

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 21, 2022

**SUBJECT:** Weekly Environmental Conditions for Systems Operations

### **Summary**

#### **Weather Conditions and Forecast**

On Wednesday, a chance of shower activity in the east or southeast is possible in the morning. Scattered showers and thunderstorms may develop over the western half of the SFWMD and possibly reach as far east as the Kissimmee Valley and the southern interior of the SFWMD through Thursday afternoon. However, the Thursday forecast is quite uncertain due to inconsistent model solutions. An arctic front will plunge into north Florida Friday morning, ahead of which light, fast-moving showers are likely to produce a widespread coverage of rainfall. The strong front will reach Lake Okeechobee by the early afternoon and clear the southeast coast of Florida Friday evening, bringing an end to all rain. A very cold and dry air mass behind the front will mean well below normal temperatures this weekend, with the threat of freezing temperatures at least as far south as the northern Kissimmee Valley and the risk for frost over interior sections of the SFWMD around and west/south of Lake Okeechobee Sunday morning if the high cloud cover is not thick enough and the winds are light. A series of upper-air disturbances rotating around an upper-air trough of low pressure located over the eastern U.S. will reinforce the cold weather pattern into early next week with overcast skies prevailing. The same weather pattern will favor the development of widespread rains over the Florida Straits and the western Atlantic Ocean, some of which could reach the Florida Keys and southeastern part of the SFWMD Sunday through Tuesday. For the week ending next Tuesday morning, total SFWMD rainfall is likely to be much above normal, with regional amounts of 150-350% of normal most likely, if today's forecast verifies.

#### **Kissimmee**

In most lakes, stages remain near the top of the regulation schedules, with occasional releases made for local basin runoff. Weekly average discharges on December 18, 2022, at S-65 and S-65A were 1,200 cfs and 1,400 cfs, respectively, both of which were unchanged from the previous week. Mean weekly water depth on the Kissimmee River floodplain stayed about the same from the previous week at 0.58 feet. The weekly

average concentration of dissolved oxygen in the Kissimmee River increased from 4.4 mg/L the previous week to 4.9 mg/L for the week ending December 18, 2022, above both the potentially lethal level and the physiologically stressful range for largemouth bass and other sensitive species.

### **Lake Okeechobee**

Lake Okeechobee stage was 16.41 feet NGVD on December 18, 2022, which is the same as the previous week and 0.14 feet higher than a month ago. Lake stage remained in the Intermediate sub-band and was 0.91 feet above the upper limit of the ecological envelope. According to NEXRAD, 0.71 inches of rain fell directly on the Lake last week. This is the third year in a row Lake stages have exceeded 16 feet NGVD at the beginning of the dry season and is the highest lake stage at this time of year for more than two decades. Average daily inflows (excluding rainfall) decreased from the previous week, going from 2,395 cfs to 2,307 cfs. Average daily outflows (excluding evapotranspiration) also decreased from the previous week going from 1,955 cfs to 1,686 cfs. The most recent satellite image (December 19, 2022) from NOAA's Harmful Algal Bloom Monitoring System showed very patchy low-moderate bloom potential along most of the nearshore areas and very patchy low potential scattered throughout most of the pelagic region of the Lake.

### **Estuaries**

Total inflow to the St. Lucie Estuary averaged 629 cfs over the past week with no flow coming from Lake Okeechobee. Mean surface salinities increased at all sites over the past week. Salinity in the middle estuary was in the optimal range (10-25) for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 2,303 cfs over the past week with 1,143 cfs coming from Lake Okeechobee. Mean surface salinities remained the same at S-79 and increased at the remaining sites in the estuary over the past week. Salinities were in the optimal range (0-10) for tape grass in the upper estuary. Salinities were in the optimal range for adult eastern oysters at Cape Coral (10-25) and in the upper stressed range at Shell Point and Sanibel (>25).

### **Stormwater Treatment Areas**

For the week ending Sunday, December 18, 2022, no Lake Okeechobee water was delivered to the FEBs/STAs. The total amount of Lake releases sent to the FEBs/STAs in WY2023 (since May 1, 2022) is approximately 12,600 ac-feet. The total amount of inflows to the STAs in WY2023 is approximately 972,000 ac-feet. STA cells are at or near target stage. STA-1E Western Flow-way is offline for post-construction vegetation grow in, STA-3/4 Eastern Flow-way is offline for vegetation rehabilitation/drawdown, and STA-2 Flow-way 2 is offline for construction activities. Operational restrictions are in effect in STA-1E Central and Eastern Flow-ways, STA-1W Eastern, Western, and Northern Flow-ways, and STA-2 Flow-ways 3 and 4 for vegetation management activities. This week, there is no capacity for Lake releases in the STAs.

## **Everglades**

Rates of stage-change last week remained in the “fair” or “poor” category as recessions were faster than optimal in WCA-2A and -3A. While one of the shallowest regions in the WCAs, depths are above average in northeastern WCA-3A and maintaining that condition could be important for wading bird nesting in that region. Taylor slough stages fell in the north but increased in the south last week and remains above the pre-Florida Bay initiative average. Average salinity increased again last week in Florida Bay and remains above average. Salinities in the eastern bay moved back into the interquartile range (IQR) last week.

## **Biscayne Bay**

Total inflow to Biscayne Bay averaged 712 cfs and the previous 30-day mean inflow averaged 1,025 cfs. The seven-day mean salinity was 25.0 at BBCW8 and 22.2 at BBCW10, both within the ideal salinity range for estuarine organisms in this region (salinity less than 35). Data provided by Biscayne National Park.

## Supporting Information

### Kissimmee Basin

#### *Upper Kissimmee*

On December 18, 2022, mean daily lake stages were 58.1 feet NGVD (0.1 feet above schedule) in East Lake Toho, 55.1 feet NGVD (0.1 above schedule) in Lake Toho, and 52.7 feet NGVD (0.2 above schedule) in Lakes Kissimmee-Cypress-Hatchineha (KCH) (**Table KB-1, Figures KB-1-3**).

#### *Lower Kissimmee*

For the week ending December 18, 2022, mean weekly discharge was 1,200 cfs at S-65 and 1,400 cfs at S-65A. Mean weekly discharge from the Kissimmee River was 1,600 cfs at both S-65D and S-65E (**Table KB-2**). Mean weekly headwater stages were 46.3 feet NGVD at S-65A and 28.4 feet NGVD at S-65D on December 18, 2022. Mean weekly river channel stage decreased from the previous week's mean of 37.7 feet to 37.6 feet (**Figure KB-4**). Mean weekly water depth on the Kissimmee River floodplain for the week ending December 18, 2022 stayed approximately the same from the previous week at 0.58 feet. (**Table KB-2, Figure KB-5**). The weekly average concentration of dissolved oxygen in the Kissimmee River increased from 4.4 mg/L the previous week to 4.9 mg/L for the week ending December 18, 2022 (**Table KB-2, Figure KB-6**).

#### *Water Management Recommendations*

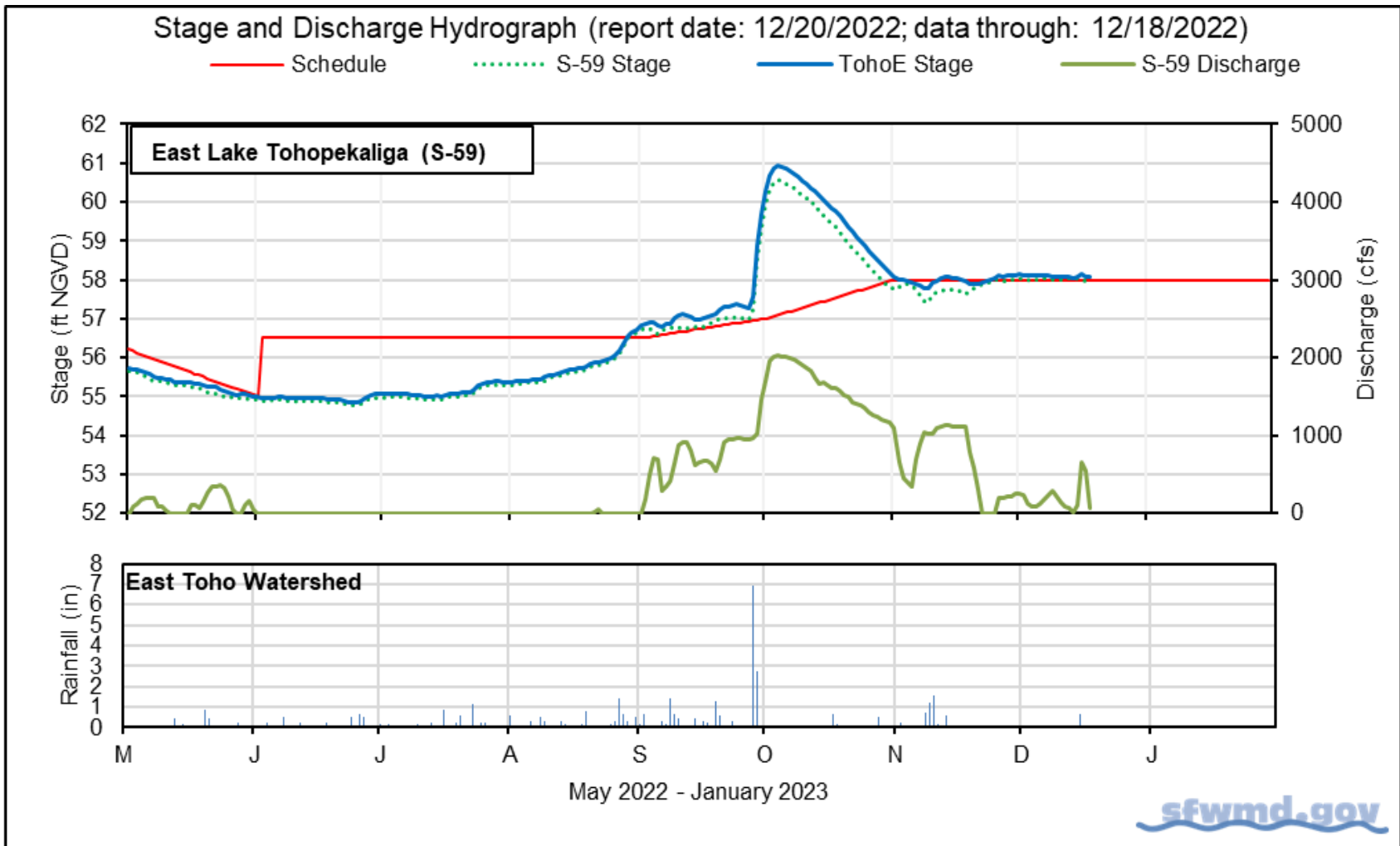
Per the IS-14-50.0 discharge plan, adjust S-65 discharge to maintain a minimum flow of at least 1,400 cfs at S-65A to the Kissimmee River. Note general guidance for discharge and maximum rates of change in discharge (**Figure KB-7**).

**Table KB-1.** Average discharge for the preceding seven days, Sunday's average daily stage and Sunday's average daily departure from KCOL flood regulation lines or temporary schedules. All data are provisional.

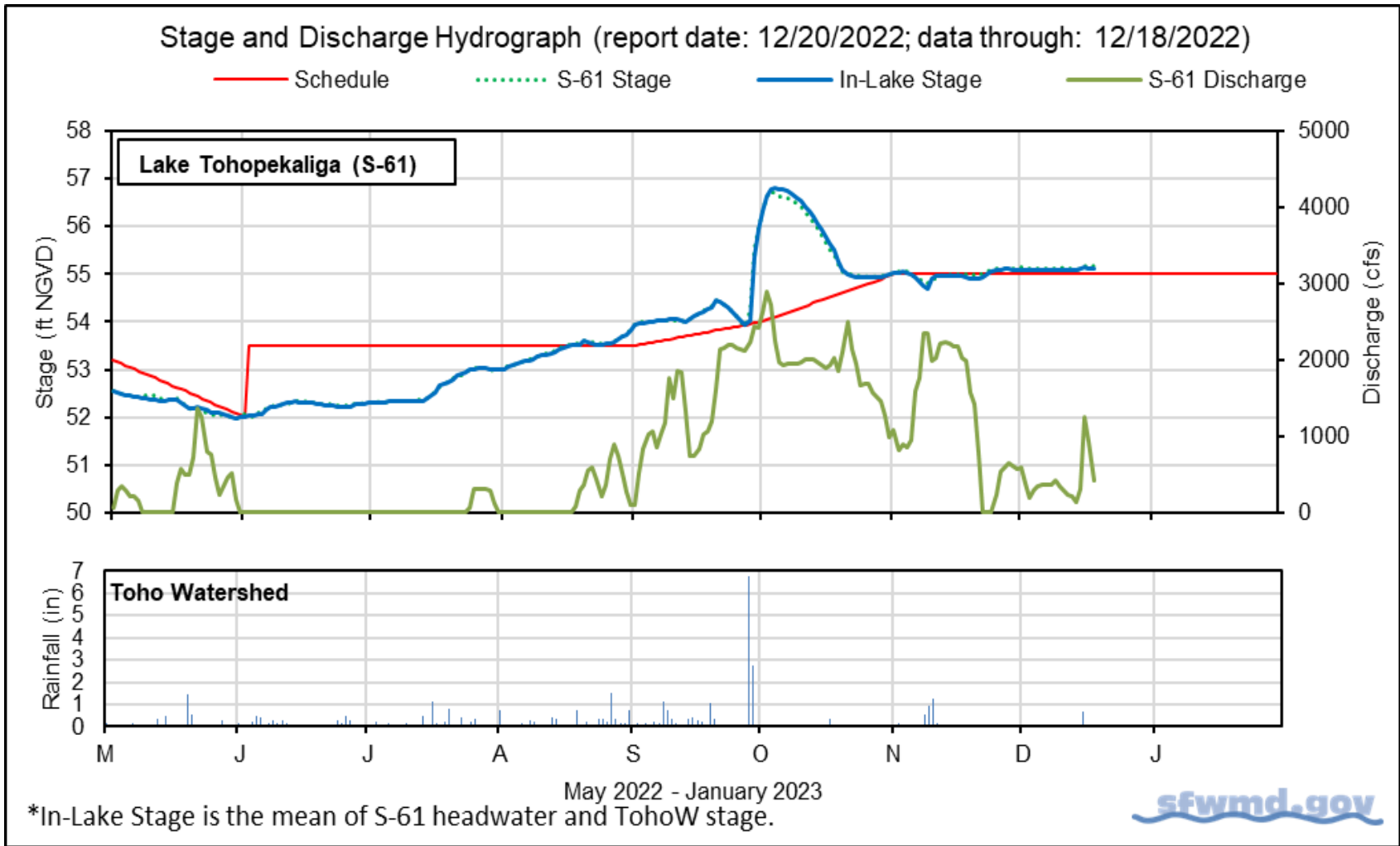
Water Body	Structure	Stage Monitoring Site	Weekly (7-Day) Average Discharge (cfs)	Sunday Lake Stage (feet NGVD) <sup>a</sup>	Schedule Type <sup>b</sup>	Sunday Schedule Stage (feet NGVD)	Sunday Departure from Regulation (feet)	
							12/18/22	12/11/22
Lakes Hart and Mary Jane	S-62	LKMJ	93	61.0	R	61.0	0.0	0.1
Lakes Myrtle, Preston and Joel	S-57	S-57	47	61.9	R	61.8	0.1	0.1
Alligator Chain	S-60	ALLI	69	64.1	R	64.0	0.1	0.1
Lake Gentry	S-63	LKGT	97	61.5	R	61.5	0.0	0.1
East Lake Toho	S-59	TOHOE	220	58.1	R	58.0	0.1	0.1
Lake Toho	S-61	TOHOW S-61	500	55.1	R	55.0	0.1	0.1
Lakes Kissimmee, Cypress and Hatchineha	S-65	KUB011 LKIS5B	1200	52.7	R	52.5	0.2	0.2

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

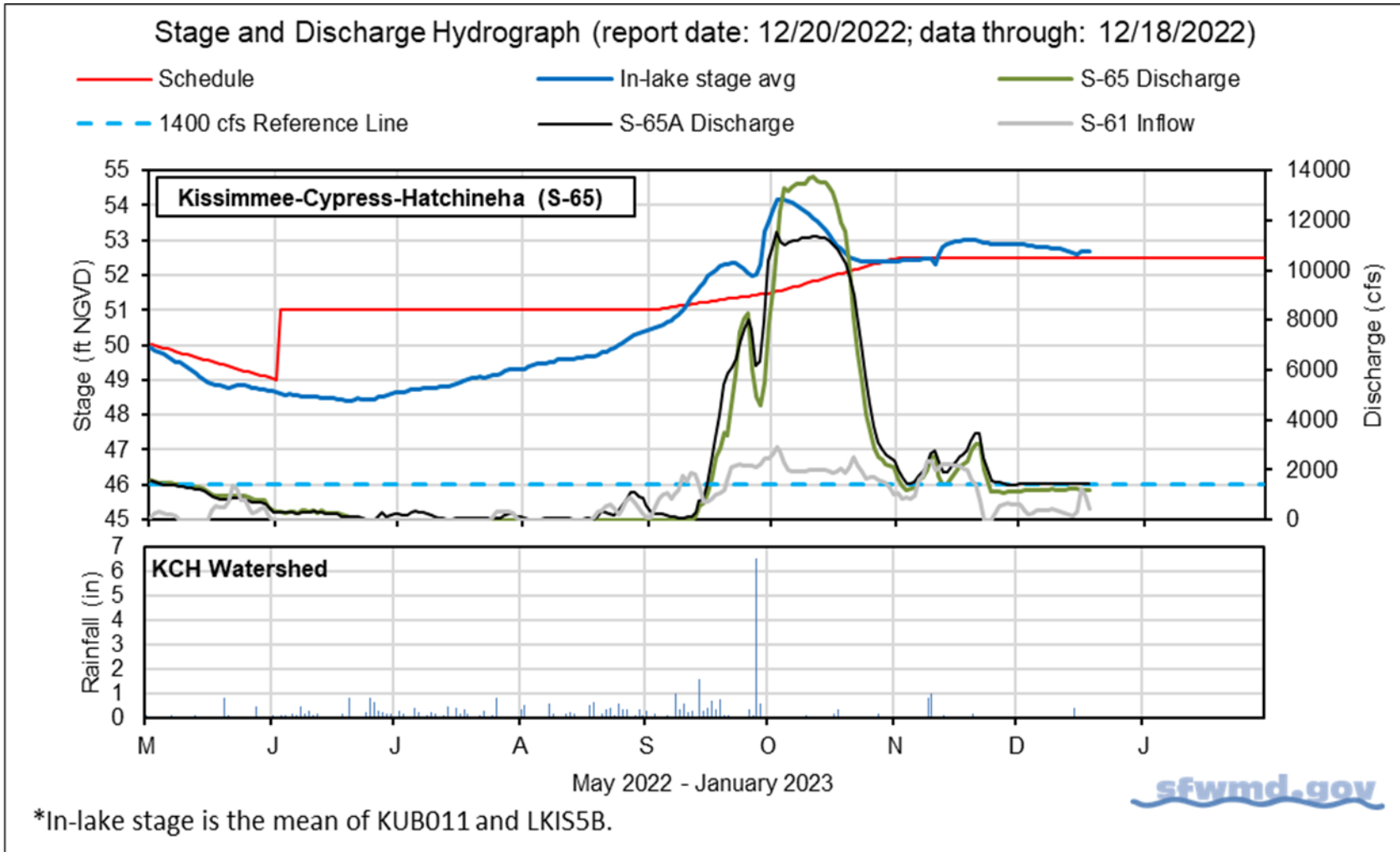
b. A: projected recession line; R: USACE regulation schedule; S: temporary recession target line; T: temporary schedule; NA: not applicable or not available.



**Figure KB-1.** East Lake Toho regulation schedule, stage, discharge and rainfall.



**Figure KB-2.** Lake Toho regulation schedule, stage, discharge and rainfall.



**Figure KB-3.** Lakes Kissimmee, Cypress and Hatchineha regulation schedule, stage, discharge and rainfall.



**Table KB-2.** One- and seven-day average discharge and stage at Lower Kissimmee basin structures, river channel dissolved oxygen concentrations and water depths in the Phase I area floodplain. All data are provisional.

Metric	Location	Sunday Daily Average	Weekly Average for Previous Seven Day Periods			
		12/18/22	12/18/22	12/11/22	12/4/22	11/27/22
Discharge	S-65	1,200	1,200	1,200	1,200	1,600
Discharge	S-65A <sup>a</sup>	1,400	1,400	1,400	1,400	2,000
Headwater Stage (feet NGVD)	S-65A	46.3	46.3	46.3	46.3	46.5
Discharge	S-65D <sup>b</sup>	1,600	1,600	1,700	2,500	3,300
Headwater Stage (feet NGVD)	S-65D <sup>c</sup>	28.4	28.4	28.3	28.3	28.4
Discharge (cfs)	S-65E <sup>d</sup>	1,600	1,600	1,700	2,500	3,400
Discharge (cfs)	S-67	0	0	0	0	0
Dissolved Oxygen (mg/L) <sup>e</sup>	Phase I, II/III river channel	5.2	4.9	4.4	3.6	3.3
River channel mean stage <sup>f</sup>	Phase I river channel	37.6	37.6	37.7	37.9	38.7
Mean depth (feet) <sup>g</sup>	Phase I floodplain	0.60	0.58	0.62	0.87	0.98

a. Combined discharge from main and auxiliary structures.

b. Combined discharge from S-65D, S-65DX1 and S-65DX2.

c. Average stage from S-65D and S-65DX1.

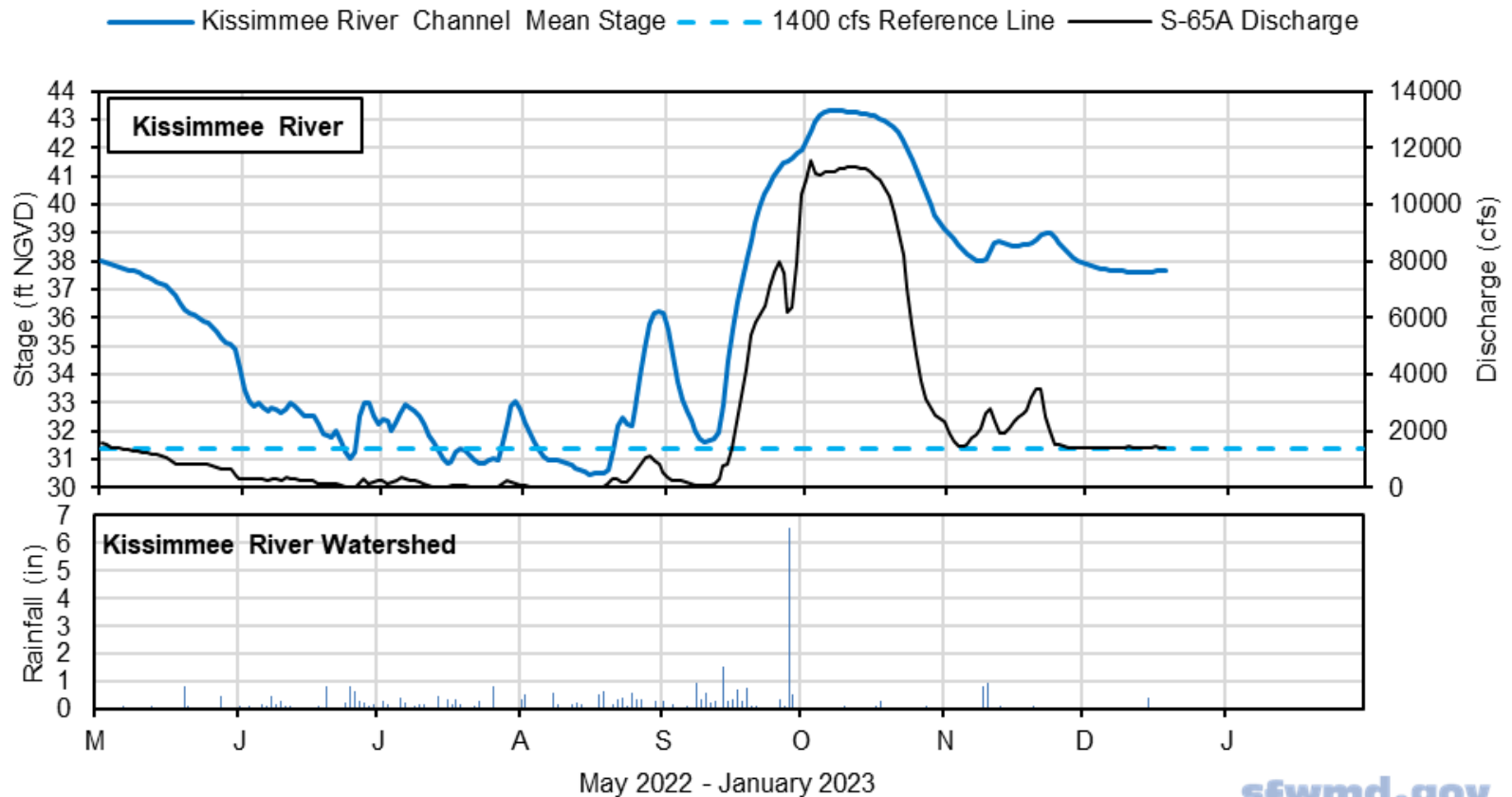
d. Combined discharge from S-65E and S-65EX1.

e. Dissolved oxygen is the average of values from sondes KRBN, PC62, PC33, PD62R and PD42R.

f. Mean of five river channel stations (PC62, KRDR02, KRBN, PC33, PC11) in the Phase I area.

g. One-day spatial average obtained from the South Florida Water Depth Assessment Tool (SFWDAT).

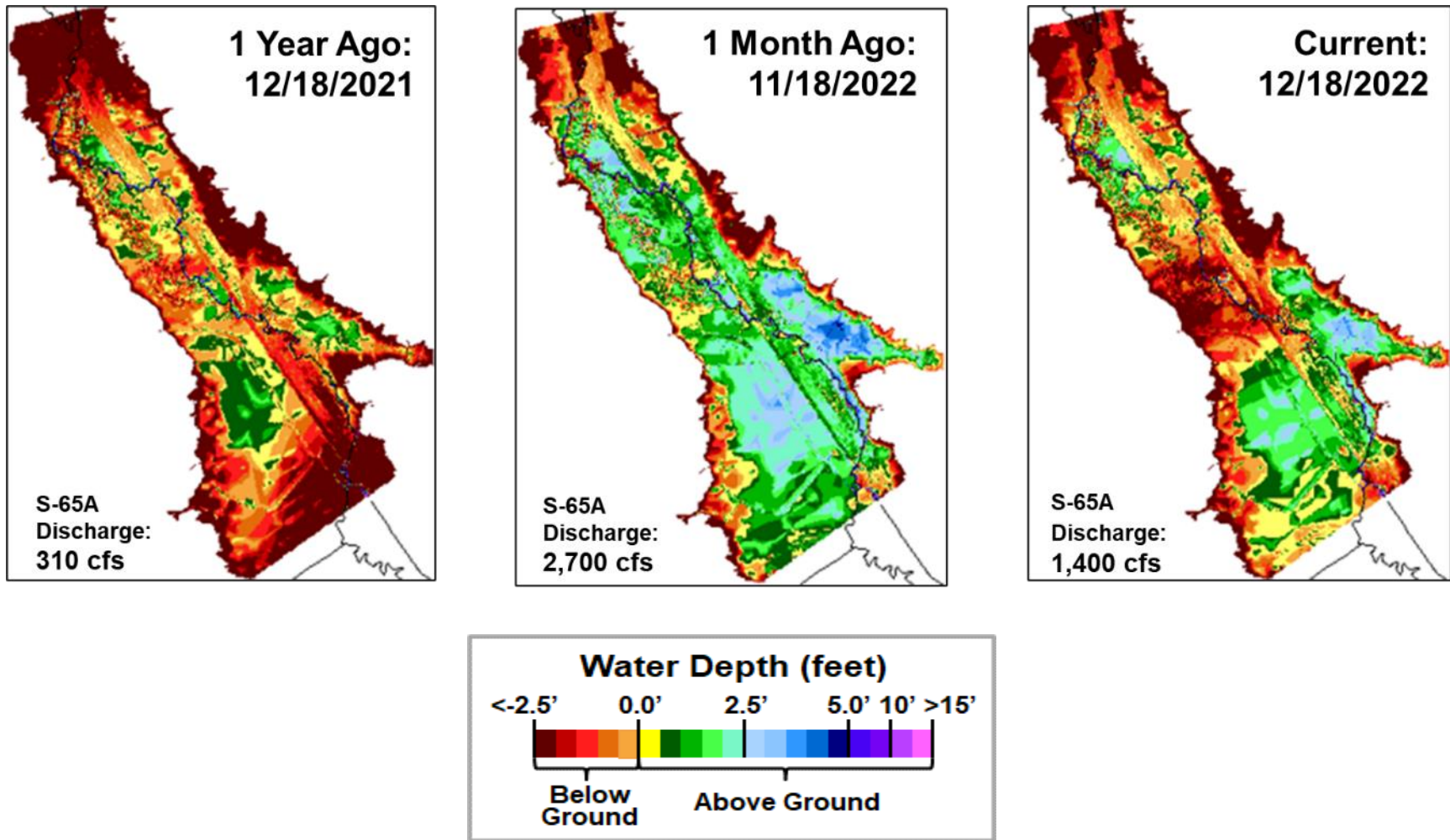
Stage and Discharge Hydrograph (report date: 12/20/2022; data through: 12/18/2022)



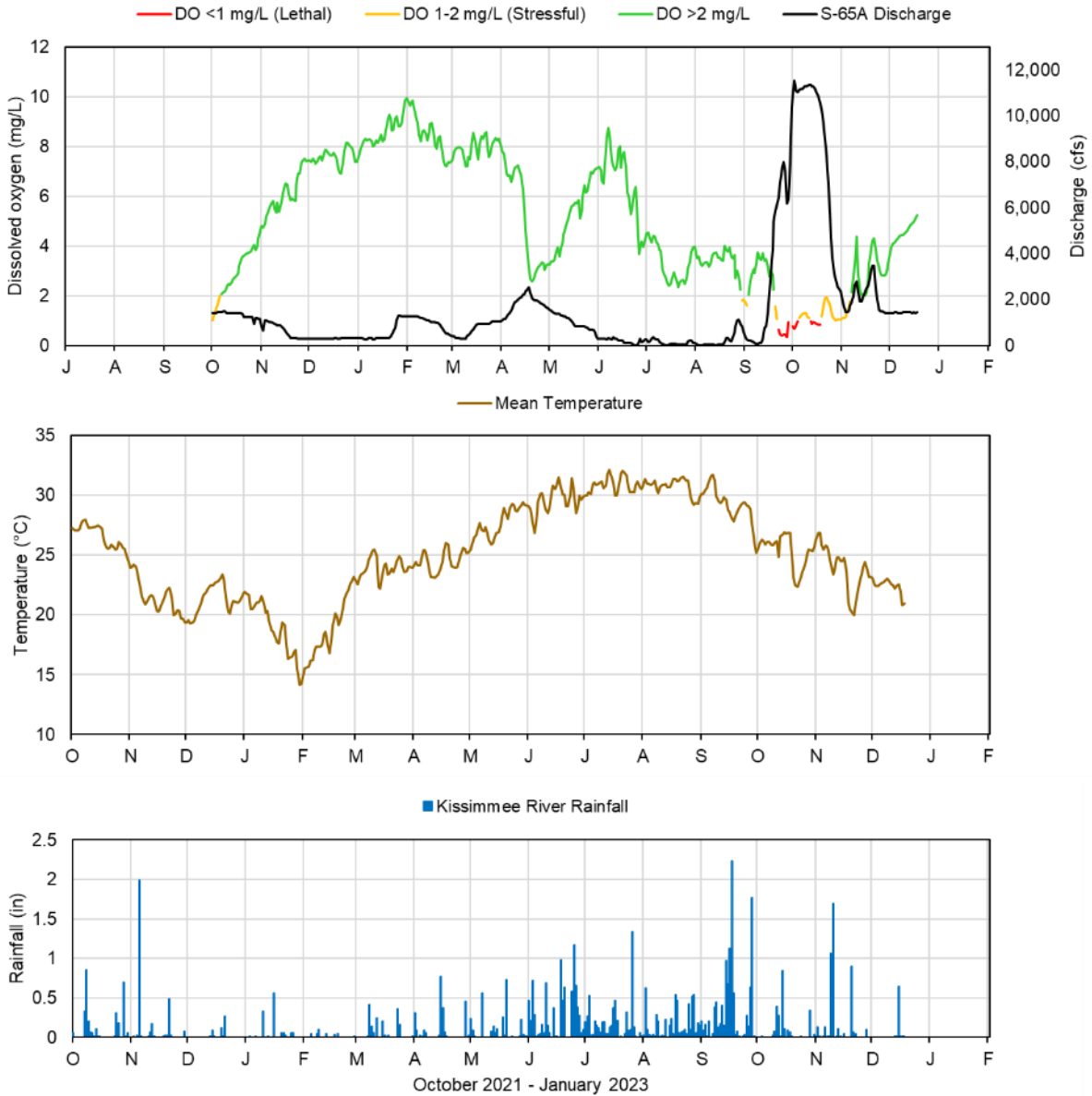
\*River Channel Stage is the average for PC62, KRDR02, KRBN, PC33, and PC11.



Figure KB-4. Kissimmee River stage, discharge and rainfall.



**Figure KB-5.** Phase I area Kissimmee River floodplain water depths (from left to right) one year ago, one month ago and current



Report Date: 12/20/2022; data are through: 12/18/2022



**Figure KB-6.** Restored Kissimmee river channel mean daily dissolved oxygen concentration (mg/L), S-65A discharge (cfs), temperature (°C) and rainfall (inches). Dissolved oxygen (DO) and temperature are mean daily values averaged for PC62, KRDR02, KRBN, PC33, PC11, PD62R, and PD42R with an average of six stations reporting this week. Rainfall values are daily totals for Kissimmee River (Pool BCD) AHED watershed.

**SOUTH FLORIDA WATER MANAGEMENT DISTRICT**

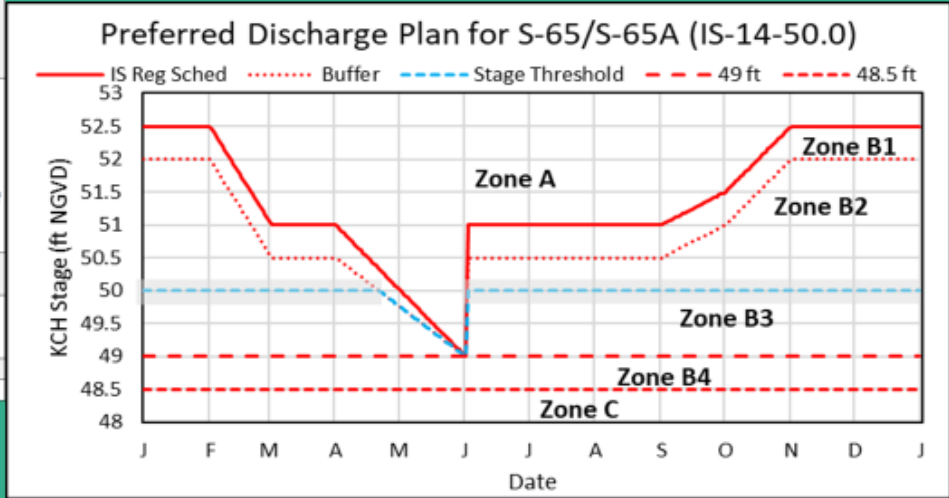
Stage and Discharge Guidance for 2021-2022.		
Zone	KCH Stage (ft NGVD)	S-65/S-65A Discharge*
A	Above regulation schedule line.	Flood control releases as needed with no limits on the rate of discharge change.
B1	In flood control buffer zone (0.5 ft below the schedule line).	Adjust S-65 discharge so that 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 $\pm 0.2$ 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.

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	-600
>3000	1000	-2000

[sfwmd.gov](http://sfwmd.gov)

## 2021-2022 Discharge Plan for S-65/S-65A



**Other Considerations**

- When possible, limit lake ascension rate in the Jun 1 - Aug 15 window to 0.25 ft per 7 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.

Slide Revised 1/3/2022

**Figure KB-7.** IS-14-50 Discharge Plan for S65/S65A with discharge rate of change limits (revised 1/14/19).

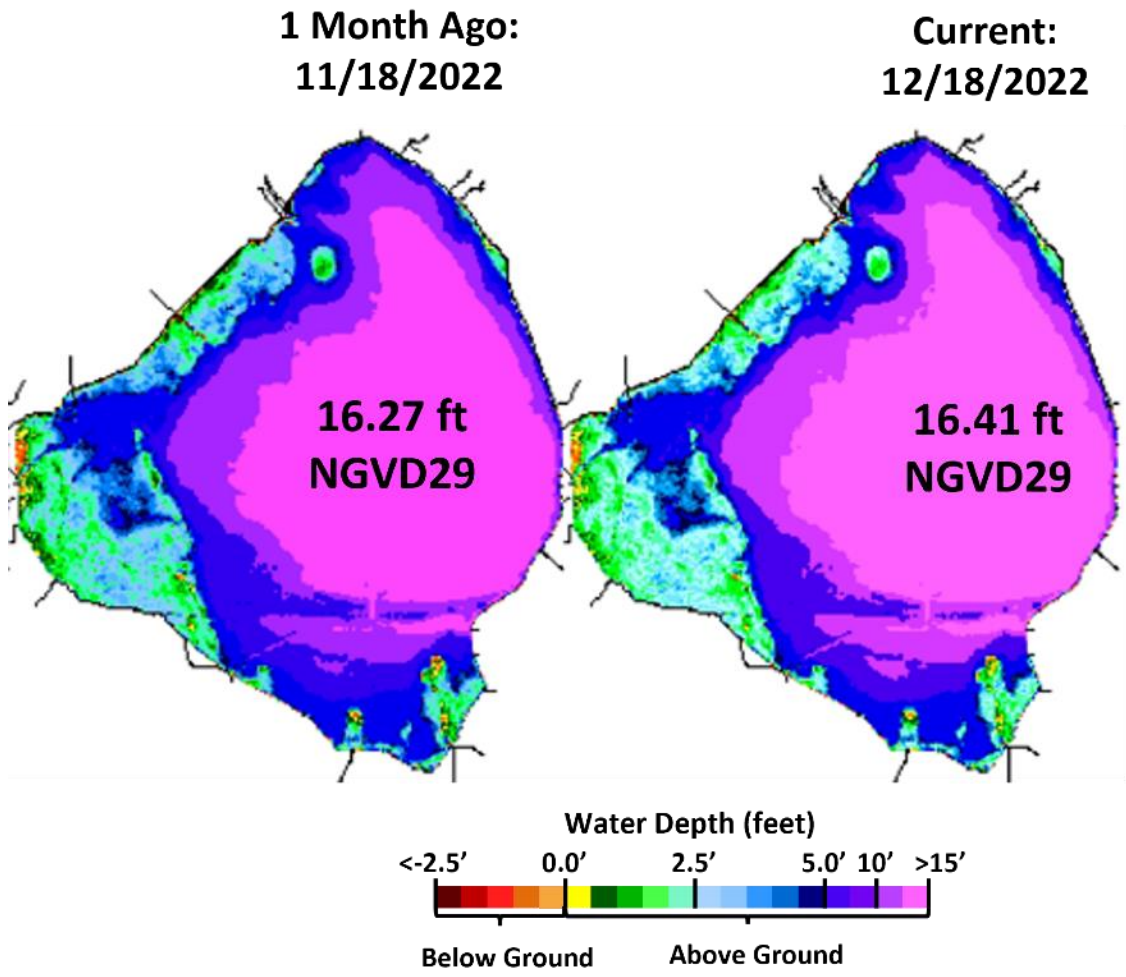
## Lake Okeechobee

Lake Okeechobee stage was 16.41 feet NGVD on December 18, 2022, which is the same as the previous week and 0.14 feet higher than a month ago (**Figure LO-1**). Lake stage remained in the Intermediate sub-band (**Figure LO-2**) and was 0.91 feet above the upper limit of the ecological envelope (**Figure LO-3**). According to NEXRAD, 0.71 inches of rain fell directly on the Lake last week.

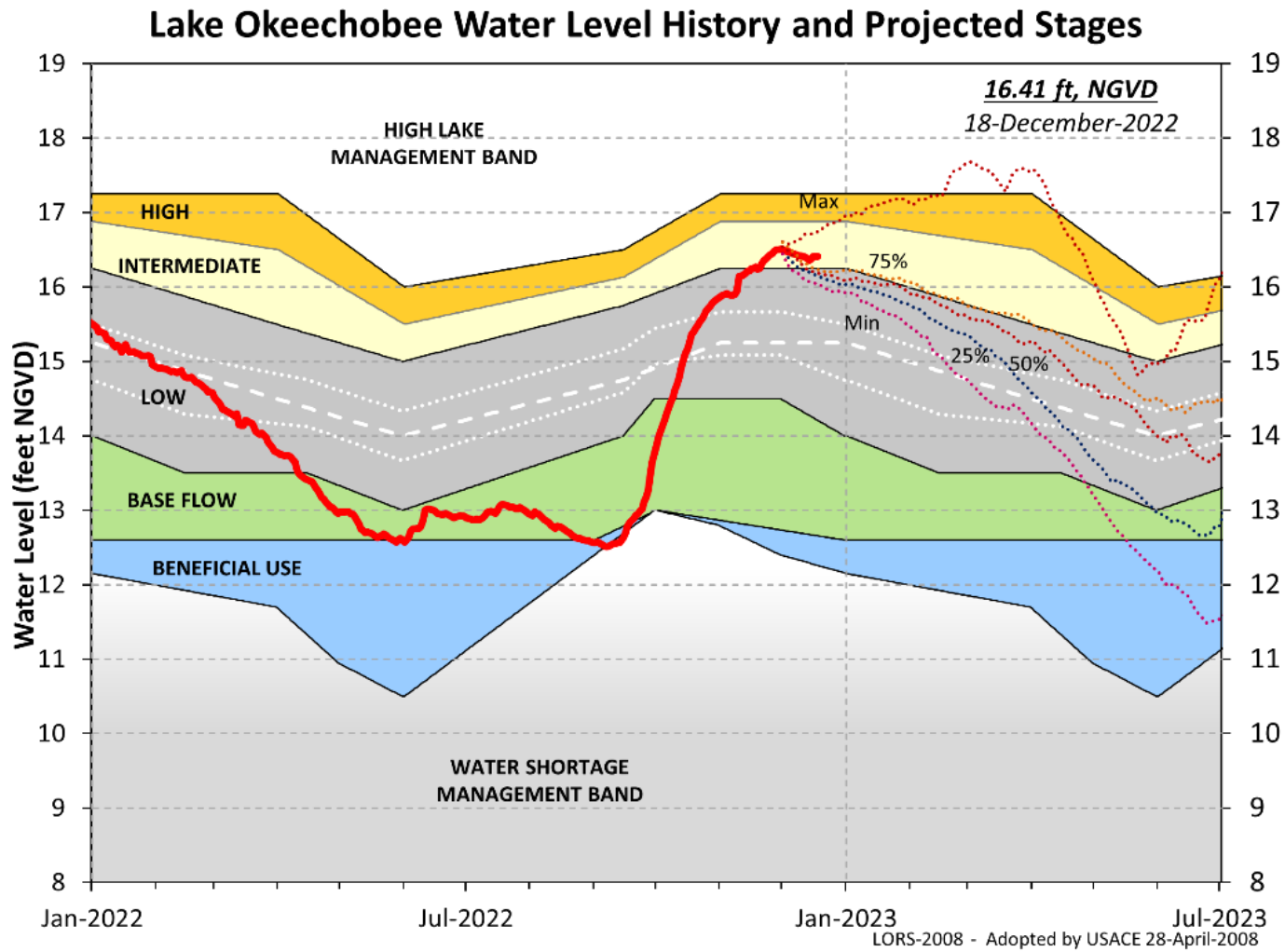
Average daily inflows (excluding rainfall) decreased from the previous week, going from 2,395 cfs to 2,307 cfs. Average daily outflows (excluding evapotranspiration) also decreased from the previous week going from 1,955 cfs to 1,686 cfs. The highest inflow came from the Kissimmee River (C-38 Canal; 1,572 cfs), followed by the S-71 & S-72 structures (291 cfs from Indian Prairie). Outflows to the west via the S-77 structure were reinitiated on November 28 and averaged 1,428 cfs for the week. Outflows to the south via the S-350 structures averaged 252 cfs, and an average of 7 cfs flowed into the L-8 canal through the S-271 structure. There was no flow to the east via the S-308 structure. **Figures LO-4 and LO-5** show the combined average daily inflows and outflows for the Lake over the past eight weeks, and average inflows and outflows last week, respectively. These data are provisional and are subject to change.

The most recent satellite image (December 19, 2022) from NOAA's Harmful Algal Bloom Monitoring System showed low-moderate bloom potential along most of the nearshore areas and very patchy low potential scattered throughout most of the pelagic region of the Lake (**Figure LO-6**).

Water quality monitoring in Lake Okeechobee is now on the non-bloom season (Nov-Apr) sampling schedule, with samples collected monthly at approximately 32 sites. Samples from 9 of these sites are also analyzed for dominant cyanobacteria taxa and certain cyanotoxins. The December 5-7 surveys showed one site with detectable levels of total microcystins (POLESOUT) and one site (S-308C) is pending. Only two sites (6%) had chlorophyll *a* concentrations above 20 µg/L, no sites had > 40 µg/L chlorophyll *a*, and two sites are pending (**Figure LO-7**).



**Figure LO-1.** Lake Okeechobee water depth estimates based on South Florida Water Depth Assessment Tool (SFWDAT).



**Figure LO-2.** Recent Lake Okeechobee stages with projected stages based on a dynamic position analysis.



### Lake Okeechobee Stage vs Ecological Envelope

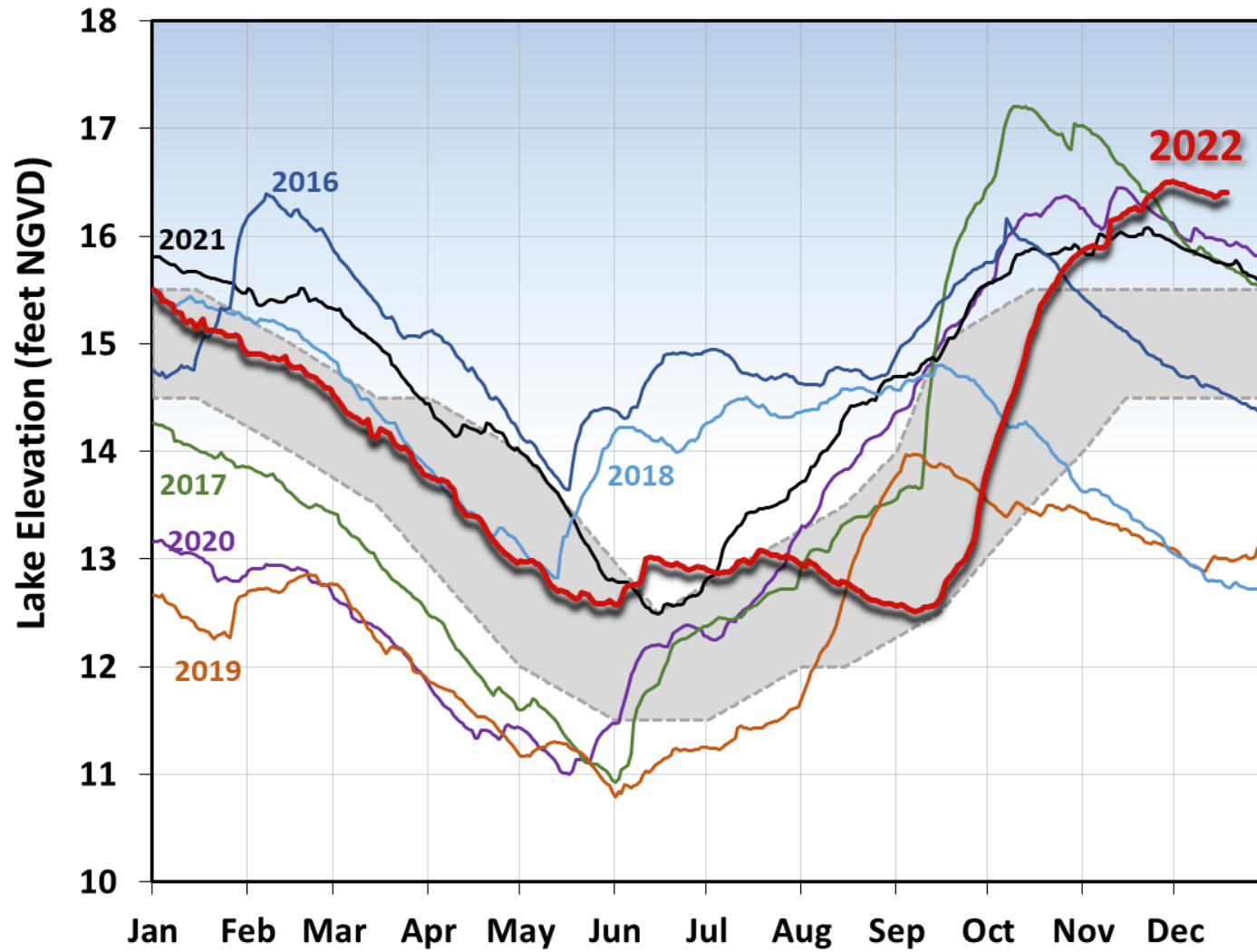
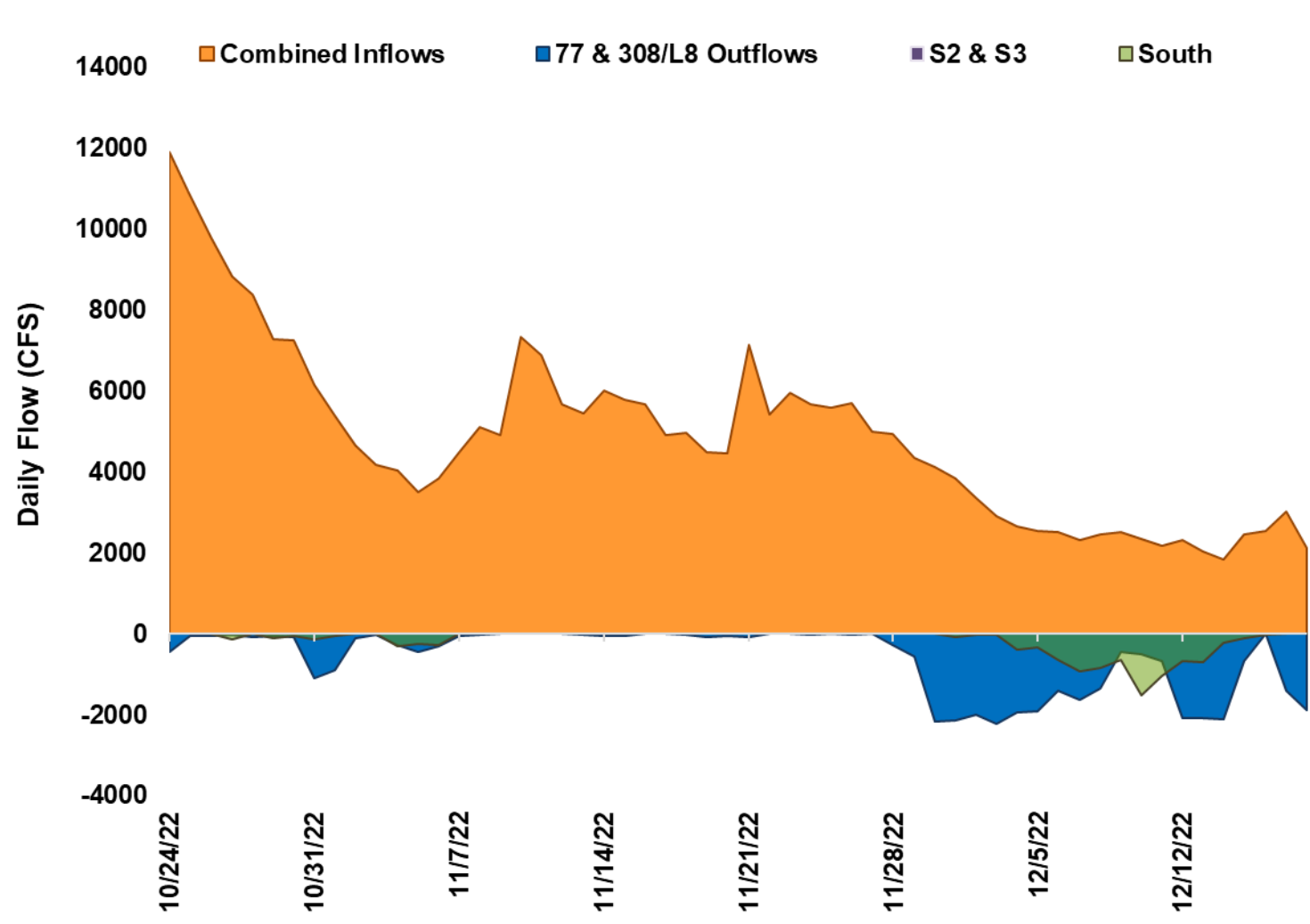


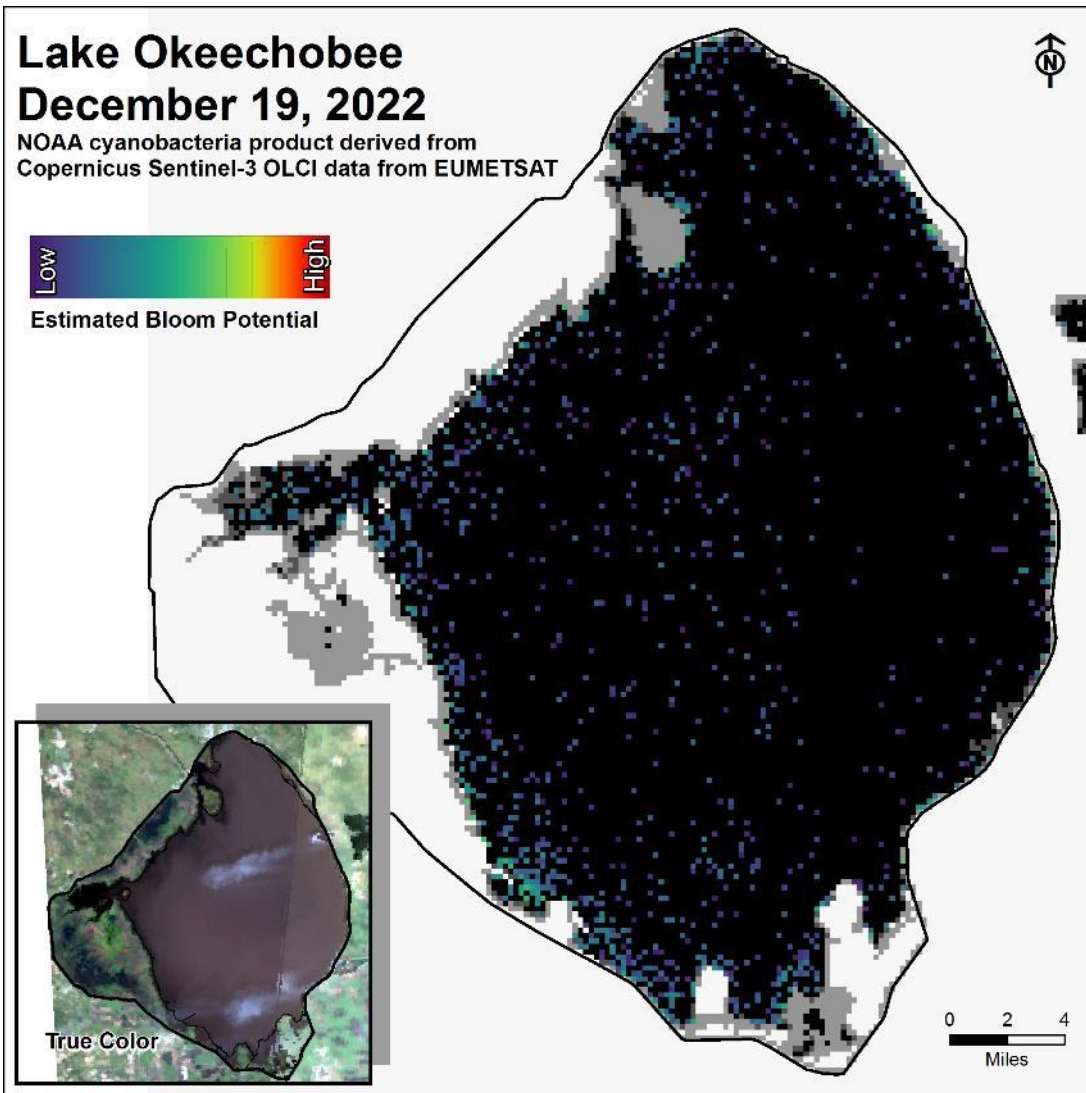
Figure LO-3. The prior six years of annual stage hydrographs for Lake Okeechobee in comparison to the ecological envelope.



**Figure LO-4.** Major inflows (orange) to and outflows east and west (blue) from Lake Okeechobee. Outflows south are shown in green. Flows into Lake Okeechobee from the L-8 canal through S-271 (formerly Culvert 10A) or from the C-44 canal through the S-308 are included as inflows. Conversely, flows from Lake Okeechobee into the L-8 or C-44 canals are included with outflows. Inflows are shown as positive values; outflows are negative. Outflows through the S-77 (Caloosahatchee) and S-308 (C-44 Canal) structures are based on downstream gauges to include flows to lock openings for navigation.



**Figure LO-5.** Inflows into Lake Okeechobee from Indian Prairie basins, Taylor Creek/Nubbin Slough, Kissimmee River and Fisheating Creek, and outflows to the west via S-77, to the east via S-308, to the south via S-351, S-352, S-354, and to southeast via S-271 (formerly Culvert 10A) for the week of December 12 – December 18, 2022.

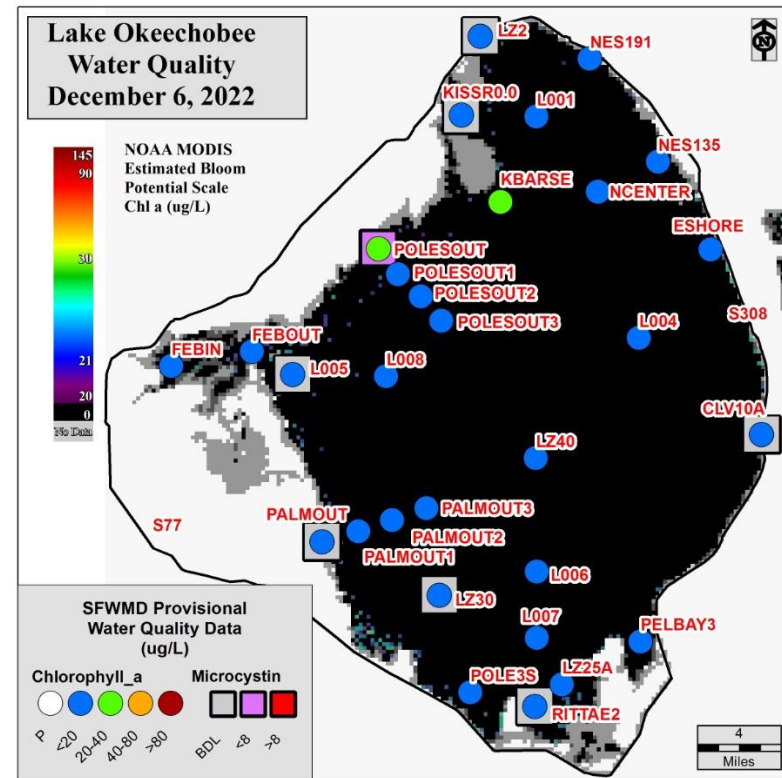


**Figure LO-6.** Cyanobacteria bloom potential on December 19, 2022, based on NOAA's harmful algal bloom monitoring system. Gray color indicates cloud cover.

Collection Date: December 5-7, 2022

Station	CHL <sub>a</sub> (ug/L)	TOXIN (ug/L)	TAXA	Station	CHL <sub>a</sub> (ug/L)	TOXIN (ug/L)	TAXA
FEBIN	4.2			L001	3.7		
FEBOUT	10.0			L004	7.4		
KISSRO.0	5.4	BDL	<i>mixed</i>	L006	4.2		
L005	19.7	BDL	<i>mixed</i>	L007	4.8		
LZ2	4.6	BDL	<i>mixed</i>	L008	6.6		
KBARSE	20.4			LZ30	5.0	BDL	<i>mixed</i>
RITTAE2	8.0	BDL	<i>mixed</i>	LZ40	3.9		
PELBAY3	4.6			CLV10A	3.3	BDL	<i>mixed</i>
POLE3S	7.0			NCENTER	3.4		
LZ25A	5.2						
PALMOUT	16.8	BDL	<i>mixed</i>	S308C	P	P	
PALMOUT1	8.7			S77	P		
PALMOUT2	7.8						
PALMOUT3	5.1						
POLESOUT	30.5	0.3	<i>mixed</i>				
POLESOUT1	15.9						
POLESOUT2	6.1						
POLESOUT3	6.8						
EASTSHORE	7.3						
NES135	3.6						
NES191	2.1						

- SFWMD considers >40 µg/L Chlorophyll<sub>a</sub> (Chl<sub>a</sub>) an algal bloom
- BDL – Below Detectable Limit of 0.25 µg/L
- ND – No Dominant taxa
- P – Pending
- NS – Not Sampled
- Station bold font – crew observed possible BGA
- Chlorophyll *a* analyzed by SFWMD
- Toxin and Taxa analyzed by FDEP: *Microcys* = *Microcystis*; *Cylindro* = *Cylindrospermopsis*; *Planktol* = *Planktolyngbya*; *Dolicho* = *Dolichospermum*



**Figure LO-7.** Lake Okeechobee water quality results for chlorophyll *a* samples collected from 32 sites, and cyanobacteria taxa/toxin samples at 9 sites, from December 5-7, 2022. Note: Data are still Pending at S-308C and S-77.

## Estuaries

### ***St. Lucie Estuary***

Over the past week, mean total inflow to the St. Lucie Estuary was 629 cfs (**Figures ES-1 and ES-2**) and the previous 30-day mean inflow was 1,212 cfs. For comparison, the historical provisional mean inflows from the contributing areas are shown in **Figure ES-2**.

Over the past week, surface salinities increased at all sites within the estuary (**Table ES-1 and Figure ES-3**). The seven-day moving average of the surface and bottom salinities at the US1 Bridge was 17.1. Salinity conditions in the middle estuary were estimated to be within the optimal range for adult eastern oysters (**Figure ES-4**). The mean larval oyster recruitment rate reported by the Fish and Wildlife Research Institute (FWRI) was 0.6 spat/shell for November (**Figure ES-5**).

### ***Caloosahatchee River Estuary***

Over the past week, mean total inflow to the Caloosahatchee River Estuary was 2,303 cfs (**Figures ES-6 and ES-7**) and the previous 30-day mean inflow was 1,968 cfs. For comparison, the historical provisional mean inflows from the contributing areas are shown in **Figure ES-7**.

Please note the surface sensor at the Sanibel site may be malfunctioning, so reported values may be incorrect. The sensor will be retrieved and evaluated in early January. Over the past week, surface salinities remained the same at S-79 and increased at the remaining sites in the estuary (**Table ES-2 and Figures ES-8 and ES-9**). The seven-day mean salinities (**Table ES-2**) were in the optimal range (0-10) for tape grass in the upper estuary. The seven-day mean salinity values were within the optimal range for adult eastern oysters at Cape Coral, and in the stressed range at Shell Point and Sanibel (**Figure ES-10**). Oyster recruitment data in the CRE are not available at this time; FWRI will redeploy recruitment collectors once water quality conditions improve.

Surface salinity at Val I-75 was forecast for the next two weeks, using an autoregression model (Qiu and Wan, 2013<sup>1</sup>) coupled with a linear reservoir model for the tidal basin. Model scenarios included pulse releases at S-79 ranging from 0 to 1,500 cfs, and a steady release at 2,000 cfs with estimated tidal basin inflows of 452 cfs. Model results from all scenarios predict daily salinity to be 1.0 or lower and the 30-day moving average surface salinity to be 0.7 or lower at Val I-75 at the end of the two-week period (**Table ES-3 and Figure ES-11**). This keeps predicted salinities in the upper estuary within the optimal salinity range (0-10) for tape grass.

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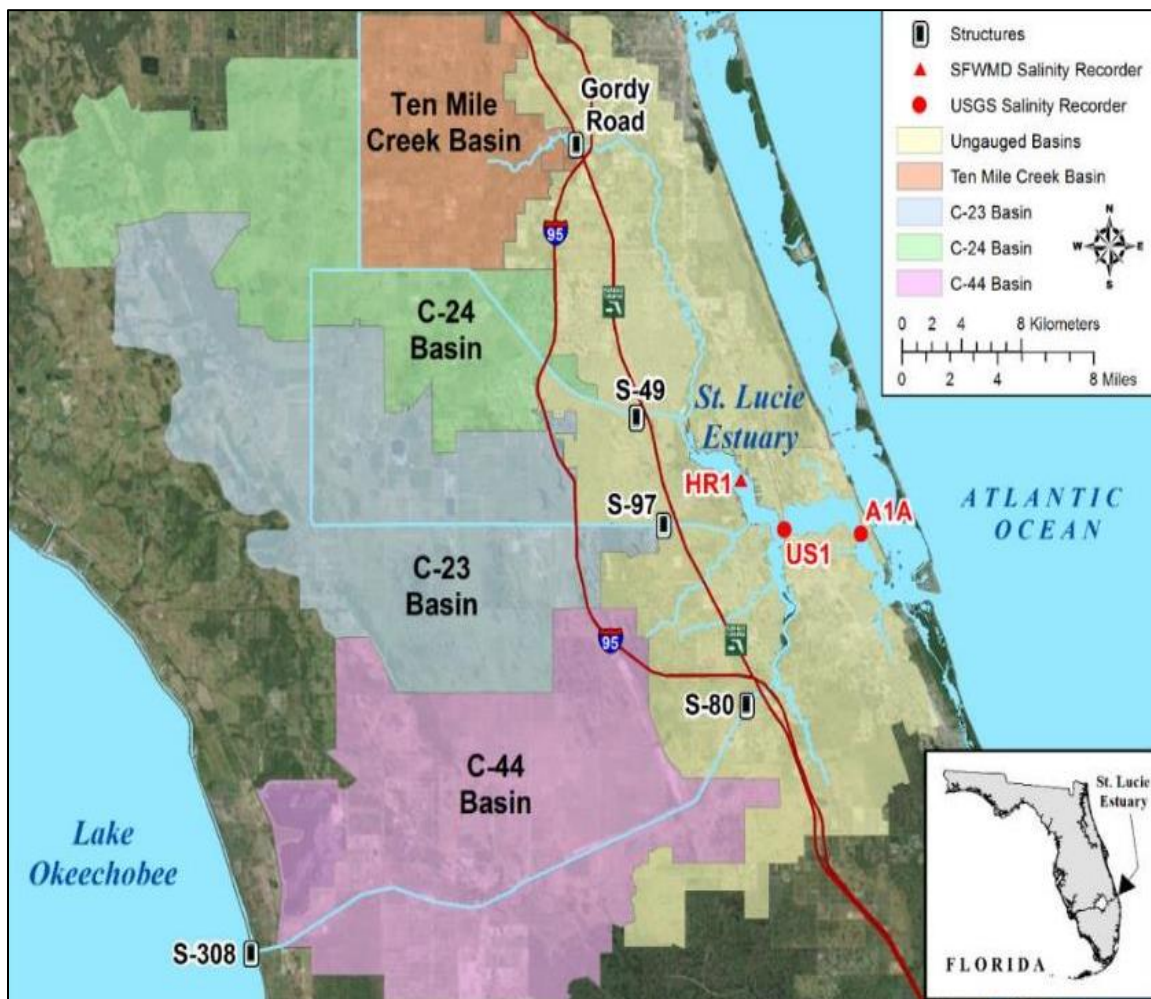
<sup>1</sup> Qui, C., and Y. Wan. 2013. Time series modeling and prediction of salinity in the Caloosahatchee River Estuary. *Water Resources Research* 49:5804-5816.

## Red Tide

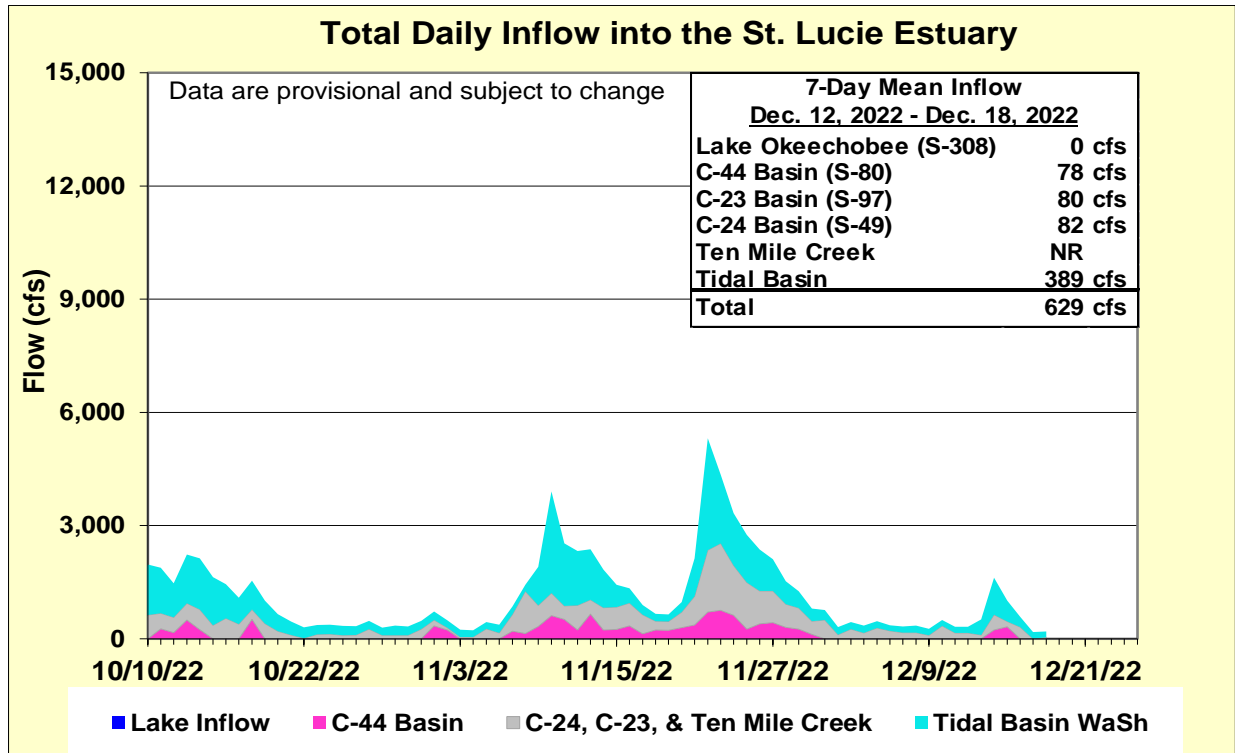
The Florida Fish and Wildlife Research Institute reported on December 16, 2022, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed at bloom concentrations in samples collected from Charlotte and Monroe counties over the past week. On the east coast, red tide was not observed in samples from Palm Beach or Miami-Dade counties.

## Water Management Recommendations

Lake stage is in the Intermediate Sub-Band. Tributary conditions are normal. The LORS2008 release guidance suggests up to 4,000 cfs release at S-77 to the Caloosahatchee River Estuary and up to 1,800 cfs release at S-80 to the St. Lucie Estuary.



**Figure ES-1.** Basins, water control structures and salinity monitoring sites in the St. Lucie Estuary.

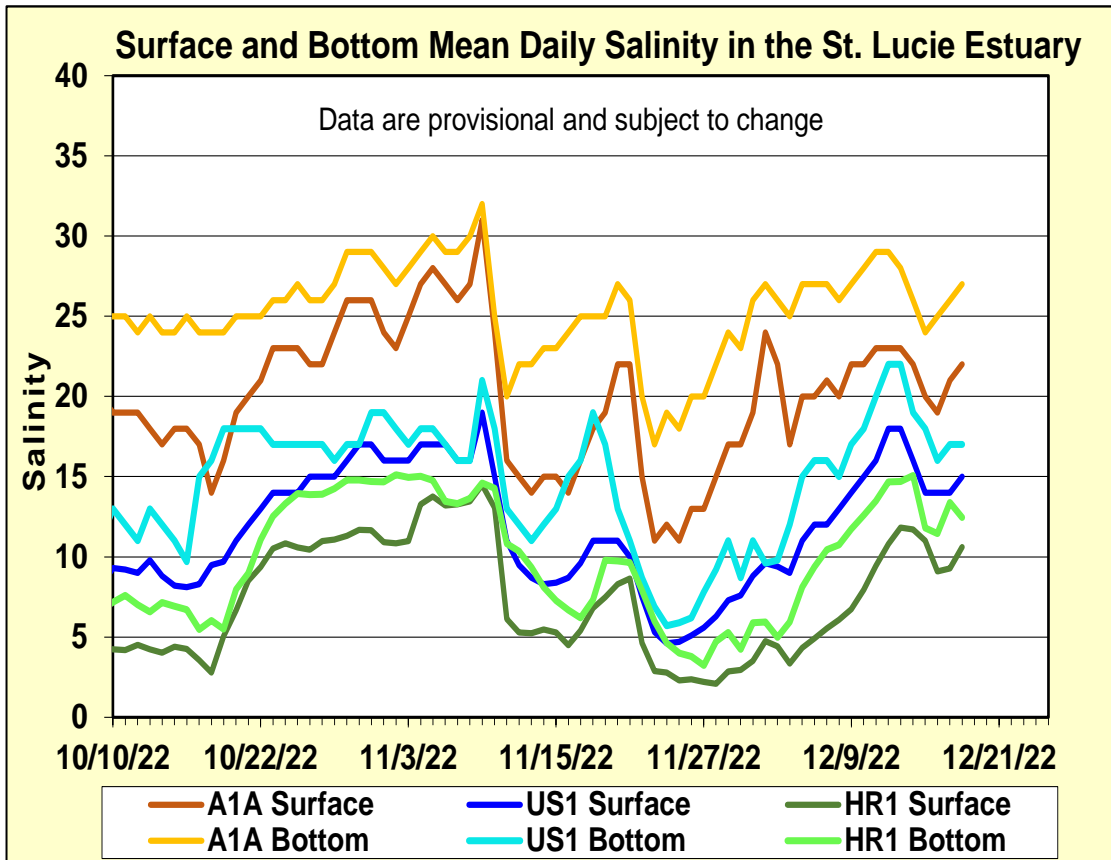


**Figure ES-2.** Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and Tidal Basins into the St. Lucie Estuary.

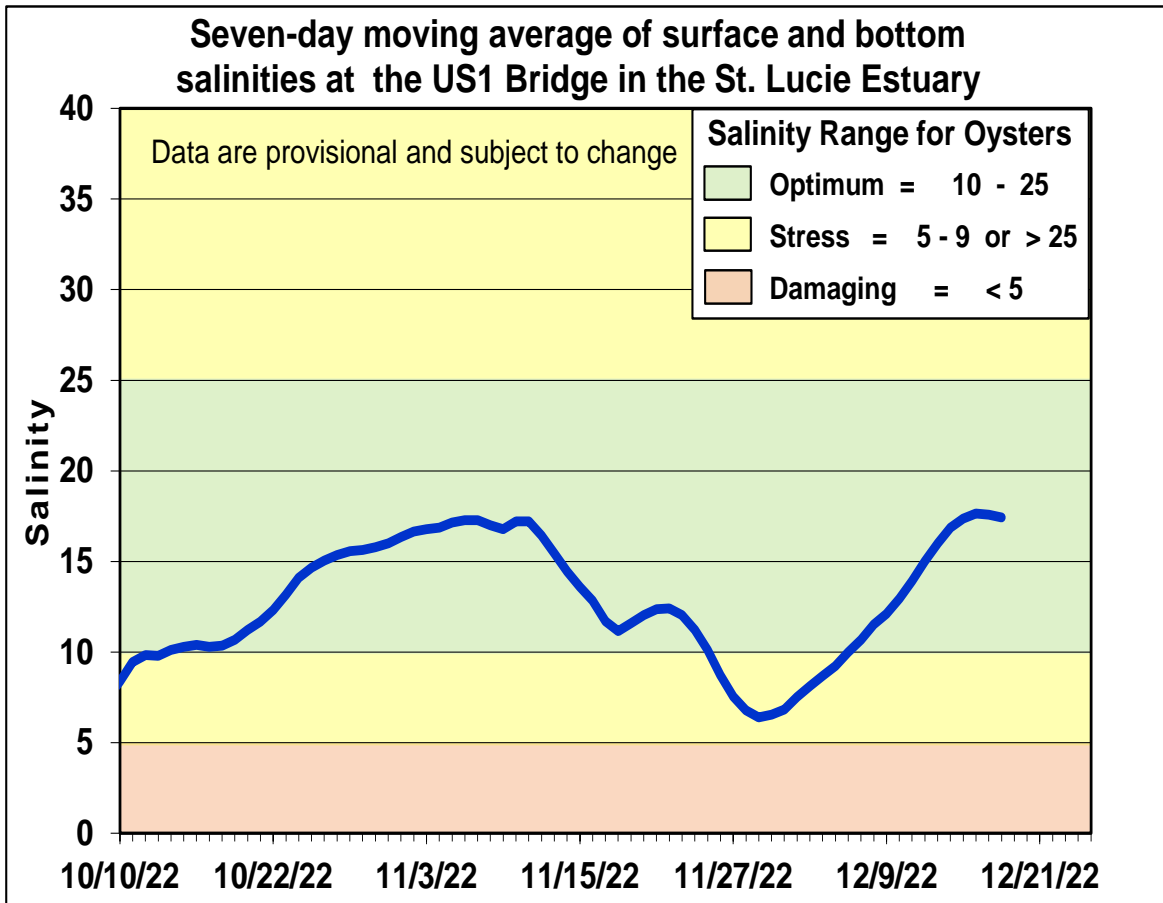
**Table ES-1.** Seven-day mean salinity at oyster monitoring sites in the St. Lucie Estuary. Current means are in bold font; previous week's means are in parentheses. The envelope reflects the optimum salinity range for adult eastern oysters (*Crassostrea virginica*) in the estuary. Data are provisional.

Sampling Site	Surface	Bottom	Optimum Envelope
HR1 (North Fork)	<b>10.6</b> (6.4)	<b>13.4</b> (10.9)	10.0 – 25.0
US1 Bridge	<b>15.6</b> (13.3)	<b>18.7</b> (16.7)	10.0 – 25.0
A1A Bridge	<b>21.4</b> (21.1)	<b>26.4</b> (27.3)	10.0 – 25.0

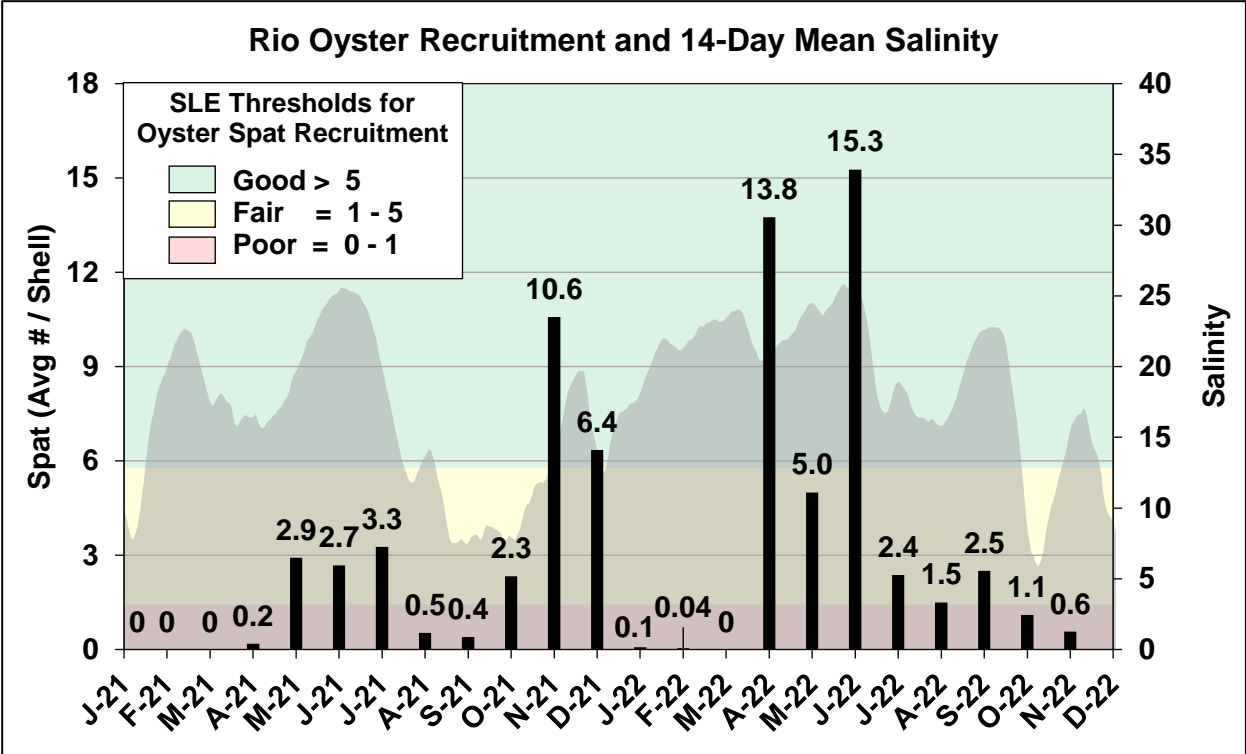




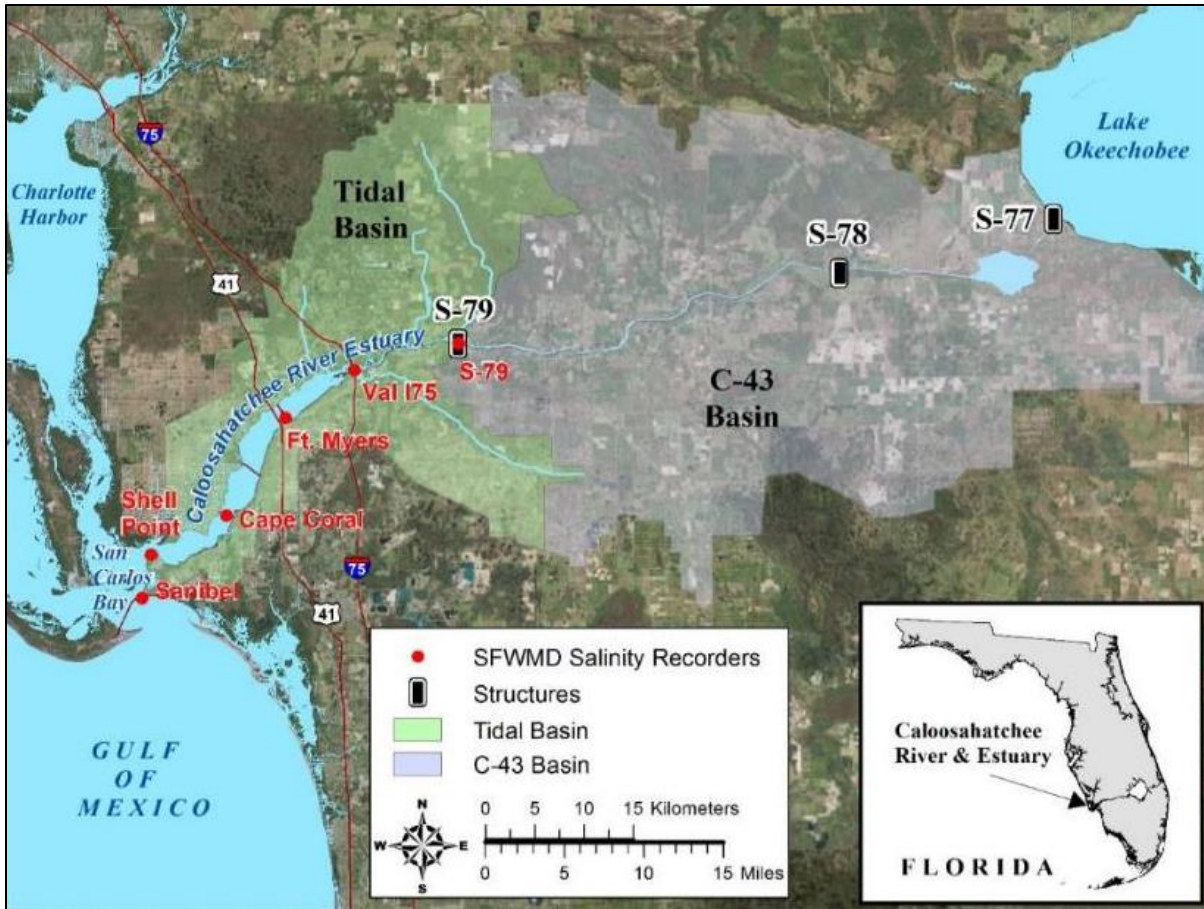
**Figure ES-3.** Mean daily salinity at the A1A, US1 and HR1 sites in the St. Lucie Estuary.



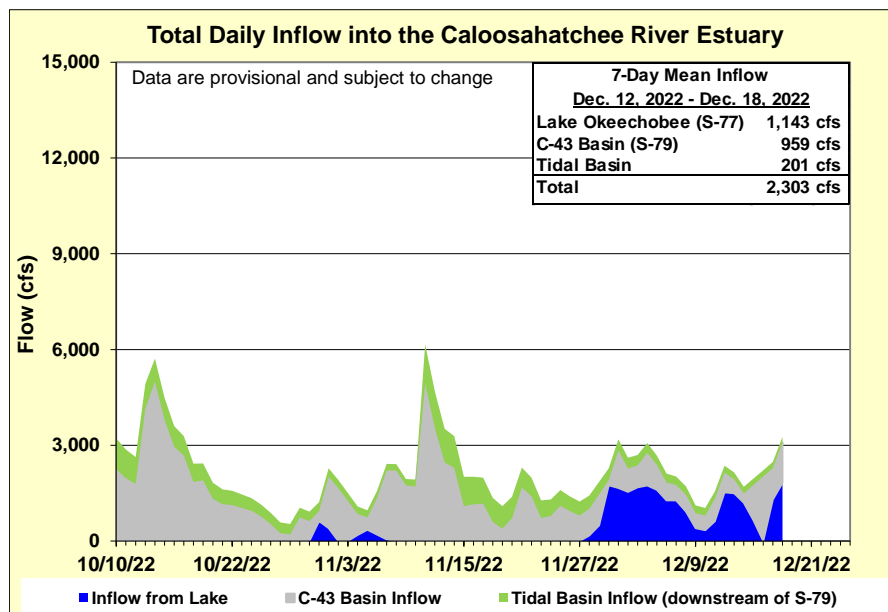
**Figure ES-4.** Seven-day moving average of the surface and bottom salinities at the US1 Bridge in the St. Lucie Estuary.



**Figure ES-5.** Mean oyster recruitment at the Rio oyster monitoring station and 14-day mean salinity at US1 Bridge.



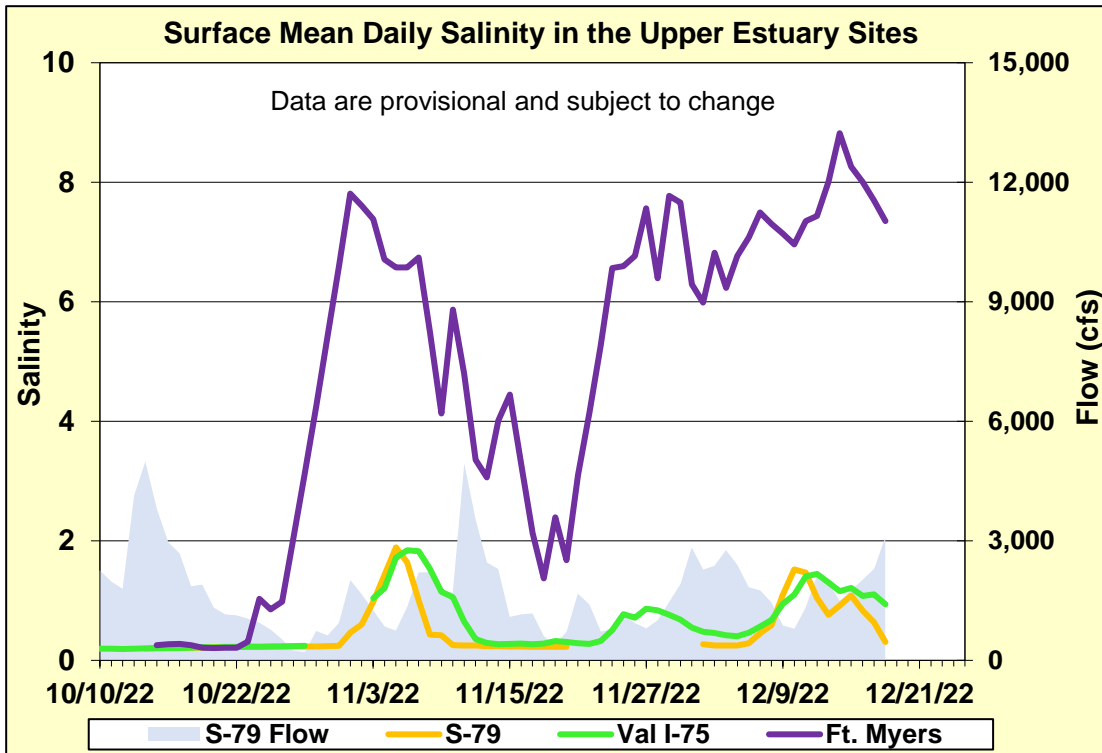
**Figure ES-6.** Basins, water control structures and salinity monitoring sites in the Caloosahatchee River Estuary.



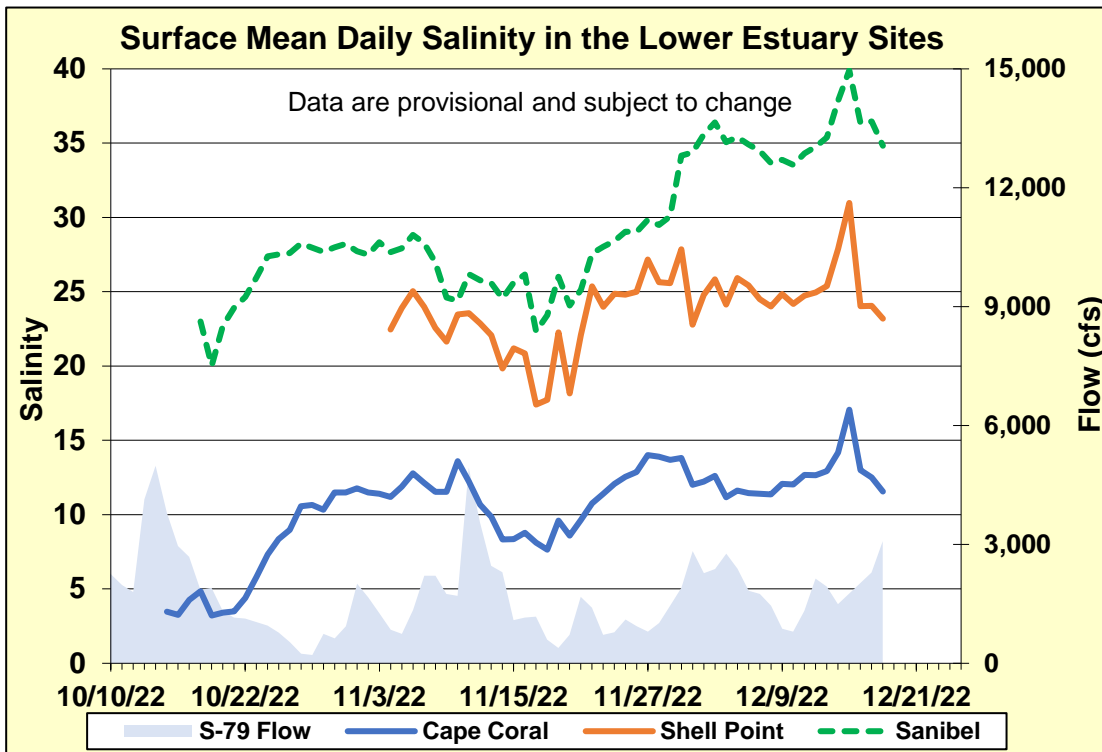
**Figure ES-7.** Total daily inflows from Lake Okeechobee, and runoff from the C-43 and Tidal basins into the Caloosahatchee River Estuary.

**Table ES-2.** Seven-day mean salinity at six monitoring sites in the Caloosahatchee River Estuary. Current means are in bold font; previous week's means are in parentheses. The envelope in the upper estuary sites is for the protection of tape grass and the envelope in the lower estuary is the optimum salinity range for adult eastern oysters (*Crassostrea virginica*). Data are provisional.

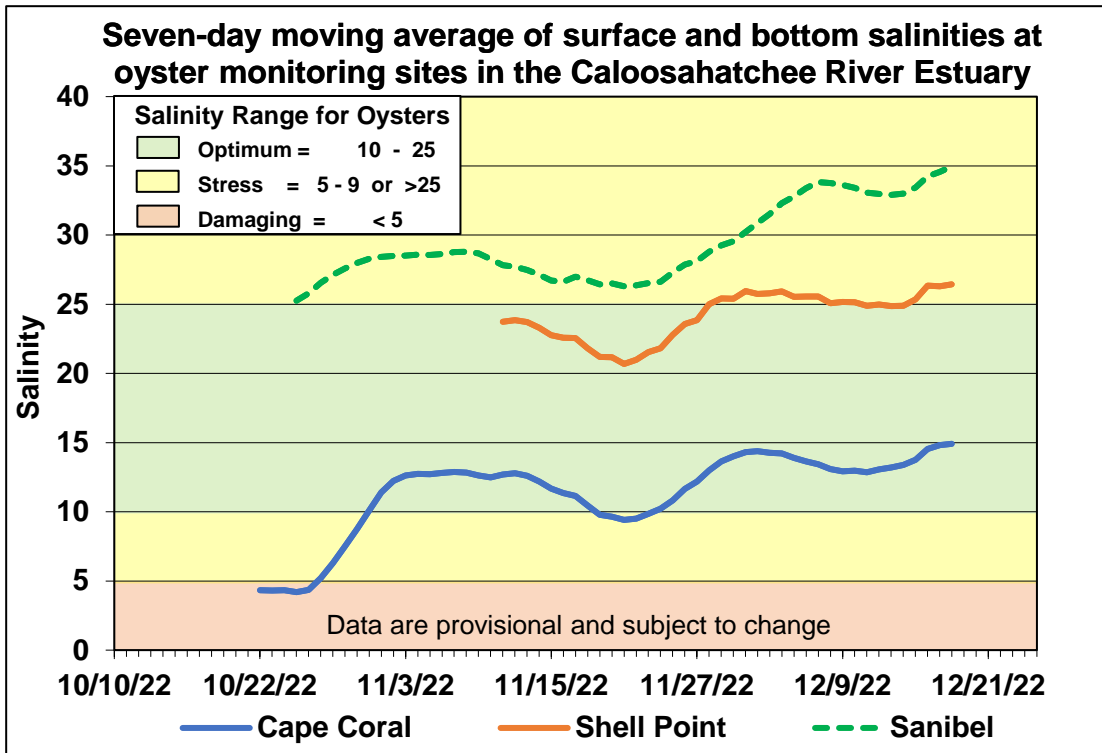
Sampling Site	Surface	Bottom	Optimum Envelope
S-79 (Franklin Lock)	<b>0.8</b> (0.8)	<b>0.8</b> (0.9)	0.0 – 10.0
Val I-75	<b>1.2</b> (0.8)	<b>1.7</b> (1.9)	0.0 – 10.0
Fort Myers Yacht Basin	<b>7.9</b> (7.2)	<b>9.3</b> (8.3)	0.0 – 10.0
Cape Coral	<b>13.4</b> (11.8)	<b>16.1</b> (14.3)	10.0 – 25.0
Shell Point	<b>25.8</b> (24.8)	<b>26.7</b> (25.1)	10.0 – 25.0
Sanibel	<b>36.5</b> (34.3)	<b>33.6</b> (31.6)	10.0 – 25.0



**Figure ES-8.** Mean daily salinity at upper Caloosahatchee River Estuary monitoring sites and mean daily flow at S-79.



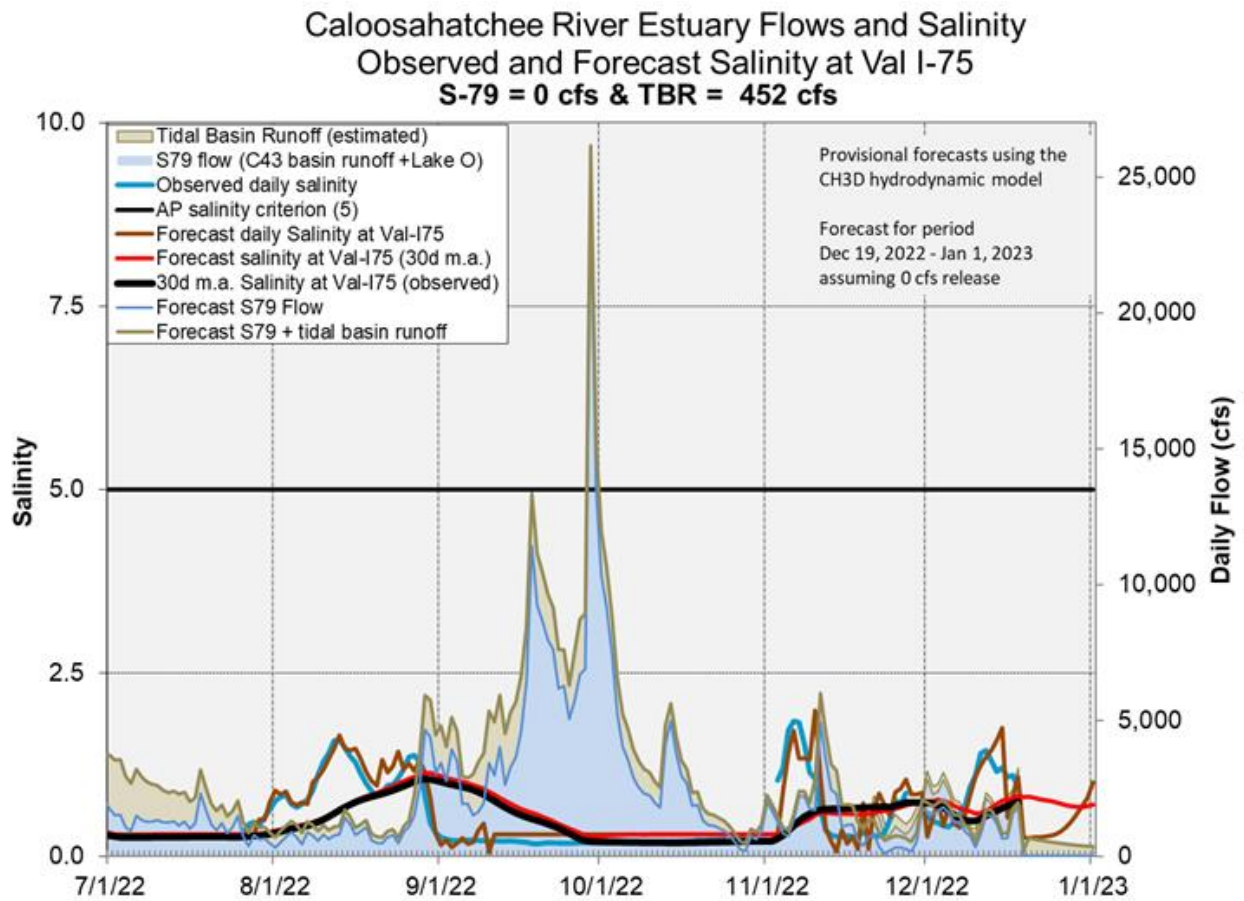
**Figure ES-9.** Mean daily surface salinity at lower Caloosahatchee River Estuary monitoring sites and mean daily flow at S-79.



**Figure ES-10.** Seven-day moving average of surface and bottom salinities at Cape Coral, Shell Point and Sanibel monitoring sites in the Caloosahatchee River Estuary.

**Table ES-3.** Predicted salinity at Val I-75 in the Caloosahatchee River Estuary at the end of the forecast period for various S-79 flow release scenarios.

Scenario	Simulated S-79 Flow (cfs)	Tidal Basin Runoff (cfs)	Daily Salinity	30-Day Mean Salinity
A	0	452	1.0	0.7
B	450	452	0.5	0.6
C	750	452	0.4	0.6
D	1000	452	0.3	0.6
E	1500	452	0.3	0.6
F	2000	452	0.3	0.6



**Figure ES-11.** Forecasted Val I-75 site surface salinity assuming no pulse release at S-79.



## **Stormwater Treatment Areas**

**STA-1E:** STA-1E Western Flow-way is offline for post-construction vegetation grow in. Operational restrictions are in place in STA-1E Central and Eastern Flow-ways for vegetation management activities. Online treatment cells are at or near target stage and vegetation in the flow-ways is stressed and highly stressed. The 365-day phosphorus loading rates (PLRs) are high for the Eastern and Central Flow-way (**Figure S-1**).

**STA-1W:** Operational restrictions are in place in STA-1W Western, Eastern, and Northern Flow-ways for vegetation management activities. Treatment cells are at target stage. Vegetation in the flow-ways is stressed and highly stressed. The 365-day PLR for the Eastern Flow-way is below 1.0 g/m<sup>2</sup>/year. The 365-day PLRs for the Northern and Western Flow-way are high (**Figure S-2**).

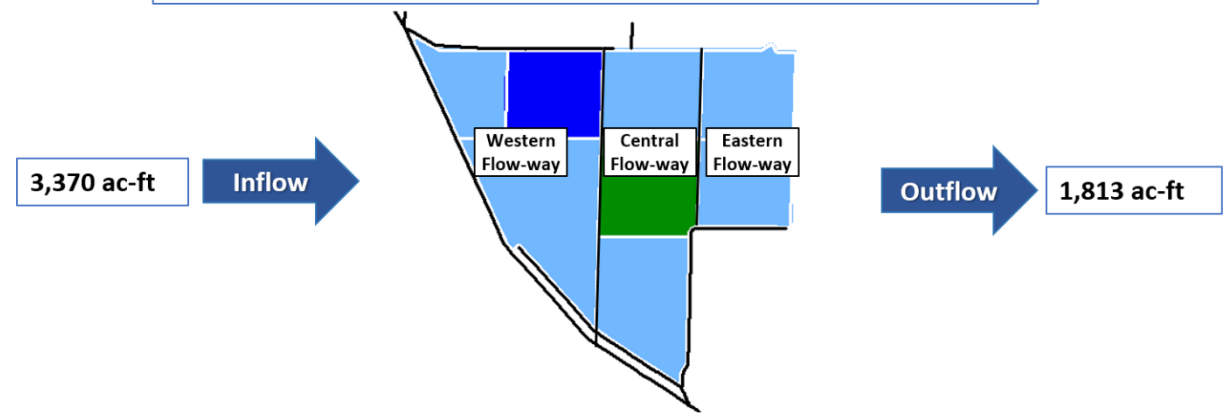
**STA-2:** STA-2 Flow-way 2 is offline for construction activities. Operational restrictions are in place in STA-2 Flow-ways 3 and 4 for vegetation management activities. Online treatment cells are at or near target stage. Vegetation in Flow-ways 1 and 3 is stressed, and in Flow-ways 2, 4 and 5 is highly stressed. The 365-day PLRs for Flow-ways 4 and 5 are below 1.0 g/m<sup>2</sup>/year. The 365-day PLR for Flow-ways 1 and 3 are high (**Figure S-3**).

**STA-3/4:** STA-3/4 Eastern Flow-way is offline for vegetation rehabilitation/drawdown. Online treatment cells are at or near above target stage. Vegetation in the Eastern and Central Flow-ways is highly stressed and in the Western Flow-way is stressed. The 365-day PLRs for the Central and Western Flow-ways are below 1.0 g/m<sup>2</sup>/year (**Figure S-4**).

**STA-5/6:** All flow-ways in STA-5/6 are online. Treatment cells are at or near target stage. All treatment cells have highly stressed vegetation conditions except Flow-ways 7 and 8 which are healthy. The 365-day PLRs for most flow-ways are at or below 1.0 g/m<sup>2</sup>/year, except Flow-ways 3 and 4 which are high (**Figure S-5** and **S-6**).

For definitions on STA operational language see glossary following figures.

STA-1E Weekly Status Report – 12/12/2022 through 12/18/2022



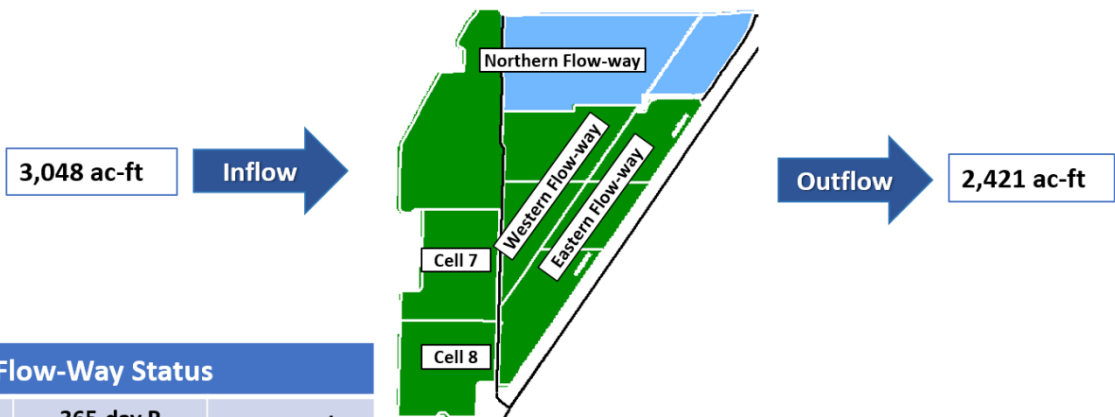
STA-1E Flow-Way Status			
Flow-Way	Vegetation Status Healthy ----- Stressed	365-day P Loading Rate (below 1.0 g P / m <sup>2</sup> /yr is optimal)	Online / Offline / Restrictions
Eastern	← →	1.0	Vegetation management
Central	← →	1.0	Vegetation rehabilitation
Western	Offline, post-construction grow in starting 3/28/2022		

As of 12/18/2022	
Stage Based: Relative to Target Stage (TS)	
	Deep Water Level (> 2.8' above TS)
	High Water Level (1.5' – 2.8' above TS)
	0.2' – 1.5' above TS
	Target Stage (TS +/- 0.2')
	0.2' – 0.5' below TS
	0.5' – 1.0' below TS
	Low Water Level (1.0' – 1.2' below TS)
	Extreme Low Water (> 1.2' below TS)

STA-1E Flow & Phosphorus Concentration			
	7-day	28-day	365-day
Total Inflow, ac-ft	3,370	6,137	131,386
--Lake Inflow, ac-ft	0	N/A	2,600
Total Outflow, ac-ft	1,813	3,932	102,564
Inflow Conc., ppb	130	117	112
Outflow Conc., ppb	27	30	26
Includes Preliminary Data			

Figure S-1. STA-1E Weekly Status Report

STA-1W Weekly Status Report – 12/12/2022 through 12/18/2022



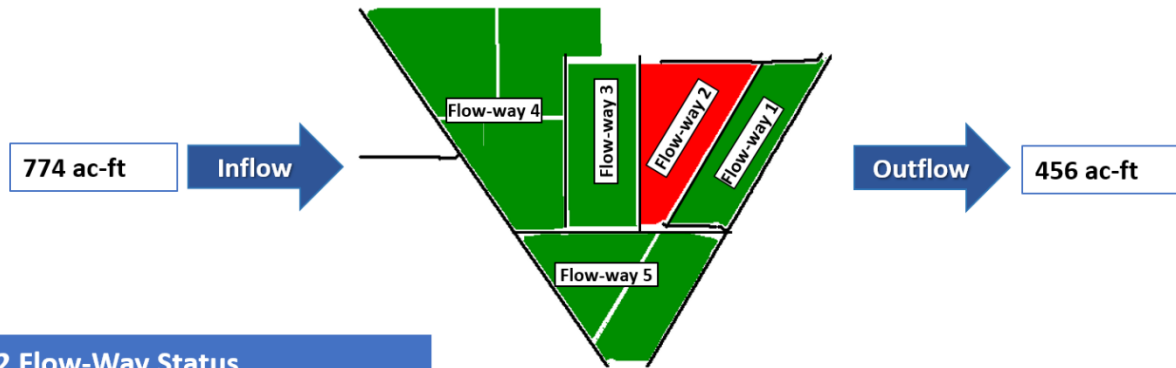
STA-1W Flow-Way Status			
Flow-Way	Vegetation Status Healthy --- Stressed	365-day P Loading Rate (below 1.0 g P /m <sup>2</sup> /yr is optimal)	Online / Offline / Restrictions
Northern	← [Yellow Leaf] →	1.0	Vegetation management
Western	← [Yellow Leaf] →	1.0	Vegetation management
Eastern	← [Yellow Leaf] →	1.0	Vegetation management
Cell 7	← [Green Leaf] →	N/A	Online
Cell 8	← [Green Leaf] →	N/A	Construction

As of 12/18/2022	
Stage Based: Relative to Target Stage (TS)	
[Purple]	Deep Water Level (> 2.8' above TS)
[Blue]	High Water Level (1.5' – 2.8' above TS)
[Light Blue]	0.2' – 1.5' above TS
[Green]	Target Stage (TS +/- 0.2')
[Light Green]	0.2' – 0.5' below TS
[Yellow]	0.5' – 1.0' below TS
[Orange]	Low Water Level (1.0' – 1.2' below TS)
[Red]	Extreme Low Water (> 1.2' below TS)

STA-1W Flow & Phosphorus Concentration				
	7-day	28-day	365-day	
Total Inflow, ac-ft	3,048	9,311	144,163	
--Lake Inflow, ac-ft	0	N/A	2,000	
Total Outflow, ac-ft	2,421	7,704	144,614	
Inflow Conc., ppb	119	152	197	
Outflow Conc., ppb	26	21	20	
Includes Preliminary Data				

Figure S-2. STA-1W Weekly Status Report

STA-2 Weekly Status Report – 12/12/2022 through 12/18/2022



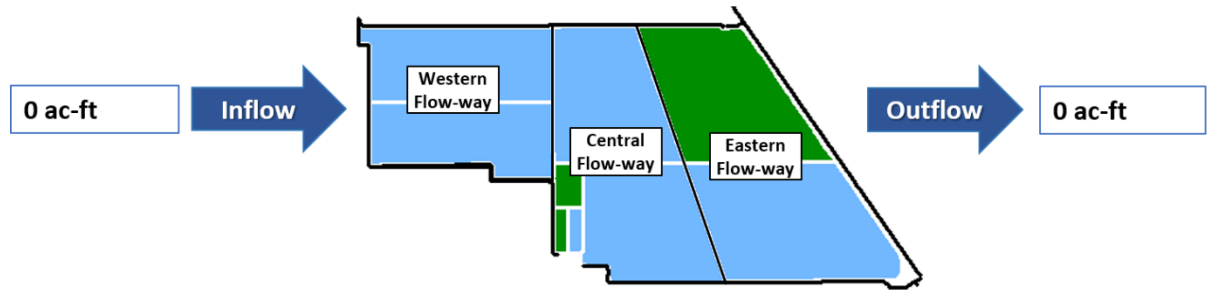
STA-2 Flow-Way Status			
Flow-Way	Vegetation Status Healthy ----- Stressed	365-day P Loading Rate (below 1.0 g P /m <sup>2</sup> /yr is optimal)	Online / Offline / Restrictions
1			Online
2	Offline, construction activities as of 9/7/2021		
3			Vegetation Rehab
4			Vegetation Rehab
5			Online

As of 12/18/2022	
Stage Based: Relative to Target Stage (TS)	
	Deep Water Level (> 2.8' above TS)
	High Water Level (1.5' – 2.8' above TS)
	0.2' – 1.5' above TS
	Target Stage (TS +/- 0.2')
	0.2' – 0.5' below TS
	0.5' – 1.0' below TS
	Low Water Level (1.0' – 1.2' below TS)
	Extreme Low Water (> 1.2' below TS)

STA-2 Flow & Phosphorus Concentration			
	7-day	28-day	365-day
Total Inflow, ac-ft	774	4,459	312,450
--Lake Inflow, ac-ft	0	N/A	27,700
Total Outflow, ac-ft	456	7,330	332,947
Inflow Conc., ppb	32	48	114
Outflow Conc., ppb	18	18	30
Includes Preliminary Data			

Figure S-3. STA-2 Weekly Status Report

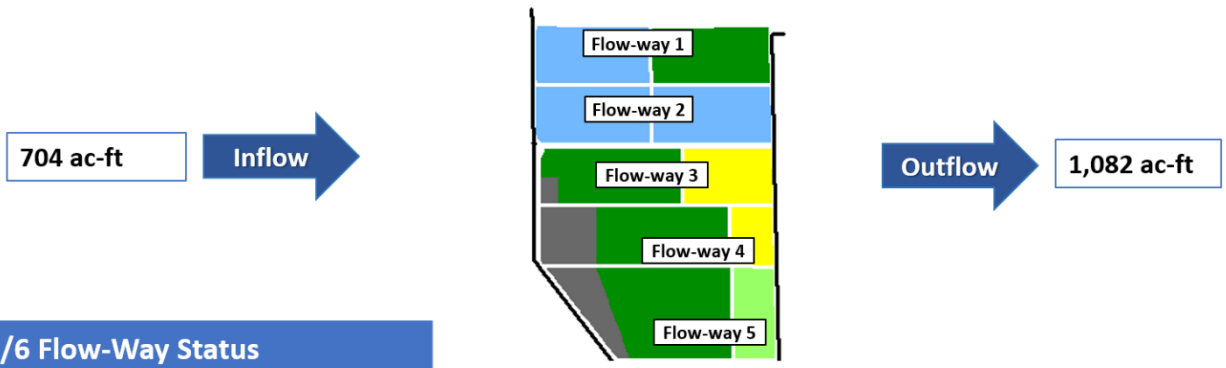
STA-3/4 Weekly Status Report – 12/12/2022 through 12/18/2022



STA-3/4 Flow-Way Status				As of 12/18/2022		STA-3/4 Flow & Phosphorus Concentration			
Flow-Way	Vegetation Status Healthy ----- Stressed	365-day P Loading Rate (below 1.0 g P /m <sup>2</sup> /yr is optimal)	Online / Offline / Restrictions	Stage Based: Relative to Target Stage (TS)			7-day	28-day	365-day
Eastern	Offline, vegetation management drawdown as of 3/1/2021			<ul style="list-style-type: none"> <li><span style="color: purple;">■</span> Deep Water Level (&gt; 2.8' above TS)</li> <li><span style="color: blue;">■</span> High Water Level (1.5' – 2.8' above TS)</li> <li><span style="color: lightblue;">■</span> 0.2' – 1.5' above TS</li> <li><span style="color: green;">■</span> Target Stage (TS +/- 0.2')</li> <li><span style="color: lightgreen;">■</span> 0.2' – 0.5' below TS</li> <li><span style="color: yellow;">■</span> 0.5' – 1.0' below TS</li> <li><span style="color: orange;">■</span> Low Water Level (1.0' – 1.2' below TS)</li> <li><span style="color: red;">■</span> Extreme Low Water (&gt; 1.2' below TS)</li> </ul>		Total Inflow, ac-ft	0	24	299,784
Central			Online			--Lake Inflow, ac-ft	0	N/A	5,300
Western			Online			Total Outflow, ac-ft	0	1,008	294,176
						Inflow Conc., ppb	N/A	82	92
						Outflow Conc., ppb	N/A	17	16
Includes Preliminary Data									

Figure S-4. STA-3/4 Weekly Status Report

STA-5/6 Weekly Status Report – 12/12/2022 through 12/18/2022



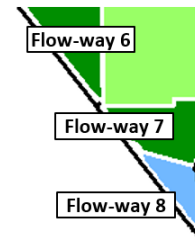
STA-5/6 Flow-Way Status			
Flow-Way	Vegetation Status Healthy ----- Stressed	365-day P Loading Rate (below 1.0 g P /m <sup>2</sup> /yr is optimal)	Online / Offline / Restrictions
1	← →		Online
2	← →		Online
3	← →		Online
4	← →		Online
5	← →		Online

As of 12/18/2022	
Stage Based: Relative to Target Stage (TS)	
	Deep Water Level (> 2.8' above TS)
	High Water Level (1.5' – 2.8' above TS)
	0.2' – 1.5' above TS
	Target Stage (TS +/- 0.2')
	0.2' – 0.5' below TS
	0.5' – 1.0' below TS
	Low Water Level (1.0' – 1.2' below TS)
	Extreme Low Water (> 1.2' below TS)

STA-5/6 Flow & Phosphorus Concentration			
	7-day	28-day	365-day
Total Inflow, ac-ft	704	7,915	153,996
--Lake Inflow, ac-ft	0	N/A	0
Total Outflow, ac-ft	1,082	9,160	146,666
Inflow Conc., ppb	499	370	285
Outflow Conc., ppb	16	24	40
Includes Preliminary Data			

Figure S-5. STA-5/6 Weekly Status Report (Flow-ways 1 – 5)

STA-5/6 Weekly Status Report – 12/12/2022 through 12/18/2022



STA-5/6 Flow-Way Status				As of 12/18/2022	
Flow-Way	Vegetation Status Healthy ----- Stressed	365-day P Loading Rate (below 1.0 g P / m <sup>2</sup> /yr is optimal)	Online / Offline / Restrictions	Stage Based: Relative to Target Stage (TS)	
				Legend	Legend
6			Online		
7			Online		
8			Online		

Figure S-6. STA-5/6 Weekly Status Report (Flow-ways 6 – 8)

## Basic Concepts and Definitions for STA Weekly Status Report

- **Inflow:** Sum of flow volume at all inflow structures to an STA.
- **Lake Inflow:** Portion of the STA total inflow volume that originates from Lake Okeechobee.
- **Outflow:** Sum of flow volume at outflow structures from an STA.
- **Total Phosphorus (TP):** Total mass of phosphorus in all its forms; including particulate, dissolved, etc.
- **Inflow Concentration:** TP concentration is the mass of TP in micrograms per liter of water,  $\mu\text{g/L}$  or ppb. Inflow concentration refers to the flow-weighted mean TP from all inflow structures over a period of time.
- **Outflow Concentration:** The flow-weighted mean TP from all outflow structures over a period of time. The outflow concentration represents the reduction of inflow TP achieved by STA treatment of the inflow water.
- **WQBEL:** The STA outflow concentration that is required upon completion of the Restoration Strategies projects by December 2025. The outflow concentration shall not exceed 13 ppb as an annual flow weighted mean in more than 3 out of 5 water years on a rolling basis and shall not exceed 19 ppb as an annual flow weighted in any water year.
- **Flow-Way (FW):** One or more treatment cells connected in series. Cells typically have emergent aquatic vegetation (EAV) in the front portion of the flow-way followed by a mix of EAV and submerged aquatic vegetation (SAV)
- **Vegetation Status:** Healthy means the vegetation condition is good and will allow the STA to perform as designed. Stressed means the vegetation is showing signs of poor health, such as browning or areas of vegetation die-off, or the cell contains undesirable vegetation such as floating exotic vegetation requiring treatment. The TP reduction capability of the STA is affected when the vegetation condition is poor.
- **Phosphorus Loading Rate (PLR):** Mass of inflow TP in grams, divided by total treatment area of STA in square meters, per year. In general, a 365-day value of less than 1.0 is needed for an STA to perform optimally. A PLR of 2.0 is considered very high and a PLR of 3.0 is considered extremely high. The TP reduction capability of the STA is affected when the PLR is high, very high and extremely high.
- **Online:** Online status means the FW can receive and treat inflow.
- **Online with Restriction:** The FW can receive and treat inflow, but the amount of flow or water level may be limited temporarily. For example, a vegetation rehabilitation effort may require reduced flows through an area while the new plants are establishing, or nesting by protected species may require a certain water level not to be exceeded.
- **Offline:** The FW is unable to receive and treat inflow due to repairs, construction, or other prohibitive reasons.
- **Depth:** Difference between the average surface water level in a cell and the average ground elevation in that cell. Target depths, or depths between flow events, are between 1.25 ft to 1.5 ft. As depth approaches or drops below zero, an increasing percentage of the cell is considered dry and STA conditions deteriorate. An increase in depth above target depth is expected with increasing flow. However, as depth increases much above the target depth and is sustained over a period of time, it can be detrimental to vegetation health and overall STA treatment performance.
- **Note:** The data provided in this summary report were developed using a combination of provisional and quality-assured flow and water quality data. In some cases, best professional judgment was used to estimate missing data and revise questionable data. Values provided are not considered final but are appropriate for use in STA operational decision-making.



## **Everglades**

### ***Water Conservation Area Regulation Schedules***

Last week the Everglades Protection Area (EPA) received much more rainfall than the previous week, especially in the north and south. WCA-1: Stage at the 1-8C rose and then steadied over the week. The average on Sunday was 0.17 feet above the falling Zone A1 regulation line. WCA-2A: Stage at the 2-17 gauge continued to recede faster than the slope of the regulation line last week. The average on Sunday was 1.05 feet above the falling regulation line. WCA-3A: Over the last week the Three Gauge Average stages fell and steadied over the week. The average stage was 0.15 feet below the flat regulation line on Sunday. WCA-3A North: At gauge 62 (Northwest corner) stage continued a recession that is falling faster than the slope of the Upper schedule line, the average on Sunday was 0.61 feet below (**Figures EV-1 through EV-4**).

### ***Water Depths***

The SFWDAT illustrates current stages in the EPA are falling in most of the major basins, with NESRS, WCA-1, and -3B retaining stage. WCA-3A is drying down with the drying front progressing from the Northwest to the Southeast. There is some potential for stages to have moved to ground surface on the west of the Miami canal in northwest WCA-3A. Connectivity in the sloughs of ENP remains. Comparing current WDAT water depths to one month ago conditions within the EPA are generally shallower with northern WCA-2A significantly so. Looking back a year ago, most of WCA-3A is deeper; significantly so in extreme northeastern WCA-3A, and northern ENP (**Figure EV-5 and Figure EV-6**). Comparing current conditions to the 20-year average on December 18th: Conditions are above average in northeastern WCA-3A, -3B; significantly above average in portions of WCA-1 and northeastern SRS. (**Figure EV-7**).

### ***Taylor Slough and Florida Bay***

Taylor Slough and Florida Bay received an average of 1.2 inches of total rain this past week based on the 18 gauges used in this report. Weekly totals ranged from +0.4 inches in northern Taylor Slough to +2.8 inches in Taylor River (TR) in the eastern nearshore region. Most rainfall was recorded between 12/16-12/17. Taylor Slough stages decreased in northern stations with a maximum decrease of -0.02 feet but increased in southern locations by up to +0.05 feet (**Figure EV-8 and Figure EV-9**). Taylor Slough water levels remain above the historical average for this time of year by +4.9 inches compared to before the Florida Bay initiative (starting in 2017), an increase of +0.5 inches from last week.

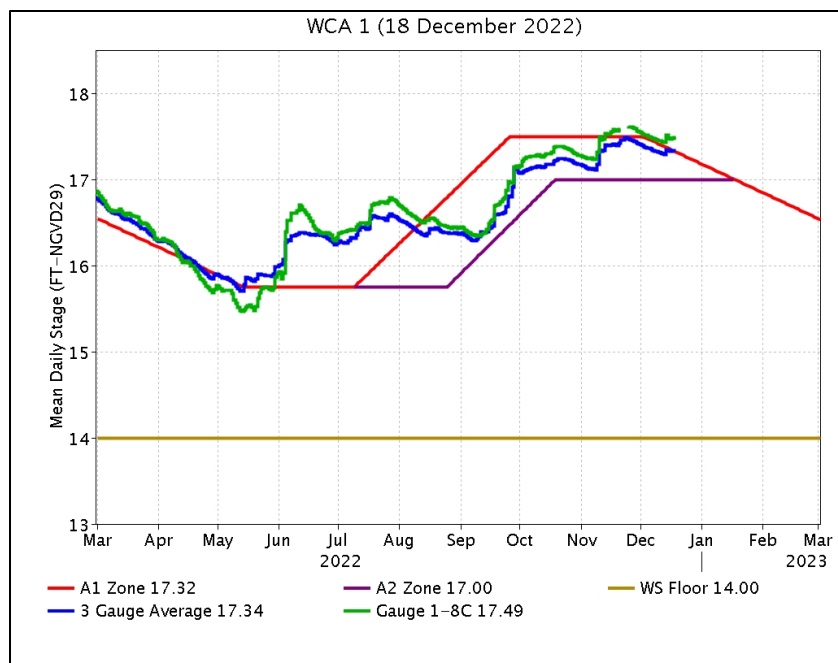
Average Florida Bay salinity is 27.9, an increase of +1.1 from the previous week. Salinity changes ranged from a decrease of -1.7 in Little Madeira Bay (LM) to an increase of +11.3 in Joe Bay (JB) following four days of negative flows last week. Salinity in Taylor Creek notably increased by +14.9 (**Figure EV-8**). Salinities began to decrease at the end of the week, following the return of positive flows 12/16. Salinities in the three Florida Bay regions are back within the historical IQR (**Figure EV-10**). Florida Bay salinity is +3.2 above its historical average for this time of year, up +0.1 from the previous week.

### Water Management Recommendations

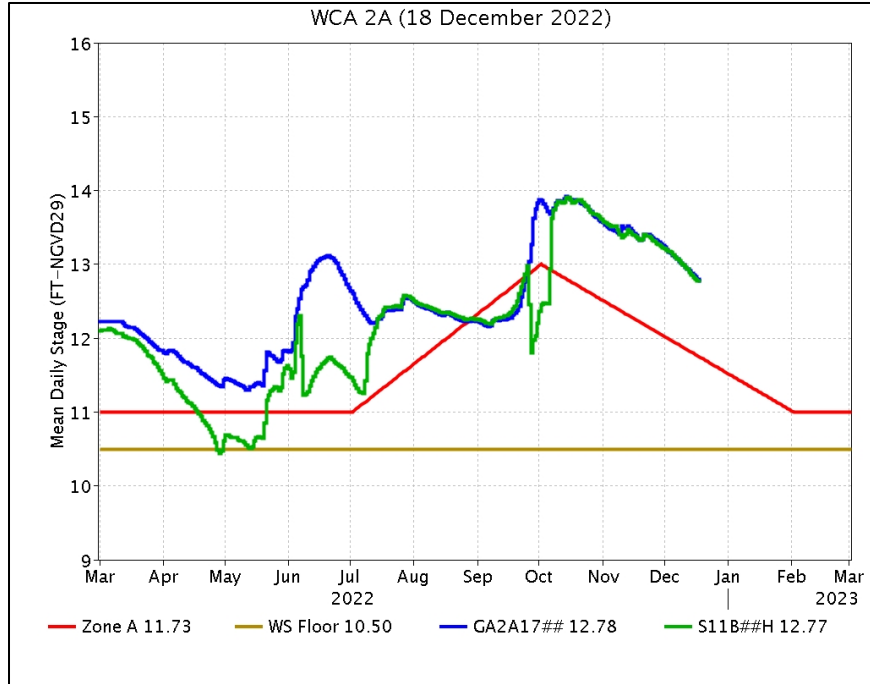
We recommend continuing a discussion of strategies that could prolong flooded conditions in WCA3A North. Conserving water in this region will most likely prove critical for the upcoming wading bird nesting season. Optimizing the volume of water moving into the northern perimeter of WCA-3A will benefit the ecology of that region as conditions transition to a dry season predicted to be drier than average in some months. Maintaining a moderate rate of stage change within the marshes of WCAs, avoiding abrupt changes in water depth and conserving water north in the system has an ecological benefit. Moderating the recession rate in WCA-2A by decreasing outflows could help serve this purpose. When water is available, discharges should be made downstream through Taylor Slough. Individual regional recommendations can be found in **Table EV-2**.

**Table EV-2.** Previous week’s rainfall and water depth changes in Everglades basins.

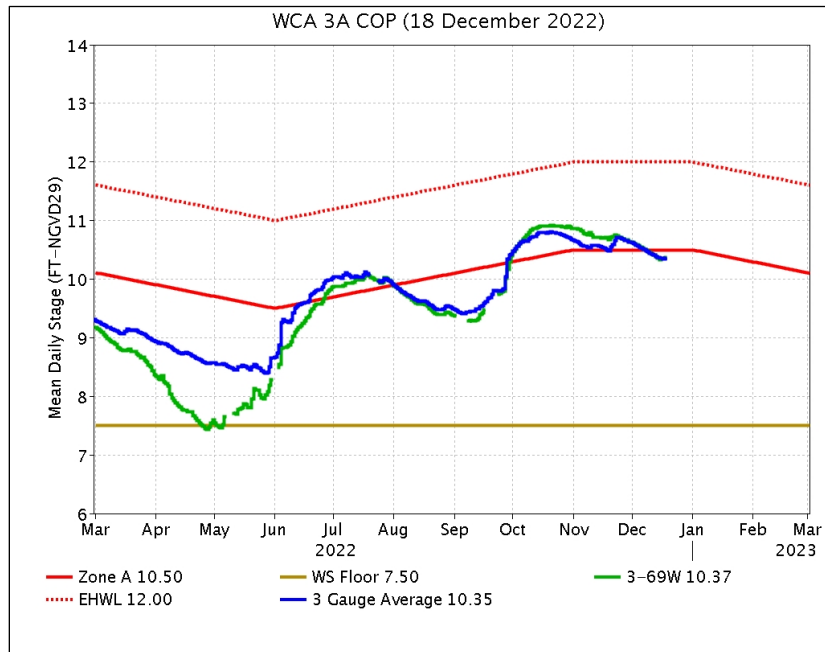
Everglades Region	Rainfall (inches)	Stage change (feet)
WCA-1	0.00	-0.06
WCA-2A	0.00	-0.19
WCA-2B	0.00	-0.13
WCA-3A	<0.01	-0.12
WCA-3B	0.01	-0.07
ENP	<0.01	-0.02



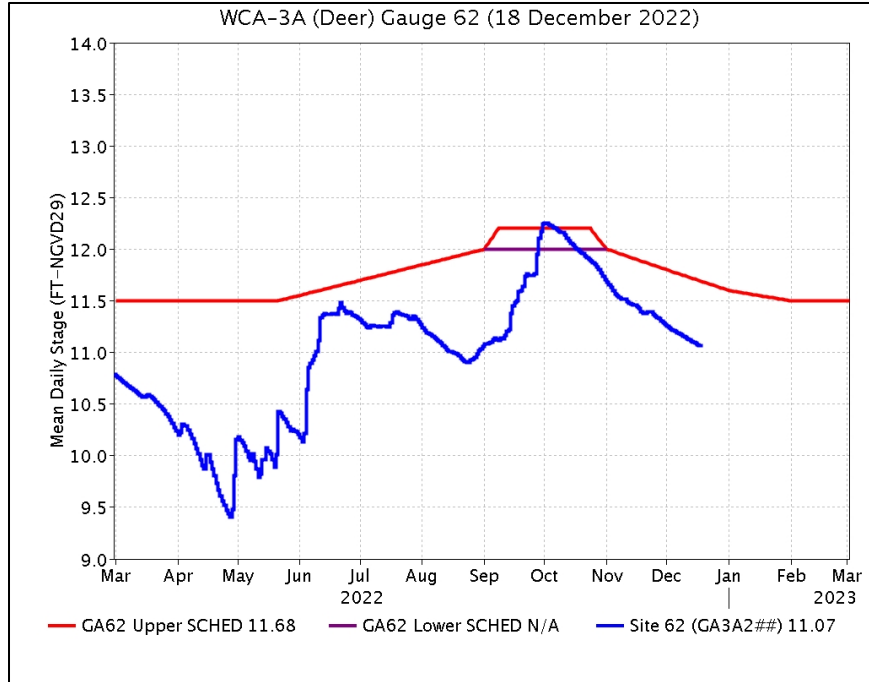
**Figure EV-1.** WCA-1 stage hydrographs and regulation schedule.



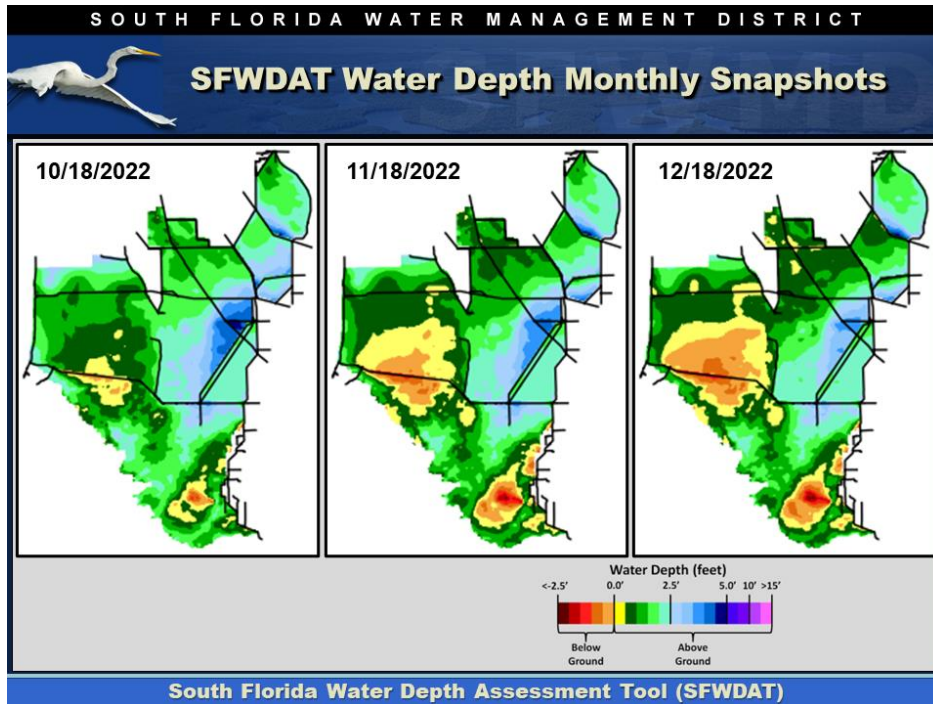
**Figure EV-2.** WCA-2A stage hydrographs and regulation schedule.



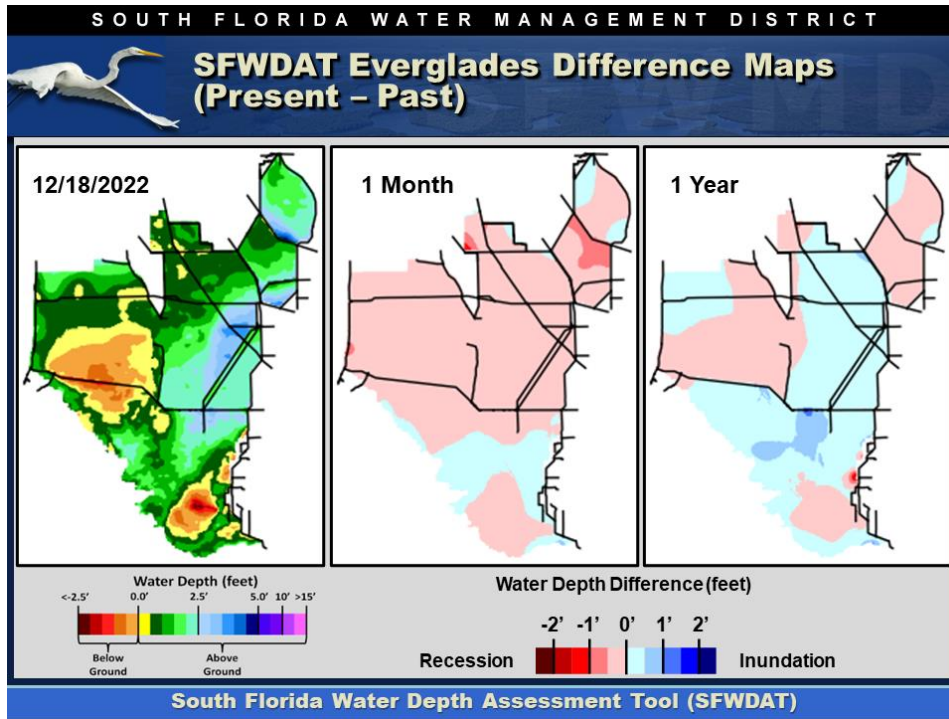
**Figure EV-3.** WCA-3A stage hydrographs (three-gauge average, S-333 headwater) and regulation schedule.



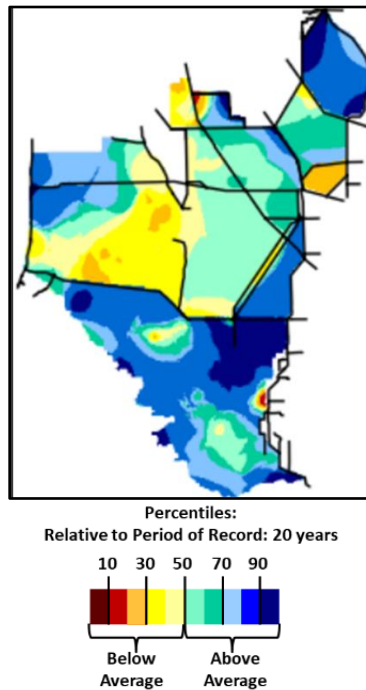
**Figure EV-4.** WCA-3A stage hydrograph (Deer gauge; Site 62) and CA62 regulation schedule.



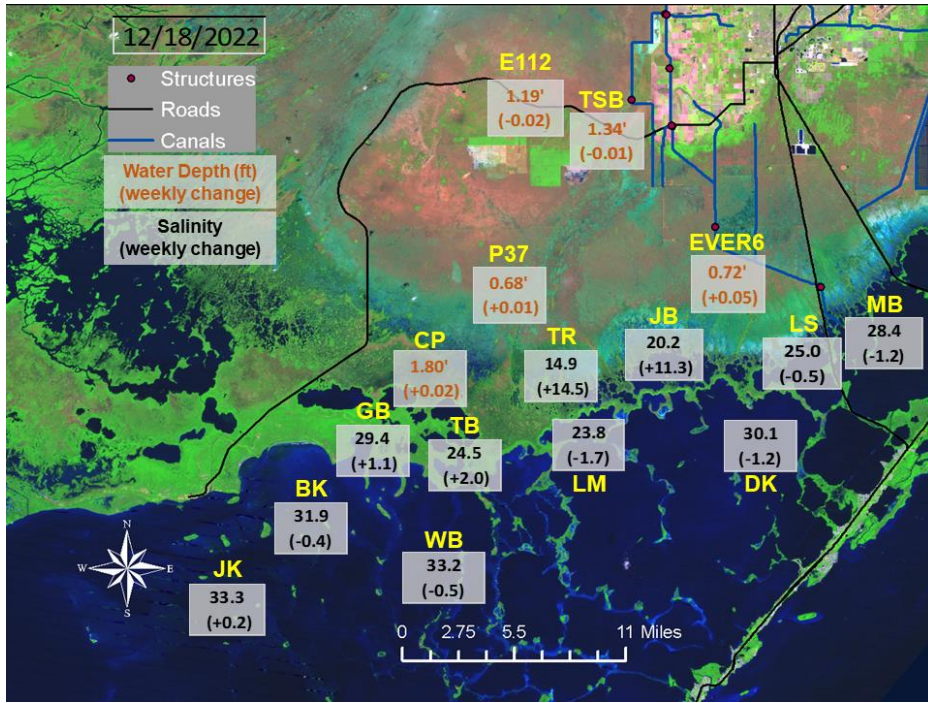
**Figure EV-5.** Everglades water depths from two months ago (left), one month ago (center) and present (right), based on SFWDAT.



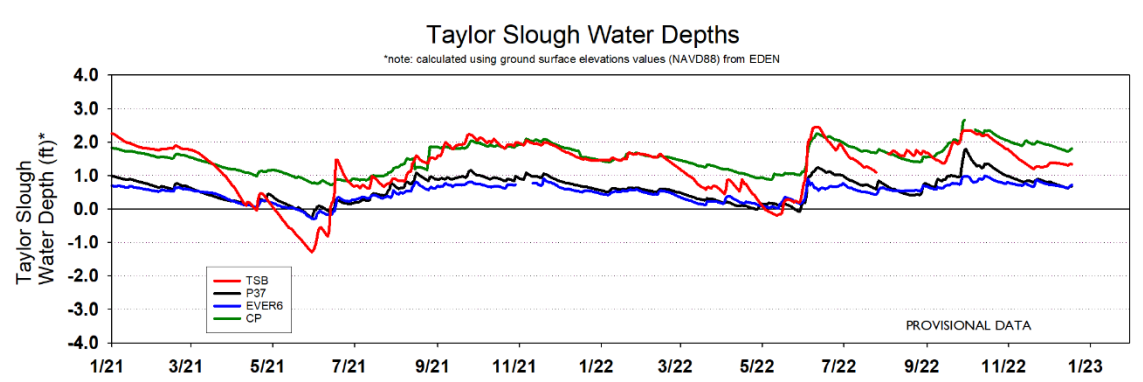
**Figure EV-6.** Present Everglades water depths (left) and water depth changes from one month (center) and one year (right) ago, based on SFWDAT.



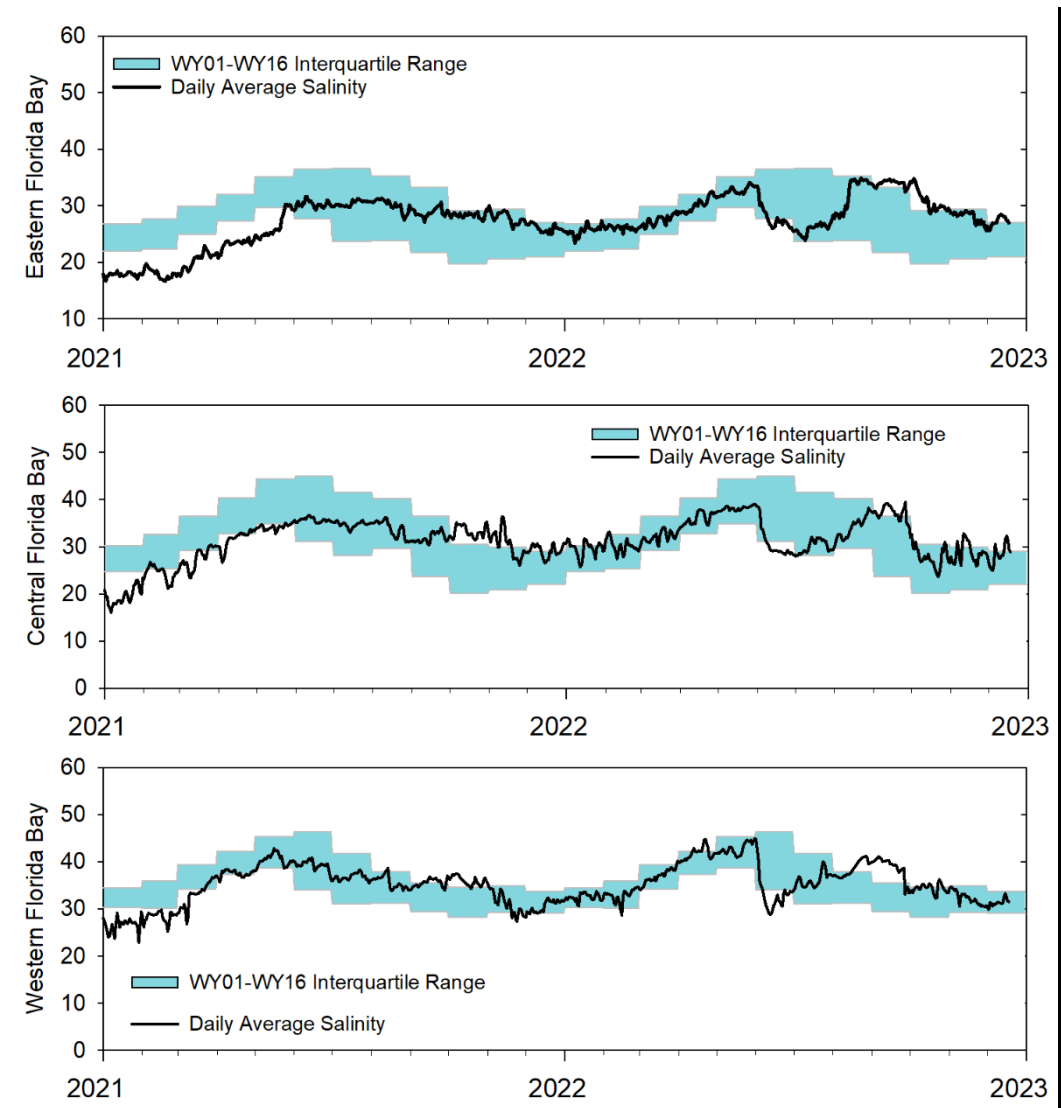
**Figure EV-7.** Present water depths (12/18/2022) compared to the day of year average over the previous 20 years.



**Figure EV-8.** Taylor Slough water depths with changes since a week ago and Florida Bay salinities with changes since a week ago.



**Figure EV-9.** Taylor Slough water depth time series.



**Figure EV-10.** Eastern (top panel), Central (middle panel) and Western (bottom panel) Florida Bay daily average salinities with interquartile (25-75 percentile) ranges.

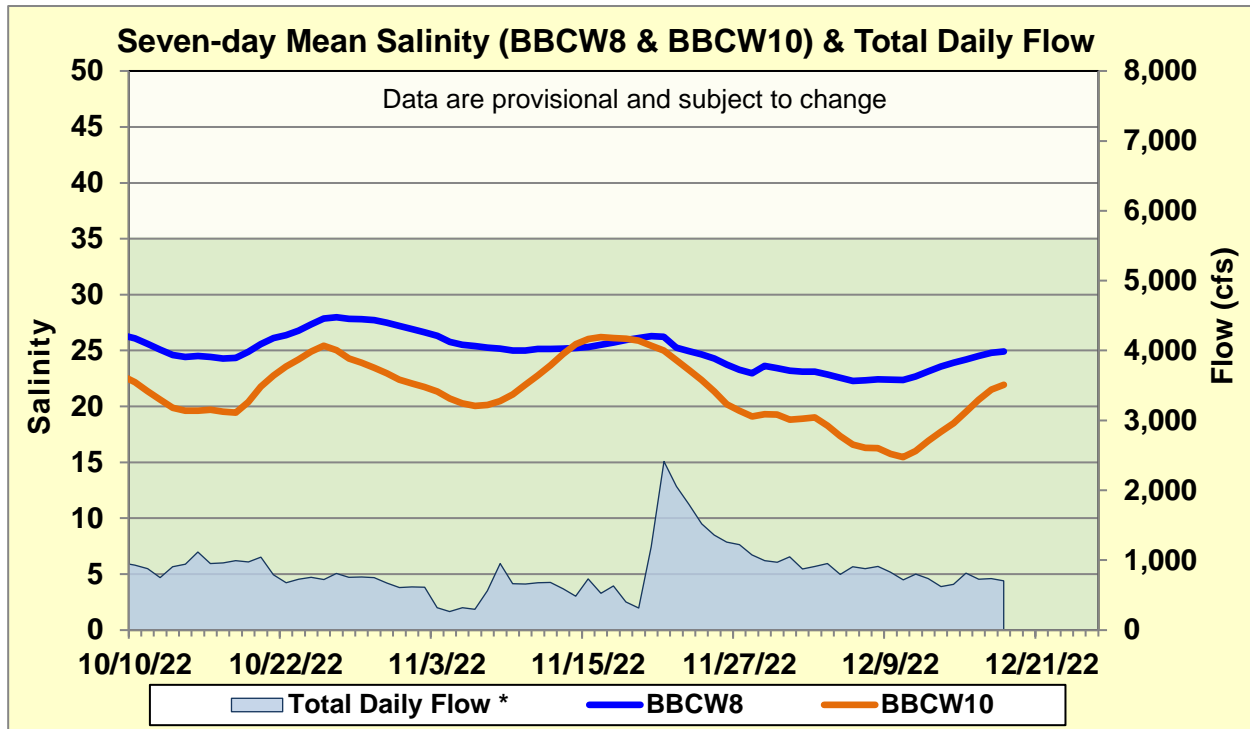
**Table EV-2.** Weekly water depth changes and water management recommendations

SFWMD Everglades Ecological Recommendations, December 20 <sup>th</sup> 2022 (red is new)			
Area	Weekly change	Recommendation	Reasons
WCA-1	Stage increased by 0.04'	Conserve water in this basin as possible. Recession rate of less than 0.04' per week.	Protect within basin and downstream habitat and wildlife.
WCA-2A	Stage decreased by 0.19'	Conserve water in this basin as possible. Recession rate of less than 0.04' per week.	Protect within basin and downstream habitat and wildlife. Protect conditions conducive to wading bird foraging later in the season.
WCA-2B	Stage decreased by 0.10'	Conserve water in this basin as possible. Recession rate of less than 0.04' per week.	Protect within basin and downstream habitat and wildlife.
WCA-3A NE	Stage decreased by 0.11'	Conserve water in this basin as possible. Recession rate of less than 0.04' per week	Protect within basin and downstream habitat and wildlife. Protect conditions conducive to wading bird foraging later in the season. Lower fire risk and protect peat soils.
WCA-3A NW	Stage decreased by 0.07'	Conserve water in this basin as possible. Recession rate of less than 0.04' per week	
Central WCA-3A S	Stage decreased by 0.09'	Conserve water in this basin as possible. Recession rate of less than 0.12' per week	Protect within basin and downstream habitat and wildlife.
Southern WCA-3A S	Stage decreased by 0.01'		
WCA-3B	Stage decreased by 0.02'	Recession rate of less than 0.12' per week.	Protect within basin and downstream habitat and wildlife.
ENP-SRS	Stage increased by 0.02'	Make discharges to ENP according to COP and TTF protocol while adaptively considering upstream and downstream ecological conditions. Discussions on water management within the system should be continued.	Protect within basin and upstream habitat and wildlife.
Taylor Slough	Stage changes ranged from -0.02' to +0.05'	Move water southward as possible.	When available, provide freshwater buffer for downstream conditions.
FB- Salinity	Salinity changes ranged from -1.7 to +11.3	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.



## Biscayne Bay

As shown in **Figure BB-1**, mean total inflow to Biscayne Bay was 712 cfs and the previous 30-day mean inflow was 1,025 cfs. The seven-day mean salinity was 25.0 at BBCW8 and 22.2 at BBCW10, both within the ideal salinity range for estuarine organisms in this region (salinity less than 35). Data provided by Biscayne National Park.



**Figure BB-1.** Seven-day mean salinity at BBCW8 and BBCW10 and total daily flow in Biscayne Bay. Total daily flow was calculated using flow from structures S20G, S20F, S21, S21A, S123, and S700P.