Disclaimer: Information contained in the report addresses environmental conditions only and is not the official South Florida Water Management District operations recommendation or decision.

MEMORANDUM

- **TO:** John Mitnik, Chief, Operations, Engineering and Construction Bureau Paul Linton, Chief, Operations Section
- **FROM:** SFWMD Staff Environmental Advisory Team

DATE: March 5, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

Updated to indicate a slight greater total District rainfall. A stationary cold front to the north of Lake Okeechobee this morning should move little until a secondary cold front arriving over the northern portion of the District early today catches up with it this afternoon. An area of light, fast-moving rains ahead of the secondary front should push through the Kissimmee Valley beginning this morning and likely become increasingly more scattered or diminish over the northwestern portion of the District before the secondary front reaches Lake Okeechobee by the early or middle afternoon. Scattered showers should also develop ahead of the secondary front over the central and southern part of the District this afternoon, with embedded pockets of heavier rain possible over this region due to the extra heating of the day. The merged fronts should then push through all of south Florida later this evening or early in the night, bringing an end to the rain in most areas except for isolated, very light post-frontal rains possibly lingering south and east of Lake Okeechobee through about midnight tonight. Overall, total District rainfall is not expected to amount to much, with rainfall accumulations generally not exceeding 0.33 inches over the northern portion of the District and possibly reaching 0.5 inches to 0.66 inches in localized areas to the south and east of Lake Okeechobee later in the day. Much cooler and drier weather is forecast on Wednesday and Thursday across the District, and no rainfall is expected on either day except for a light shower or two possible along the immediate east coast early Friday morning. Temperatures should begin to moderate starting on Friday and there should be greater low-level moisture across the area by the weekend and early next week. Although these two ingredients should be enough to produce isolated light shower activity over portions of the District from Friday through Tuesday next week, the forecast is for no measurable total District rainfall during that time. For the week ending Tuesday morning next week, less than 0.05 inches for the total District area is predicted (or about 5% of normal), with the probabilistic guidance indicating a strong likelihood for greatly below normal total District rainfall (an average of less than 0.06 inches). The model guidance indicates an increasing chance of a wetter weather pattern developing late next week or next weekend, a pattern that would likely produce the greatest rainfall thus far in the month of March for the District. However, no specific details are possible at this time with regard to the probable increase of rains.

<u>Kissimmee</u>

Tuesday morning stages were 56.6 feet NGVD (1.4 feet below schedule) in East Lake Toho, 53.8 feet NGVD (1.2 feet below schedule) in Toho, and 50.3 feet NGVD (0.7 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.7 feet NGVD at S-65D. Tuesday morning discharges were 649 cfs at S-65, 501 cfs at S-65A, 1664 cfs at S-65D and 1560 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 4.1 mg/L for the week.

Kissimmee River mean floodplain depth on Sunday was 0.68 feet. No new recommendations for the week.

Lake Okeechobee

Lake Okeechobee stage is 12.71 feet NGVD, decreasing 0.04 feet from the previous week. The Lake decreased back to the same level as 30 days ago and remains in the Base Flow sub-band. The lake remains below the bottom of the ecological envelope (currently 0.96 ft below), which varies seasonally from 12.5 – 15.5 feet NGVD. Given the potential for above average rainfall associated with a weak El Niño conditions this winter/spring and the poor condition of SAV and EAV in the nearshore zone, these lower lake stages are ideal for vegetation recovery, but will reduce habitat for fish and wildlife in the near-term and encourage spread of invasive vegetation in the upper marsh.

Estuaries

Total inflow to the St. Lucie Estuary averaged 892 cfs over the past week with 505 cfs coming from Lake Okeechobee. Over the past week, salinity decreased in the estuary. The seven-day average salinity at the US1 Bridge is within the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 2,370 cfs over the past week with 717 cfs coming from the Lake. Over the past week, salinity decreased in the estuary. The 30-day moving average surface salinity is 0.3 at Val I-75 and 3.0 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass. Salinity conditions are in the good range for adult eastern oysters at Cape Coral and Shell Point. Given the current estuarine conditions, there are no ecological benefits to the upper estuary associated with freshwater releases from Lake Okeechobee, but some benefits may accrue to areas further downstream.

Stormwater Treatment Areas

Over the past week, the STAs received approximately 9,600 acre-feet of Lake releases. The total amount of inflows to the STAs in WY2019 (since May 1, 2018) is approximately 1,466,000 acre-feet, which includes approximately 392,000 acre-feet of Lake releases. Most STA cells are at or near target depths. STA-1W Northern Flow-way is offline for STA-1W Expansion project construction activities, STA-1E Central Flow-way if offline for vegetation management activities, STA-1E Western Flow-way is offline for levee repairs in the West Distribution Cell, and STA-5/6 Flow-ways 2 and 3 are offline for the Restoration Strategies project to grade non-effective treatment areas. Operational restrictions are in place in STA-3/4 Western Flow-way for a Restoration Strategies Science Plan study. This week, if Lake releases are sent to the WCAs and conditions allow, releases will be sent to STA-2 and STA-3/4.

Everglades

The WCAs received more rainfall in the north last week and stages responded. The ENP station NESRS2 continues ascending, + 0.23 feet over the last week. Keeping rainfall runoff within the Everglades system, distributing it equally across the WCAs and moving it south through the system when possible remains ecologically beneficial as the WCAs are at or near average stages for this time of year. Very little rain fell on Taylor Slough or Florida Bay this week. Depths in Taylor Slough remain above average for this time of year. Average salinity remained the same this week as last in Florida Bay, and continues to be slightly above average for this time of year.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 0.33 inches of rainfall in the past week and the Lower Basin received 0.65 inches (SFWMD Daily Rainfall Report 3/3/2018).

Upper Kissimmee Basin

Stages and departures in the Kissimmee Chain of Lakes (KCOL) are shown in **Table 1**. KCOL stage hydrographs with respective regulation schedules and rainfall are shown in Figures 1-7.

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

| | | 7-day | | | | Schedule | | | Daily | Departure | e (feet) | | |
|---|-----------|--|---------------------------------------|----------------------|-------------------------------|-----------------|--------|---------|---------|-----------|----------|---------|---------|
| Water Body | Structure | Average Discharge (cfs) ¹ | Stage Monitoring Site ² | Lake Stage (feet) | Schedule Type ³ | Stage (feet) | 3/3/19 | 2/24/19 | 2/17/19 | 2/10/19 | 2/3/19 | 1/27/19 | 1/20/19 |
| Lakes Hart and Mary Jane | S-62 | 61 | LKMJ | 60.7 | R | 61.0 | -0.3 | -0.2 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 |
| Lakes Myrtle, Preston, and Joel | S-57 | 17 | S-57 | 60.9 | R | 61.0 | -0.1 | -0.1 | 0.1 | 0.1 | 0.0 | -0.2 | 0.0 |
| Alligator Chain | S-60 | 0 | ALLI | 63.8 | R | 64.0 | -0.2 | -0.2 | -0.2 | -0.4 | -0.5 | -0.7 | -0.8 |
| Lake Gentry | S-63 | 16 | LKGT | 61.4 | R | 61.5 | -0.1 | 0.0 | 0.0 | 0.0 | -0.1 | -0.1 | 0.0 |
| East Lake Toho | S-59 | 197 | TOHOE | 56.6 | R | 58.0 | -1.4 | -1.2 | -1.0 | -0.8 | -0.8 | -0.5 | -0.5 |
| Lake Toho | S-61 | 533 | TOHOW, S-61 | 53.7 | R | 55.0 | -1.3 | -1.2 | -1.0 | -0.9 | -0.8 | -0.7 | -0.5 |
| Lakes Kissimmee, Cypress, and Hatchineha | S-65 | 1,368 | KUB011, LKIS5B | 50.3 | R | 51.0 | -0.7 | -0.8 | -1.0 | -1.0 | -1.1 | -1.5 | -1.7 |

Report Date: 3/5/2019

¹Seven-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.

³T = temporary schedule, R = USACE flood control schedule, S = temporary snail kite schedule, A = projected ascension line, N/A= not applicable or data not available.

DATA ARE PROVISIONAL

Lower Kissimmee Basin

Discharges at Lower Basin structures are shown in Table 2. SFWDAT depth maps for the Phase I restoration area are shown in Figure 8. Kissimmee River floodplain stages at selected stations are shown in Figure 9.

Table 2. One-day and seven-day averages of discharge at S-65x structures, of dissolved oxygen concentration in the Phase I area river channel, and water depth in the Phase I area floodplain. Data are provisional real-time data from SFWMD.

| Report Date: | 3/5/2019 | | | | | | | | | | | |
|-----------------------------------|--------------------------|--|--------|---------|---------|---------|--------|---------|---------|---------|--------|----------|
| | | 1-Day Average Average for the Preceeding 7-Days ¹ | | | | | | | | | | |
| Wietric | Location | 3/3/2019 | 3/3/19 | 2/24/19 | 2/17/19 | 2/10/19 | 2/3/19 | 1/27/19 | 1/20/19 | 1/13/19 | 1/6/19 | 12/30/18 |
| Discharge (cfs) | S-65 | 892 | 1,368 | 2,385 | 3,220 | 2,653 | 1,615 | 950 | 392 | 343 | 273 | 277 |
| Discharge (cfs) | S-65A ² | 745 | 1,190 | 2,280 | 3,154 | 2,472 | 1,517 | 764 | 306 | 261 | 194 | 201 |
| Discharge (cfs) | S-65D ² | 1,934 | 2,310 | 3,097 | 2,668 | 1,564 | 1,221 | 621 | 341 | 261 | 241 | 242 |
| Headwater Stage (feet NGVD) | S-65D ² | 25.77 | 25.76 | 25.77 | 25.81 | 25.82 | 25.90 | 26.00 | 25.94 | 25.91 | 25.86 | 25.88 |
| Discharge (cfs) | S-65E ² | 1,747 | 2,167 | 2,915 | 2,533 | 1,442 | 1,151 | 606 | 309 | 261 | 215 | 218 |
| Discharge (cfs) | S-67 | 83 | 30 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DO (mg/L) ³ | Phase I river channel | 4.7 | 4.1 | 3.4 | 4.0 | 5.3 | 6.5 | 6.6 | 6.8 | 6.4 | 6.1 | 6.6 |
| Mean depth (feet) ⁴ | Phase I floodplain | 0.68 | 0.86 | 1.20 | 1.25 | 0.71 | 0.46 | 0.12 | 0.07 | 0.08 | 0.09 | 0.11 |

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

²S-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.

³DO is the average for sondes at PC62 and PC33.

⁴1-day spatial average from South Florida Water Depth Assessment Tool (SFWDAT).

DATA ARE PROVISIONAL; N/A indicates that data were not available.

KCOL Hydrographs (through Sunday midnight)



Figure 1.











Figure 4.







Figure 6.



Figure 7.



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



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





Water Management Recommendations

| Kissimmee Basin Ad | daptive Recommendations and Operational Actions | | | | |
|-------------------------|---|---|-------------|---------------------------|-------------|
| Recommendation | Recommendation | Purpose | Outcome | Source | Report Date |
| Date | | · | | | |
| 3/4/2019 | No new recommendations. | | N/A | | 3/5/2019 |
| 2/26/2019 | No new recommendations. | | N/A | | 2/26/2019 |
| 2/19/2019 | No new recommendations. | | N/A | | 2/19/2019 |
| 2/10/2019 | Increase discharge at S-65 by 600 cfs. | To compensate for increased inflow and rain forecast for Tuesday. | Implemented | KB Ops/SFWMD Water Mgt | 2/12/2019 |
| 2/4/2019 | Increase discharge at S-65/S-65A to begin reducing KCH stage to reach 50.75 ft on 2/15/2019. | Reduce to the stage at which the seasonal recession will begin. | Implemented | KB Ops/SFWMD Water Mgt | 2/5/2019 |
| 1/26/2019 | Increase S65A dishcarge by a total of 350 cfs today, which will put S65A at 1,400 cfs. Continue to increase discharge as needed. | Moderate or stop the rise in Lake KCH preemptively before forecast rainfall and provide capacity at S65A for S65A basin runoff. | Implemented | SFWMD Water Mgt/KB Ops | 1/29/2019 |
| 1/22/2019 | No new recommendations. | | N/A | | 1/22/2019 |
| 1/15/2019 | Begin recessions on Lake Toho and East Lake Toho on Jan 15, with a continuous recession to the regulation dry season low (52.0 ft on Toho; 55.0 ft on East Lake) on May 31. The lines are represented graphically in the Dry Season Operations slides. Tentatively plan on a recession in Kissimmee- Cypress-Hatchineha starting on February 15 with a continuous recession to the dry season low (49 ft) | Slow recession rates in East Toho, Toho, and KCH to benefit fish and wildlife; as possible limit flow volume at S-65D to facilitate KRR construction. | N/A | KB Ops | 1/15/2019 |
| | on May 31. A provisional diagram is included in the Dry Season Operations sildes; however, starting stage may change depending on conditions. Discharge and reversal guidelines are provided in the Dry Season Operations sildes. | | | | |
| 1/4/2019 | Discontinue 54 foot stage reduction target in Lake Toho. | Lake Kissimmee has already risen by ~1.5 ft. | Implemented | SFWMD Water Mgt/KB Ops | 1/8/2019 |
| 12/14/2018 | Manage S-61 discharge to reduce stage in Lake Toho to 54 ft over the next 7-9 days. | Move water to KCH to reduce the rate of stage decline in KCH; reduce the head difference between S-61 headwater and tailwater. | N/A | SFWMD Water Mgt/KB Ops | 12/18/2018 |
| 12/10/2018 | Reduce S-65A discharge to 180 cfs. | Reduce rate of stage decline in lakes Kissimmee- Cypress-Hatchineha | N/A | SFWMD Water Mgt/KB Ops | 12/11/2018 |
| 12/3/2018 | No new recommendations. | | N/A | | 12/4/2018 |
| 11/26/2018 | No new recommendations. | | N/A | | 11/27/2018 |
| 11/19/2018 | No new recommendations. | | N/A | | 11/20/2018 |
| 11/12/2018 | No new recommendations. | | N/A | | 11/13/2018 |
| 11/2/2018 | Reduce S-65/S-65A discharge to approximately 250 cfs. | To conserve stage in Lake Kissimmee. | Implemented | SFWMD Water Mgt/KB Ops | 11/6/2018 |
| 10/30/2018 | No new recommendations. | | N/A | | 10/30/2018 |
| 10/22/2018 | Reduce S-65/S-65A discharge to approximately 300 cfs (minimum discharge) in one step of approximately 1100 cfs today. | Reduce rate of stage decline in lakes Kissimmee- Cypress-Hatchineha | Implemented | SFWMD Water Mgt/KB Ops | 10/23/2018 |
| 10/16/2018 | No new recommendations. | | N/A | | 10/16/2018 |
| 10/9/2018 | No new recommendations. | | N/A | | 10/9/2018 |
| 10/2/2018 | No new recommendations. | | N/A | | 10/2/2018 |
| 9/25/2018 | No new recommendations. | | N/A | | 9/25/2018 |
| 9/18/2018 | No new recommendations. | | N/A | | 9/18/2018 |
| 9/11/2018 | No new recommendations. | | N/A | | 9/11/2018 |
| 9/4/2018 | No new recommendations. | | N/A | | 9/4/2018 |
| 8/28/2018 | No new recommendations. | | N/A | | 8/28/2018 |
| 8/21/2018 | No new recommendations. | | N/A | | 8/21/2018 |
| 8/14/2018 | No new recommendations. | | N/A | | 8/14/2018 |
| 8/7/2018 | No new recommendations. | | N/A | | 8/7/2018 |
| 7/23/2018- 7/24/2018 | Increase discharge from 1400 cfs to 3000 cfs, then 3200 cfs and 3500 cfs. | For flood control in Lake Kissimmee. | Implemented | SFWMD Water Mgt/KB Ops | 7/31/2018 |
| | | | | | |



Figure 11. Interim operations schedule for S-65. The discharge schedule shown to the right has not been used in recent years.



Figure 12. Kissimmee River Wading Bird and Waterfowl Surveys from November 2018 to February 2019.



Figure 13. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee stage is at 12.71 feet NGVD for the period ending at midnight on March 4, 2019. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and three perimeter stations (S-308, S-4 and S-133). The Lake is now at the same level as it was a month ago and 1.97 feet lower than a year ago when runoff from Hurricane Irma caused extreme high lake stages (Figure 1). The Lake is in the Base Flow sub-band (Figure 2). The March 5 lake stage was the lowest for this time of year since 2011, which followed a very dry rainy season in 2010 (Figure 3). According to RAINDAR, 0.51 inches of rain fell directly over the Lake and the entire watershed received approximately 0.8 inches during the week of February 26 – March 5, 2019 (Figure 4).

Average daily inflows (minus rainfall) to the Lake were lower than last week at 2,241 cfs, compared to 3,123 cfs. The inflows from the Kissimmee River decreased, dropping from 2,860 cfs to 2,048 cfs, inflows from the remaining structures were similar or slightly decreased from the previous week (Table 1).

Total outflows (minus evapotranspiration) also decreased from the previous week, going from 3,266 average daily cfs to 2,958 cfs this past week (Table 1). Outflows increased at S308, S351 and S352, but decreased at S77 and S354. Outflows west via S-77 decreased from 1,108 cfs to 735 cfs, outflows east via S308 increased from 360 cfs to 545 cfs, and south outflows through the S-350 structures remained similar to the previous week. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiations was 0.06 inches this week.

Total lake inflows and outflows for the past week are detailed in Table 1, as well as the approximate change in lake stage from each major structure's total flows over the period. Figure 5 shows the combined average daily cfs for inflows and outflows for the Lake over the past eight weeks. These data are provisional and are subject to change.

The most recent satellite imagery (Mar 2, 2019) using the cyanobacteria monitoring product derived from NOAA's analysis of EUMETSAT's OLCI satellite sensor showed bloom potential is low for most of the Lake, continuing the trend of gradually reducing potential over the past several weeks (Figure 6).

The most recent wading bird survey (February 26, 2019) reported just over 2,000 foraging wading birds on the lake, a considerable drop from the 15,000 wading birds seen in January. Most of the flocks were in Moonshine Bay or the North-West marsh (Figure 7) as many higher elevations are dry and unsuitable for foraging (Figure 8, red areas). The reduction in foraging was not unexpected, as substantial rainfall and the subsequent rise in lake stage prior to the survey likely dispersed prey widely enough to dramatically reduce wading bird use on the lake. Without further rises in lake stage though, it is likely water levels will be too shallow to support much wading bird breeding effort on the lake this nesting season.

Water quality samples collected on February 12 and 14 found five of eight stations in the nearshore zone with Chlorophyll a (Chla) values >20 μ g/L, with a high of 27.1 μ g/L. None of nine stations in the pelagic had elevated values of Chla >20 μ g/L, all were between 4.7 μ g/L and 19.7 μ g/L (Figure 9). Microcystin was only detected at one nearshore site, with a value of 0.26 μ g/L.

Water Management Recommendations

Lake Okeechobee stage is 12.71 feet NGVD, decreasing 0.04 feet from the previous week. The Lake is at the same level as 30 days ago and remains in the Base Flow sub-band. However, the Lake is still 1 foot below the bottom of the ecological envelope, which varies seasonally from 12.5 – 15.5 feet

NGVD. Given the potential for above average rainfall associated with weak El Niño conditions this winter/spring and the poor condition of SAV and EAV in the nearshore zone, lower lake stages are ideal for vegetation recovery but will reduce habitat for fish and wildlife in the near-term and encourage spread of invasive vegetation in the upper marsh.

| INFLOWS | Previous Week Avg Daily cfs | Avg Daily Inflow cfs | Equivalent Depth Week Total (in) | OUTFLOWS | Previous Week Avg Daily cfs | Avg Daily Outflow cfs | Equivalent Depth Week Total (in) |
|---------------------|-----------------------------------|-------------------------|-------------------------------------|------------------|-----------------------------------|--------------------------|-------------------------------------|
| S65E & S65EX1 | 2860 | 2048 | 0.9 | S77 | 1108 | 735 | 0.3 |
| S71 & 72 | 0 | 0 | 0.0 | S308 | 360 | 545 | 0.2 |
| S84 & 84X | 220 | 158 | 0.1 | S351 | 586 | 663 | 0.3 |
| Fisheating Creek | 42 | 35 | 0.0 | S352 | 586 | 689 | 0.3 |
| \$ \$15 <i>1</i> | 0 | 0 | 0.0 | S354 | 566 | 313 | 0.1 |
| 5104 | 1 | 0 | 0.0 | L8 Outflow | 60 | 14 | 0.0 |
| 2191 | 1 | 0 | 0.0 | ET | 791 | 910 | 0.4 |
| S133 P | 0 | 0 | 0.0 | Total | 4057 | 3869 | 1.7 |
| S127 P | 0 | 0 | 0.0 | | | | |
| S129 P | 0 | 0 | 0.0 | | | | |
| S131 P | 0 | 0 | 0.0 | | | | |
| S135 P | 0 | 0 | 0.0 | | | | |
| S2 P | 0 | 0 | 0.0 | Provisional Data | | | а |
| S3 P | 0 | 0 | 0.0 | | | | |

0

90.4

3213

0

1145

3386

0.0

0.5

1.5

S4 P

L8 Backflow Rainfall

Total

Table 1. Average daily inflows and outflows and the approximate depth equivalents on Lake Okeechobee for various structures.



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



Lake Okeechobee Water Level History and Projected Stages

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



Lake Okeechobee Water Level Comparison

Figure 3. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.



Figure 4. Rainfall estimates by basin.

Figure 5. Major inflows (orange) and outflows (blue) of Lake Okeechobee, including the S-350 structures designated as South (green). The L-8 Canal flows through Culvert 10A are included as outflows when positive, and as inflows when backflowing into the lake. All inflows and outflows are shown as positive and negative, respectively, for visual purposes.

2/26/19



Gray = Cloud Cover

NOAA cyanobacteria product derived from Copernicus Sentinel-3 OLCI data from EUMETSAT

Unvalidated and Experimental Data

Figure 6. Potential for cyanobacterial blooms on Lake Okeechobee based on NOAA's harmful algal bloom monitoring system derived from Copernicus Sentinel-3 OLCI data from EUMETSAT. Gray indicates cloud cover. All data are experimental and unvalidated at this point in product development



Figure 7. Locations of foraging flocks of wading birds observed during a monitoring flight on February 26, 2019 are shown in yellow, with circle sizes representing the size of the flocks. Previous survey totals from this season and from 2018 are compared in the bar graph.



Figure 8. Wading bird habitat suitability index for Lake Okeechobee based on the South Florida Water Depth Assessment Tool.



Figure 9. Chlorophyll *a* (μ g/L) and microcystin (μ g/L) values for nearshore and pelagic stations for mid-February 2019. SFWMD classifies an algal bloom as having Chla values >40 μ g/L. Microcystin values <0.20 μ g/L are below the detection limit (BDL)

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 892 cfs (Figures 1 and 2) and last month inflow averaged about 561 cfs. Last week's provisional averaged inflows from the tidal basin and the structures are shown in Table 1.

| Location | Flow (cfs) |
|--|------------|
| Tidal Basin Inflow | 237 |
| S-80 | 549 |
| S-308 | 521 |
| S-49 on C-24 | 0 |
| S-97 on C-23 | 0 |
| Gordy Rd. structure on Ten Mile Creek | 106 |

| Table 1. Weekly average inflows (| data are | provisional |). |
|-----------------------------------|----------|-------------|----|
|-----------------------------------|----------|-------------|----|

Over the past week, salinity decreased throughout the estuary (Table 2, Figures 3 and 4). The sevenday moving average salinity of the water column (an average of the surface and bottom salinity) at the US1 Bridge is estimated to be between 10 and 26. Salinity conditions in the middle estuary are within the good range for adult eastern oysters (Figure 3).

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

| Sampling Site | Surface | Bottom | Envelope |
|------------------|--------------------|---|-----------------|
| HR1 (North Fork) | 13.7 (15.2) | 15.0 (18.1) | NA ¹ |
| US1 Bridge | 14.9 (19.9) | 13.5 ² (16.7 ²) | 10.0-26.0 |
| A1A Bridge | 22.4 (27.6) | 26.8 (29.2) | NA ¹ |

¹Envelope not applicable and ²Questionable.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 2,370 cfs (Figures 5 and 6) and last month inflow averaged about 2,102 cfs. Last week's provisional averaged inflows from the structures are shown in Table 3.

| Table 5. Weekly average minows | (uala is provisional). |
|--------------------------------|------------------------|
| Location | Flow (cfs) |
| S-77 | 735 |
| S-78 | 1109 |
| S-79 | 2162 |
| Tidal Basin Inflow | 208 |

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

Over the past week, surface salinity remained about the same to Val I-75 and decreased downstream (Table 4, Figures 7 & 8). The seven-day average salinity values are estimated to be within the good range for adult eastern oysters at Cape Coral and at Shell Point (Figure 9). Salinity values were not available at Sanibel. The 30-day moving average surface salinity is 0.3 at Val I-75 and 3.0 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass.

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

| Sampling Site | Surface | Bottom | Envelope |
|-----------------------|----------------------|--------------------|----------------------|
| S-79 (Franklin Lock) | NR (0.3) | NR (0.3) | NA ¹ |
| Val I75 | 0.3 (0.3) | 0.3 (0.3) | 0.0-5.0 ² |
| Ft. Myers Yacht Basin | 2.4 (3.0) | 3.9 (3.6) | NA |
| Cape Coral | 8.8 (10.9) | 12.0 (13.6) | 10.0-30.0 |
| Shell Point | 21.9 (23.4) | NR (21.1) | 10.0-30.0 |
| Sanibel | NR ³ (NR) | NR (NR) | 10.0-30.0 |

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

Forecast of surface salinity (Table 5 and Figure 10) at Val I-75 for the next two weeks using the autoregression model (Qiu and Wan, 2013) coupled with a linear reservoir model for the tidal basin predicts daily salinity ranging from 0.8 to 3.4 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 1800 cfs and Tidal Basin inflows of 195 cfs.

| Scenario | Q79 | TB runoff | Daily | 30 day |
|----------|-------|-----------|----------|--------|
| | (cfs) | (cfs) | salinity | mean |
| A | 0 | 195 | 3.4 | 1.0 |
| В | 300 | 195 | 3.1 | 0.9 |
| С | 450 | 195 | 2.5 | 0.8 |
| D | 650 | 195 | 1.9 | 0.6 |
| E | 1800 | 195 | 0.8 | 0.3 |

Table 5. Predicted salinity at Val I-75 at the end of forecast period

Red tide

The Florida Fish and Wildlife Research Institute reported on March 1, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from Palm Beach or Lee counties. No samples were collected from St. Lucie, Martin, Broward, or Miami-Dade counties this week.

Water Management Recommendations

Lake stage is in the Base Flow sub-band of 2008 LORS. Tributary hydrological conditions are normal. The 2008 LORS recommends up to 450 cfs release at S-79 and up to 200 cfs release at S-80. Given the current estuarine conditions, there are no ecological benefits to the upper estuary associated with freshwater releases from Lake Okeechobee, but some benefits may accrue to areas further downstream.



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



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



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



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



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



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



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



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



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



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

EVERGLADES

At the gauge locations monitored for this report stages rose in the northern WCAs and at the ENP station in NE SRS but fell in WCA-3A. The most extreme individual gauge changes within the WCAs ranged from -0.09 feet (WCA-3A South) to +0.23 feet (ENP SRS). Pan evaporation was estimated at 1.45 inches this week, up from 0.95 inches per week as estimated one month ago.

| Everglades Region | Rainfall (Inches) | Stage Change (feet) |
|----------------------|----------------------|---------------------------|
| WCA-1 | 2.69 | +0.13 |
| WCA-2A | 2.02 | +0.04 |
| WCA-2B | 1.31 | -0.01 |
| WCA-3A | 0.43 | -0.06 |
| WCA-3B | 0.20 | -0.04 |
| ENP | 0.25 | +0.23 |



Regulation Schedules: WCA1: Gauge 1-8C is 0.26 feet above the Zone A1 regulation line. The threegauge average is 0.15 below the canal stage. WCA2A: S-11B Headwater stage remains 0.26 feet above the Zone A regulation line. WCA-3A: The Three Gauge Average stage is 0.09 feet above Zone E1 regulation line and is following the line. WCA-3A at gauge 62 (northwest corner) returns to a recession and is 0.49 feet below the upper schedule and is receding -0.08 feet per week on average over the last three weeks.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate a gradual drying down of WCA-3A North and WCA-2A, with WCA-1 remaining relatively unchanged. Ground truthing conducted on 2/25 confirmed the model results of depths of up to 6 inches in northeastern WCA-3A. WDAT difference output indicates that water levels got deeper in key areas across the Everglades over the month. These changes seem to reflect the management goal of moving water through the Everglades system and south. In the "1 Year" inset we see continue to see the difference between current depths and the unusually high-water conditions a year ago. Now higher in WCA-3A North and lower in WCA-3A South, these differences are ecologically favorable as we look to protect peat soils in the north of WCA-3A and moderate the flooding of tree islands in the south.





Taylor Slough Water Levels: About 0.1 inches of rain fell on Taylor Slough and Florida Bay this past week allowing water depths to continue decreasing an average of 0.11 feet. Water depths averaged 0.58 feet across Taylor Slough by Sunday. Conditions are 4 inches above average for this time of year with northern Taylor Slough staying the furthest from average (7 inches above).

Florida Bay Salinities: Average salinity in Florida Bay stayed the same this last week with individual station changes ranging from a decrease of 5 psu to an increase of 2 psu. Daily average salinities ranged from 20 psu in the northeast to 36 psu in the central bay and are still about 3.5 psu above average for this time of year.







Florida Bay MFL: Salinity in the mangrove zone stayed at 0.6 psu. The 30-day moving average also remained at 0.6 psu over the last week. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about 3,600 acre-feet with most of that coming at the beginning of last week. The rest of the week had less than 1000 acre-feet per day switching back and forth between upstream and downstream flows. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) has increased slightly to 208,594 acre-feet (less than the long-term average of 257,628 acre-feet and approaching the 25th percentile). Creek flow is provisional data from the USGS and is highly variable.



Water Management Recommendations

Keeping rainfall/freshwater in the Everglades system while protecting a dry season recession is a priority. Discharges into northern WCA-3A, Holey Land and Rotenberger remain ecologically beneficial and an ecological priority. As northeastern WCA-3A North has reached depths typical for this time of year, discharges into northwestern WCA-3A North and south from WCA-3A at the current rate have downstream ecological benefit. Increases in flows south from WCA-3A should be made cautiously as the Cape Sable Seaside Sparrow nesting season window began March 1. While very low numbers of wading birds have been noted foraging in the WCAs and expectations are for lower than average nesting success. WCA-2A has the potential to support nesting colonies in WCA-1 and WCA-3A. A careful recession is recommended in WCA-2A with the goal to reach suitable wading bird foraging depths within the next month and not too fast as to over drain the area. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

| SFWMD Everglades Ecological Recommendations, March 5th, 2019 (red is new) | | | | | | | |
|---|--|--|--|--|--|--|--|
| Area | Weekly change | Recommendation | Reasons | | | | |
| WCA-1 | Stage increased by 0.13' | Maintain depths at regulation schedule. | Protect upstream/downstream habitat and wildlife. | | | | |
| WCA-2A | Stage increased by 0.04' | Moderate ascension rates as possible, manage recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week. | Protect conditions that provide wading bird foraging habitat later into the nesting season. | | | | |
| WCA-2B | Stage decreased by 0.01' | Maintain depths at regulation schedule. | Protect upstream/downstream habitat and wildlife. | | | | |
| WCA-3A NE | Stage decreased by 0.02' | Maintain depths at regulation schedule. Moderate recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week. | Protect habitat including peat soil development, tree islands and | | | | |
| WCA-3A NW | Stage decreased by 0.06' | Maintain depths at regulation schedule. Moderate recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week. | wildlife. | | | | |
| Central WCA-3A S | Stage decreased by 0.06' | Maintain depths at regulation schedule. Moderate | Protect unstream/downstream babitat and wildlife | | | | |
| Southern WCA-3A S | Stage decreased by 0.03' | for optimal wading bird foraging of -0.09 ft per week. | | | | | |
| WCA-3B | Stage decreased by 0.04' | Maintain depths at regulation schedule. Moderate recession rates to the extent possible. | Protect upstream/downstream habitat and wildlife. | | | | |
| ENP-SRS | Stage increased by 0.23' | Make discharges to the Park according to the 2012 WCP rainfall plan. Continue with current rate of discharge. | Protect upstream/downstream habitat and wildlife. | | | | |
| Taylor Slough | Stage changes ranged from -0.06' to -0.22' | Move water southward as possible | When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP. | | | | |
| FB- Salinity | Salinity changes ranged -4.9 to +2.0 psu | Move water southward as possible | When available, provide freshwater to maintain low salinity buffer and promote water movement. | | | | |