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 23, 2020

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

## Summary

### Weather Conditions and Forecast

Dry conditions are expected to prevail through most of Wednesday. A trough of low pressure forming over the Plains mid-week will strengthen and push into the eastern U.S. on Friday. Ahead of this weather system, the frontal boundary that passed through the District on Monday will return as a warm front over southern Florida late Wednesday and lift north of the area on Thursday. As this occurs, much warmer air and a large influx of moisture across the area will increase light shower activity along and near the east coast of Florida and over the Florida Keys Wednesday evening and night. No more than a tenth of an inch of areal average rainfall by sunrise Thursday along the east coast is expected. However, warm southerly winds and a good supply of moisture ahead of a strong cold front Thursday morning and afternoon should trigger widely scattered showers, a few of which could be moderately heavy. A greater coverage of mostly light, fast-moving showers with a few embedded heavier streaks of rain is expected late Thursday afternoon and evening, sweeping from northwest to southeast across the area. The rains are likely to quickly end overnight once the strong front pushes offshore the southeast coast, followed by a significant drying and much cooler temperatures by Friday morning. The model guidance indicates a widespread coverage of rain on Thursday with most District basins likely to see a tenth to a quarter of an inch of areal average rainfall. Breezy, dry and sharply colder temperatures are likely on Friday, with the coldest temperatures of the fall/winter season predicted on Saturday morning. Dry conditions are predicted on Saturday, although a few very light showers are possible along the immediate east coast by late Saturday. A continued gradual moderation of the air mass is forecast through Monday but with a chance of showers in the east both Sunday and Monday. The best chance for an increase of rains in the east would occur on Sunday. However, forecast confidence at this time is low regarding the exact amount to expect due to significant model differences. The next cold front will likely feature little, if any, rainfall Monday night as it pushes across the Florida peninsula, and indications are that a reinforcement of a dry and cool weather pattern would occur by Tuesday next week following its passage.

### Kissimmee

Tuesday morning stages were 58.1 feet NGVD (0.1 feet above schedule) in East Lake Toho, 55.1 feet NGVD (0.1 feet above schedule) in Toho, and 52.4 feet NGVD (0.1 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.8 feet NGVD at S-65D. Tuesday morning discharges were 780 cfs at S-65, 840 cfs at S-65A, 1,480 cfs at S-65D and 1,820 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 6.4 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.89 feet. Today's recommendation is to continue S-65/S-65A discharge at or below 800 cfs. The purpose is to allow for 2-3 weeks with flow below 800 cfs before construction in Pool D resumes in early January 2021.

## Lake Okeechobee

Lake Okeechobee stage was 15.92 feet NGVD on December 20, 2020, 0.07 feet lower than last week and 0.36 feet lower than a month ago. The Lake is currently in the Low Sub-band. Stage has been above or near the top of the preferred ecological envelope since August 1, 2020 and is currently 0.42 feet above. Wading bird monitoring for the 2021 breeding season began in early December and 3,500 foraging birds were observed, more than expected given relatively high lake stages but by mid-December those numbers declined to approximately 340 wading birds which is more in line with surveys conducted under similar conditions. Recent satellite imagery suggests little to no bloom potential on the Lake.

## Estuaries

Total inflow to the St. Lucie Estuary averaged more than 985 cfs with approximately 684 cfs coming from Lake Okeechobee. The seven-day average surface salinities increased throughout the estuary over the past week. Salinity at the US1 Bridge is in the fair range (5-10) for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 3,652 cfs over the past week with approximately 2,116 cfs coming from the Lake. Seven-day average surface salinities remained almost fresh (0.2) at the three most upstream sites (S-79, Val I75 and Ft. Myers Yacht Basin) and increased downstream over the past week. Salinities are in the good range (0-10) for tape grass at Val I-75 and Ft. Myers. Salinities are in the good range (10-30) for adult eastern oysters at Shell Point and Sanibel, and in the poor range (0-5) at Cape Coral.

Lake stage is in the Low Sub-Band of 2008 LORS. Tributary hydrological conditions are wet. The LORS2008 Release Guidance suggests up to 450 cfs release at S-79 to the Caloosahatchee Estuary and up to 200 cfs release at S-80 to the St. Lucie Estuary.

## Stormwater Treatment Areas

Over the past week, 700 ac-ft of Lake Okeechobee water was delivered to the FEBs/STAs. The total amount of Lake releases sent to the FEBs/STAs in WY2021 (since May 1, 2020) is approximately 97,000 ac-feet. The total amount of inflows to the STAs in WY2021 is approximately 1,499,000 ac-feet. Most STA cells are near or above target stage. STA-1E Western Flow-way is offline for the Restoration Strategies project to fill and grade Cells 5 and 7, and STA-2 Flow-way 2 is offline for construction activities. Operational restrictions are in place in STA-1W Western, Eastern, and Northern Flow-ways due to discharge canal plug construction activities, in STA-1E Central Flow-way, STA-2 Flow-way 3, STA-2 Flow-way 4, STA-3/4 Eastern, Central, and Western Flow-ways for vegetation management activities, and in STA-5/6 Flow-ways 2 and 3 following the Restoration Strategies project to grade non-effective treatment areas. This week, if 2008 LORS recommends Lake releases to the WCAs and conditions allow, releases will be sent to STA-2.

## Everglades

WCA stages fell on average within the early dry season WY21 recession recommendations last week. Depths remain above average in Taylor Slough and salinities in Florida Bay fell on average, and also remain below historical average for this time of year. High concentrations of wading birds were noted along the southern coast last week, indicating good conditions moving towards nesting season. If recessions continue more wading birds are expected in high numbers within the central Everglades soon.

## Supporting Information

## KISSIMMEE BASIN

### Rainfall

The Upper Kissimmee Basin received 0.11 inches of rainfall in the past week and the Lower Basin received 0.07 inches (SFWMD Daily Rainfall Report 12/20/2020).

### Upper Kissimmee

**Table 1** lists stage and discharge for several KCL water bodies using data from lake outfall structures. KCL stage hydrographs with respective regulation schedules and rainfall are shown in **Figures 1-3**.

**Table 1.** Average discharge (cfs) for the preceding seven days, stage (feet NGVD), and departures from KCL flood regulation (R) or temporary schedules (T, A, or S); provisional, real-time data are from SFWMD.

**Report Date: 12/22/2020**

| Water Body | Structure | 7-day Average Discharge (cfs)[1] | Stage Monitoring Site[2] | Lake Stage (feet) | Schedule Type[3] | Schedule Stage (feet) | Daily Departure (feet) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 12/20/20 | 12/13/20 | 12/6/20 | 11/29/20 | 11/22/20 | 11/15/20 | 11/8/20 |
| Lakes Hart and Mary Jane | S-62 | 40 | LKMJ | 61.0 | R | 61.0 | 0.0 | 0.1 | -0.1 | 0.0 | 0.1 | 0.1 | -0.1 |
| Lakes Myrtle, Preston, and Joel | S-57 | 16 | S-57 | 61.8 | R | 61.8 | 0.0 | 0.0 | -0.1 | 0.0 | 0.1 | 0.0 | -0.1 |
| Alligator Chain | S-60 | 0 | ALLI | 64.0 | R | 64.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | -0.1 |
| Lake Gentry | S-63 | 27 | LKGT | 61.5 | R | 61.5 | 0.0 | 0.1 | -0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| East Lake Toho | S-59 | 0 | TOHOE | 58.0 | R | 58.0 | 0.0 | -0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| Lake Toho | S-61 | 129 | TOHOW, S-61 | 55.0 | R | 55.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 |
| Lakes Kissimmee, Cypress, and Hatchineha | S-65 | 848 | KUB011, LKIS5B | 52.5 | R | 52.5 | 0.0 | 0.0 | 0.2 | 0.3 | 0.4 | 0.4 | 0.0 |

[1] Seven-day average of weighted daily means through midnight.
[2] Names of in-lake monitoring sites and structures used to determine lake stage; if more than one site is listed, an average is reported.
[3] A = projected ascension line, R = USACE regulation schedule, S = temporary recession target line, T = temporary schedule, N/A= not applicable or data not available.
DATA ARE PROVISIONAL

## Lower Kissimmee

Discharges at lower basin structures are shown in **Table 2**. **Figure 4** compares floodplain inundation depths from one year and one month ago with current inundation depths in the Phase I restored area of the Kissimmee River. **Figure 5** shows dissolved oxygen concentration along with S-65A discharge, water temperature and rainfall. **Figures 6-8** are included for reference: **Figure 6** is the current guide for operation of S-65 and S-65A, called the "Preferred Discharge Plan IS-14-50.0". This is developed collaboratively each year between ecologists and SFWMD water managers based on prevailing ecological and hydrologic conditions. A preferred discharge plan and the interim regulation schedule (**Figure 7**) will be used until the Headwaters Lakes Revitalization regulation schedule is implemented. **Figure 8** is a map of the Kissimmee Basin showing Central and Southern Florida (C&SF) flood control project structures and color-coded watersheds.

**Table 2.** One- and seven-day average discharge at lower basin structures, dissolved oxygen concentration in phases I and II/III area river channel, and depth in the Phase I area floodplain using provisional, real-time data from SFWMD.

**Report Date:** **12/22/2020**

| Metric | Location | 1-Day Average | Average for the Preceeding 7-Days[1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 12/20/2020 | 12/20/20 | 12/13/20 | 12/6/20 | 11/29/20 | 11/22/20 | 11/15/20 | 11/8/20 | 11/1/20 | 10/25/20 |
| Discharge (cfs) | S-65 | 709 | **848** | 1,382 | 1,083 | 842 | 784 | 385 | 187 | 209 | 180 |
| Discharge (cfs) | S-65A[2] | 813 | **974** | 1,566 | 1,275 | 1,108 | 1,095 | 724 | 361 | 330 | 346 |
| Discharge (cfs) | S-65D[2] | 1,599 | **1,704** | 1,605 | 1,497 | 1,541 | 1,685 | 1,590 | 797 | 1,122 | 1,714 |
| Headwater Stage (feet NGVD) | S-65D[2] | 25.95 | **26.08** | 26.40 | 26.82 | 26.99 | 26.98 | 27.03 | 26.94 | 27.35 | 27.62 |
| Discharge (cfs) | S-65E[2] | 1,490 | **1,710** | 1,687 | 1,545 | 1,657 | 1,835 | 1,904 | 895 | 1,283 | 1,935 |
| Discharge (cfs) | S-67 | 0 | **0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DO (mg/L)[3] | Phases I & II/III river channel | 6.8 | **6.4** | 7.2 | 6.0 | 5.3 | 4.7 | 5.2 | 5.6 | 3.8 | 3.0 |
| Mean depth (feet)[4] | Phase I floodplain | 0.89 | **1.00** | 1.01 | 0.90 | 0.93 | 0.94 | 0.75 | 0.52 | 0.67 | 0.90 |

[1]Seven-day average of weighted daily means through Sunday midnight.
[2]S-65A discharge combines S-65A with auxillary strucutures; S-65D discharge combines discharge at S-65D, S-65DX1, and S-65DX2; S-65D stage averages stage at S-65D and S-65DX1; S-65E discharge combines S-65E and S-65EX1.
[3]DO is the average for sondes at KRBN, PC62, PC33, PD62R, and PD42R.
[4]1-day spatial average from South Florida Water Depth Assessment Tool (SFWDAT).
DATA ARE PROVISIONAL; N/A indicates that data were not available.

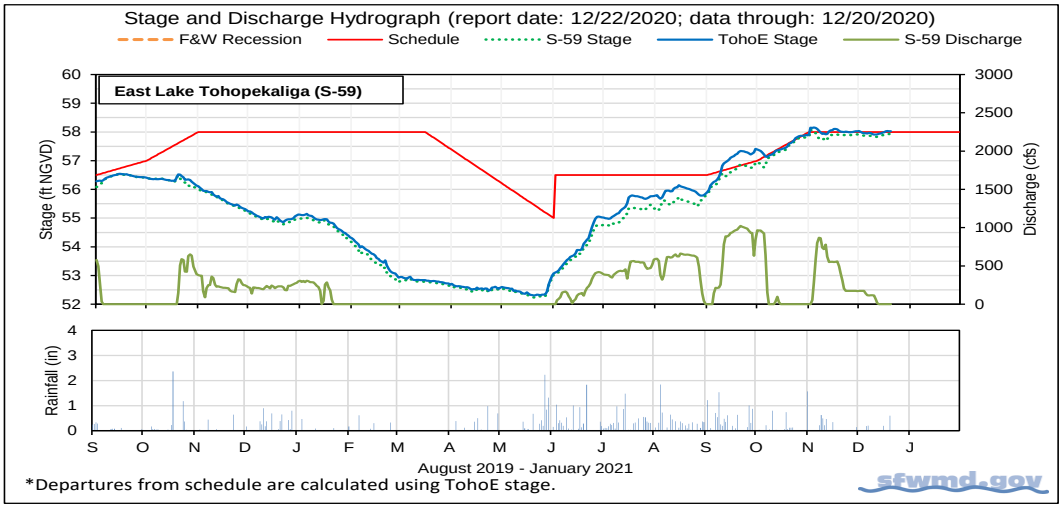



**Figure 1.** East Lake Toho regulation schedule, stage, discharge and rainfall.

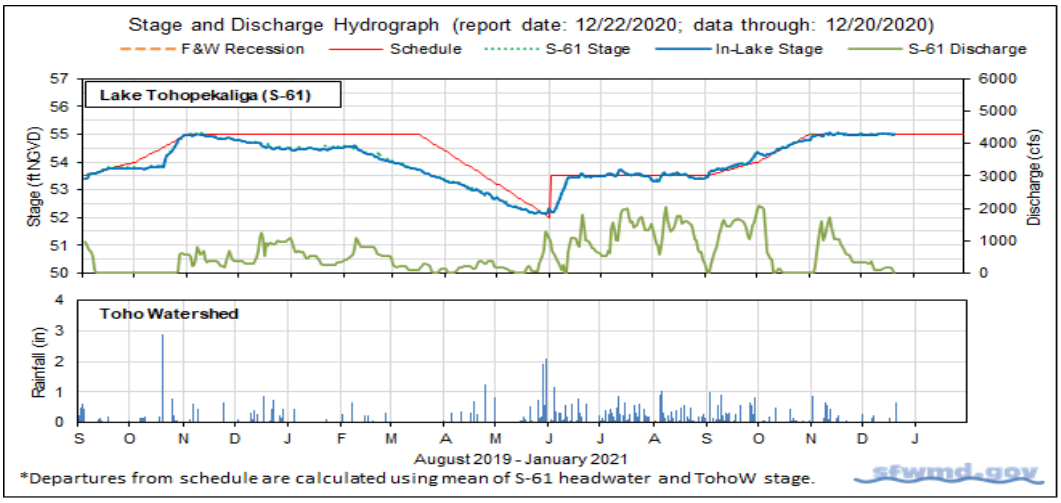



**Figure 2.** Lake Toho regulation schedule, stage, discharge and rainfall.

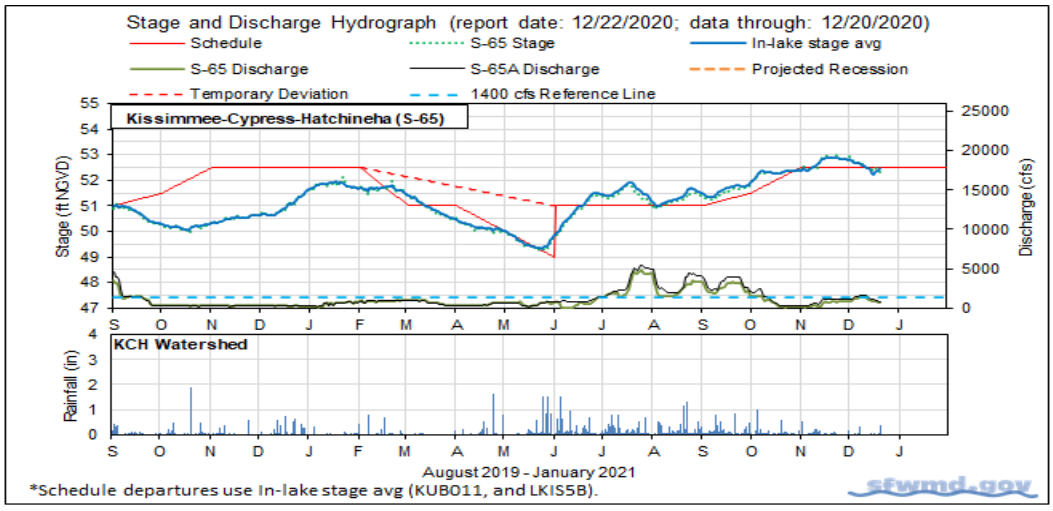



**Figure 3.** Lakes Kissimmee, Cypress and Hatchineha regulation schedule, stage, discharge and rainfall.

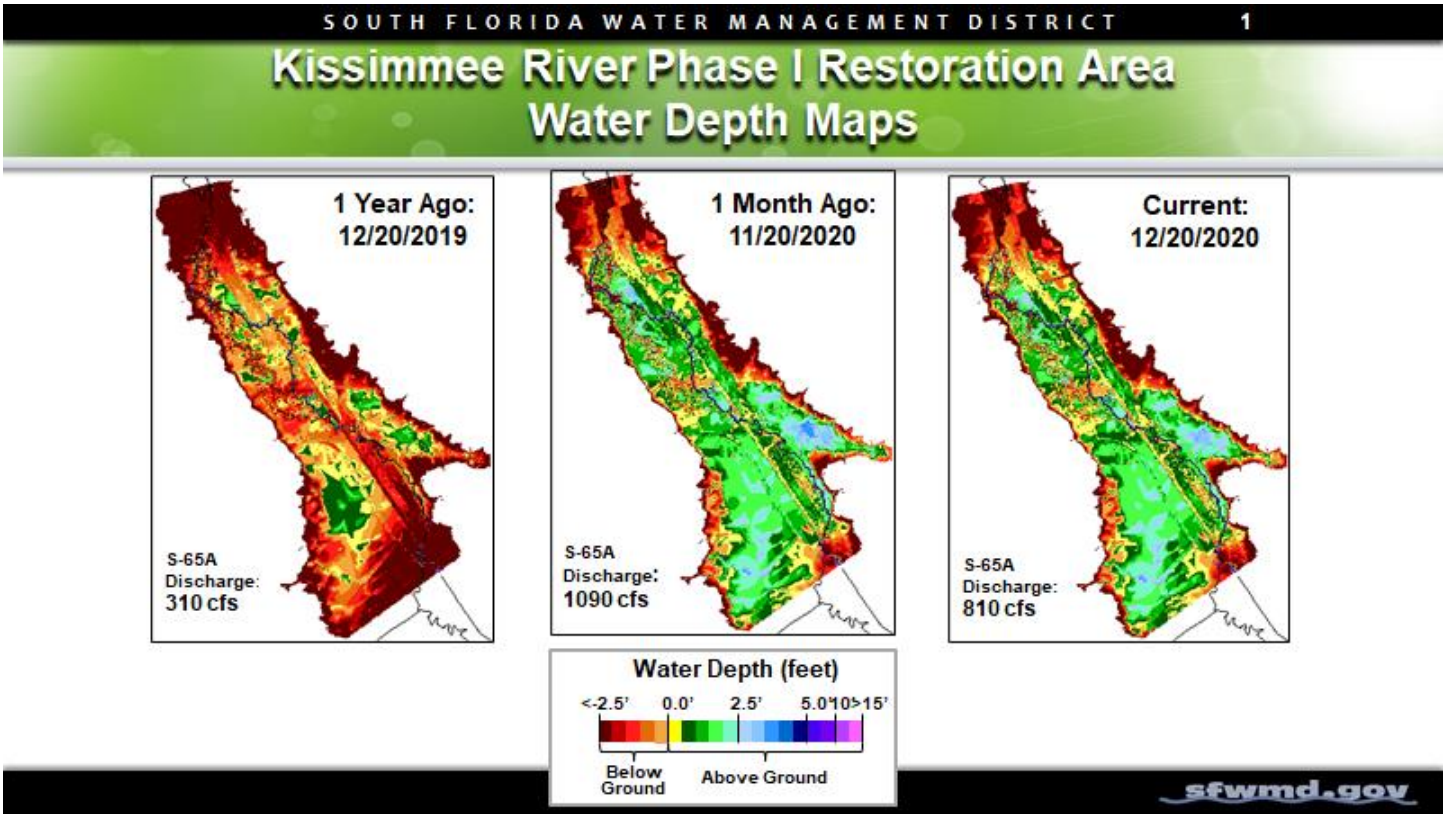



**Figure 4.** Phase I area floodplain water depths (from left to right) one year ago, one month ago and current. Color-coding has been modified to accommodate greater water depths; these maps are not directly comparable to Kissimmee Basin WDAT maps published prior to January 16, 2012.

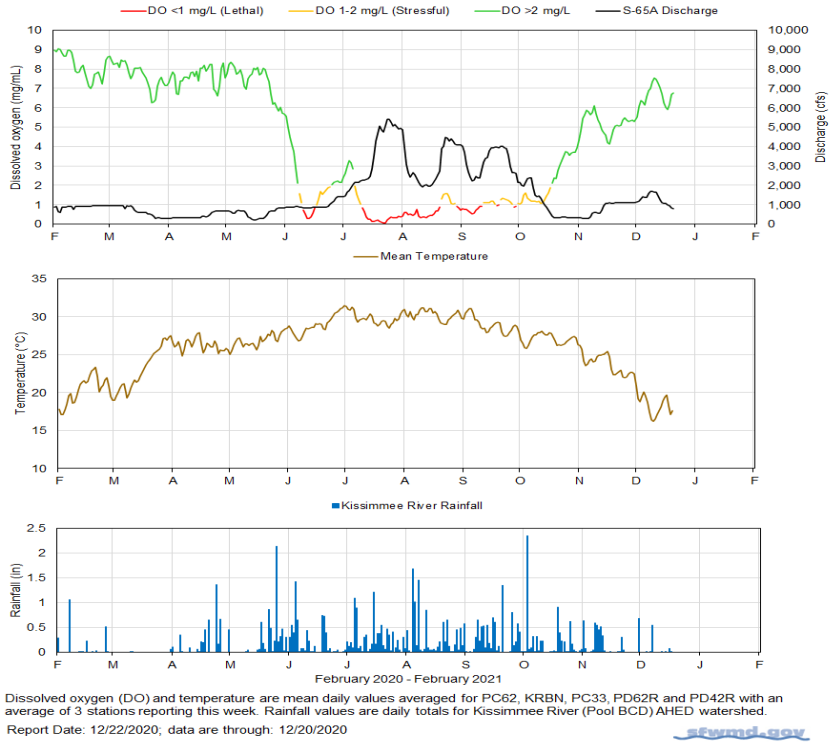



**Figure 5.** Restored Kissimmee river channel mean daily dissolved oxygen concentration (mg/L), S-65A discharge (cfs), temperature (°C) and rainfall (inches).

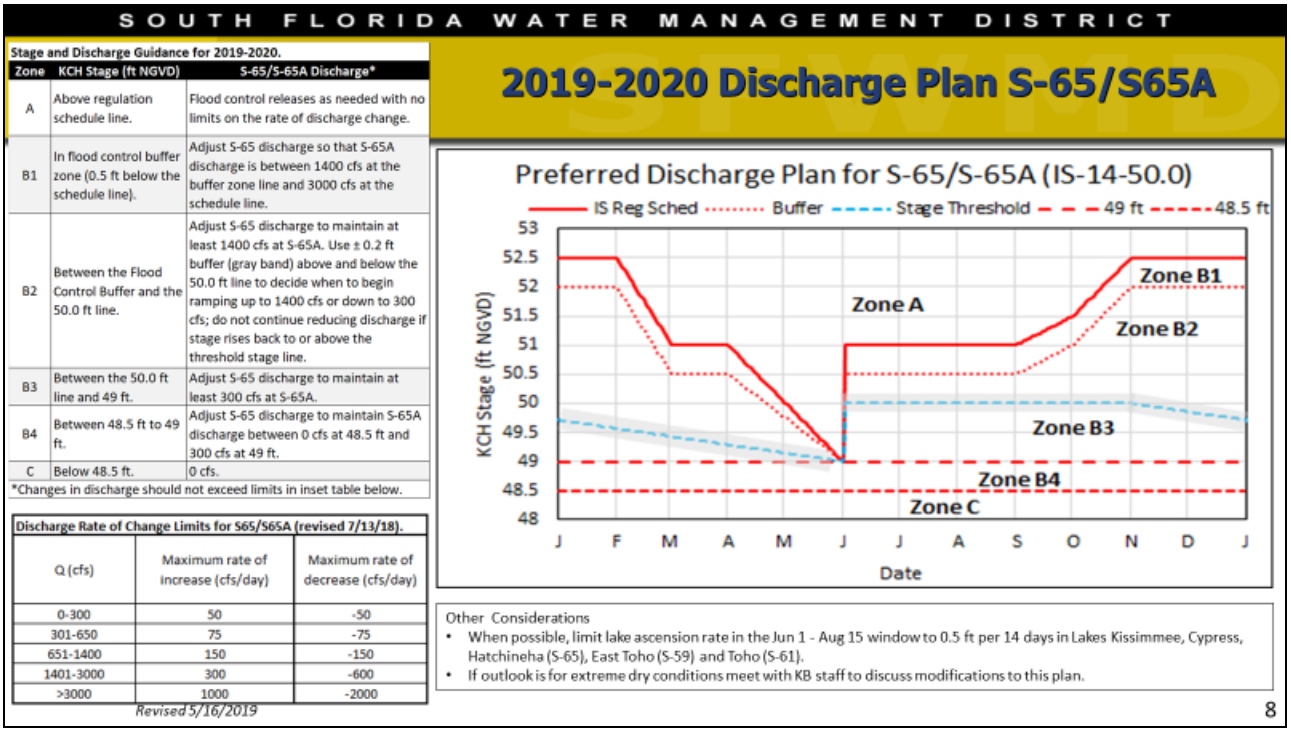



**Figure 6.** The 2019-2020 Discharge Plan for S-65/S-65A.

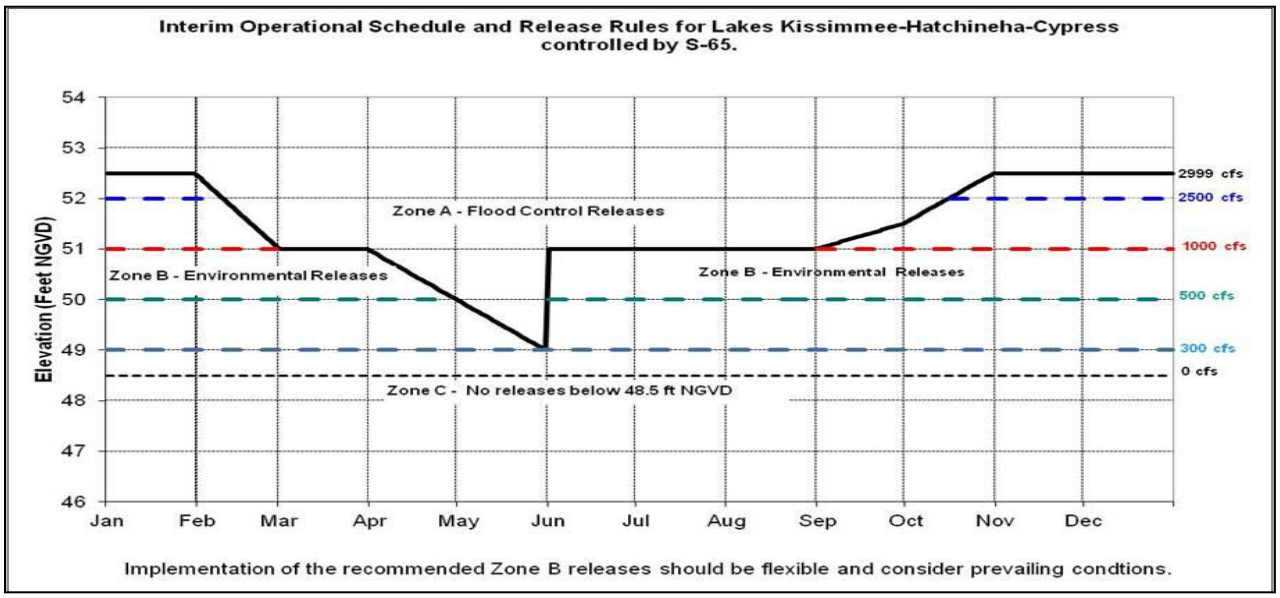



**Figure 7.** Interim operations schedule for S-65 (solid black line). The discharge schedule shown to the right has not been used in recent years.

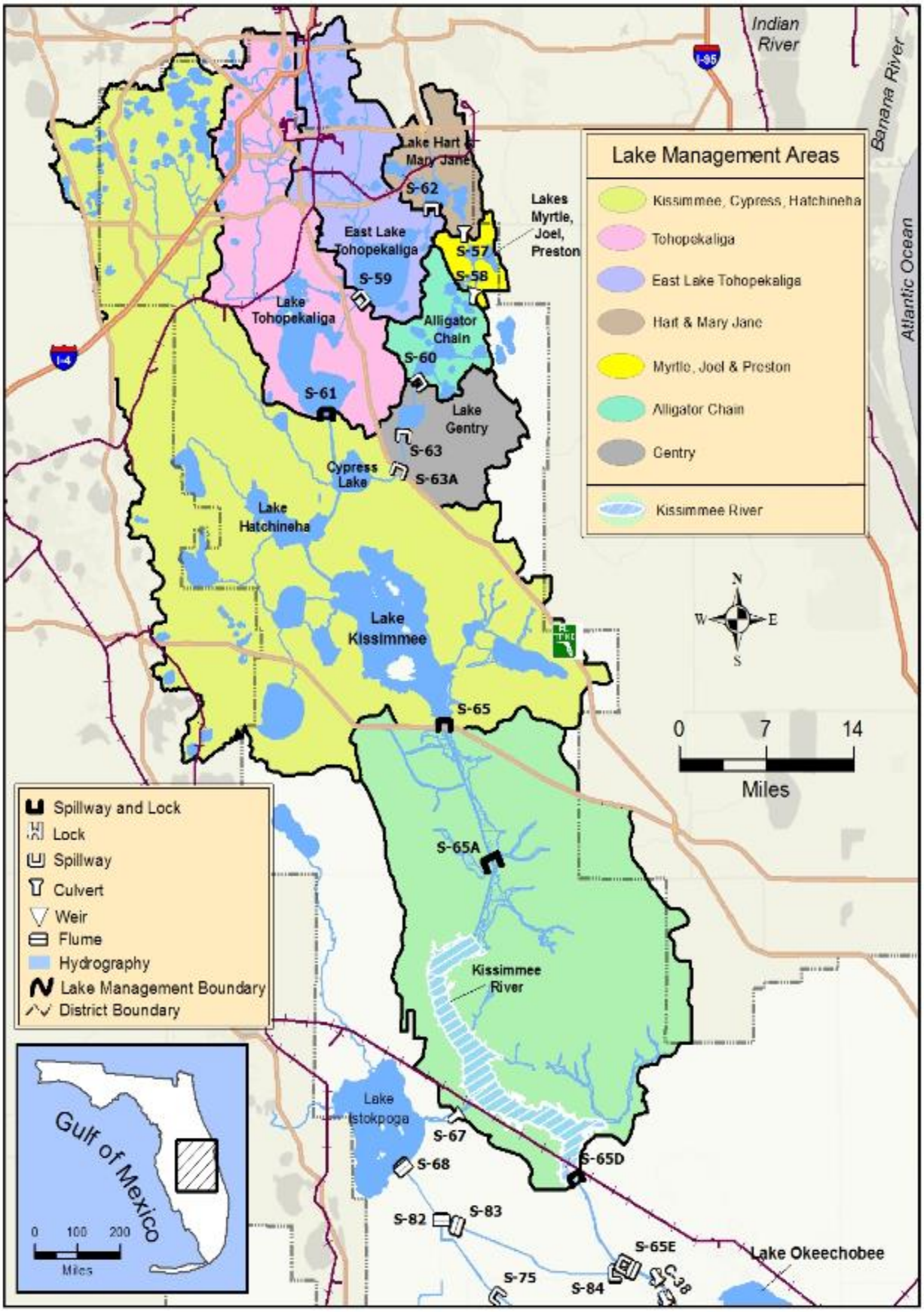



**Figure 8.** The Kissimmee Basin.

## LAKE OKEECHOBEE

Lake Okeechobee stage is 15.92 feet NGVD, 0.36 feet lower than a month ago, and 2.94 feet higher than one year ago (Figure 1). Lake stages rose into the lower portion of the preferred ecological envelope on June 2, 2020 (Figure 2) but have been above the envelope since August 1, 2020; currently 0.42 feet above. Lake stage reached a low of 10.99 feet on May 17 and a high of 16.45 feet on November 12 (post Tropical Storm Eta), a difference of 5.5 feet (Figure 3). Lake stage has declined since mid-November and is currently in the Low sub-band. According to RAINDAR, approximately 0.16 inches of rain fell on the Lake and in most of the watershed last week. The Upper Kissimmee basin and the Caloosahatchee basin received between 0.5 and 1.5 inches (Figure 4).

Average daily inflows (excluding rainfall) were lower than the previous week, going from 3,080 cubic feet per second (cfs) to 2,516 cfs. Outflows (excluding evapotranspiration) decreased from 3,961 cfs to 3,074 cfs. Most of the inflows came from the Kissimmee River (1,710 cfs through S-65E & S-65EX1) and the C-41a canal (313 cfs through S-84 & S-84X) combined. Releases to the west via S-77 and east via S-308 both decreased from last week, going from 2,898 cfs to 2,116 cfs at S-77 and from 972 cfs to 880 cfs at S-308. Average inflows and outflows through water control structures surrounding the Lake for the previous two weeks (cfs) are shown in Table 1. The resultant Lake elevation change (in) due to each structure's flow for the past week is also shown in Table 1. 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 second wading bird survey of the 2021 breeding season (conducted December 17, 2020) reported approximately 340 foraging wading birds on the lake, compared to about 3,500 on the December 3rd survey and about 1,300 birds foraging at the same time last year (Figure 6) when lake stage was almost 3 feet lower (Figure 2). Suitable foraging habitat is currently limited especially for the short-legged wading birds. Higher lake stages throughout the summer and fall of 2020 likely sparked prey production in the marsh, leading to more wading bird foraging activity than would be expected at nearly 16 feet in lake stage on the survey two weeks ago. Most of the wading birds during that survey were seen using vegetation to forage from in deeper areas, with very few species observed that tend to rely on shallow areas (e.g. white ibis). Lake stages near the top of the ecological envelope throughout the spring should provide good conditions for wading bird nesting this breeding season.

Water quality sampling is now on the non-bloom season schedule (November – April), occurring once monthly at approximately 30 stations for chlorophyll *a,* and at 9 stations for taxonomic identification and toxin analyses. The November sampling occurred on the 17th and 18th and six sites were not sampled due to unsafe conditions (Figure 7). All chlorophyll *a* samples have been analyzed and all levels were below the bloom threshold of 40 μg/L, the highest of which was 36.0 μg/L. All toxin samples have been completed and only three sites had toxin levels above detection, but still well below the EPA recreational waters recommendation of 8 μg/L.

The most recent satellite image (December 16, 2020) from the NOAA cyanobacteria monitoring product derived from EUMETSAT's Sentinel 3 OLCI sensor data showed continued low bloom potential on the Lake (Figure 8).

### Water Management Summary

Lake Okeechobee stage was 15.92 feet NGVD on December 20, 2020, 0.07 feet lower than last week and 0.36 feet lower than a month ago. The Lake is currently in the Low Sub-band. Stage has been above or near the top of the preferred ecological envelope since August 1, 2020 and is currently 0.42 feet above. Wading bird monitoring for the 2021 breeding season began in early December and 3,500 foraging birds were observed, more than expected given relatively high lake stages but by mid-December those numbers declined to approximately 340 wading birds which is more in line with surveys

conducted under similar conditions. Recent satellite imagery suggests little to no bloom potential on the Lake.

**Table 1.** Average daily inflows and outflows for the most recent two weeks and approximate depth equivalents on Lake Okeechobee for various structures.

| INFLOWS | Previous week Avg Daily CFS | Avg Daily Flow cfs | Equivalent Depth Week Total (in) |
|---|---|---|---|
| S-65E & S-65EX1 | 1684 | 1710 | 0.7 |
| S-71 & S-72 | 305 | 177 | 0.1 |
| S-84 & S-84X | 513 | 313 | 0.1 |
| Fisheating Creek | 127 | 125 | 0.0 |
| S-154 | 37 | 25 | 0.0 |
| S-191 | 0 | 0 | 0.0 |
| S-133 P | 74 | 34 | 0.0 |
| S-127 P | 26 | 5 | 0.0 |
| S-129 P | 18 | 3 | 0.0 |
| S-131 P | 7 | 3 | 0.0 |
| S-135 P | 159 | 119 | 0.0 |
| S-2 P | 0 | 0 | 0.0 |
| S-3 P | 0 | 0 | 0.0 |
| S-4 P | 72 | 0 | 0.0 |
| L-8 Backflow | 57 | 1 | 0.0 |
| Rainfall | 215 | 419 | 0.2 |
| **Total** | **3295** | **2935** | **1.1** |

| OUTFLOWS | Previous week Avg Daily CFS | Avg Daily Flow cfs | Equivalent Depth Week Total (in) |
|---|---|---|---|
| S-77 | 2898 | 2116 | 0.8 |
| S-308 | 972 | 880 | 0.3 |
| S-351 | 91 | 26 | 0.0 |
| S-352 | 0 | 28 | 0.0 |
| S-354 | 0 | 23 | 0.0 |
| L-8 Outflow | | | |
| ET | 1630 | 1765 | 0.7 |
| **Total** | **5591** | **4839** | **1.9** |

Provisional Data

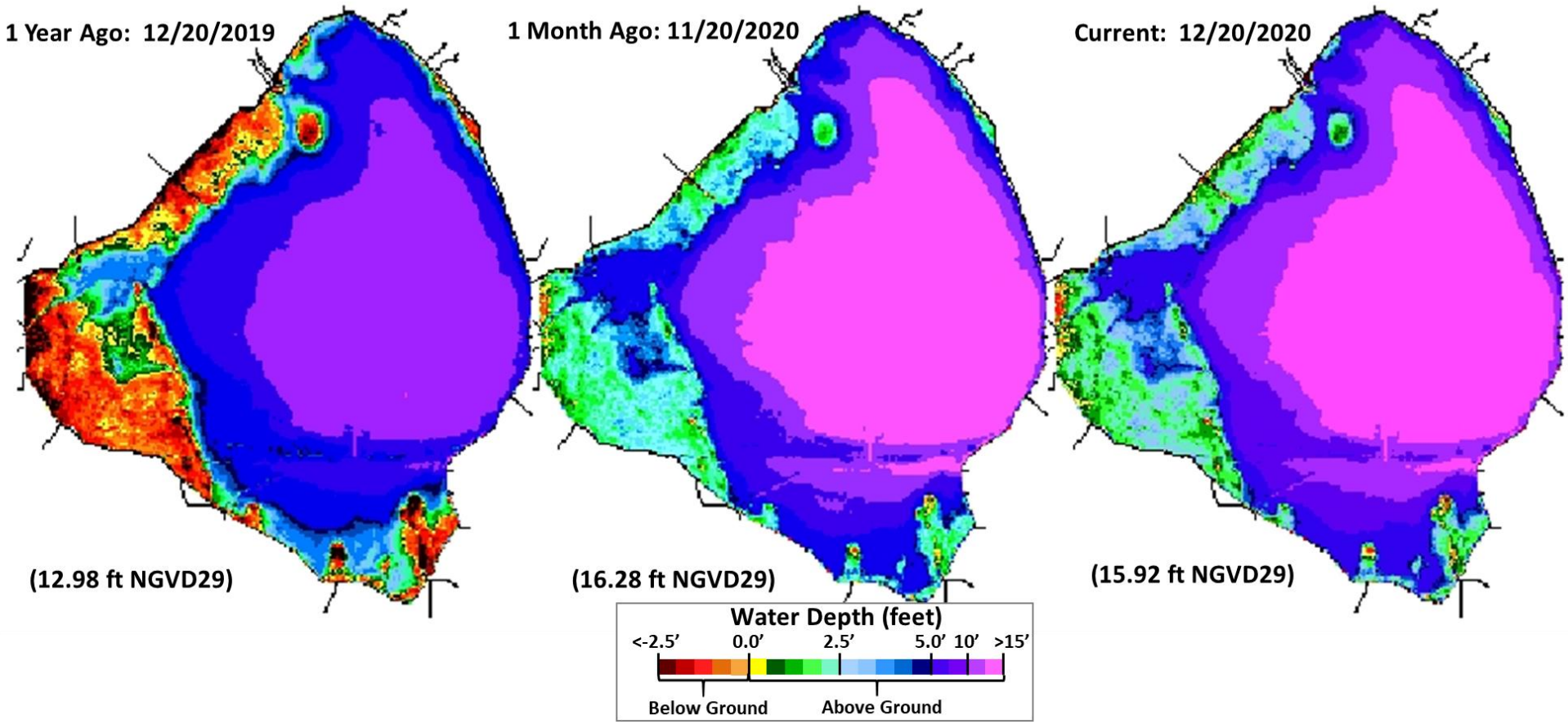



**Figure 1.** Water depth estimates on Lake Okeechobee based on the South Florida Water Depth Assessment Tool.

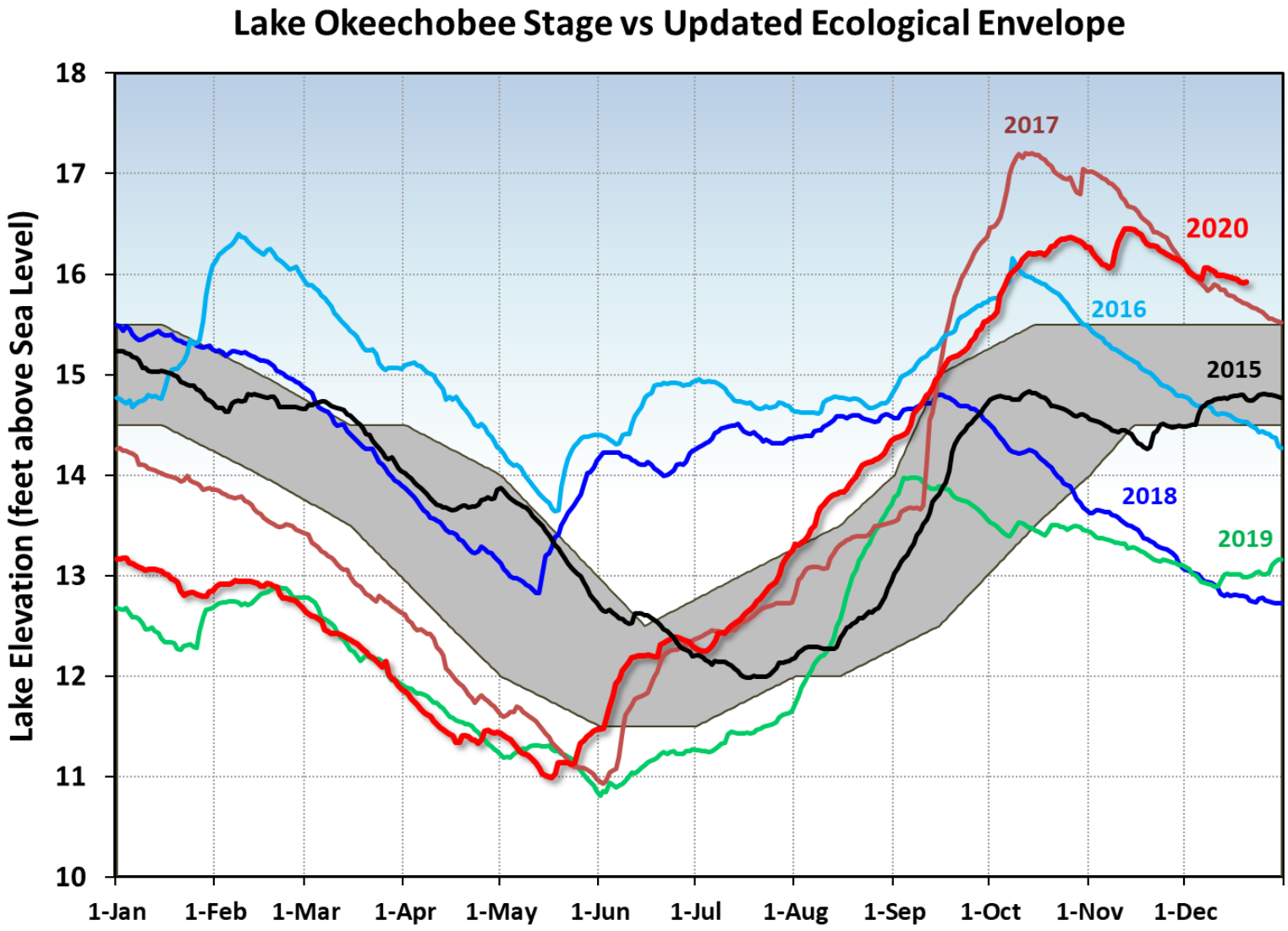



**Figure 2.** Select annual stage hydrographs for Lake Okeechobee in comparison to the updated Ecological Envelope.

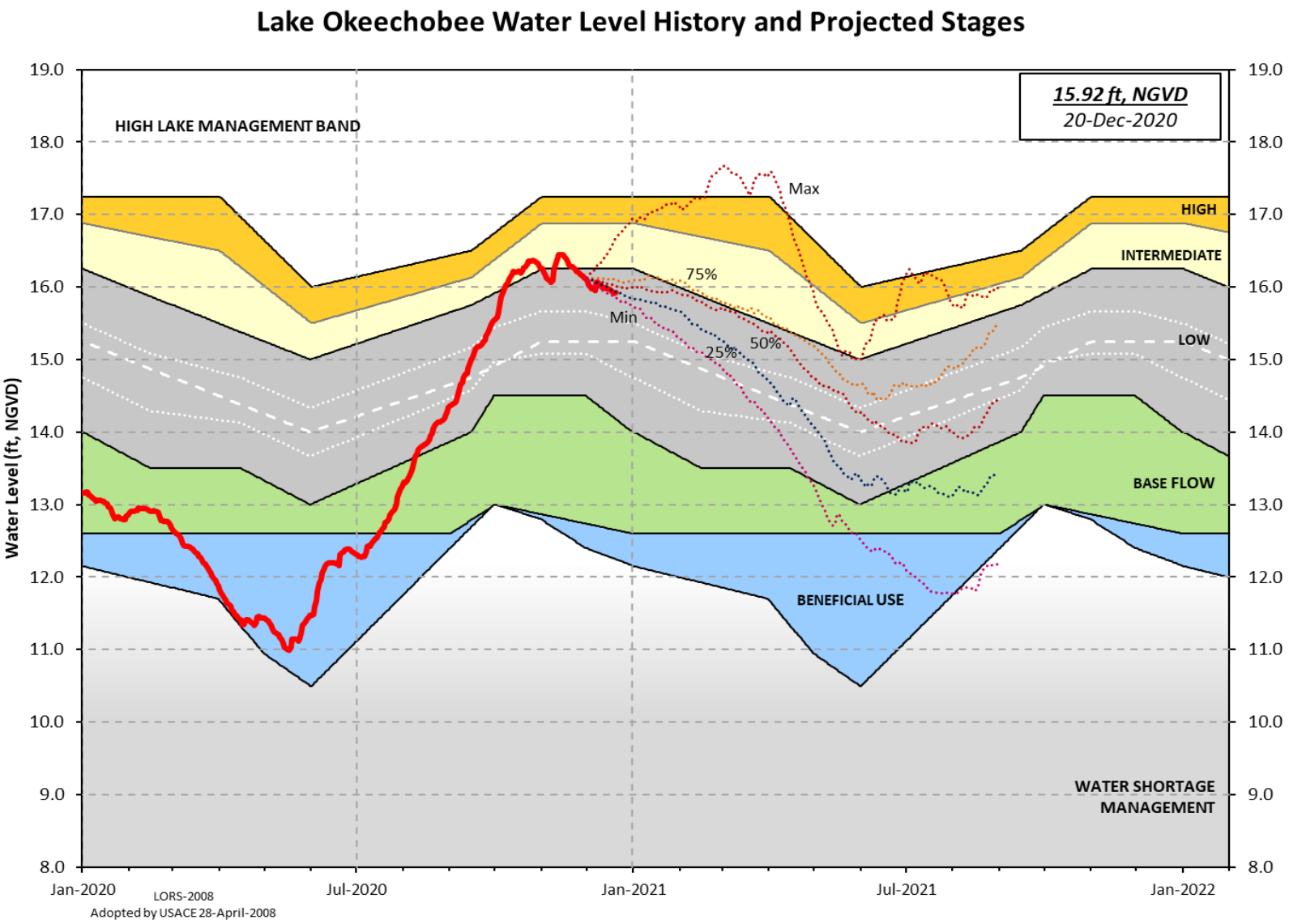



**Figure 3.** Recent Lake Okeechobee stages and releases, with projected stages based on a dynamic position analysis.

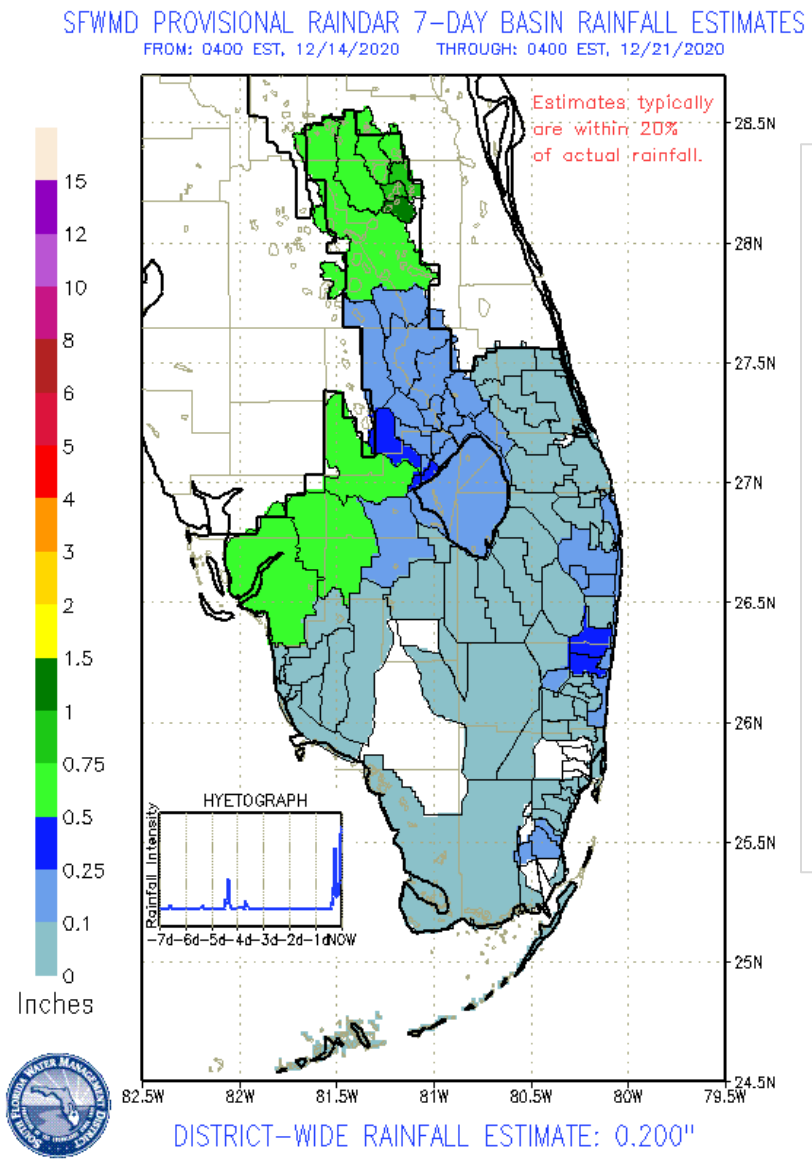



**Figure 4.** 7-Day rainfall estimates by RAINDAR.

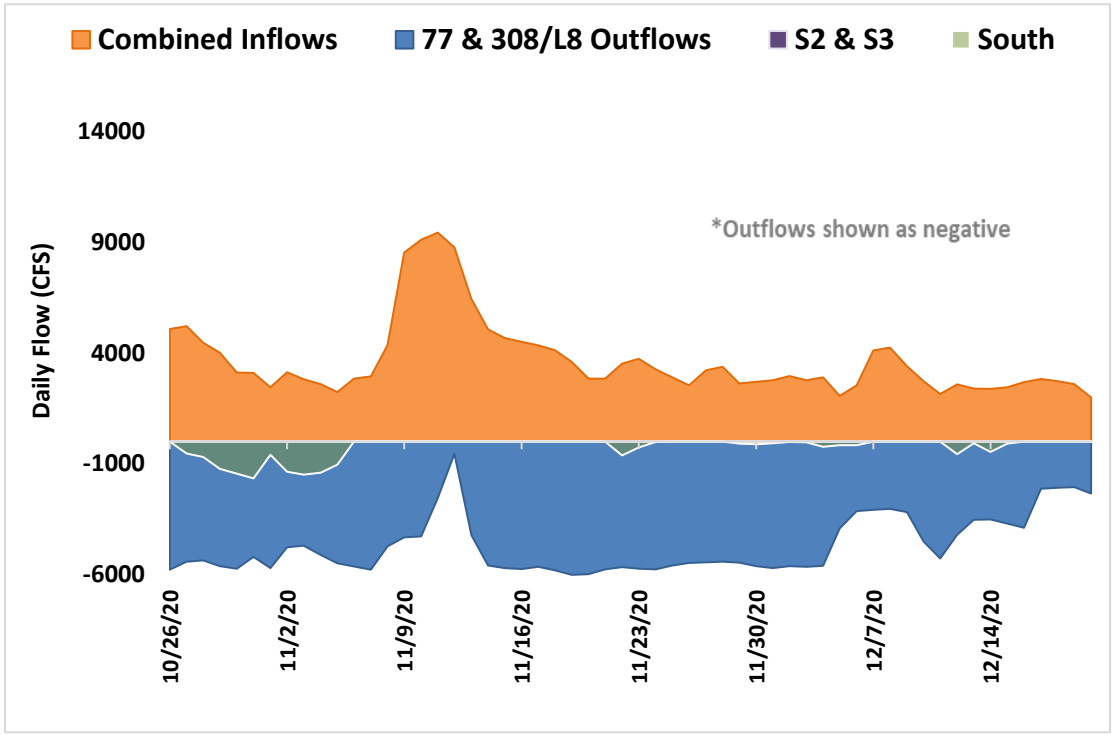
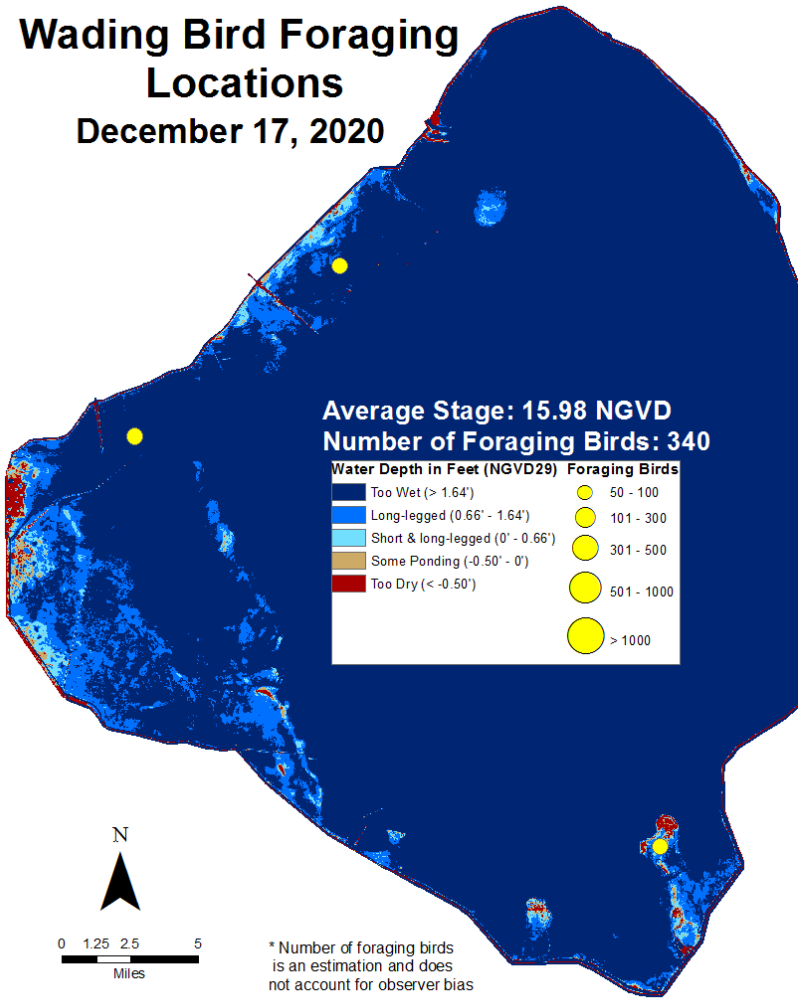



**Figure 5.** Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the Lake. All inflows and outflows are shown as positive and negative, respectively, for visual purposes. Outflows through the S-77 and S-308 structures are shown based on their downstream gauges to account for lock openings for navigation.

# Wading Bird Foraging Locations

## December 17, 2020



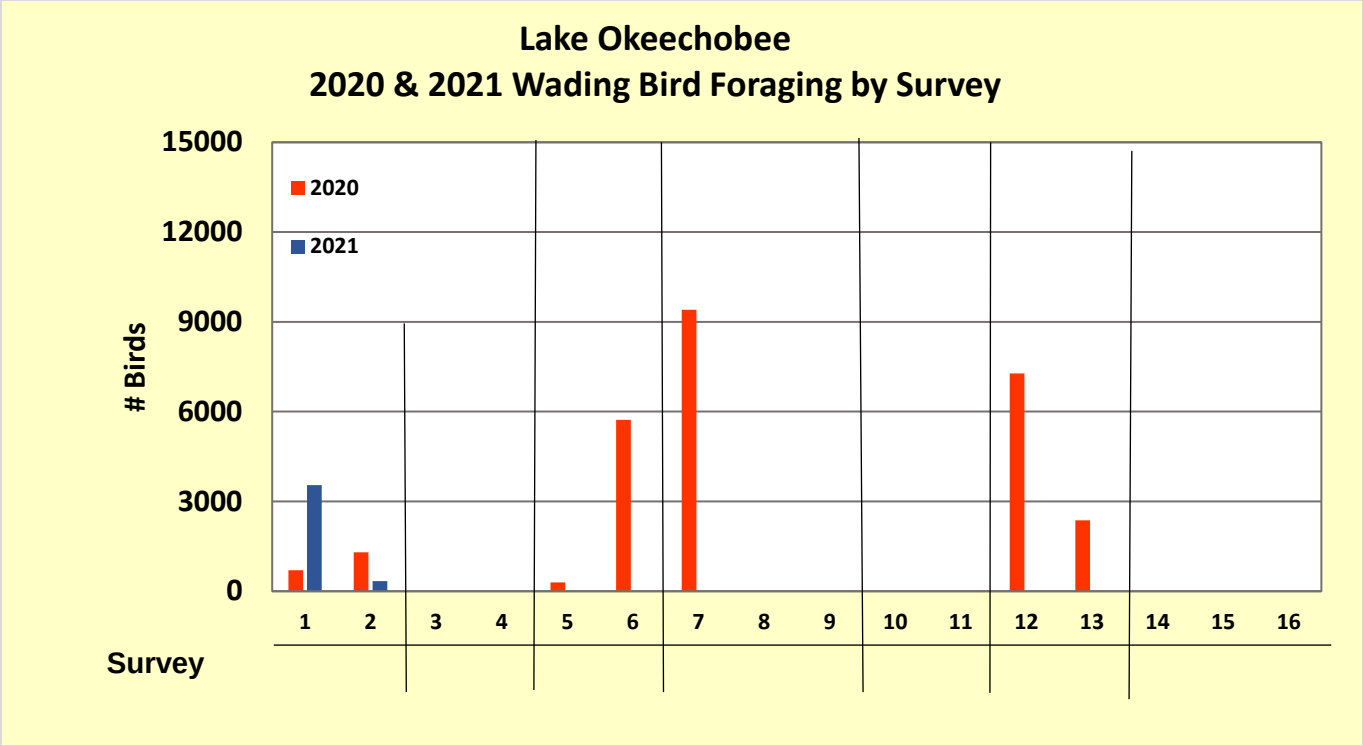



**Figure 6.** Locations of foraging flocks of wading birds observed during a monitoring flight on December 17, 2020 are shown in yellow, with circle sizes representing the size of the flocks. Previous survey totals from last year's breeding season are compared in the bar graph.

**Collection Date: November 17-18, 2020**

| Station | CHL*a* (ug/L) | TOXIN (ug/L) | TAXA |
|---|---|---|---|
| FEBIN (11/2) | 14.8 | | |
| FEBOUT (11/2) | **36.0** | | |
| KISSR0.0 | 9.2 | BDL | mixed |
| L005 | 18.3 | **0.5** | *Microcys* |
| LZ2 | 18.0 | BDL | *Microcys* |
| KBARSE | 9.5 | | |
| RITTAE2 | 10.4 | BDL | mixed |
| PELBAY3 | 8.9 | | |
| POLE3S | 10.3 | | |
| LZ25A | 5.9 | | |
| PALMOUT | - | | NS |
| PALMOUT1 | - | | |
| PALMOUT2 | - | | |
| PALMOUT3 | - | | |
| POLESOUT | **35.9** | **0.5** | *Microcys* |
| POLESOUT1 | **21.5** | | |
| POLESOUT2 | 14.1 | | |
| POLESOUT3 | 14.4 | | |
| EASTSHORE | 4.6 | | |
| NES135 | 6.9 | | |
| NES191 | 2.8 | | |

| Station | CHL*a* (ug/L) | TOXIN (ug/L) | TAXA |
|---|---|---|---|
| L001 | 9.5 | | |
| L004 | 6.0 | | |
| L006 | 9.0 | | |
| L007 | 6.3 | | |
| L008 | 9.6 | | |
| LZ30 | 7.0 | BDL | *Microcys* |
| LZ40 | - | | |
| CLV10A | - | | NS |
| NCENTER | 11.3 | | |
| Sampled 11/16 | | | |
| S308C | 3.3 | **1.0** | *Microcys* |
| **S77** | 3.9 | BDL | *Microcys* |

- SFWMD considers >40 µg/L Chlorophyll *a* (Chl*a*) an algal bloom
- BDL – Below Detectable Limit of **0.25** µg/L
- ND – No Dominant taxa
- P – Pending
- NS – Not Sampled
- Bold – crew observed possible BGA
- Chlorophyll *a* analyzed by SFWMD
- Toxin and Taxa analyzed by FDEP

*Cylindro* = *Cylindrospermopsis*
*Planktol* = *Planktolyngbya*
*Dolicho* = *Dolichospermum*

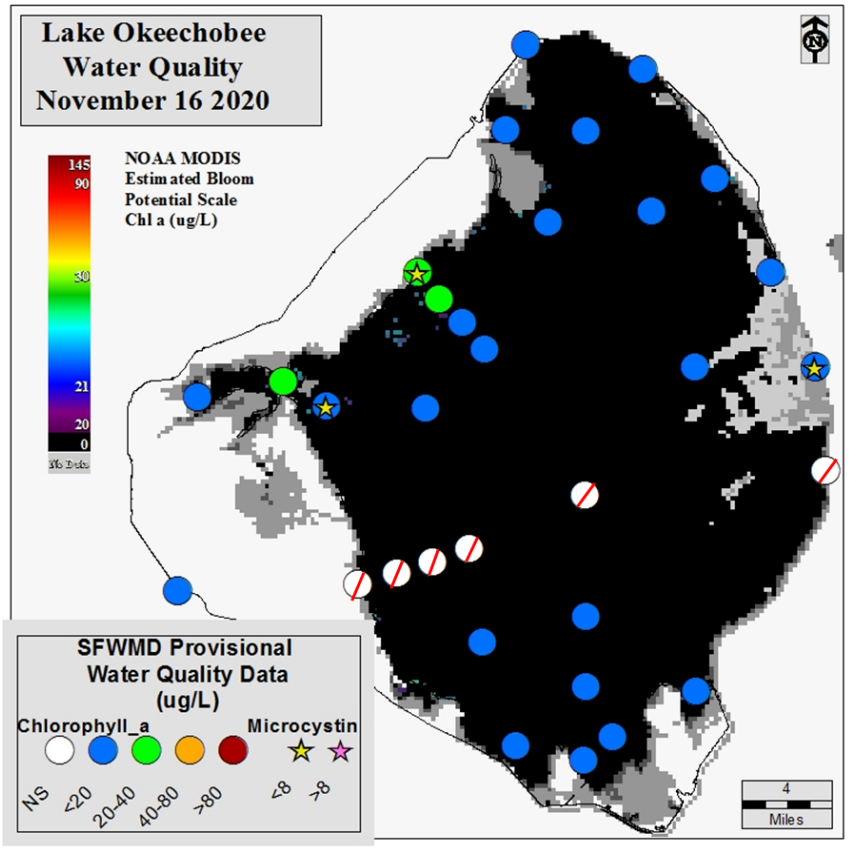



**Figure 7.** Provisional results from the expanded monitoring sampling trips on November 17 - 18, 2020. Sites on map with a red slash (*/*) were not sampled due to unsafe conditions.

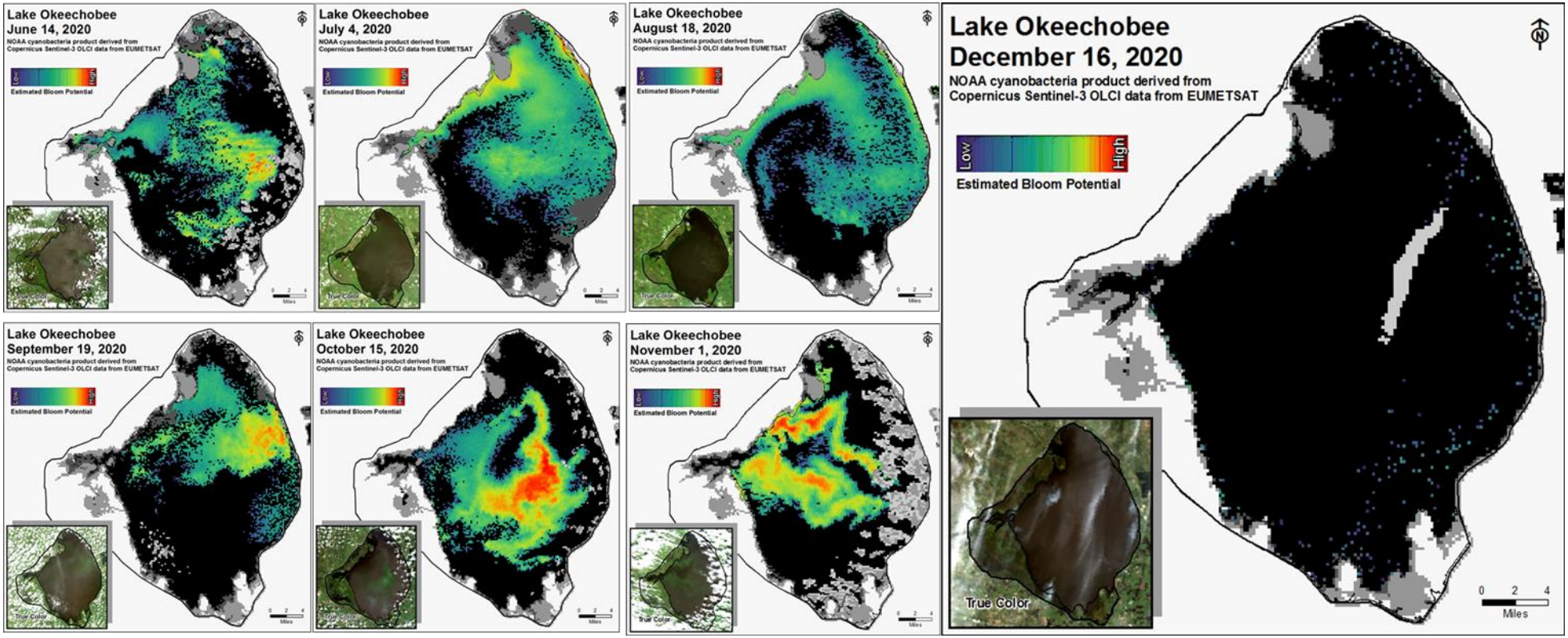



**Figure 8.** Cyanobacteria bloom potential based on NOAA's harmful algal bloom monitoring system. Gray color indicates cloud cover.

## ESTUARIES

**St. Lucie Estuary**:

Last week total inflow to the St. Lucie Estuary averaged more than 985 cfs (Figures 1 and 2) and last month inflow averaged more than 1,868 cfs. Note these numbers do not include contributions from the Gordy Road Structure due to missing data. Last week's provisional averaged inflows from the tidal basin and the structures are shown in Table 1. (Note: Recorder at Gordy Road structure was removed due to bridge construction)

**Table 1.** Weekly average inflows (data are provisional).

| Location | Flow (cfs) |
|---|---|
| Tidal Basin Inflow | 108 |
| S-80 | 713 |
| S-308 | 880 |
| S-49 on C-24 | 90 |
| S-97 on C-23 | 74 |
| Gordy Rd. structure on Ten Mile Creek | Not reporting |

Over the past week, surface salinity increased throughout the estuary (Table 2, Figures 3 and 4). The seven-day moving average of the water column (an average of the surface and bottom salinity) at the US1 Bridge is 9.8. Salinity conditions in the middle estuary are estimated to be 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) | **4.9** (4.5) | **6.9** (7.1) | NA[1] |
| US1 Bridge | **8.2** (7.0) | **11.3** (10.6) | 10.0-26.0 |
| A1A Bridge | **15.8** (14.2) | **22.8** (20.9) | NA[1] |

[1]Envelope not applicable

**Caloosahatchee Estuary**:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 3,652 cfs (Figures 5 and 6) and last month inflow averaged about 5,150 cfs. Last week's provisional averaged inflows from the structures and the tidal basin are shown in Table 3.

**Table 3.** Weekly average inflows (data is provisional).

| Location | Flow (cfs) |
|---|---|
| S-77 | 2,116 |
| S-78 | 2,309 |
| S-79 | 3,404 |
| Tidal Basin Inflow | 249 |

Over the past week in the estuary, surface salinity remained the same to Ft. Myers Yacht Basin and increased downstream (Table 4, Figures 7 & 8). The seven-day average salinity values are within the poor range for adult eastern oysters at Cape Coral and in the good range at Shell Point and at Sanibel (Figure 9). The seven-day average surface salinities (Table 4) are in the good range (0-10) for tape grass at Val I-75 and at Ft. Myers.

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

| Sampling Site | Surface | Bottom | | Envelope |
|---|---|---|---|---|
| S-79 (Franklin Lock) | **0.2** (0.2) | **0.2** (0.2) | | NA[1] |
| Val I75 | **0.2** (0.2) | **0.2** (0.2) | | 0.0-5.0[2] |
| Ft. Myers Yacht Basin | **0.2** (0.2) | **0.2** (0.2) | | NA |
| Cape Coral | **3.8** (1.3) | **4.4** (1.9) | | 10.0-30.0 |
| Shell Point | **17.7** (14.4) | **19.4** (16.5) | | 10.0-30.0 |
| Sanibel | **24.9** (24.2) | **25.0** (25.5) | | 10.0-30.0 |

[1]Envelope not applicable and [2]Envelope is based on a 2-week forecast 30-day average

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 to be 0.3 or lower at the end of the two week period for pulse release at S-79 ranging from 0 to 800 cfs and estimated Tidal Basin inflows of 160 cfs. The 30-day moving average surface salinity at Val I-75 is forecast to be 0.3 or lower (Table 5). The current salinity conditions at Val I-75 are within the envelope of salinity 0.0-5.0 for this site (Table 4).

**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 | 160 | 0.3 | 0.3 |
| B | 300 | 160 | 0.3 | 0.3 |
| C | 450 | 160 | 0.3 | 0.3 |
| D | 650 | 160 | 0.3 | 0.3 |
| E | 800 | 160 | 0.3 | 0.3 |

## Red tide

The Florida Fish and Wildlife Research Institute reported on December 18, 2020, that *Karenia brevis*, the Florida red tide dinoflagellate, was observed in background to high concentrations in 26 samples collected from and offshore of Lee and Collier Counties. No samples were analyzed this week from Miami-Dade, St. Lucie, Martin, Palm Beach, or Broward counties.

## Water Management Recommendations

Lake stage is in the Low Sub-Band. Tributary conditions are wet. The LORS2008 release guidance suggests up to 450 cfs release at S-79 to the Caloosahatchee Estuary and up to 200 cfs release at S-80 to the St. Lucie Estuary.

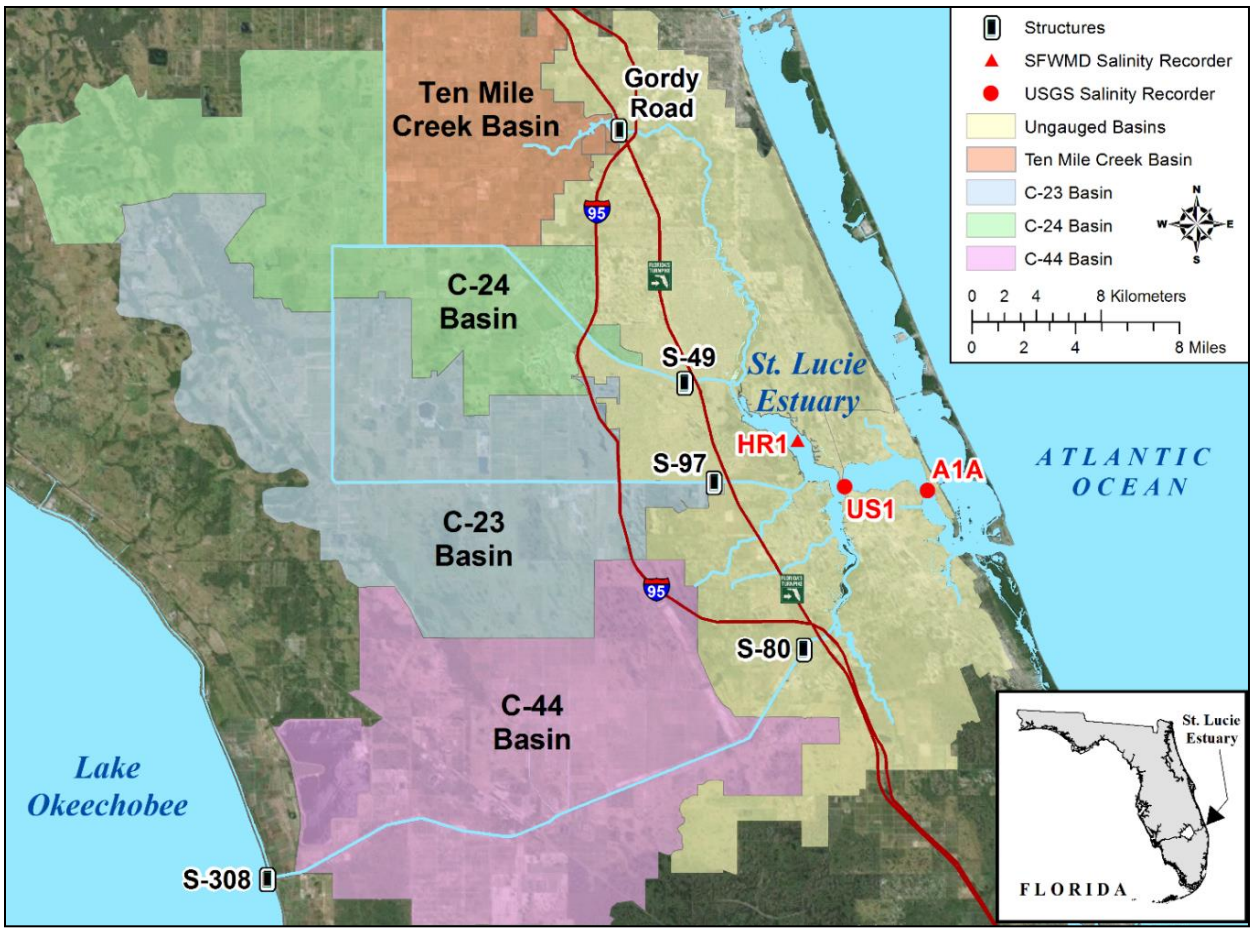



**Figure 1.** Basins, water control structures, and salinity monitoring for the St. Lucie Estuary.

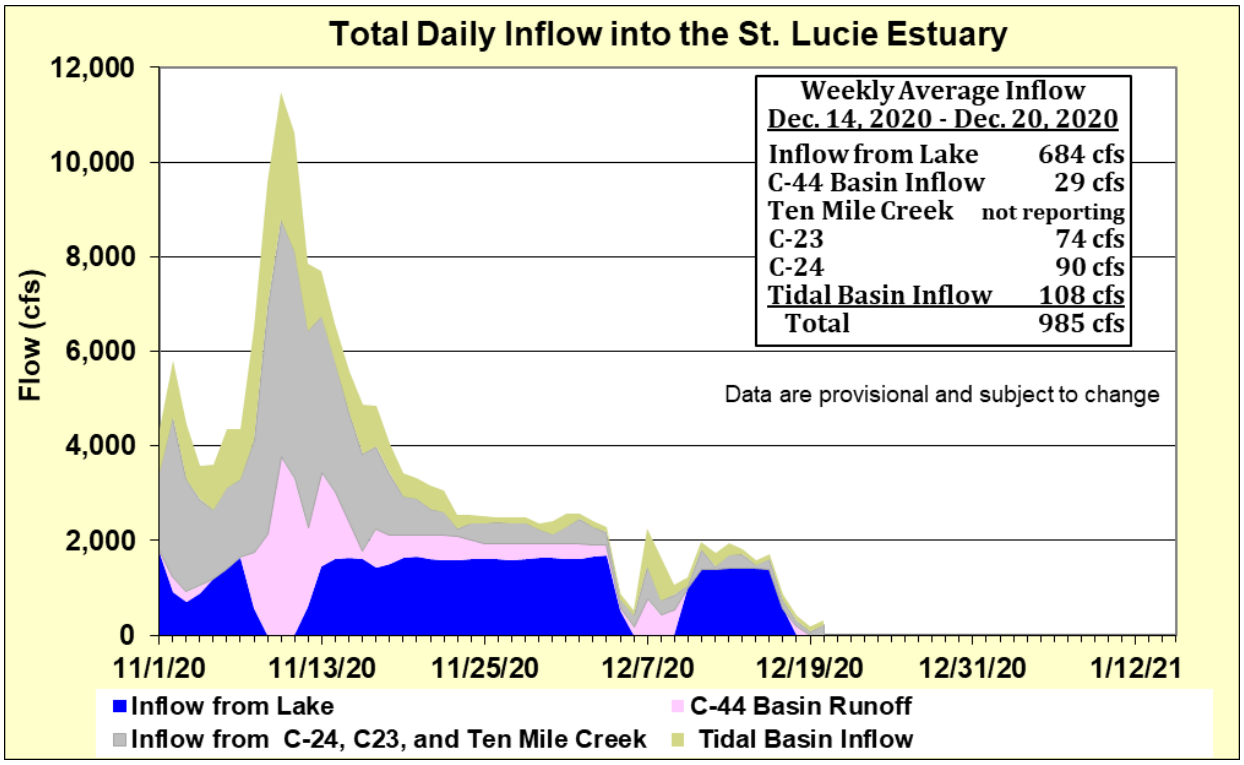



**Figure 2.** Total daily inflows from Lake Okeechobee and runoff from the C-44, C-23, C-24, Ten Mile Creek, and tidal basin into the St. Lucie Estuary.

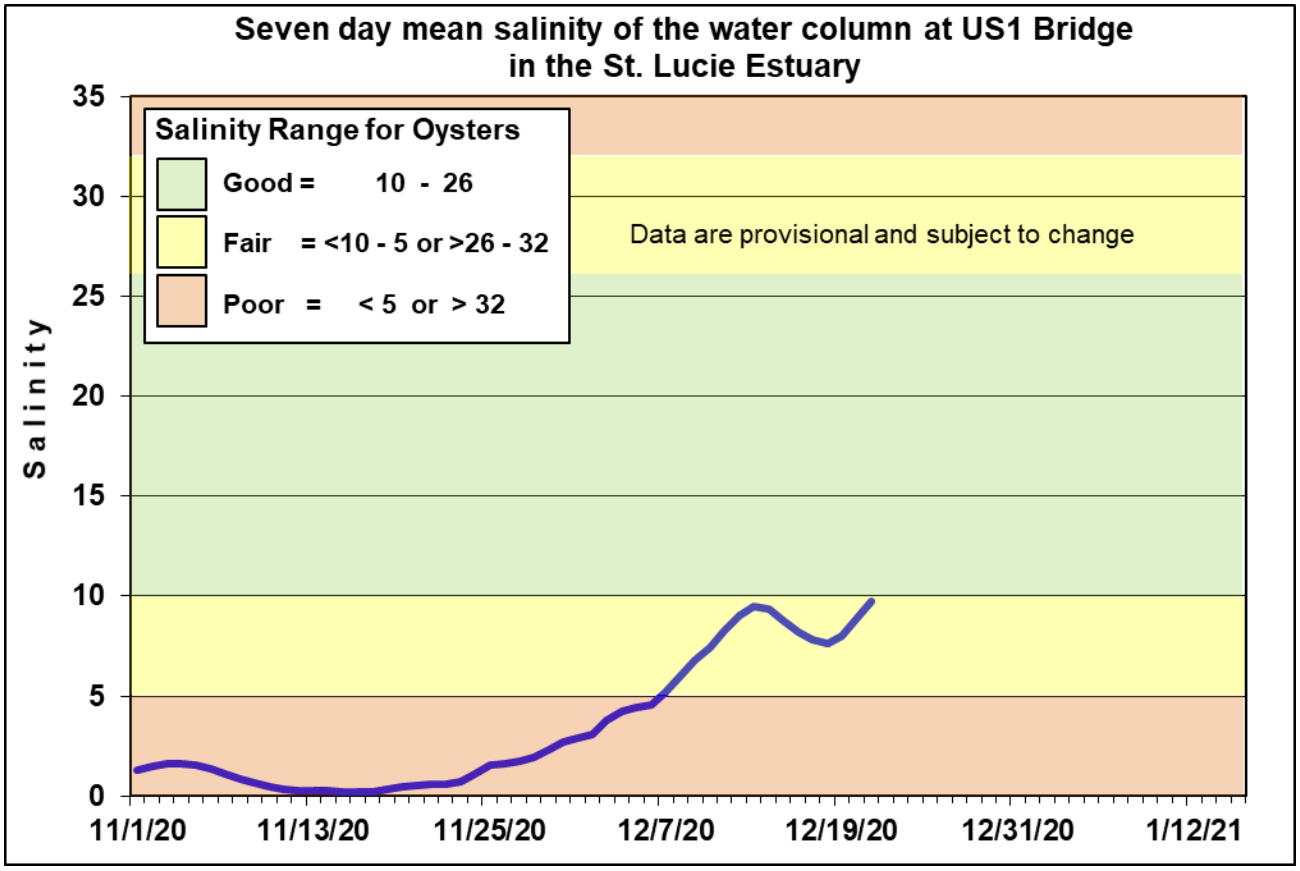



**Figure 3.** Seven-day mean salinity of the water column at the US1 Bridge.

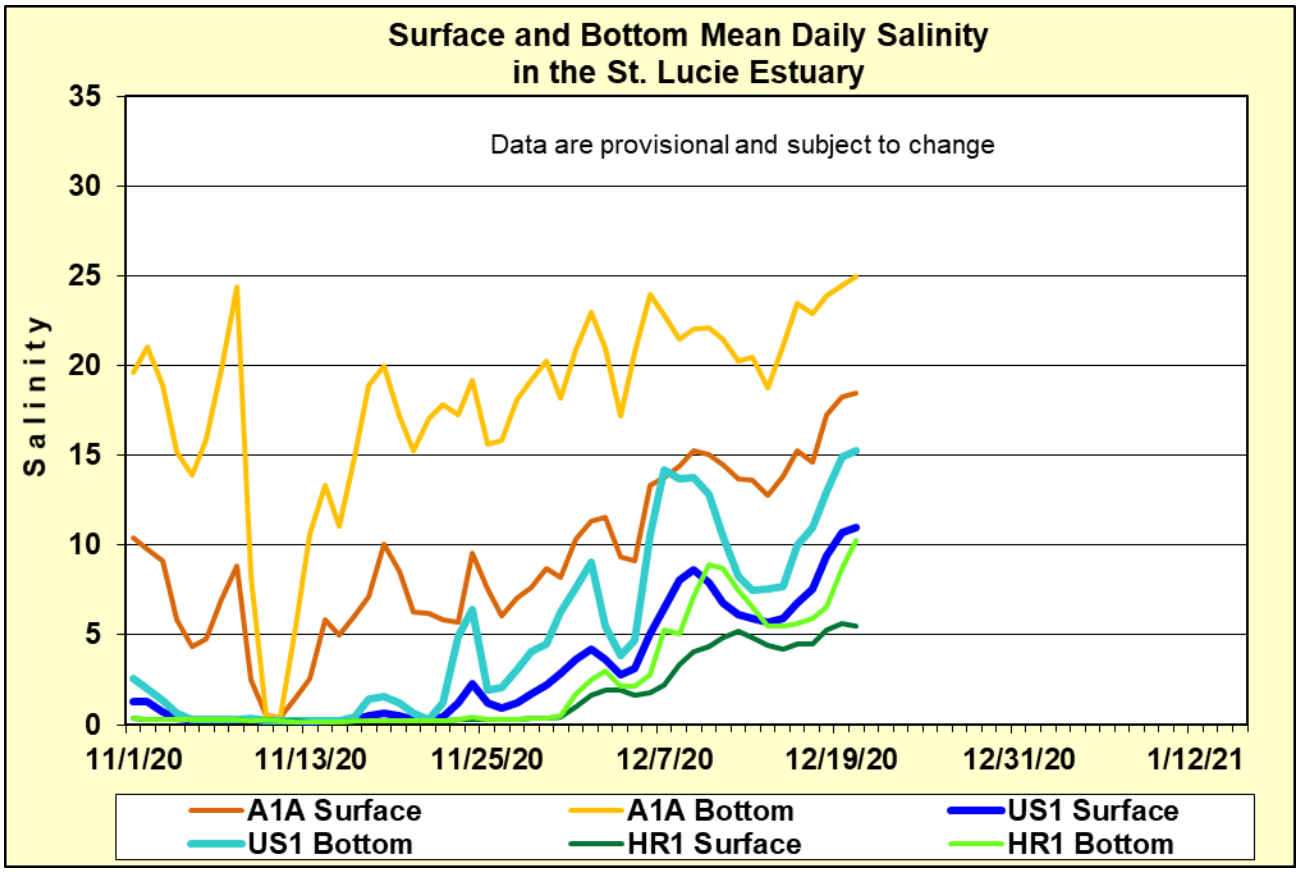



**Figure 4**. Daily mean salinity at the A1A, US1, and HR1 stations.

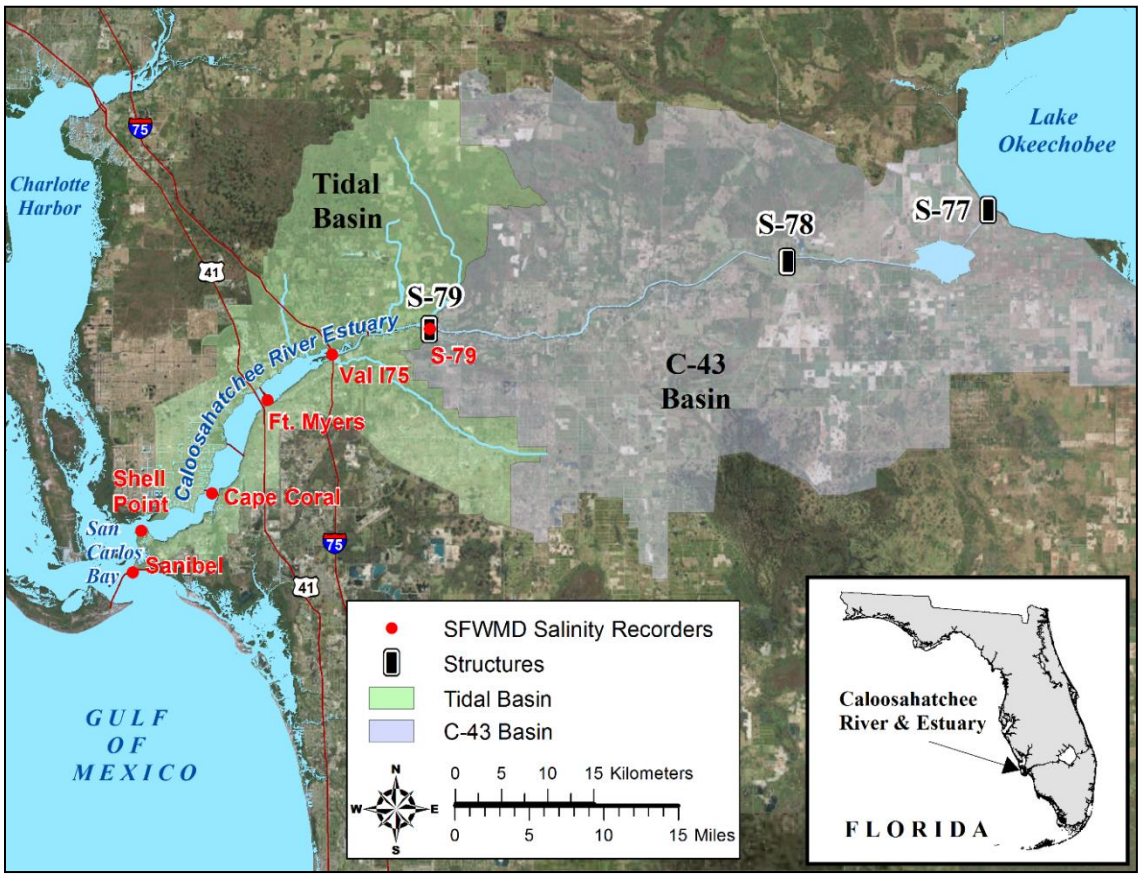



**Figure 5.** Basins, water control structures, and salinity monitoring for the Caloosahatchee Estuary.

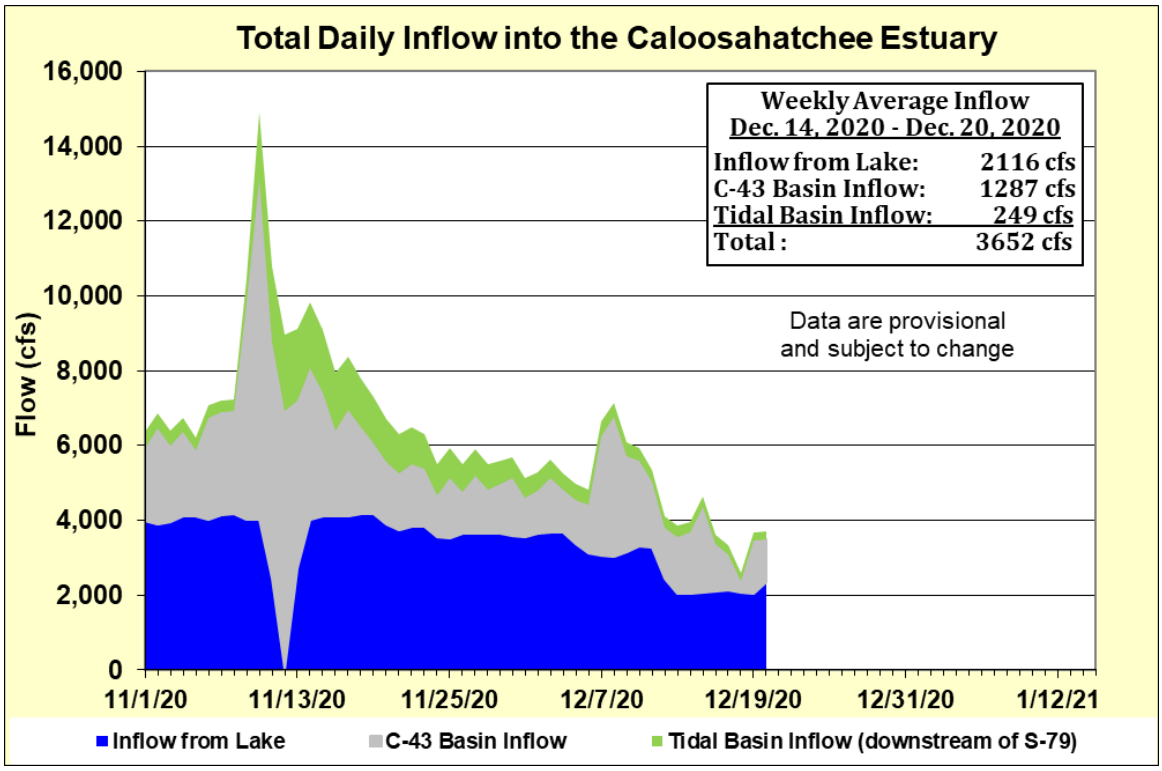



**Figure 6.** Total daily inflows from Lake Okeechobee, runoff from the C-43 basin, and tributaries in the tidal basin into the Caloosahatchee River Estuary.

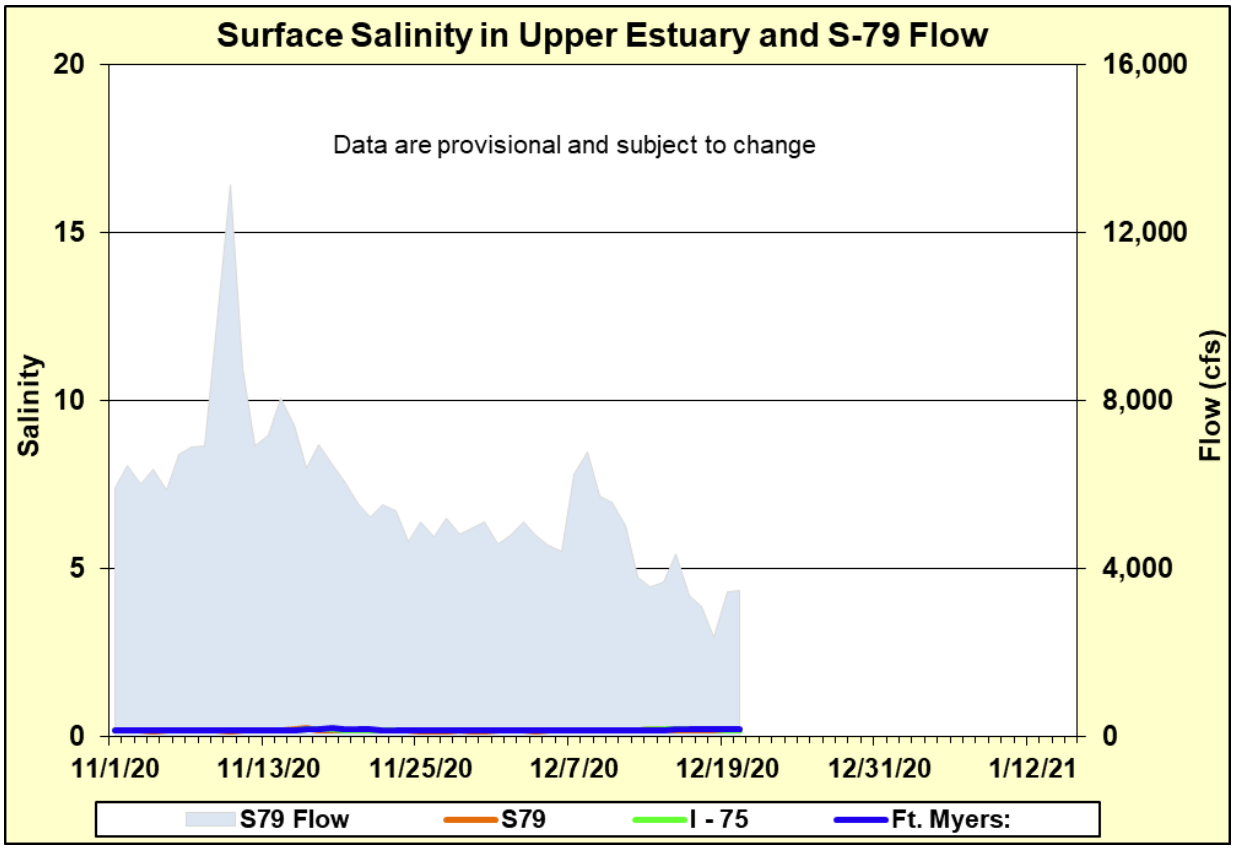



**Figure 7.** Daily mean flows at S-79 and salinity at upper estuary monitoring stations.

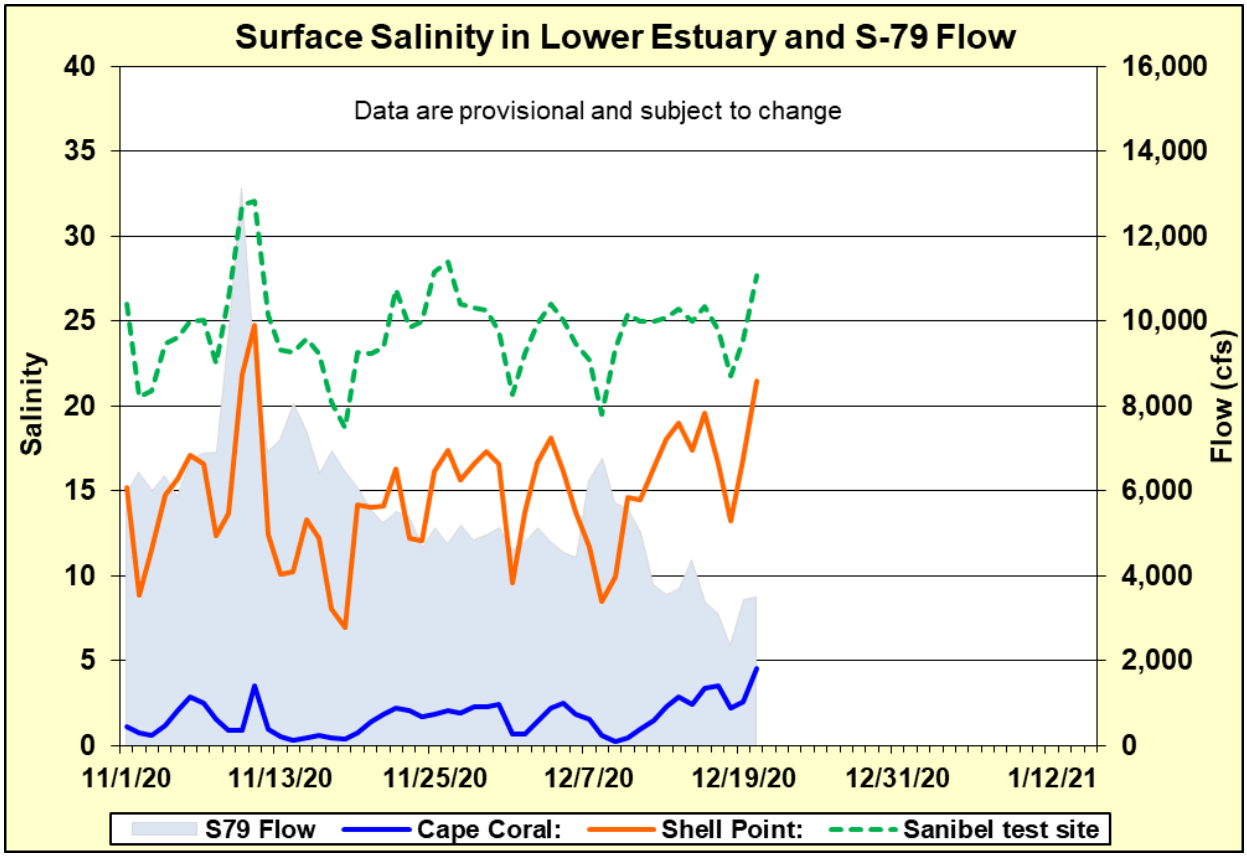



**Figure 8.** Daily mean flows at S-79 and salinity at lower estuary stations.

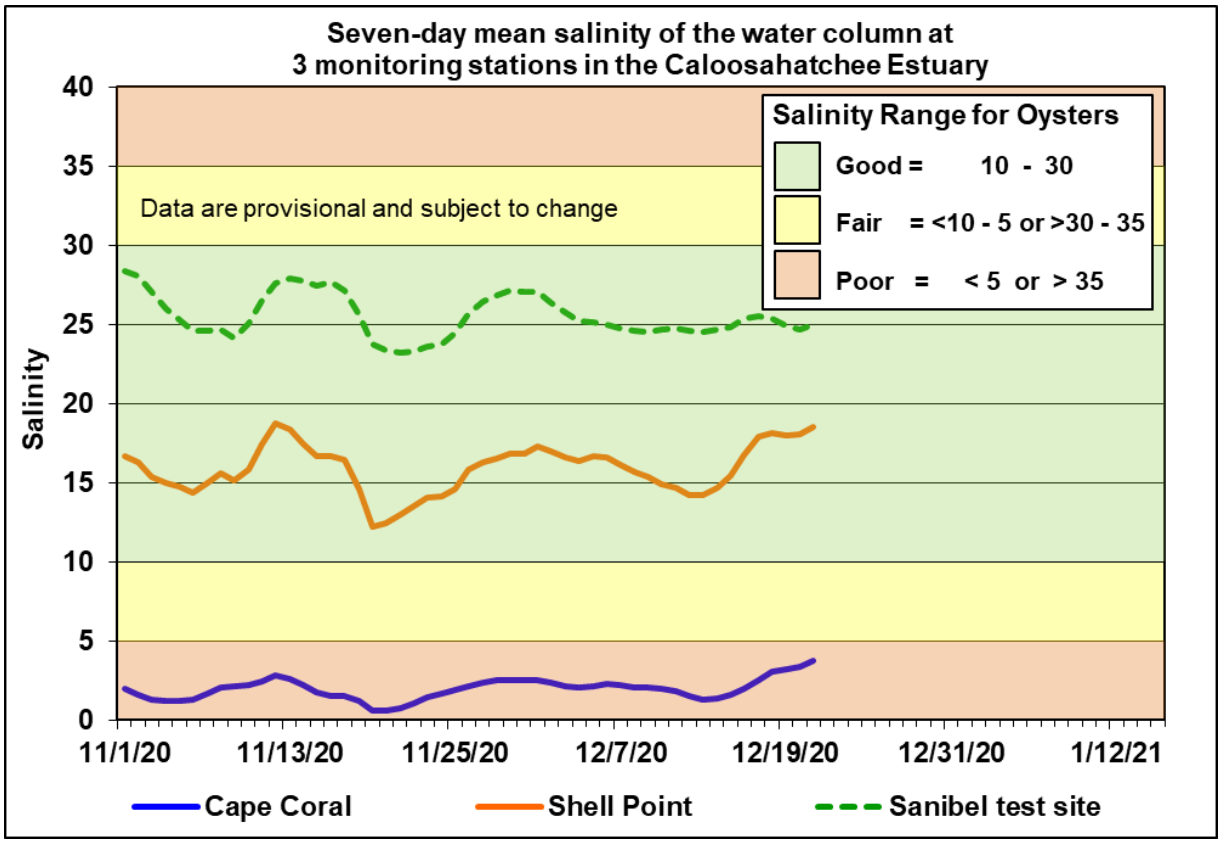



**Figure 9.** Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.

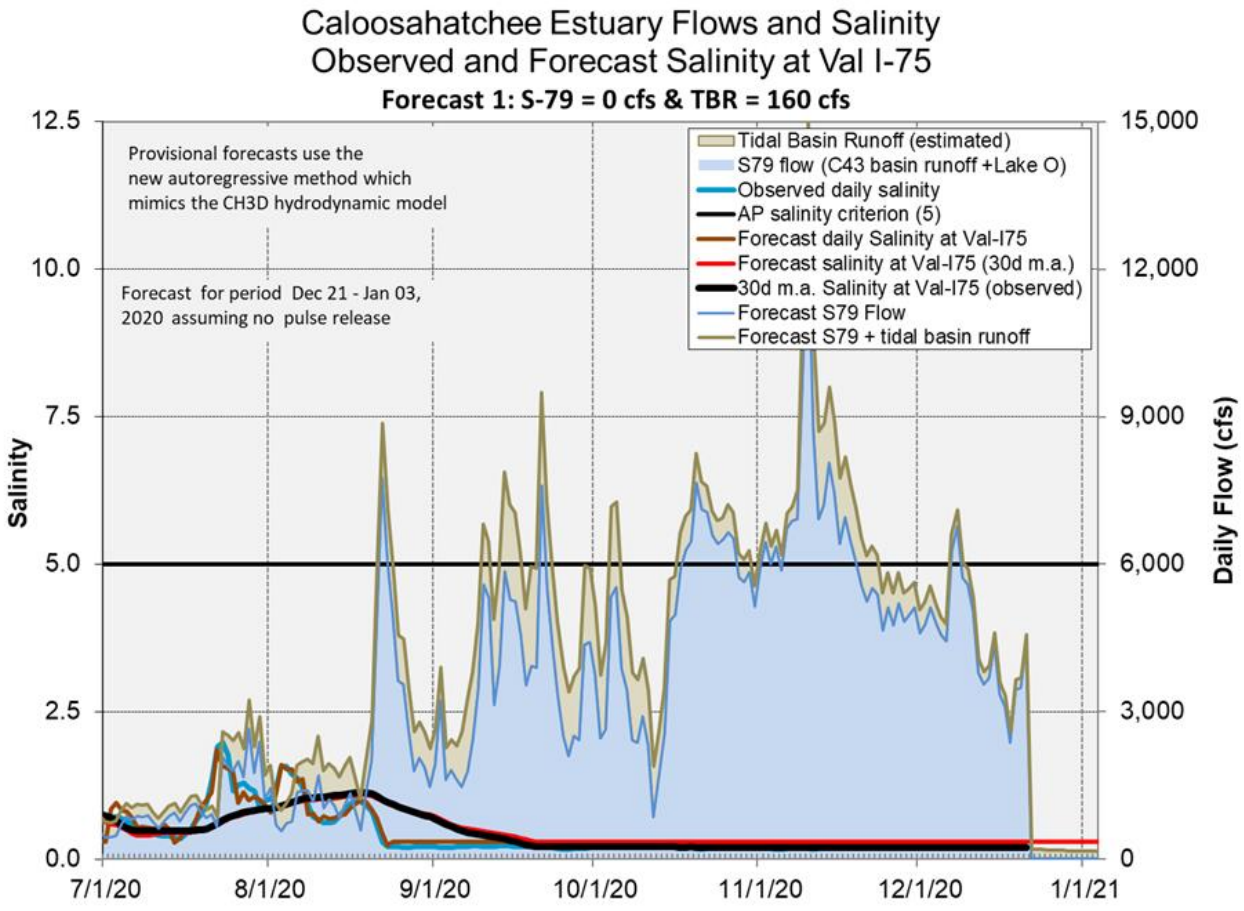
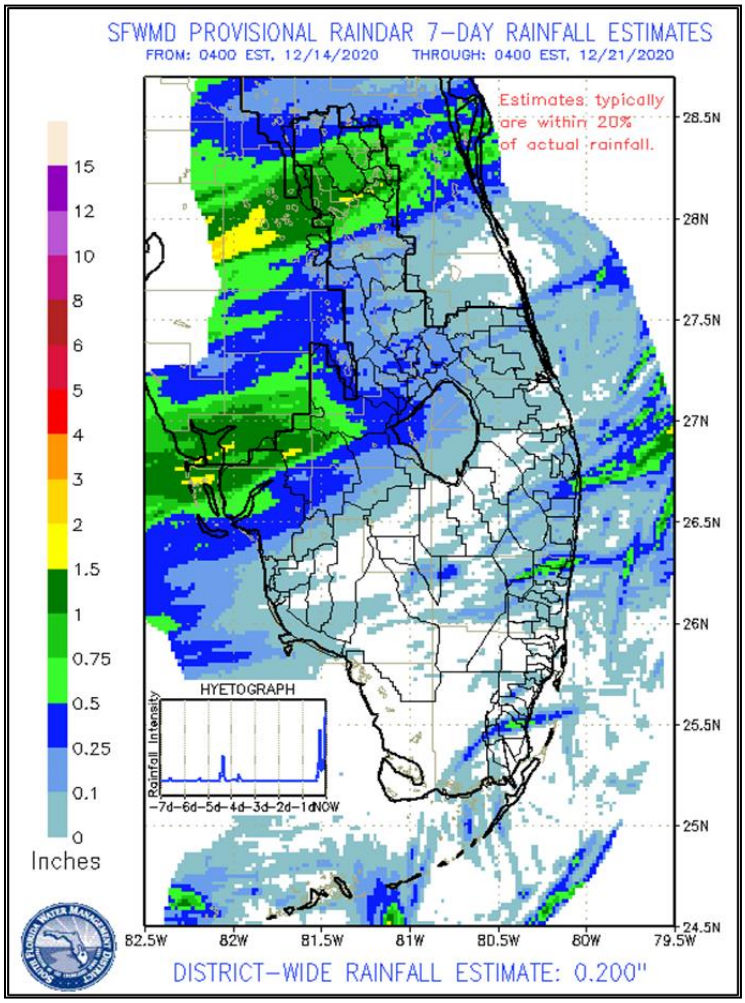



**Figure 10**. Forecasted Val I-75 surface salinity assuming no pulse release at S-79.

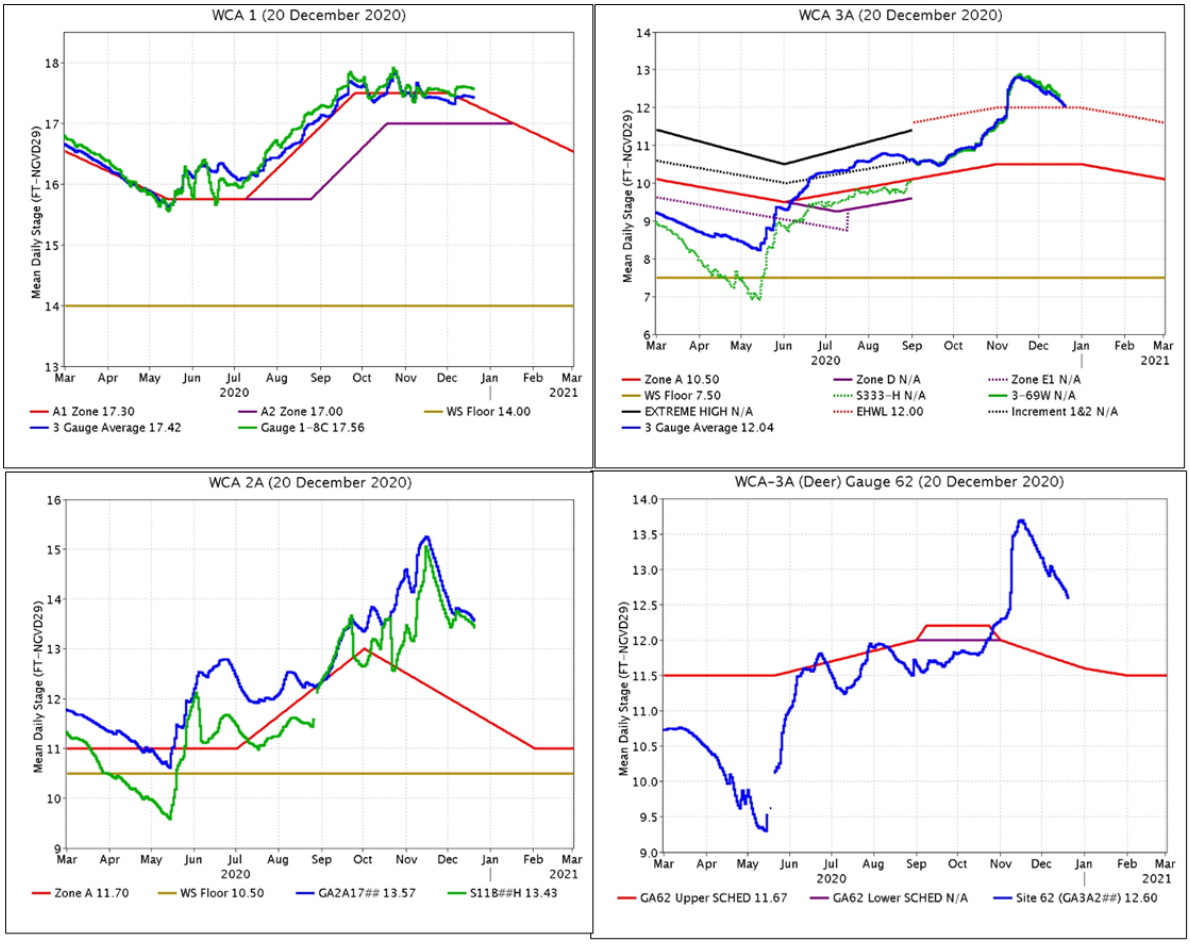
**EVERGLADES**

Below average rainfall across the system last week and stages responded. At the gauges monitored for this report stages fell 0.15 feet on average last week, with stages falling the most in WCA-3A. Evaporation was 0.73 inches last week, and the TTFF continues to call for maximum releases from WCA-3A.

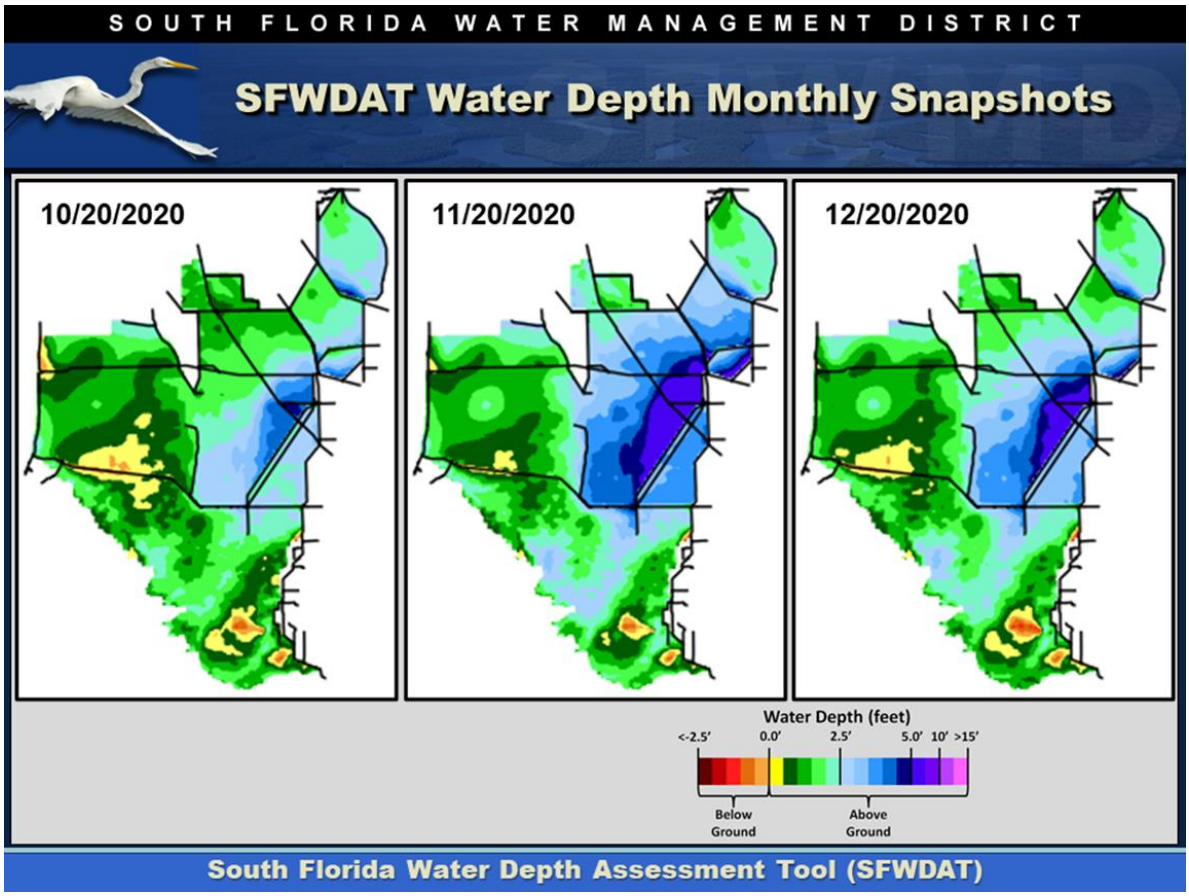
| Everglades Region | Rainfall (Inches) | Stage Change (feet) |
|---|---|---|
| WCA-1 | 0.06 | −0.04 |
| WCA-2A | 0.10 | −0.18 |
| WCA-2B | 0.17 | −0.15 |
| WCA-3A | 0.04 | −0.24 |
| WCA-3B | <0.01 | −0.16 |
| ENP | <0.01 | −0.12 |

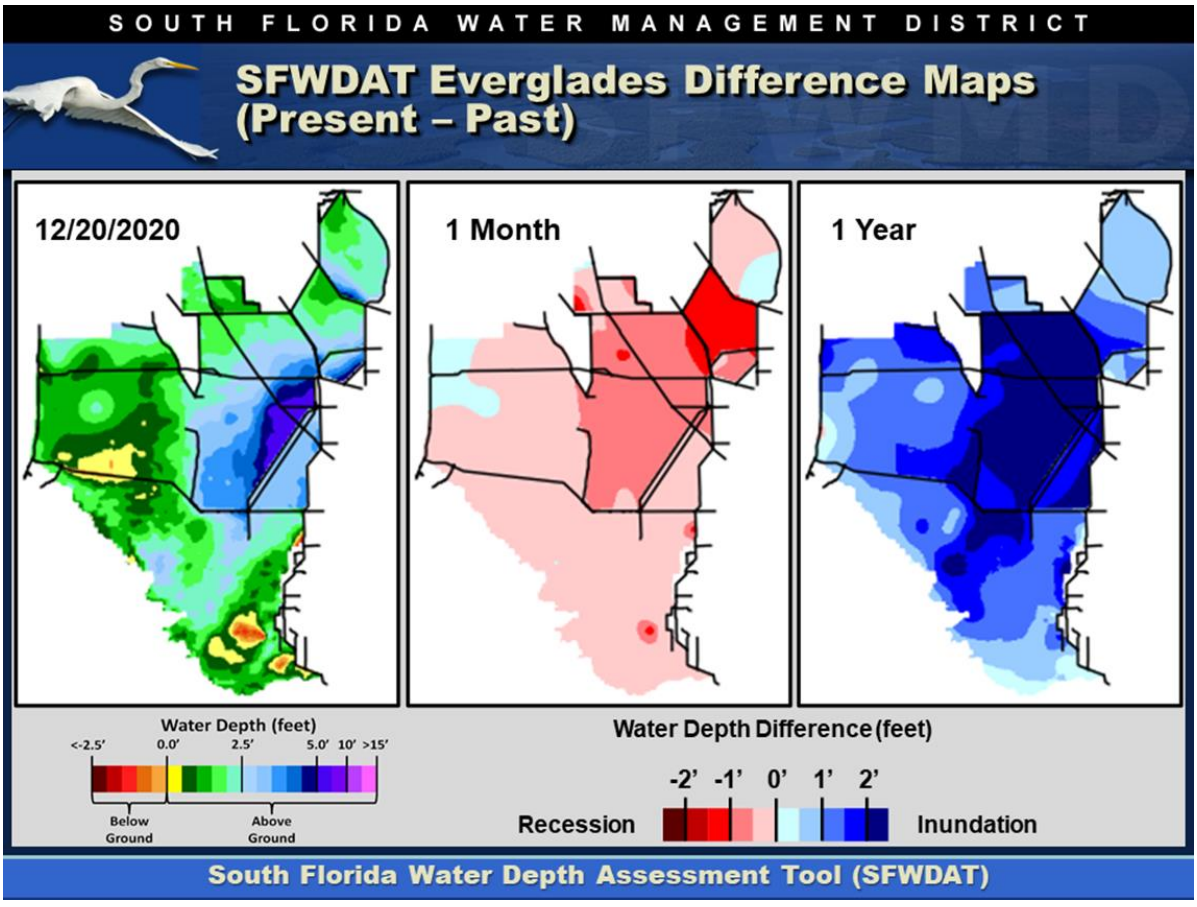


Regulation Schedules: WCA-1: Stage at the 1-8C Gauge is generally trending along with schedule, currently 0.26 feet above the falling Zone A1 regulation line. WCA-2A: The recession in stage at Gauge 2-17 remained moderate last week generally paralleling the regulation line last week and 1.87 feet above the falling schedule.WCA-3A: The Three Gauge Average stages continued to recede towards the stable Zone A regulation line  last week, currently 1.54 feet above it and 0.04 feet above the EHWL. WCA-3A: Stage at gauge 62 (Northwest corner) receded last week remaining above the falling Upper Schedule by 0.93 feet.



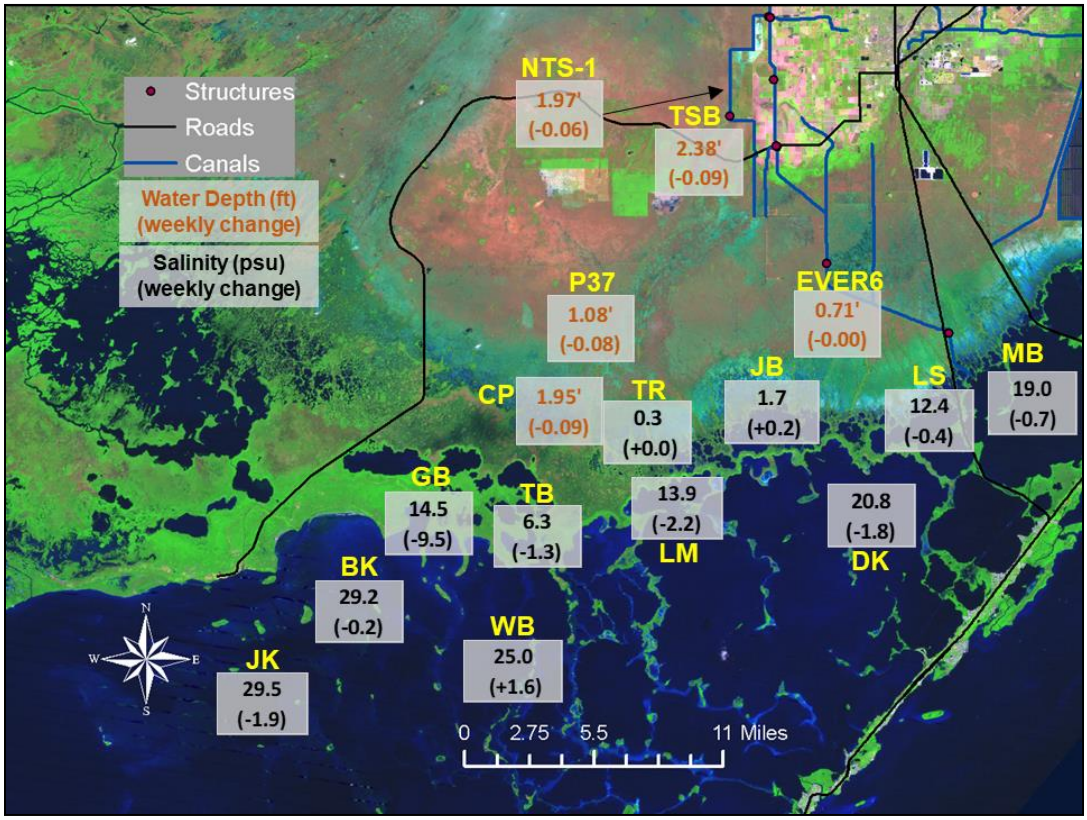

Water Depths: The WDAT tool for spatial interpolation of depth monthly snapshots indicate current depths in excess of 5.0 feet in WCA-3A South around the upper reaches of the L-67 canal but the spatial extent has lessened during that month. Ponding depths (>2.5 feet) are retreating now found across the southeastern one-third of WCA-2A, and the northwest corner and along the northern border of WCA-3A has the potential to be lower than 2.0 feet. Hydrologic connectivity remains well established within the major sloughs in ENP. Comparing WDAT water levels from present, over the last month stages fell significantly across WCA-3A and more so in WCA-2A. Looking back one year the stage difference patterns are strikingly different than one month ago. Compared to one year ago the entire region is significantly deeper than it was a year ago, more than 2.0 feet deeper across the most of WCA-3A, and more 1.0 feet in southern WCA-2A.

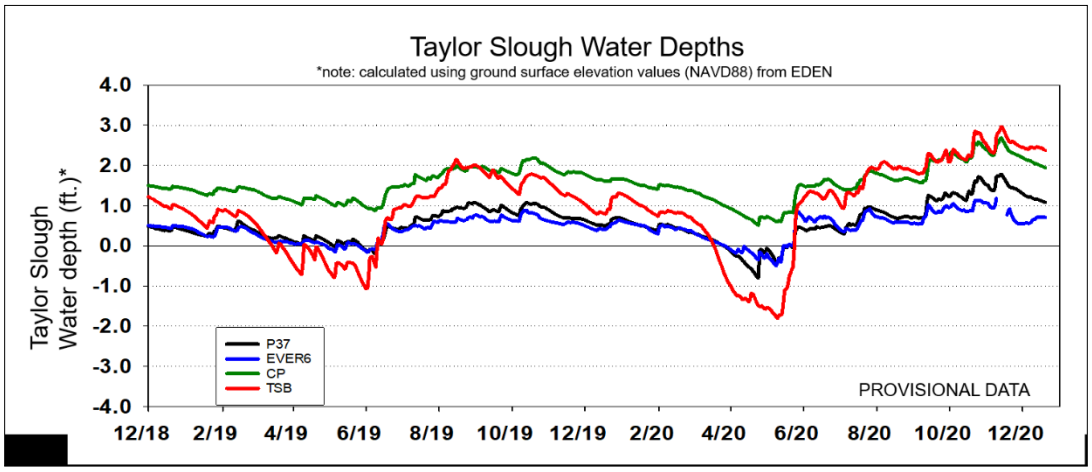

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
SFWDAT Water Depth Monthly Snapshots
10/20/2020
11/20/2020
12/20/2020
Water Depth (feet)
<-2.5'
0.0'
2.5'
5.0'
10'
>15'
Below Ground
Above Ground
South Florida Water Depth Assessment Tool (SFWDAT)

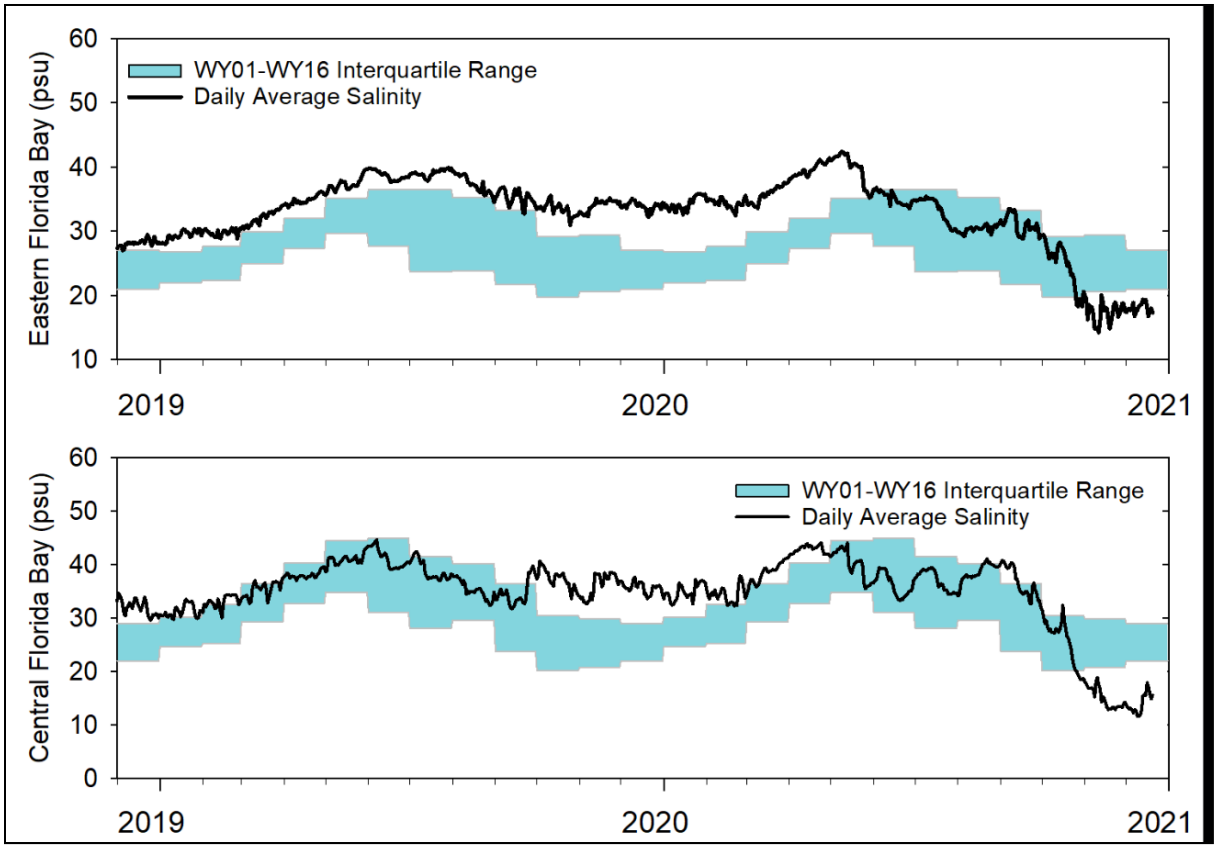

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
SFWDAT Everglades Difference Maps
(Present – Past)
12/20/2020
1 Month
1 Year
Water Depth (feet)
<-2.5'
0.0'
2.5'
5.0'
10'
>15'
Below Ground
Above Ground
Water Depth Difference (feet)
-2'
-1'
0'
1'
2'
Recession
Inundation
South Florida Water Depth Assessment Tool (SFWDAT)

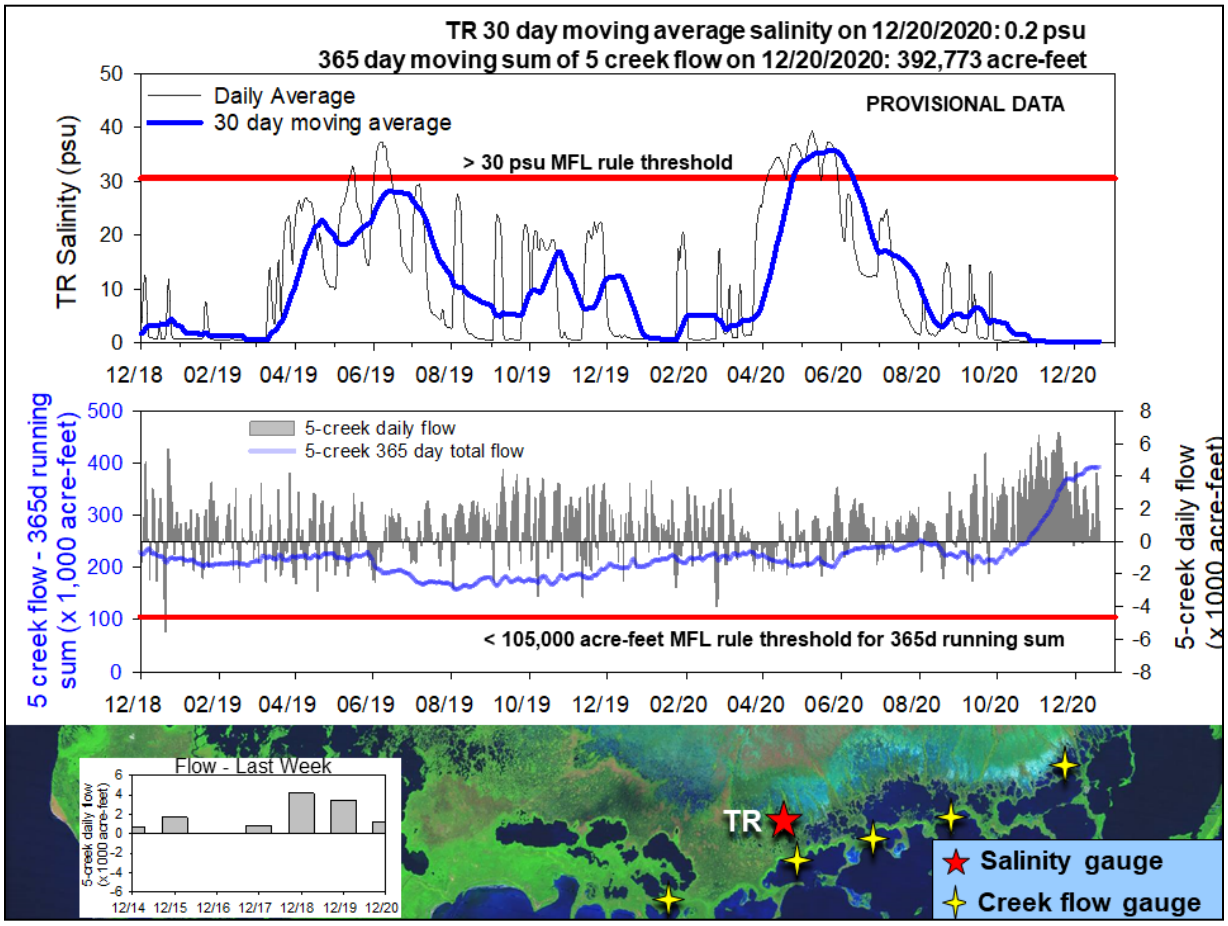
Tree island inundation in WCA-3A, WCA-3B and ENP: 371 Tree Islands of known elevation within WCA-3A, -3B, and Everglades National Park's Shark Slough. Current preliminary estimates using WDAT indicate that 85% or 314 of the tree islands are currently inundated (down from 88% the week prior), and 22% of those islands have been inundated for more than 120 days. Inundation for more than 120 days will cause ecological harm to sensitive islands.

Taylor Slough Water Levels: An average of 0.06 inches of rain fell over Taylor Slough and Florida Bay this past week which allowed stages to decrease 0.065 feet on average over the week. Taylor Slough is currently 10 inches above the historical average for this time of year.




Eastern Florida Bay (psu)
WY01-WY16 Interquartile Range
Daily Average Salinity
60
50
40
30
20
10
2019
2020
2021
Central Florida Bay (psu)
WY01-WY16 Interquartile Range
Daily Average Salinity
60
50
40
30
20
10
0
2019
2020
2021


TR 30 day moving average salinity on 12/20/2020: 0.2 psu
365 day moving sum of 5 creek flow on 12/20/2020: 392,773 acre-feet
TR Salinity (psu)
Daily Average
30 day moving average
PROVISIONAL DATA
> 30 psu MFL rule threshold
50
40
30
20
10
0
12/18
02/19
04/19
06/19
08/19
10/19
12/19
02/20
04/20
06/20
08/20
10/20
12/20
5 creek flow - 365d running sum (x 1,000 acre-feet)
5-creek daily flow
5-creek 365 day total flow
< 105,000 acre-feet MFL rule threshold for 365d running sum
500
400
300
200
100
0
8
6
4
2
0
-2
-4
-6
-8
5-creek daily flow (x 1000 acre-feet)
Flow - Last Week
5-creek daily flow (x1000 acre-feet)
6
4
2
0
-2
-4
-6
12/14
12/15
12/16
12/17
12/18
12/19
12/20
TR
Salinity gauge
Creek flow gauge

Florida Bay Salinities: Salinities in Florida Bay averaged a 1.7 psu decrease over the week. Average salinity for the Bay is 7 psu lower than the historical average for this time of year while average salinity at the central and western nearshore area is 11 psu lower than the historical average. Field reports from FIU researchers under contract with the District suggest that tarpon recruitment in the creeks and lakes upstream of western Florida Bay is very high and higher even than the response seen after Hurricane Irma in 2017.

Florida Bay MFL: The salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) has continued to be near fresh (less than 0.3 psu) and the 30-day moving average has also remained low at 0.2 psu. Weekly flow from the 5 creeks identified by yellow stars on the map totaled just over 12,300 acre-feet (up from 11,700 acre-feet last week). The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) ended at 392,773 acre-feet this week which is a 400 acre-feet decrease from last week. That is higher than the 90th percentile of historical data (390,830 acre-feet). This is a value not seen since October of 2012. Creek flows are provisional USGS data.

**Water Management Recommendations**

Very few wading birds were detected in the central Everglades, where stages are high and causing stress to terrestrial wildlife. At least 40 thousand wading birds (mainly snowy egrets and tricolored herons) were observed foraging along the southern coastal margins and creeks particularly around Flamingo. These are very high numbers and it is indicative of a good nesting season to come. It is notable that the most abundant species in the Everglades, the white Ibis, is relatively absent from the coast right now, although a few thousand were noted foraging in Big Cypress, and Ten Thousand Islands. As water levels continue to recede, large numbers of ibis are expected to descend on the Everglades.

Moderating rapid changes in stage to less than plus or minus 0.25 feet per week or 0.50 feet per two weeks has ecological benefit.

Stages in WCA-2A have fallen nearly 1.5 feet over the last three weeks, moderating and maintaining that recession rate to near the seasonal rate of -.05 to -.09 feet per week now that the stage at the 2-17 gauge is below 14.0 NGVD has ecological benefit into the dry season.

At this early point in the dry season, maintaining the recession where possible in WCA-3A South even when faster than traditional (less than -.25 feet per week) ecological recession rate recommendations has ecological benefit as long as there is no downstream deleterious ecological impact. Extreme high-water conditions call for the utilization of any and all sources of discharge from WCA-3A.

Ponding along the L-67 canal/levee system has seemed to peak and is now residing, however inundation of the tree islands in that region and east into central WCA-3A South has now persisted for more than 120 days which creates ecological harm in regions containing sensitive islands. Managing inflows/outflows within that region that decreases ponding in both spatial extent and the amount of time the region is inundated has benefit to the ecology of tree islands. When considering the status of tree islands in WCA-3A as a whole, the last two years of low flooding stress created a resilience to flooding stress for a single wet season. However, the current inundation pattern and duration is forcing many animals to flee to the surrounding levees and others to delay breeding activities. If these high stages should persist long into the dry season, ecological harm is likely, but given the low precipitation predictions for the upcoming dry season this persistence seems unlikely as long as the District continues to maximize flows south and why at this time SFWMD Everglades ecologists are recommending a careful conservation of water in WCA-3A, once conditions move closer to average.

Continued flows towards Taylor Slough and Florida Bay maintain hydration in the marshes and lower salinity conditions within the nearshore areas of Florida Bay and will provide a freshwater buffer against the drier than average dry season that is expected which would delay the start of the salinity increases that occur within the dry season and possibly prevent the occurrence of extreme hyper-salinity towards the end of the dry season.

More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

| SFWMD Everglades Ecological Recommendations, December 22nd, 2020 (red is new) | | | |
|---|---|---|---|
| Area | Weekly change | Recommendation | Reasons |
| WCA-1 | Stage decreased by 0.04' | Maintain marsh stage slightly above and parellel to the regulation schedule. | Protect within basin and downstream habitat and wildlife. |
| WCA-2A | Stage decreased by 0.18' | Moderate the recession rate to near -.10 feet per week and maintain marsh stage above and parallel to the falling regulation schedule. | Protect within basin and downstream habitat and wildlife from flooding stress. |
| WCA-2B | Stage decreased by 0.16' | Maintain a recession rate to lower marsh stage. | Protect within basin and downstream habitat and wildlife from flooding stress. |
| WCA-3A NE | Stage decreased by 0.23' | Maintain the recession rate to return marsh stage to more average conditions. | Protect within basin and downstream habitat and wildlife from flooding stress. |
| WCA-3A NW | Stage decreased by 0.25' | Maintain the recession rate to return marsh stage to more average conditions. | |
| Central WCA-3A S | Stage decreased by 0.23' | Maintain the recession rate to return marsh stage to more average conditions. | Protect within basin, upstream/downstream habitat and wildlife. Tree island ecology is diminished by flooding |
| Southern WCA-3A S | Stage decreased by 0.26' | | |
| WCA-3B | Stage decreased by 0.16' | Maintain the recession rate to lower marsh stage. | Protect within basin and downstream habitat and wildlife from flooding stress. Tree island ecology is diminished by flooding |
| ENP-SRS | Stage decreased by 0.12' | Make discharges to the Park according to the current deviation with a return to COP protocol as soon as high water conditions are alleviated in the upstream WCAs | Protect within basin and upstream habitat and wildlife from flooding stress. |
| Taylor Slough | Stage changes ranged from −0.00' to −0.09' | Move water southward as possible | When available, provide freshwater buffer for downstream conditions. |
| FB- Salinity | Salinity changes ranged −9.5 to +1.6 psu | Move water southward as possible | When available, provide freshwater to maintain low salinity buffer and promote water movement. |