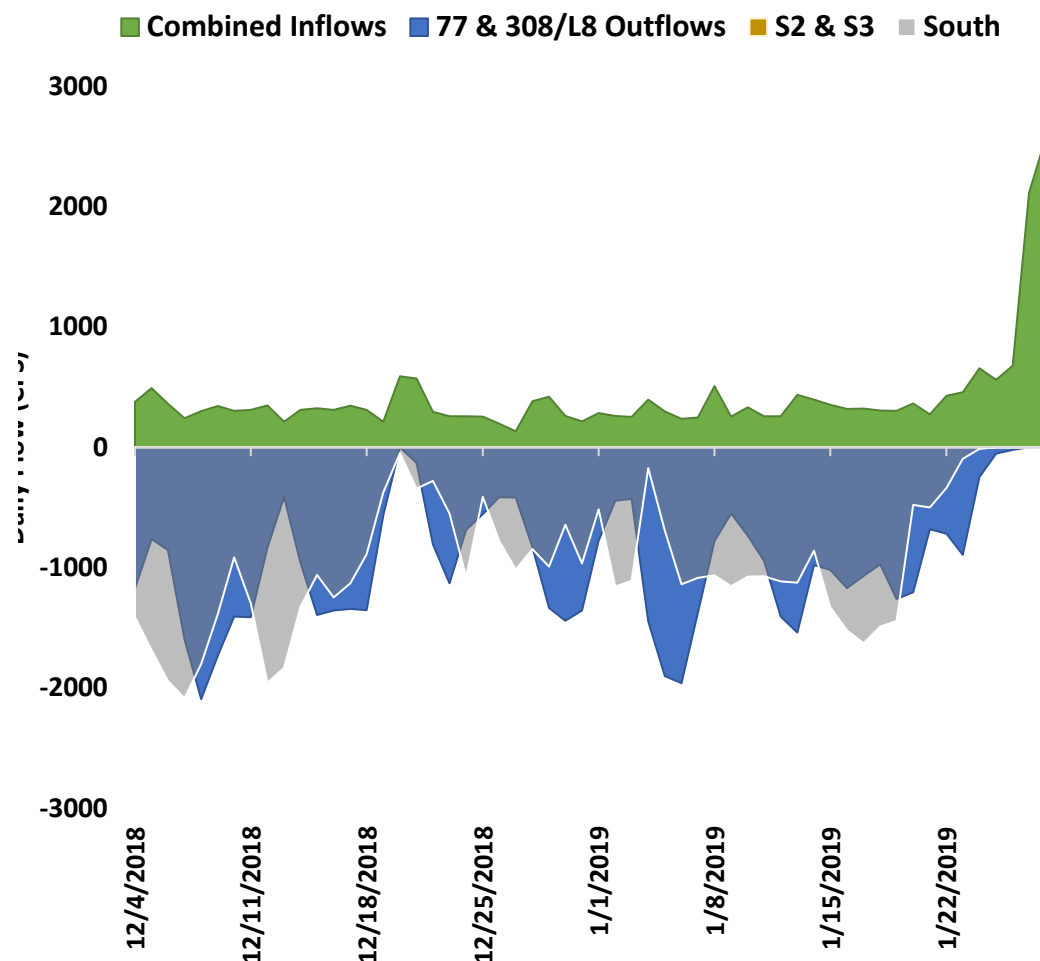
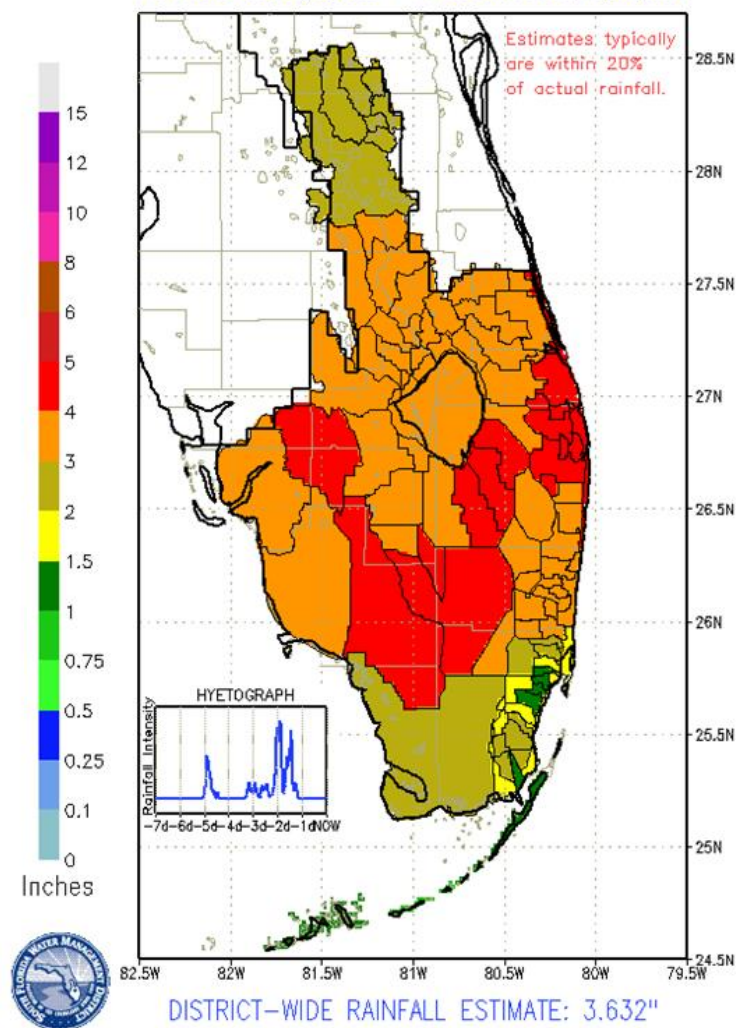


Figure 4. Rainfall estimates by basin.

Figure 5. 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.

Wading Bird Foraging Locations January 22, 2019

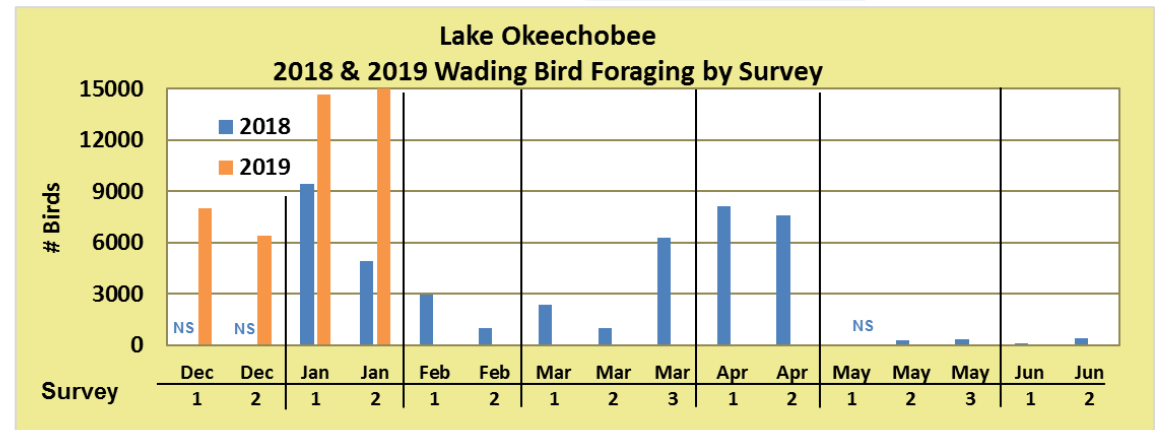
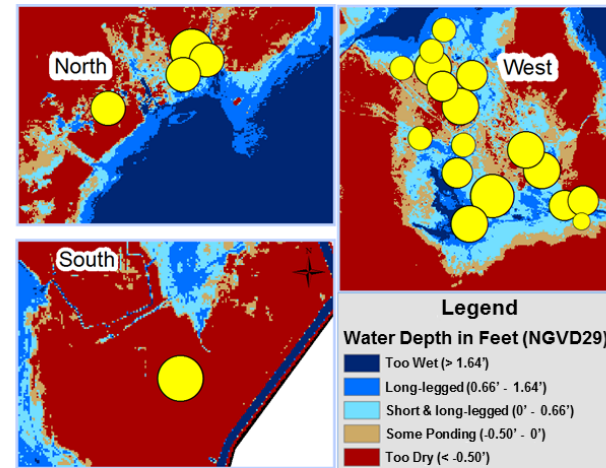
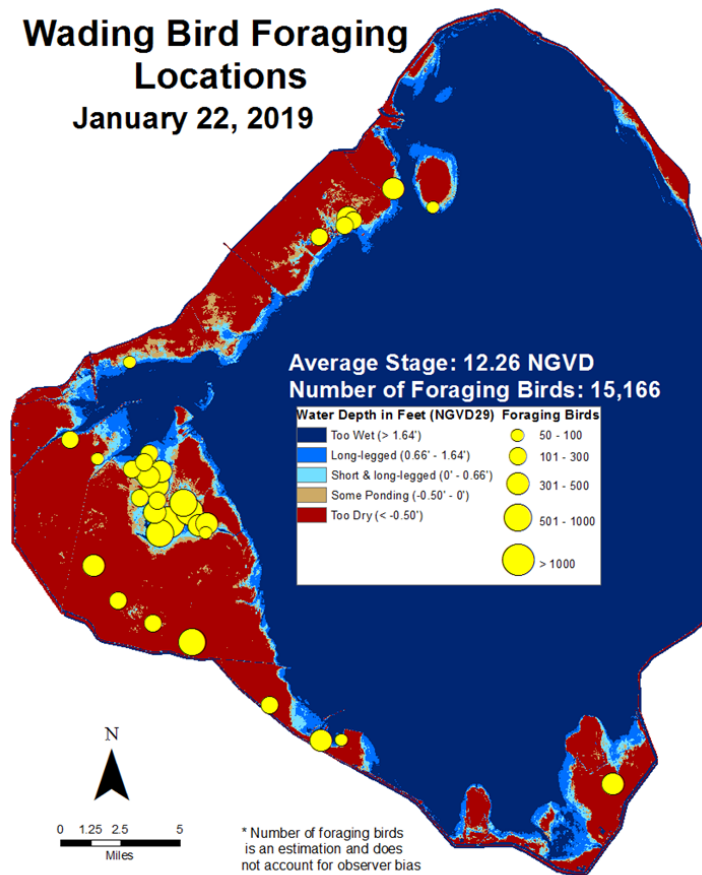


Figure 6. Locations of foraging flocks of wading birds observed during a monitoring flight on January 22, 2019 are shown in yellow, with circle sizes representing the size of the flocks. Previous survey totals from this season and from 2018 are compared in the bar graph.

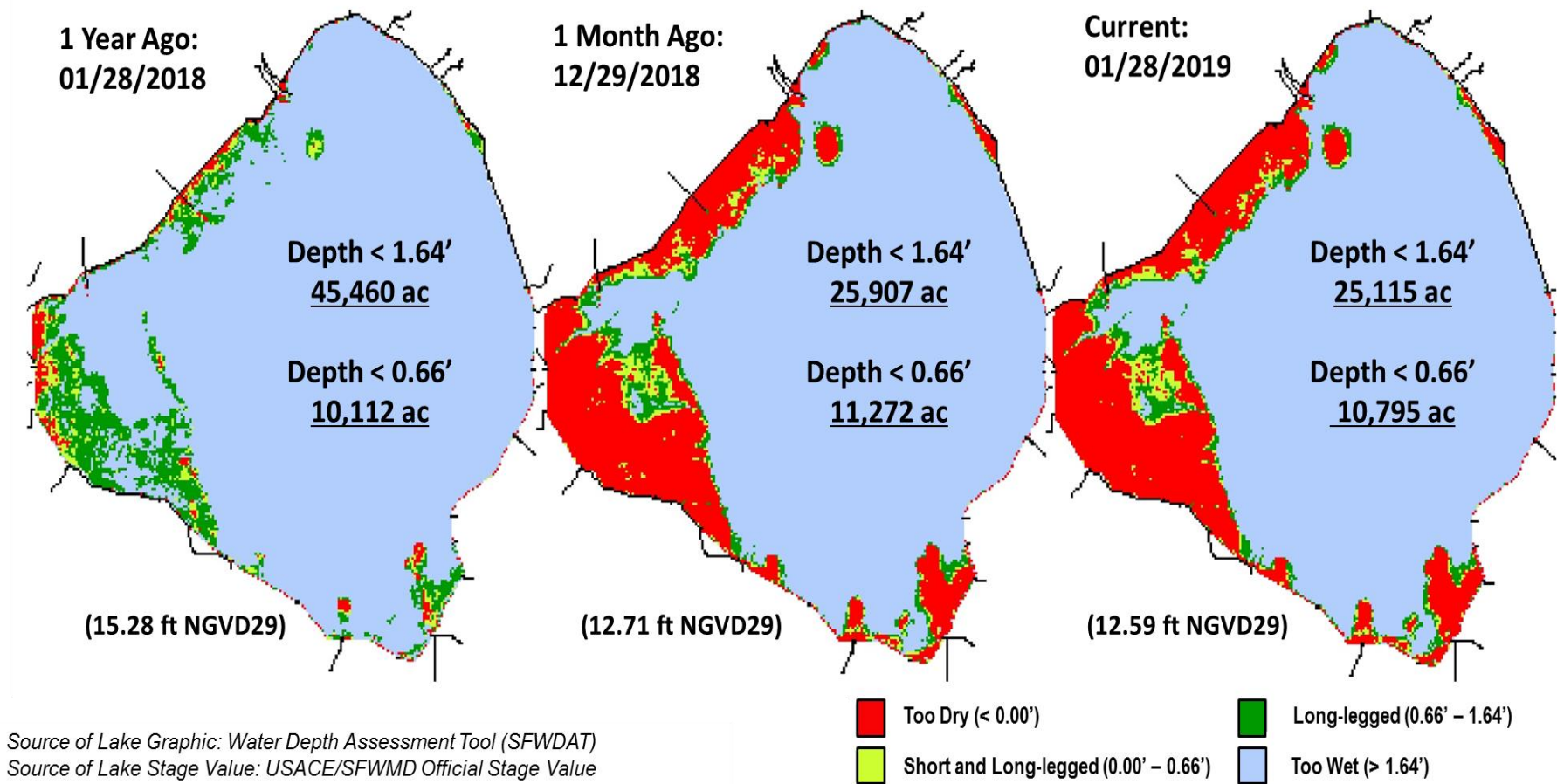


Figure 7. Wading bird habitat suitability index for Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 1,189 cfs (Figures 1 and 2) and last month inflow averaged about 366 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	825
S-80	42
S-308	-79
S-49 on C-24	34
S-97 on C-23	169
Gordy Rd. structure on Ten Mile Creek	119

Over the past week in the estuary, salinity decreased to US1 Bridge and remained about the same downstream (Table 2, Figures 3 and 4). The seven-day moving average salinity of the water column (an average of the surface and bottom salinity) at the US1 Bridge is estimated to above 26. Salinity conditions in the middle estuary are within the fair 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)	23.7 (24.5)	25.5 (26.0)	NA ¹
US1 Bridge	26.1 (26.8)	EM ² (EM)	10.0-26.0
A1A Bridge	31.5 (31.4)	32.2 (31.9)	NA ¹

¹Envelope not applicable and ²Equipment Malfunction.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 2,150 cfs (Figures 5 and 6) and last month inflow averaged about 1,223 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	193
S-78	933
S-79	1920
Tidal Basin Inflow	230

Over the past week, surface 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 Cape Coral and at Shell Point (Figure 9). Salinity values were not available at Sanibel. The 30-day moving average surface salinity is 2.7 at Val I-75 and 7.7 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)	1.4 (3.2)	1.4 (3.2)	NA ¹
Val I75	2.7 (3.5)	3.1 (4.9)	0.0-5.0 ²
Ft. Myers Yacht Basin	7.3 (8.2)	8.8 (11.0)	NA
Cape Coral	15.6 (16.1)	16.7 (17.5)	10.0-30.0
Shell Point	24.6 (25.9)	24.1 (25.2)	10.0-30.0
Sanibel	NR ³ (NR)	NR (NR)	10.0-30.0

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

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 7.4 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 650 cfs and Tidal Basin inflows of 696 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	696	7.4	3.0
B	300	696	5.7	2.8
C	375	696	5.4	2.7
D	450	696	5.2	2.7
E	650	696	4.8	2.6

Red tide

The Florida Fish and Wildlife Research Institute reported on January 25, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at background to low concentrations in 7 samples collected from and/or offshore of Lee County and respiratory irritation was also reported in Lee County. *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from St. Lucie, Martin, or Palm Beach counties. No samples were collected from Miami-Dade or Broward counties.

Water Management Recommendations

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

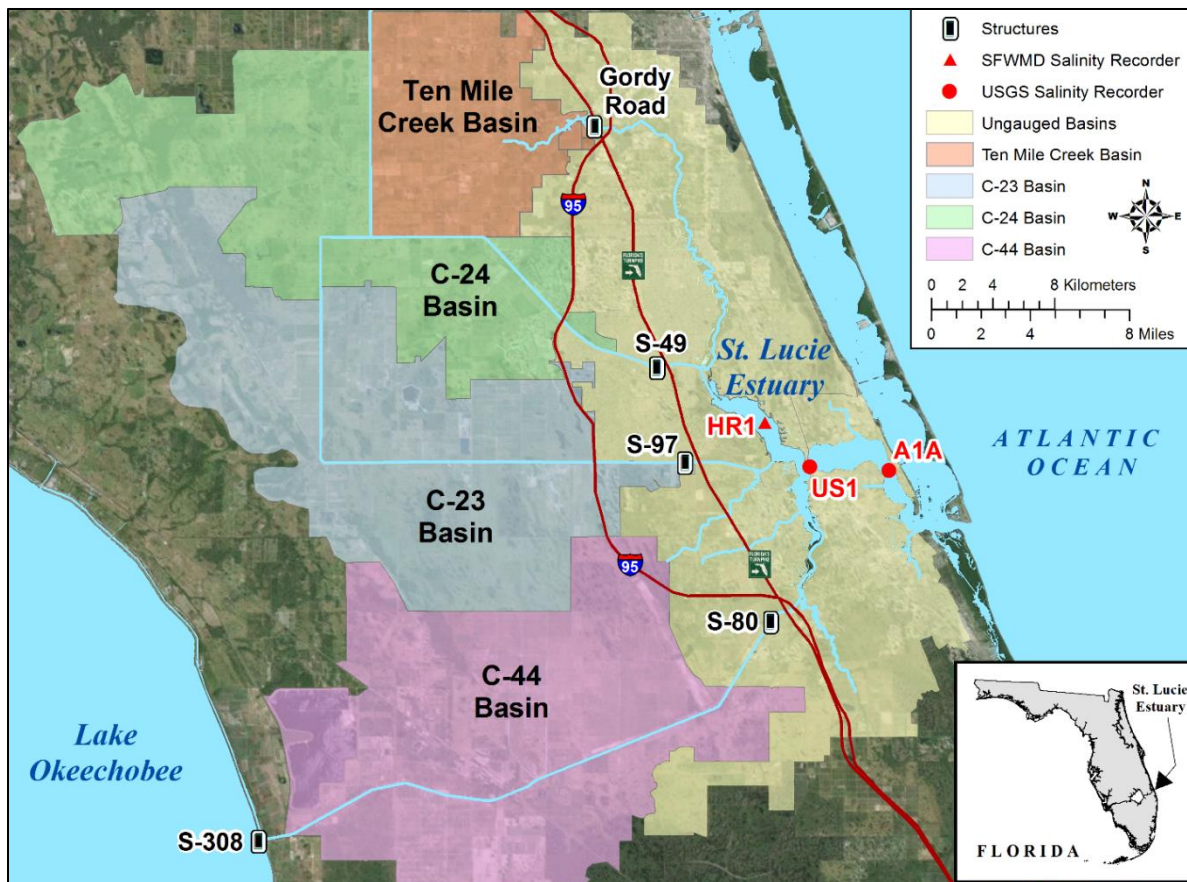


Figure 1. Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

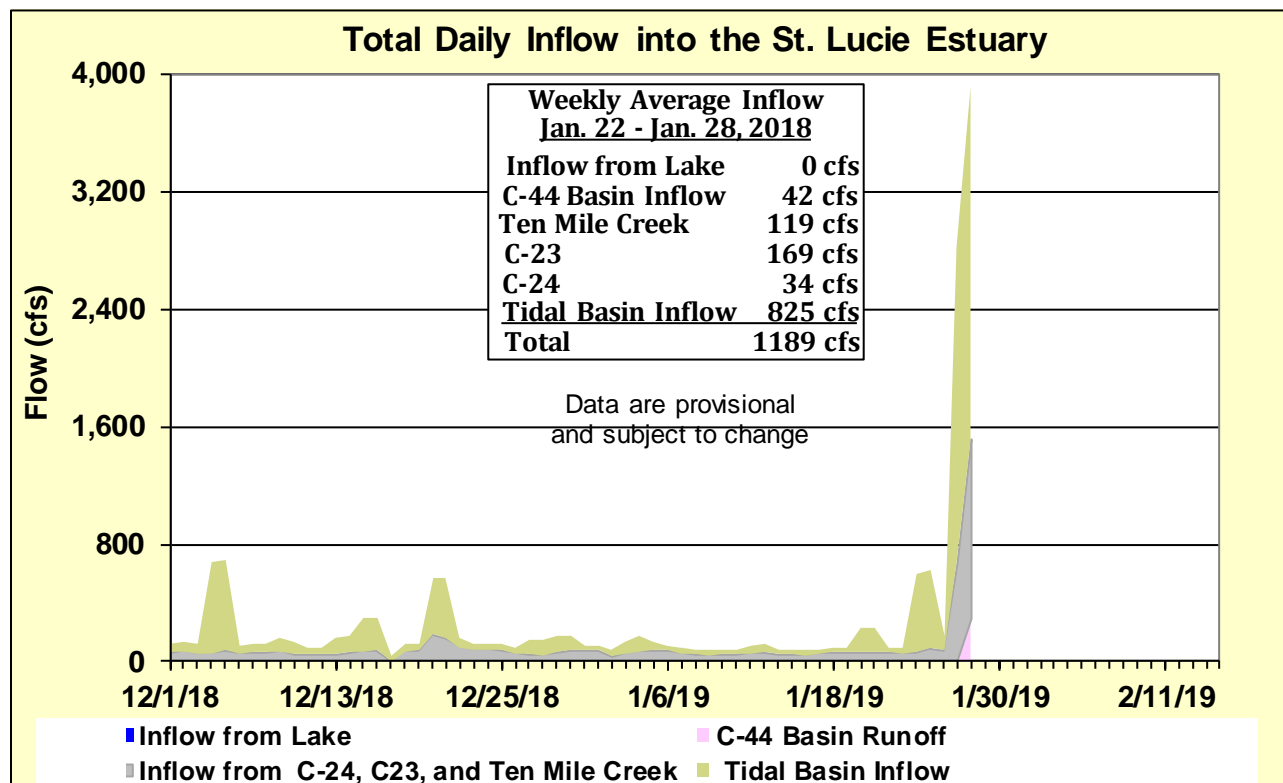


Figure 2. Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basins into the St. Lucie Estuary.

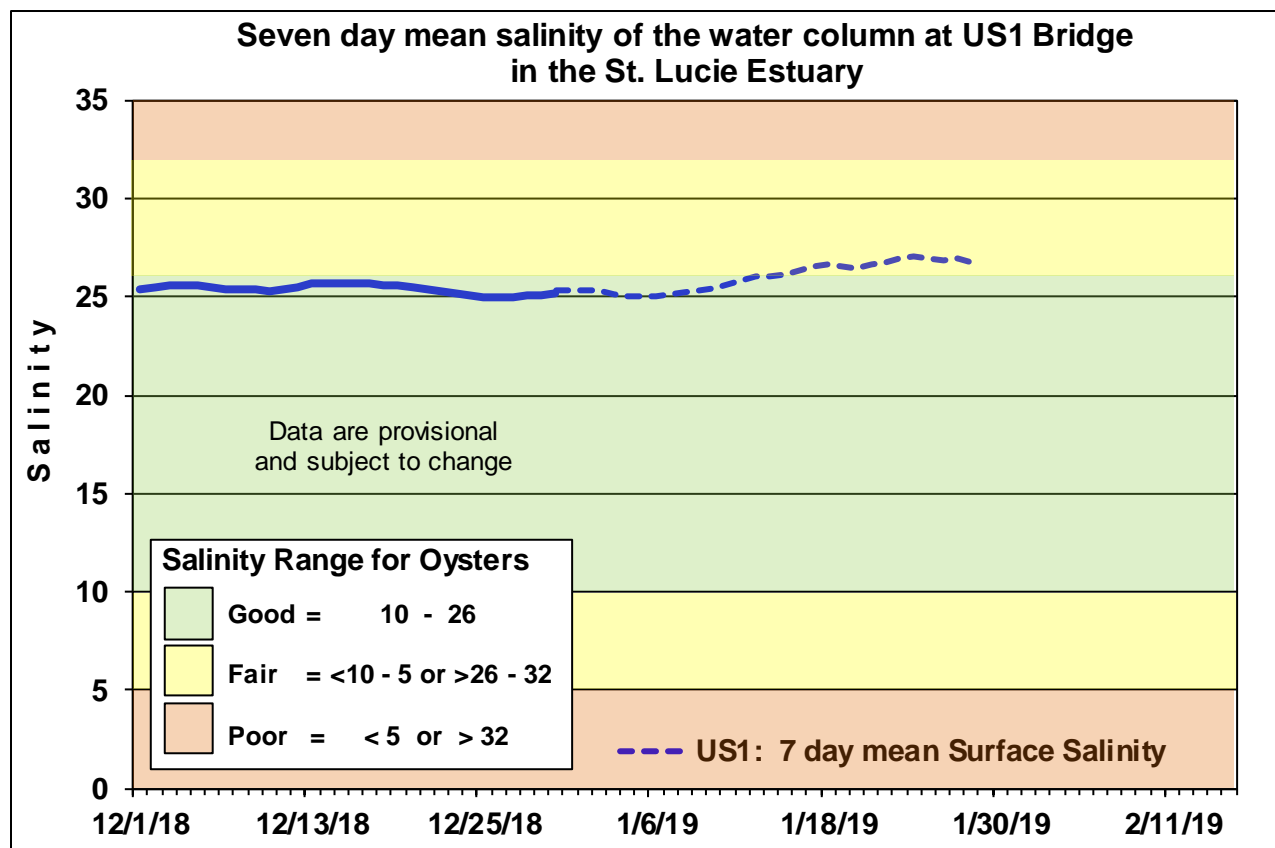


Figure 3. Seven-day mean salinity of the water column at the US1 Bridge.

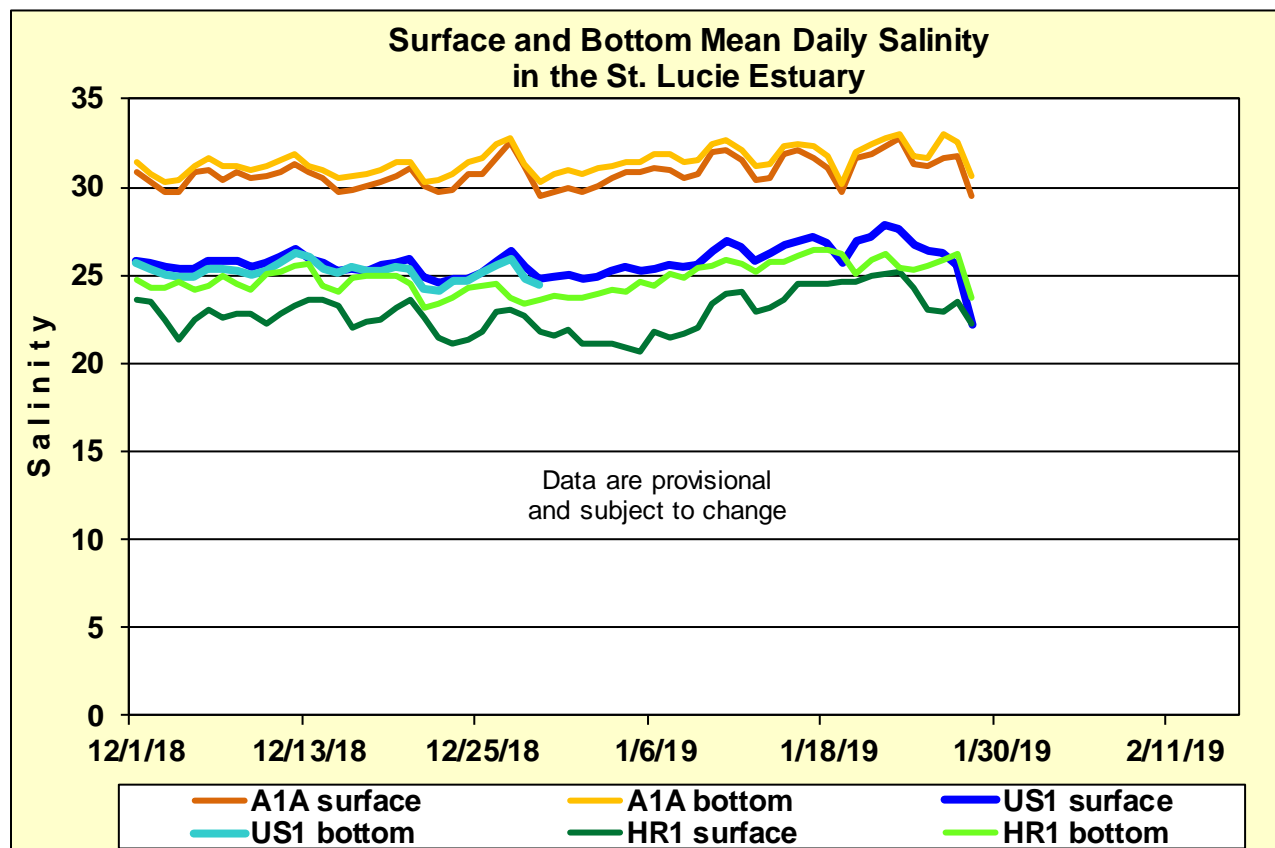


Figure 4. Daily mean salinity at the A1A, US1 and estimated HR1 stations.

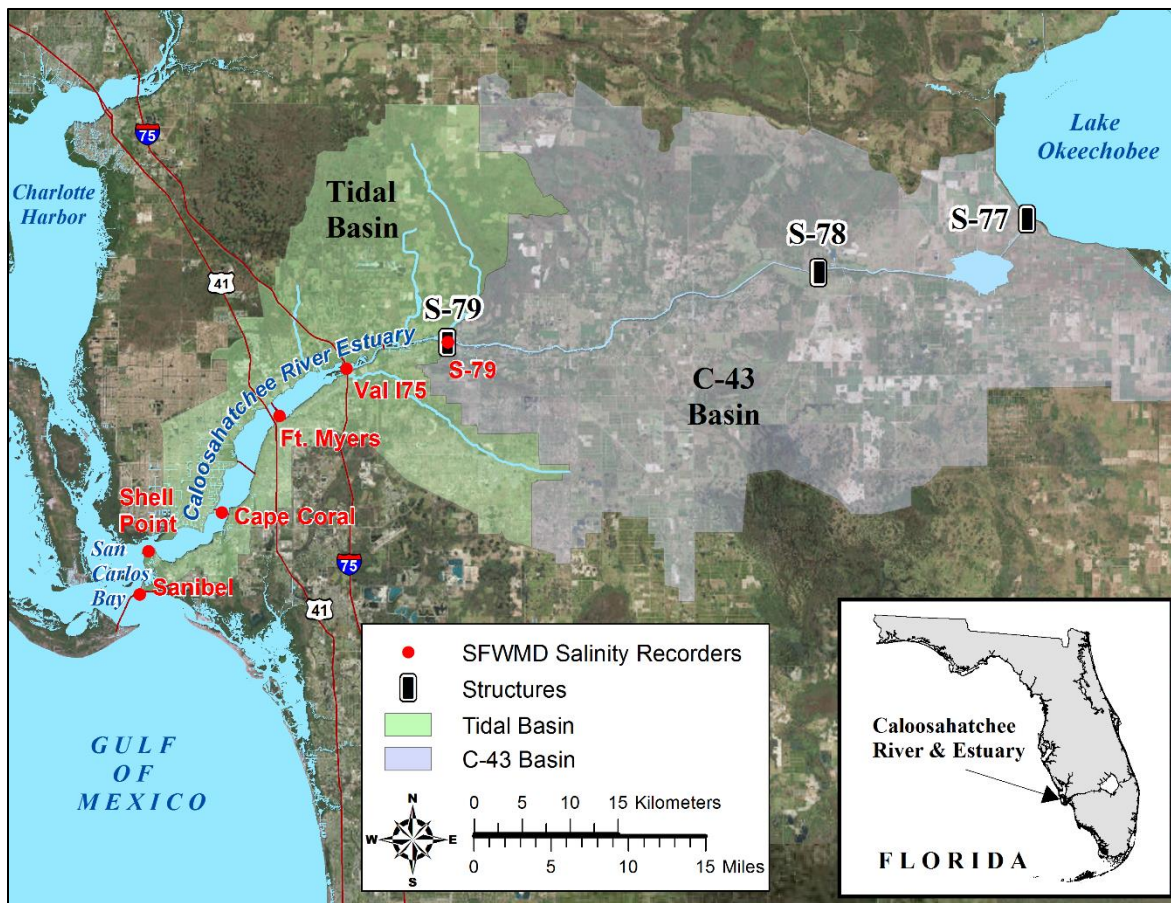


Figure 5. Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

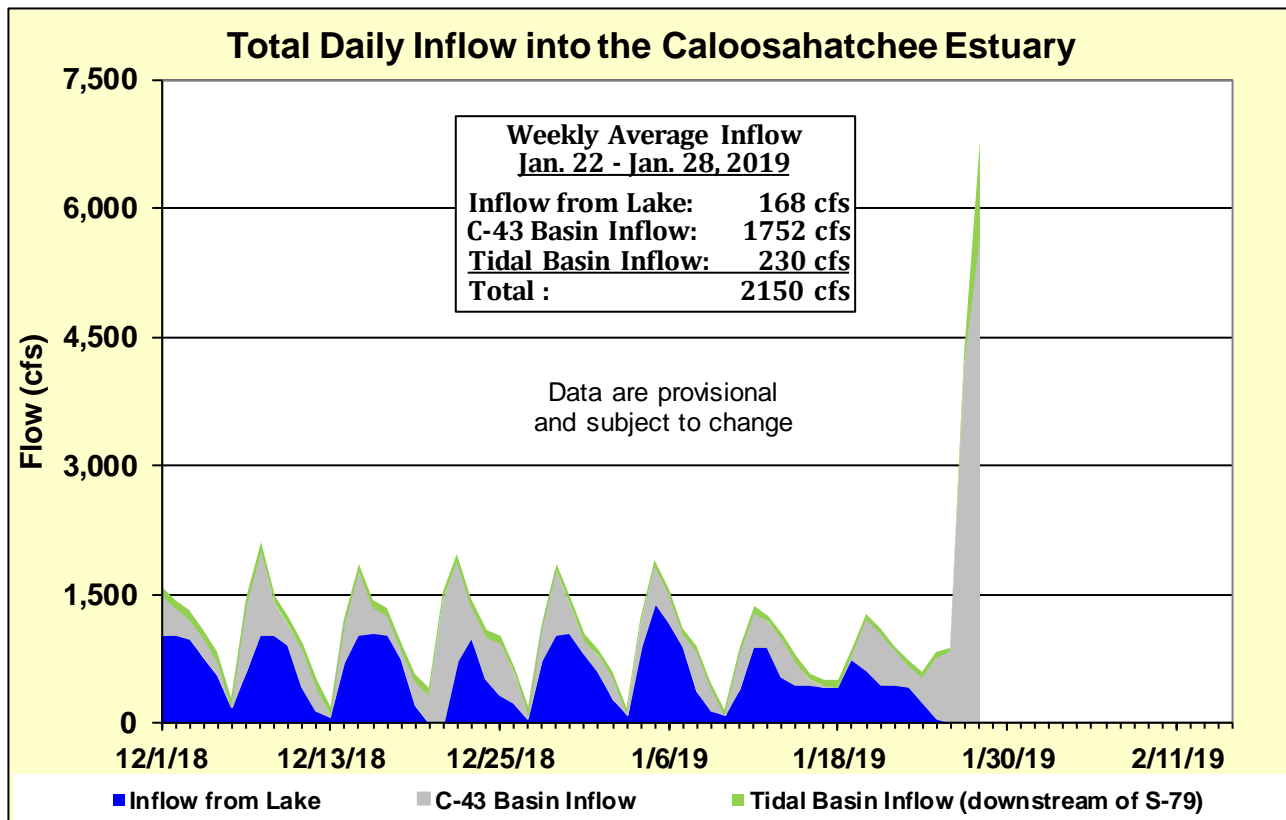


Figure 6. Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

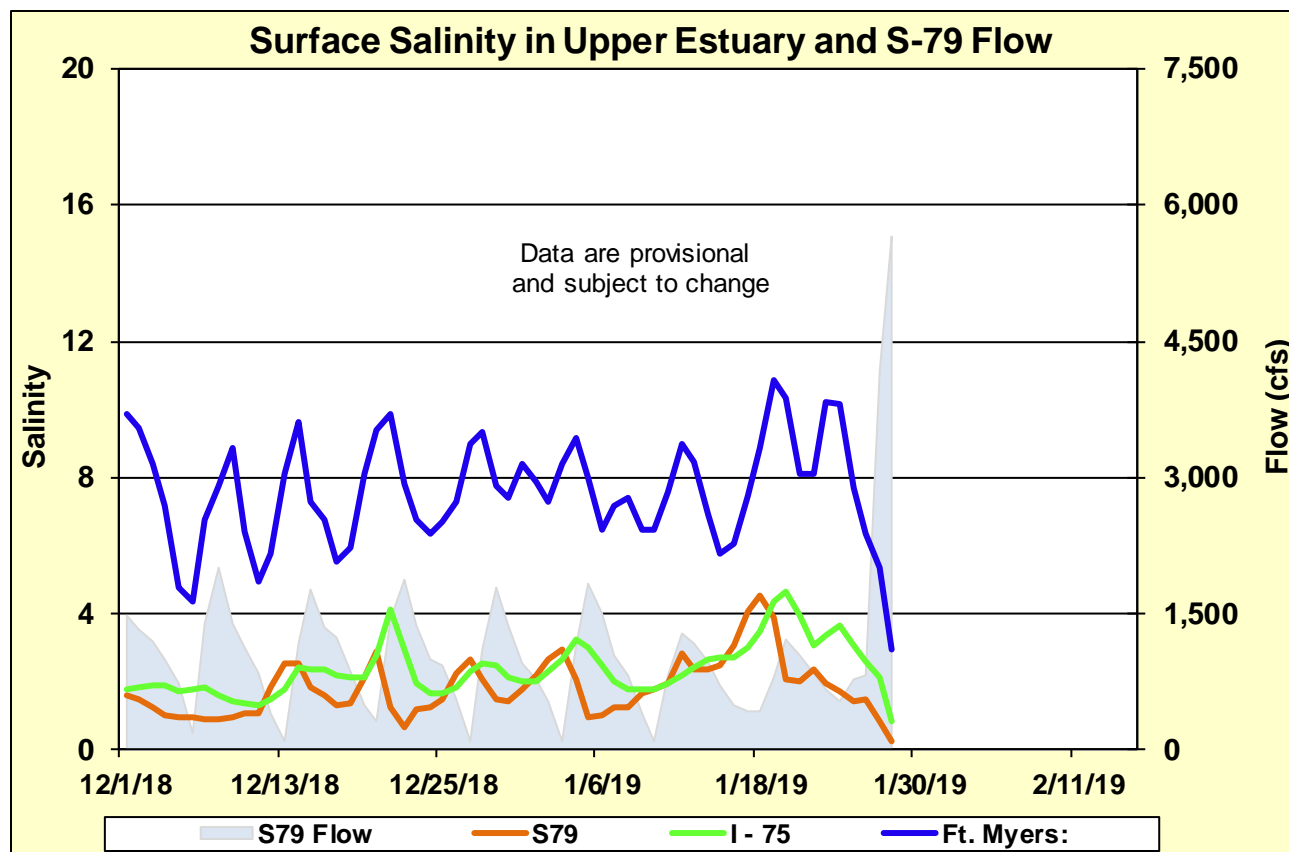


Figure 7. Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

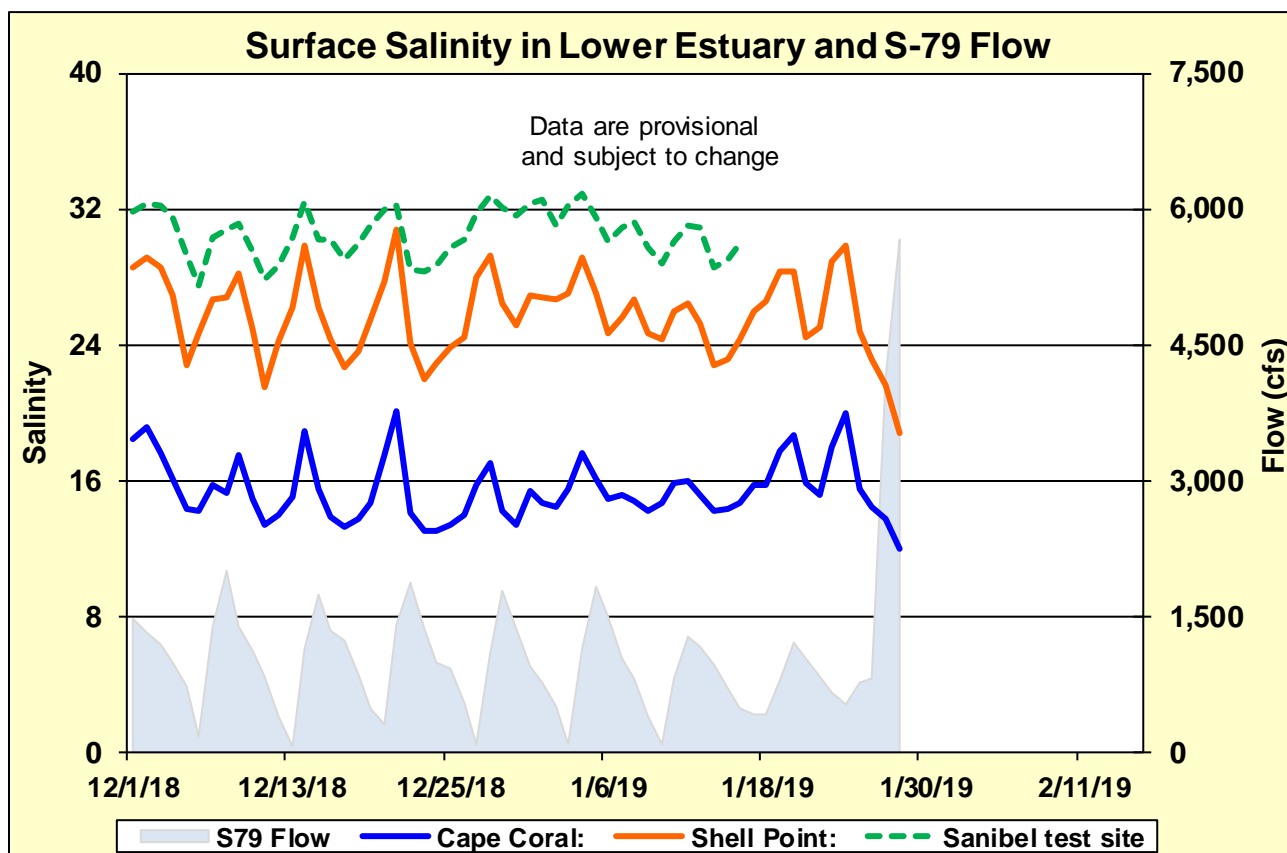


Figure 8. Daily mean flows at S-79 and salinity at lower estuary stations.

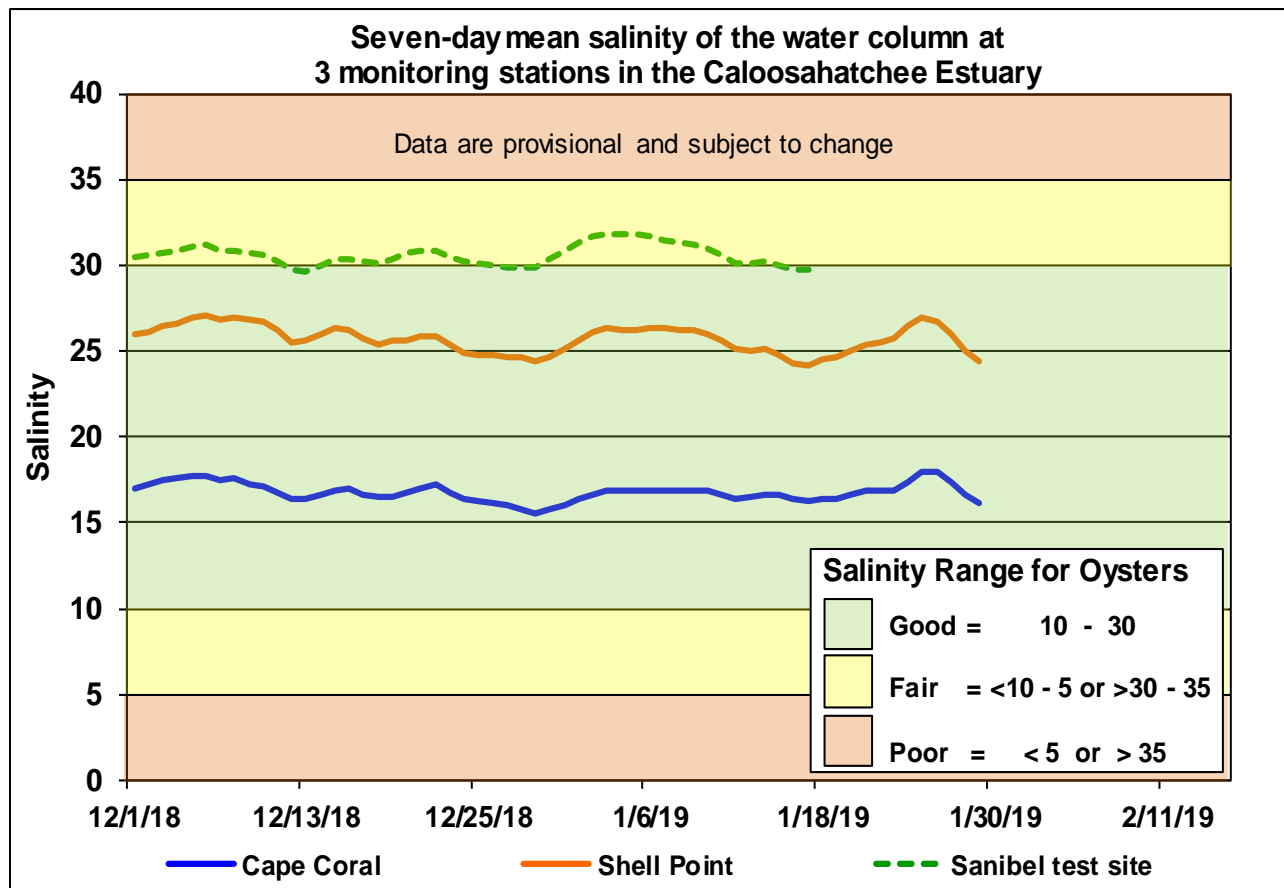


Figure 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

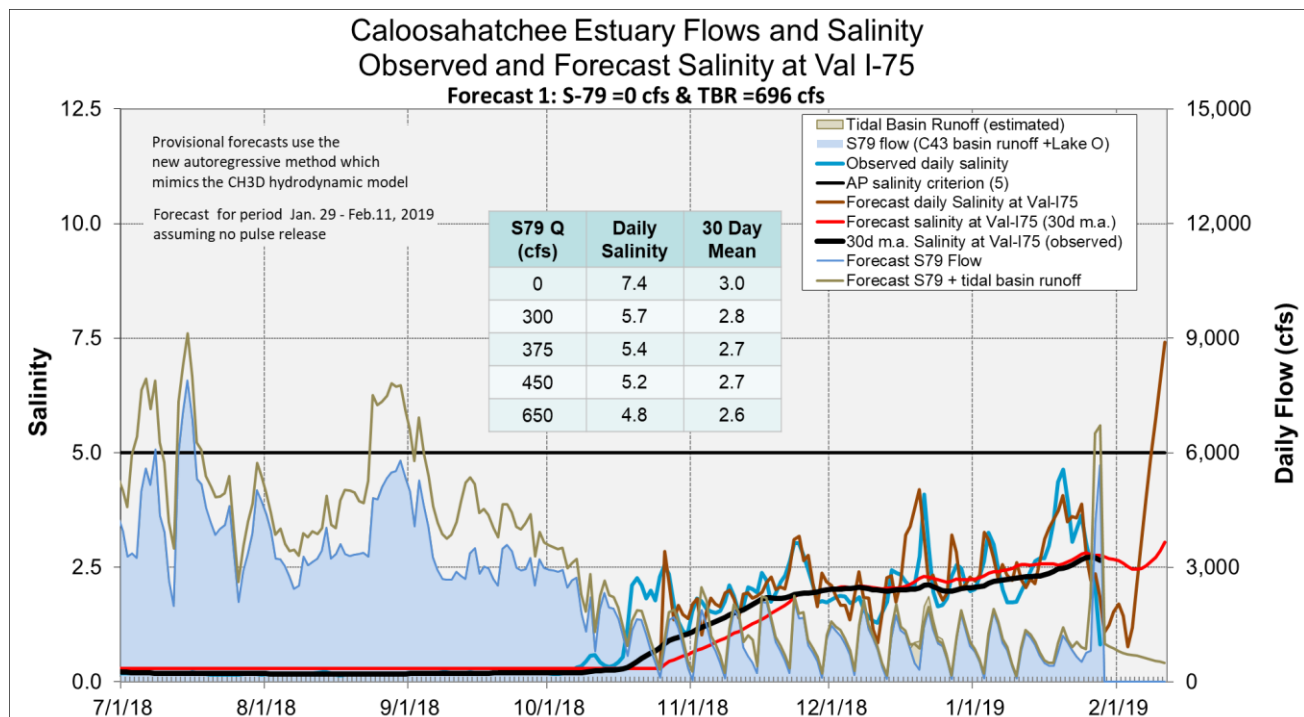
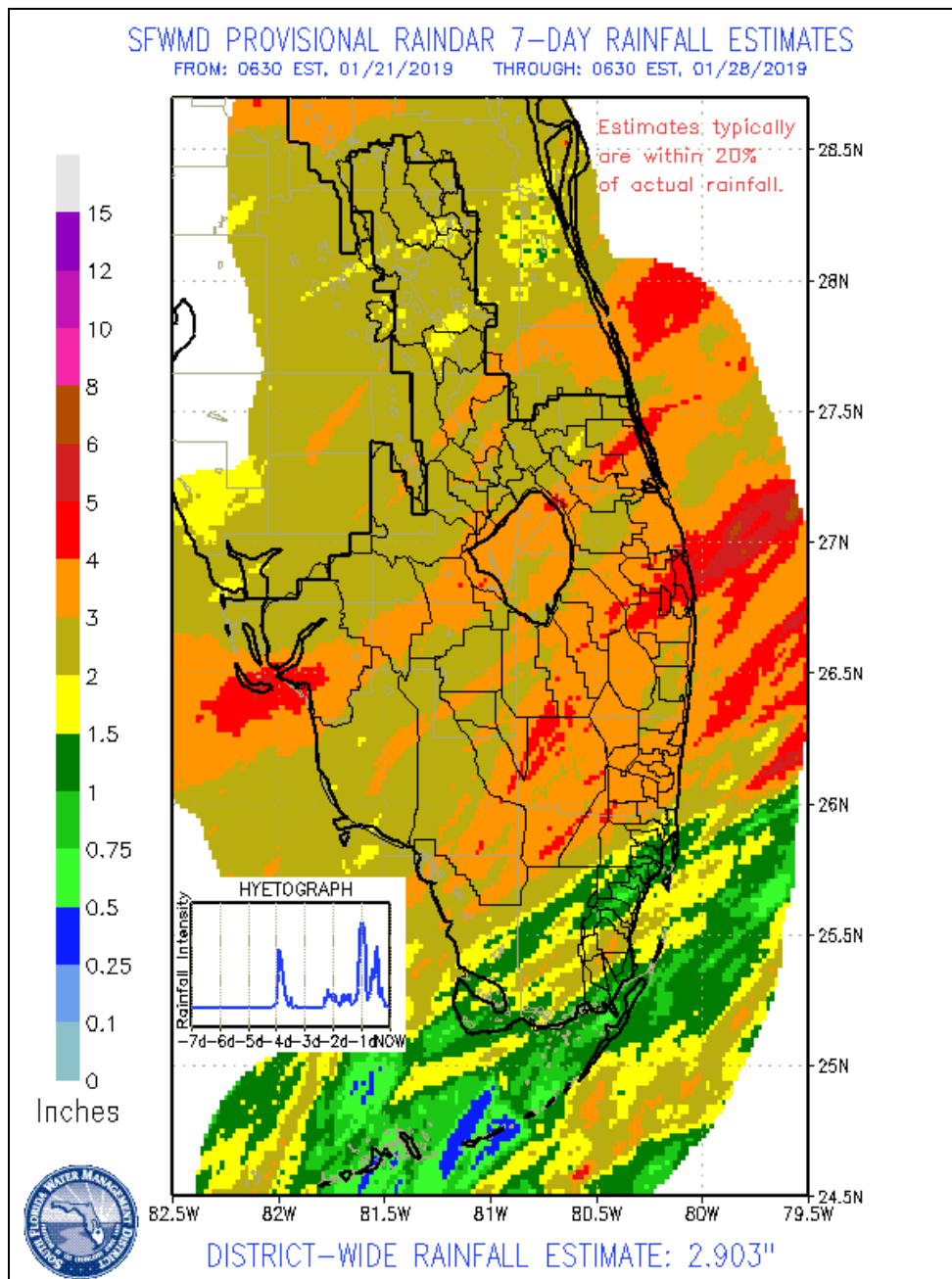


Figure 10. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

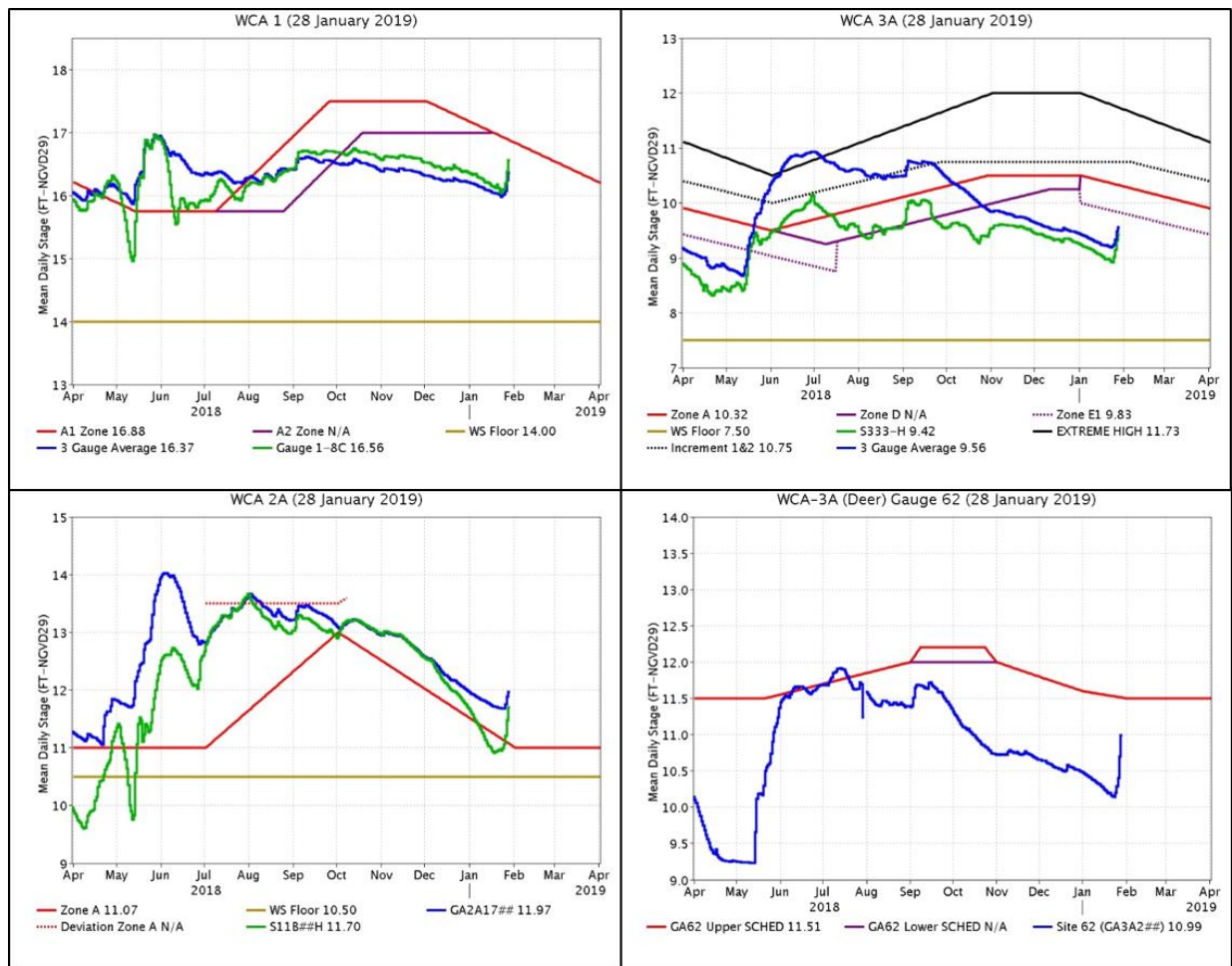
EVERGLADES

At the gauge locations monitored for this report stages rose evenly across the WCAs, with most locations ascending near the 0.30 feet average over the last week. The range of individual gauge changes within the WCAs was +0.18 feet (WCA-2B) to +0.74 feet (WCA-3A northwest). Pan evaporation was estimated at 0.94 inches this week.

Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	3.44	+0.32
WCA-2A	3.46	+0.27
WCA-2B	3.42	+0.19
WCA-3A	3.50	+0.44
WCA-3B	3.34	+0.23
ENP	1.95	+0.12



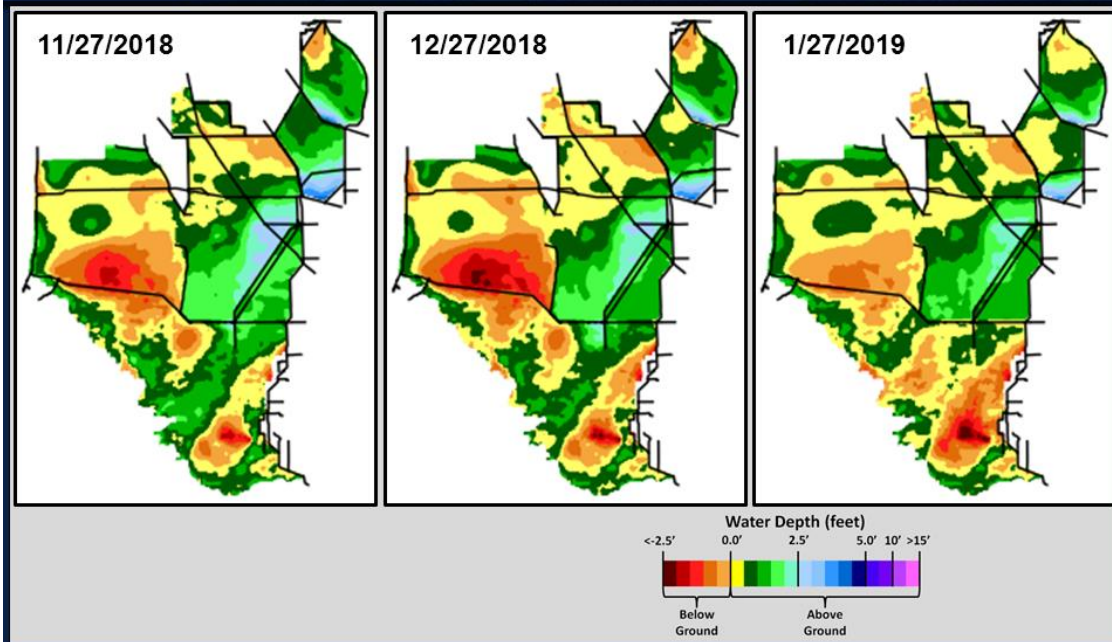
Regulation Schedules: Gauge 1-8C is 0.32 feet below the Zone A1 regulation line. The three-gauge average is 0.19 below the canal stage. Gauge 2A17 is 0.90 feet above Zone A. S-11B Headwater stages have recovered, now 0.27 feet below the marsh stage. WCA-3A three gauge average stage is 0.27 feet below the Zone E1 regulation line. WCA-3A at gauge 62 (northwest corner) rose quickly to 0.52 feet below the lower schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate conditions that are unseasonably dry, but the recent rains have had an impact on stages. The model indicates now only the eastern half of WCA-3A North with depths below or near ground surface. In the extreme northeast of that basin we see some recovery of stages where we see a shrinking extent of habitat that is indicating depths greater than 0.5 feet below ground. WDAT difference output indicates that water levels changes across all of the Everglades over the month were mixed, yet the rate of change is moderate, however this model output does not capture the entirety of the most recent rainfall event. In the “1 Year” inset we see continue to see the difference between current depth conditions and post Hurricane Irma’s lessening impact on water depths a year ago, this previous year’s high water event suggest the current lower than seasonal water depths, while precarious may be allowing ecological process to recover from high water stress.



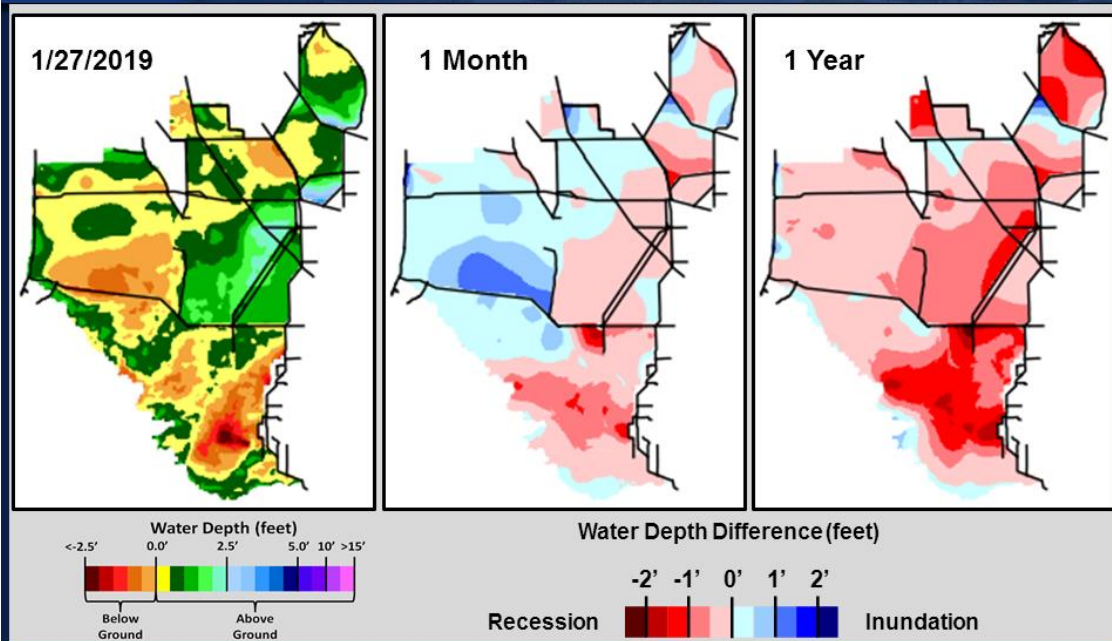
SFWDAT Water Depth Monthly Snapshots



South Florida Water Depth Assessment Tool (SFWDAT)



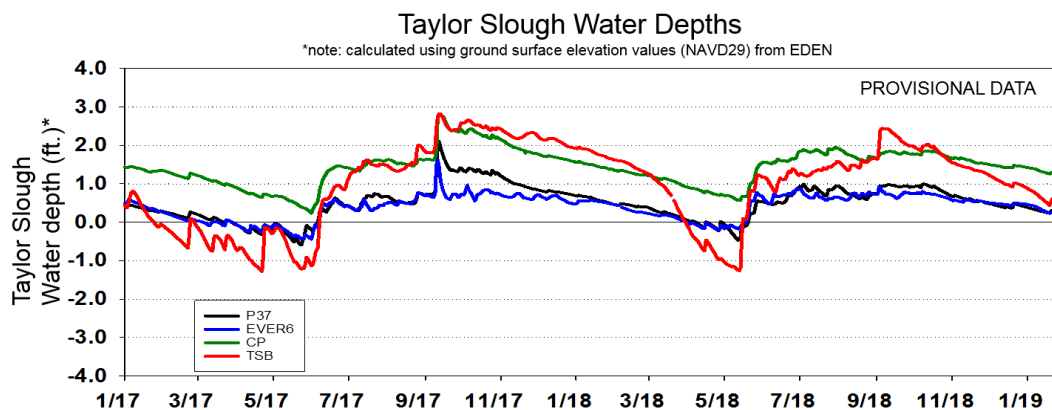
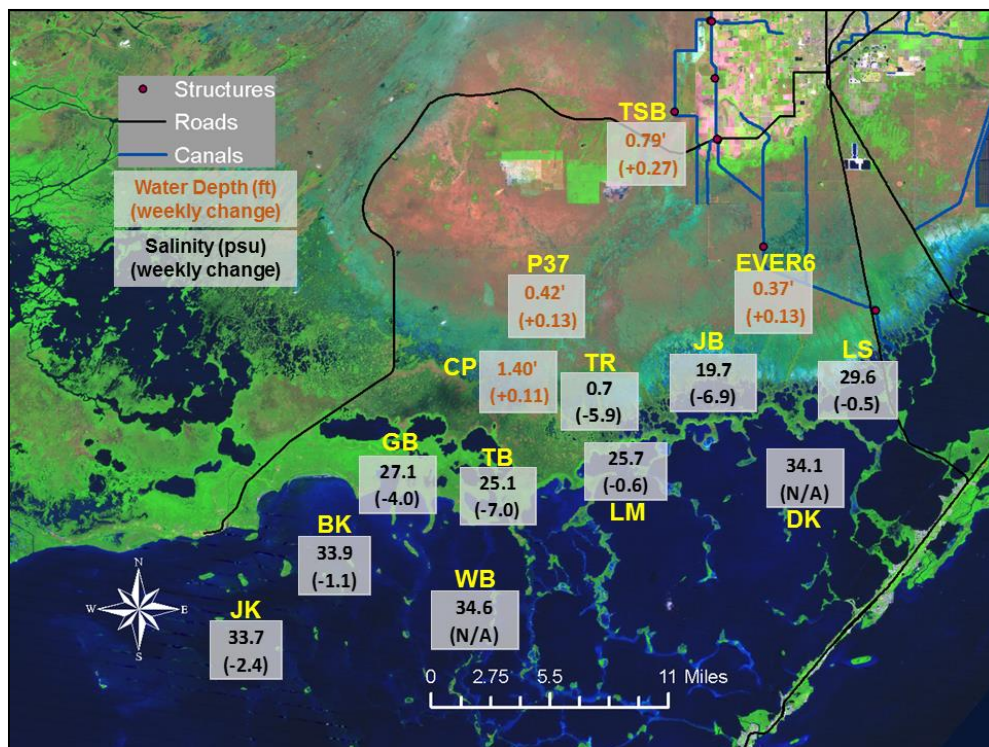
SFWDAT Everglades Difference Maps (Present - Past)

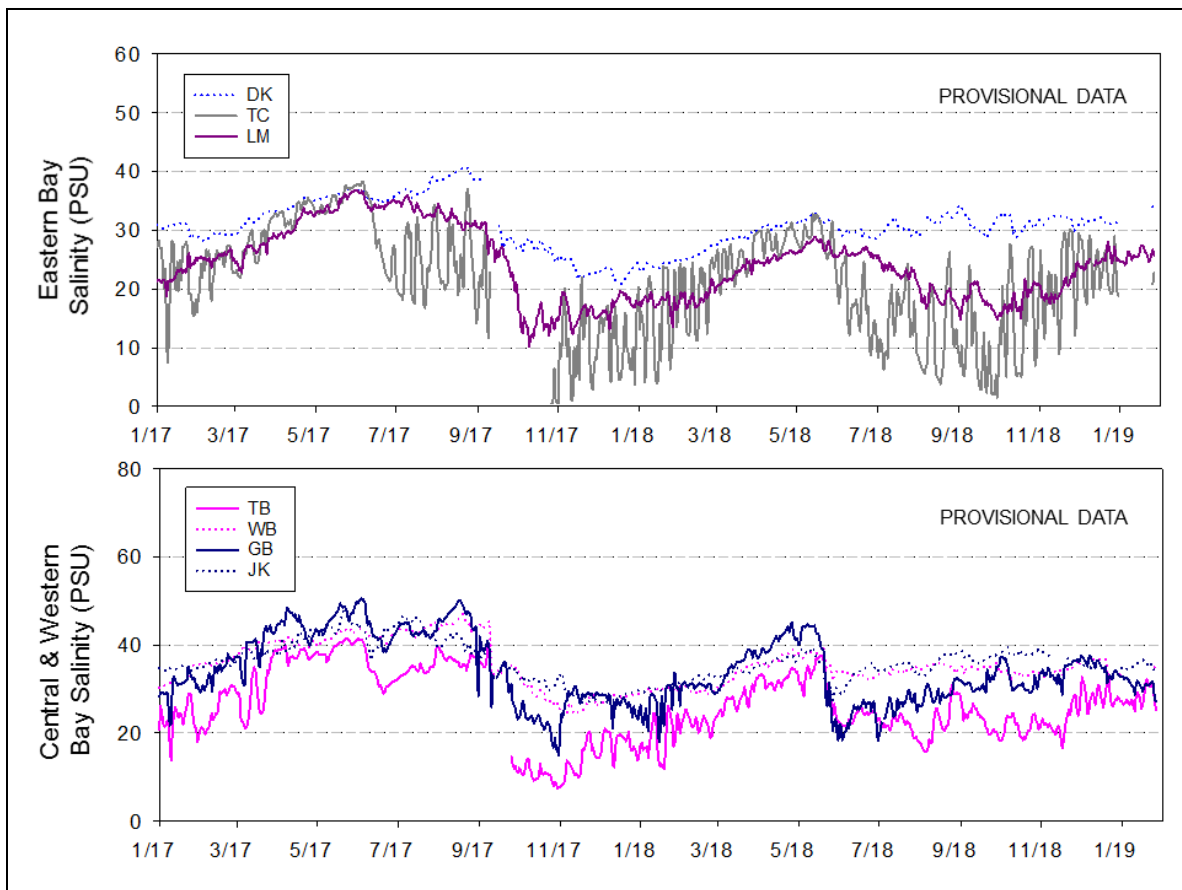


South Florida Water Depth Assessment Tool (SFWDAT)

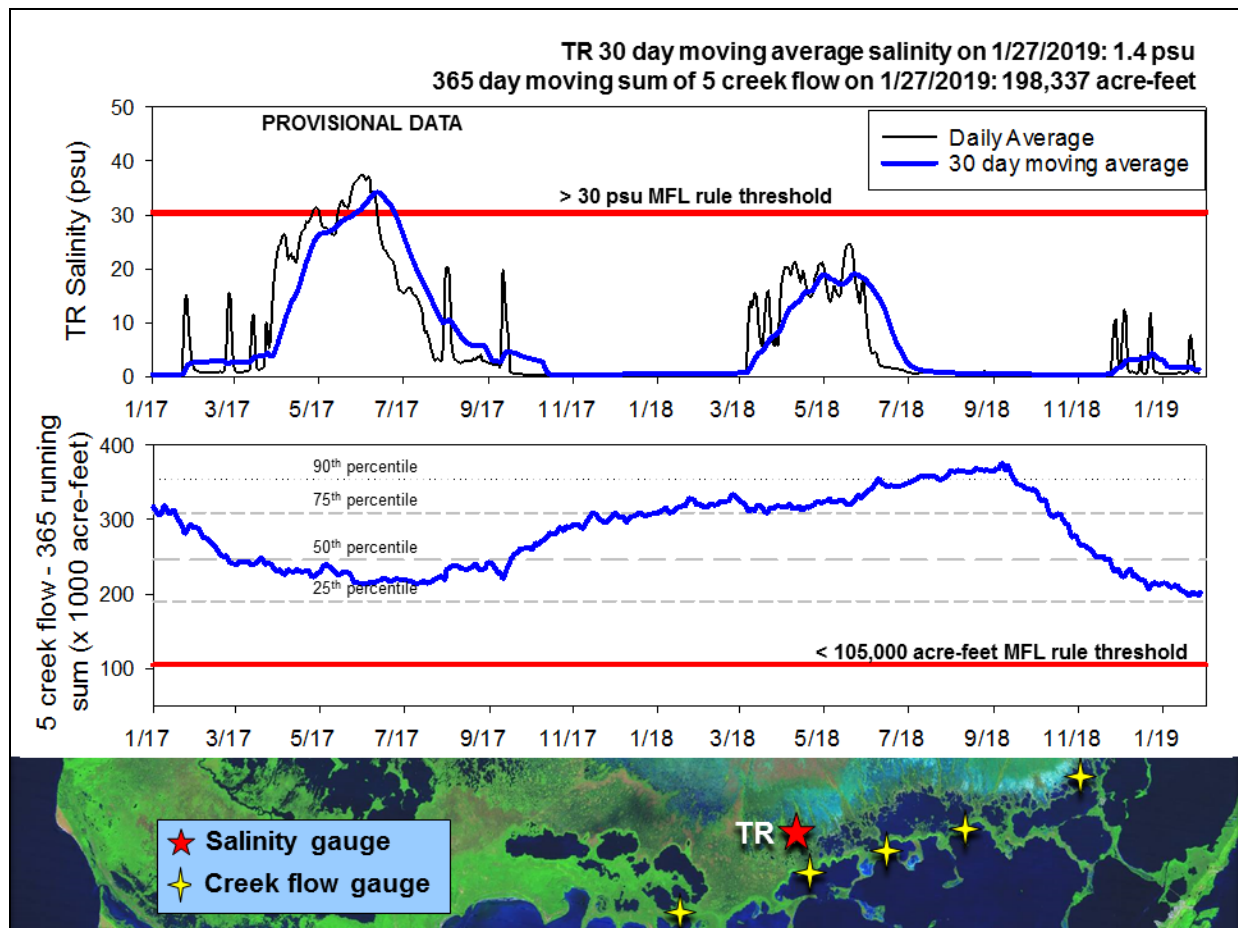
Taylor Slough Water Levels: An average of 1.1 inches of rain fell on Taylor Slough and Florida Bay this past week which caused stages to increase by 0.13 feet on average. Water depths averaged 0.68 feet across Taylor Slough and are about 3.5 inches above average with northern Taylor Slough being 6 inches above average.

Florida Bay Salinities: The rainfall also lowered salinity in Florida Bay with an average decrease of 3.2 psu for the week. The largest weekly change was a decrease of 7 psu in central shoreline area. Daily average salinities ranged from 20 psu in the northeast to 35 psu in the central bay (for which we have data again) and are average to 7 psu above average for this time of year.





Florida Bay MFL: Salinity in the mangrove zone decreased from 7.7 psu to 0.7 psu over the last week. The 30-day moving average decreased 0.4 psu to 1.4 psu after the last week. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about 5,500 acre-feet for the last week, which is 3,700 acre-feet more than the weekly five-creek flow for this time of year. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) has decreased to 198,337 acre-feet (less than the long-term average of 257,628 acre-feet and approaching the 25th percentile). Creek flow is provisional data from the USGS and is highly variable.



Water Management Recommendations

Water management that protects peat soils, especially in WCA-3A North, as the dry season becomes established has increasing ecological benefit as unusually dry conditions pervade the WCA-3A basin. Wading bird foraging was noted in WCA-2A and absent from the rest of the Everglades, and conditions there looking forward into the dry season seem the most promising (relative to other historical foraging locations) to support the limited number of nesting wading birds expected this year. Given this and the drier than average conditions very nearby in northeastern WCA-3A, we recommend that priority be given to water management that can route water into WCA-3A versus WCA-2A when possible. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, January 29th, 2019 (red is new)

Area	Weekly change	Recommendation	Reasons
WCA-1	Stage increased by 0.32'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-2A	Stage increased by 0.27'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-2B	Stage increased by 0.18'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
WCA-3A NE	Stage increased by 0.31'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect habitat including <u>peat soil</u> development, tree islands and wildlife. Hydration provided to this area <u>continues to have</u> high ecological value due to unseasonably dry conditions.
WCA-3A NW	Stage increased by 0.74'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	
Central WCA-3A S	Stage increased by 0.35'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
Southern WCA-3A S	Stage increased by 0.35'		
WCA-3B	Stage increased by 0.23'	Maintain depths at temporary regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.
ENP-SRS	Stage increased by 0.12'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.
Taylor Slough	Stage changes ranged from +0.11' to +0.27'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP.
FB- Salinity	Salinity changes ranged -7.0 to -0.5 psu.	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.