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, Acting Assistant Director, Executive Office Staff

FROM: SFWMD Staff Environmental Advisory Team

DATE: June 18, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

Summary

Weather Conditions and Forecast

A weak mid- to upper-level trough moving through the lower Mississippi Valley this morning should reach the southeastern United States by this evening. Ahead of the trough a deep layer of west-southwesterly winds is transporting abundant moisture northeastward from the Caribbean Sea and Gulf of Mexico across Florida, with morning radiosonde data indicating 70-80% relative humidity in the low- to mid-levels of the atmosphere across the District. The moisture-rich environment, weak upper-level divergence/'lift' associated with the trough and average summertime levels of instability are expected to enhance rains area wide today, except possibly in the far south or southwest. While a small complex of showers and thunderstorms has moved onshore the west coast of Florida this morning, the rains elsewhere should hold off until this afternoon and then continue possibly into the early evening. The short-range model guidance suggests that the mass of thunderstorms affecting the west-central coast of Florida could have some influence on the evolution of this afternoon's convective activity, with those rains possibly helping to trigger a semi-organized line or larger cluster of new thunderstorms that would propagate in the westsouthwesterly steering winds from the western Florida peninsula to the central and eastern parts of the District by the middle and late afternoon. A maximum of activity is shown around and southeast of Lake Okeechobee through portions of the Kissimmee Valley in agreement with the latest model output. Overall, total District rainfall is expected to be above normal yet again today, marking the fourth consecutive day of enhanced rains. The trough in the southeastern United States should only gradually exit the East Coast late on Wednesday while the southern extension of the trough hangs back over the eastern Gulf of Mexico and continues to enhance rains over much of the District Wednesday afternoon and evening. Less conducive environmental conditions for rain are predicted on Thursday ahead of yet another trough, this one moving out of the Midwest and reaching the East Coast of the U.S. by Thursday evening. The less favorable environment should result in a considerable reduction of rain and rain chances compared to the last several days, with total District rainfall likely below normal. The latter trough should move into the western Atlantic and begin strengthening well east of the District on Friday as a mid-level ridge of high pressure builds westward into Florida and the Gulf of Mexico. This weather pattern should persist into the weekend and lead to an even greater decrease of rains from Friday through Monday, with total District rainfall trending sharply below normal. In fact, there is at least some chance that on Friday or Saturday little to no measurable total District rainfall would occur. By early next week the trough east of Florida at upper levels should intensify, which should cause a cooling of the air aloft over Florida. While the overall configuration of large-scale features would still favor much below normal rainfall, there could be at least some increase by Sunday and Monday, mainly over the southern half of the area. For the week ending next Tuesday morning, the deterministic total QPF is a little under 1.1" or about slightly more than 50% of normal while the probabilistic model output strongly favors below or much below normal total weekly rainfall. The drier-than-average conditions developing late this week are expected to extend into the following week, with the model guidance indicating a good chance of below normal rainfall continuing.

Kissimmee

Tuesday morning stages were 55.2 feet NGVD (1.3 feet below schedule) in East Lake Toho, 52.5 feet NGVD (1.0 feet below schedule) in Toho, and 49.1 feet NGVD (1.9 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.9 feet NGVD at S-65D. Tuesday morning discharges were 175 cfs at S-65, 290 cfs at S-65A, 465 cfs at S-65D and 463 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 5.9 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 0.18 feet. Recommendations this week: (6/13/2019) - Increase discharge at S-65A. Double the rate of discharge increase, if necessary, to maintain headwater at S-65A. The purpose is to control stage in Pool A due to heavy rain overnight in Pool A basin. (6/17/2019) - If needed, double rates of discharge increase for S-65/S-65A up to 150 cfs/day in order to slow the rate of rise in KCH if necessary. (6/17/2019) - Increase flow at S-61 in order to slow the Lake Toho ascension rate.

Lake Okeechobee

Lake Okeechobee stage is 11.21 feet NGVD, increasing 0.22 feet from the previous week and 0.02 ft higher than the previous month, but still 2.89 ft below the stage one year ago. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and has been staying roughly parallel with the Water Shortage sub-band, currently 0.38 feet above. The lake remains below the bottom of the ecological envelope (currently 0.79 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD (+/- 0.5 ft). With the onset of the wet season, lake stage ascension rates will become important in the recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone; high ascension rates will stress newly established plants and could dramatically reduce the beneficial effects of low lake stages experienced throughout the dry season. The latest viable satellite image which was clear enough to estimate cyanobacteria bloom potential on the lake was from June 11 and suggests that the recent rainstorms have decreased the immediate bloom risks in the north and northeast portions of the lake, which were previously medium-to medium-high.

Estuaries

Total inflow to the St. Lucie Estuary averaged 756 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinities decreased throughout 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 2869 cfs over the past week with only 1 cfs coming from the Lake. Over the past week, salinity decreased throughout the estuary. The 30-day moving average surface salinity is 2.3 at Val I-75 and 8.3 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 at Cape Coral, Shell Point and Sanibel. 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 the areas further downstream.

Stormwater Treatment Areas

Over the past week, no Lake water was delivered to the STAs. The total amount of Lake releases sent to the STAs/FEBs in WY2020 (since May 1, 2019) is approximately 7,000 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 111,000 acre-feet. Most STA cells are at or above target depths. STA-1W Northern Flow-way is offline for STA-1W Expansion project construction 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-5/6 Flow-ways 1 and 4 to facilitate the Restoration Strategies grading project in Flow-ways 2 and 3, and in STA-1E Central Flow-way and STA-2 Flow-way 3 for vegetation management activities. The nest of an Endangered Species Act (ESA) protected species has been observed in STA-1E and the nests of Migratory Bird Treaty Act (MBTA) protected

species have been observed in STA-1E, STA-2, and STA-3/4. It is recommended that no Lake regulatory releases be sent to the STAs this week.

Everglades

Widespread seasonal rains brought the stages up in all the WCAs except WCA-2A. An ecological area of concern remains peat soils / fire risk in northern WCA-3A as wading bird foraging was not noted in the northern Everglades this week. Stages rose above ground throughout Taylor Slough and are within 0.5 inches of the historic average. Salinity in Florida Bay averaged a 3 psu decrease from last week. Still averaging 3 psu higher than historical averages, salinities should continue to decrease with continued rain and water movement. The nearshore area currently in the 37-39 psu range, needs to decrease to near 25 psu to prevent additional stress to the system. White ibis are initiating wet season nesting in WCA-1 and at the Alley North Colony in WCA-3A North and in the ENP.

Supporting Information

KISSIMMEE BASIN

Kissimmee Basin Rainfall

The Upper Kissimmee Basin received 2.97 inches of rainfall in the past week and the Lower Basin received 3.73 inches (SFWMD Daily Rainfall Report 6/16/2019).

Upper Kissimmee Basin

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

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

| | | 7-day | | | | Schedule | le Daily Departure (feet) | | | | | | |
|---|-----------|--|---------------------------------------|----------------------|-------------------------------|-----------------|---------------------------|--------|--------|---------|---------|---------|--------|
| Water Body | Structure | Average Discharge (cfs) ¹ | Stage Monitoring Site ² | Lake Stage (feet) | Schedule Type ³ | Stage (feet) | 6/16/19 | 6/9/19 | 6/2/19 | 5/26/19 | 5/19/19 | 5/12/19 | 5/5/19 |
| Lakes Hart and Mary Jane | S-62 | 0 | LKMJ | 59.5 | R | 60.0 | -0.5 | -0.7 | -0.6 | -0.1 | -0.2 | -0.2 | 0.0 |
| Lakes Myrtle, Preston, and Joel | S-57 | 0 | S-57 | 59.9 | R | 61.0 | -1.1 | -1.3 | -1.2 | -0.1 | 0.0 | 0.0 | 0.0 |
| Alligator Chain | S-60 | 0 | ALLI | 62.2 | R | 63.2 | -1.0 | -1.3 | -1.2 | 0.0 | 0.0 | 0.0 | 0.1 |
| Lake Gentry | S-63 | 3 | LKGT | 59.6 | R | 61.0 | -1.4 | -1.6 | -1.5 | 0.0 | 0.0 | 0.0 | 0.1 |
| East Lake Toho | S-59 | 0 | TOHOE | 55.1 | R | 56.5 | -1.4 | -1.6 | -1.5 | -0.1 | -0.3 | -0.5 | -0.4 |
| Lake Toho | S-61 | 0 | TOHOW, S-61 | 52.4 | R | 53.5 | -1.1 | -1.4 | -1.5 | -0.1 | -0.3 | -0.4 | -0.5 |
| Lakes Kissimmee, Cypress, and Hatchineha | S-65 | 165 | KUB011, LKIS5B | 49.1 | R | 51.0 | -1.9 | -2.1 | -2.0 | -0.1 | -0.1 | -0.4 | -0.5 |

Report Date: 6/18/2019

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.

³A = projected ascension line, R = USACE regulation schedule, S = temporary recession target line, T = temporary schedule, N/A= not applicable or data not available. DATA ARE PROVISIONAL

Lower Kissimmee Basin

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

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

| Report Date: | 6/18/2019 | | | | | | | | | | | |
|--|--------------------------|-----------|---------|--------|--------|---------|---------|---------|--------|---------|---------|---------|
| 1-Day Average Average for the Preceeding 7-Days ¹ | | | | | | | | | | | | |
| Metric | Location | 6/16/2019 | 6/16/19 | 6/9/19 | 6/2/19 | 5/26/19 | 5/19/19 | 5/12/19 | 5/5/19 | 4/28/19 | 4/21/19 | 4/14/19 |
| Discharge (cfs) | S-65 | 94 | 165 | 284 | 319 | 596 | 984 | 1,014 | 428 | 438 | 525 | 710 |
| Discharge (cfs) | S-65A ² | 315 | 255 | 215 | 244 | 456 | 815 | 823 | 314 | 314 | 400 | 559 |
| Discharge (cfs) | S-65D ² | 438 | 290 | 222 | 329 | 706 | 920 | 795 | 403 | 466 | 584 | 703 |
| Headwater Stage (feet NGVD) | S-65D ² | 25.83 | 25.84 | 25.78 | 25.79 | 25.80 | 25.82 | 25.78 | 25.81 | 25.76 | 25.78 | 25.77 |
| Discharge (cfs) | S-65E ² | 465 | 331 | 208 | 313 | 591 | 810 | 703 | 351 | 441 | 563 | 679 |
| Discharge (cfs) | S-67 | 97 | 22 | 0 | 0 | 0 | 79 | 102 | 68 | 107 | 110 | 106 |
| DO (mg/L) ³ | Phase I river channel | 5.1 | 5.9 | 5.7 | 6.0 | 6.7 | 5.9 | 5.9 | 6.7 | 6.7 | 6.7 | 6.3 |
| Mean depth (feet) ⁴ | Phase I floodplain | 0.18 | 0.12 | 0.06 | 0.07 | 0.11 | 0.16 | 0.15 | 0.10 | 0.12 | 0.16 | 0.18 |

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 3.



Figure 4.



Figure 5.



Figure 6.



Figure 7.



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



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



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

Water Management Recommendations

| Recommendation Date | Recommendation | Purpose | Outcome | Source | Report Date |
|------------------------|---|--|-------------|--|------------------------|
| 6/17/2019 | If needed, double rates of discharge increase for S- 65/S-65A up to 150 cfs/day. | Slow rate of rise in KCH if necessary. | TBD | KB Ops | <mark>6/18/2019</mark> |
| 6/17/2019 | Increase flow at S-61. | Slow Lake Toho ascension rate | Implemented | KB Ops | 6/18/2019 |
| 6/13/2019 | Increase discharge at S-65A. Double the rate of discharge increase if necessary to maintain headwater at S-65A. | Purpose: Control stage in Pool A due to heavy rain overnight in Pool A basin. | Implemented | Water Management/KB Ops | 6/18/2019 |
| 6/1/2019 | Begin implementation of the 2019 Wet Season Discharge Plan for S-65/S-65A (see figure). | Provide variable flow from S-65/S-65A to balance Kissimmee River and Headwaters Lakes objectives, including Kissimmee River floodplain inundation, moderate rates of change in discharge, and controlled rate of stage rise in the lakes. | Planned | KB Ops | 6/11/2019 |
| 5/31/2019 | Reduce S-65 flow by 100 cfs over 2 days (5/31 and 6/1) to about 280 cfs. | Slow rate of stage decline in KCH while sustaining about 150 cfs at S-65A. (Note: Unexpected rainfall late on 6/1 allowed S-65A discharge to be returned to about 220 cfs on 6/2). | Implemented | KB Ops/SFWMD Water Management | 6/4/2019 |
| 5/28/2019 | No new recommendations. | | N/A | | 5/28/2019 |
| 5/20/2019 | No new recommendations. | | N/A | | 5/21/2019 |
| 5/13/2019 | No new recommendations. | | N/A | | 5/14/2019 |
| 5/6/2019 | Due to the rainfall, increase S65-A to 1000 cfs today in two increments and increase flow at S-65 accordingly. We will reassess the rise in KCH stage tomorrow 5/7. | Short-term goals: try to keep S65-A discharge at or below 1000 cfs for KR fish sampling this week and next, while keeping the reversal in KCH less than about 0.4 ft. | Implemented | KB Ops | 5/7/2019 |
| 4/29/2019 | No new recommendations. | | N/A | | 4/30/2019 |
| 4/23/2019 | No new recommendations. | | N/A | | 4/23/2019 |
| 4/15/2019 | No new recommendations. | | N/A | | 4/16/2019 |
| 4/8/2019 | No new recommendations. | | N/A | | 4/9/2019 |
| 2/25/2019 | No new recommendations | | | | 2/26/2019 |
| 3/18/2019 | No new recommendations | | N/A | | 3/19/2019 |
| 3/11/2019 | No new recommendations | | N/A | | 3/12/2019 |
| 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) on May 31. A provisional diagram is included in the Dry Season Operations slides; however, starting stage may change depending on conditions. | Slow recession rates in East Toho, Toho, and KCH to benefit fish and wildlife; as possible limit flow volume at S-65D to facilitate KRR construction. | N/A | KB Ops | 1/15/2019 |
| 1/4/2019 | Discharge and reversal guidelines are provided in the Dry Season Operations slides. Discontinue 54 foot stage reduction target in Lake Toho. Manage S-61 discharge to reduce stage in Lake Toho to 54 ft over the next 7-9 days. | Lake Kissimmee has already risen by ~1.5 ft. Move water to KCH to reduce the rate of stage decline in KCH; reduce the head difference between S-61 headwater and tailwater. | Implemented | SFWMD Water Mgt/KB Ops SFWMD Water Mgt/KB Ops | 1/8/2019 12/18/2018 |
| 12/10/2018 | Reduce S-65A discharge to 180 cfs. | Reduce rate of stage decline in lakes Kissimmee- | N/A | SFWMD Water Mgt/KB | 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 |







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



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

| Table 3. Upper Kissimmee Basin Snail Kite Survey Up | date |
|---|------|
| Survey 4: May 19-21, 2019 | |

| WATERBODY | KITES | TOTAL NESTS | SUCCESSFUL | ACTIVE |
|------------|-------|--------------------|------------|--------|
| East Toho | 2 | 4 | 0 | 2 |
| Toho | 97 | 55 | 19 | 11 |
| Kissimmee | 225 | 55 | 7 | 30 |
| KCOL Total | 324 | 114 | 26 | 43 |



Figure 14. The Kissimmee Basin.

LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 11.21 feet NGVD for June 18, 2019 increasing 0.22 feet from the previous week. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and three perimeter stations (S-308, S-4 and S-133). The Lake is now 0.02 feet higher than a month ago and 2.89 feet lower than a year ago when stages were roughly a foot higher than the top of the preferred ecological envelope (Figure 1). The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is currently 0.38 feet above the Water Shortage sub-band but running parallel to it over the past week or more (Figure 2). Lake stage is currently at the lowest levels for this time of year since 2011 (Figure 3). According to RAINDAR, during the week of June 11 to June 17, 2019, 1.49 inches of rain fell directly over the Lake, compared to 2.50 inches the previous week. Most of the watershed experienced ample rainfall, receiving between 1.5 - 4 inches (Figure 4).

Following a second week of rainfall over the lake and watershed, and an increased release rate from Lakes Kissimmee and Istokpoga, the average daily inflows (minus rainfall) to the Lake increased from 291 cfs to 1,205 cfs. The inflows from the Kissimmee River (S-65E) increased from 225 cfs to 348 cfs, and those from Lake Istokpoga (via S-84 and S-71) increased from 24 cfs to 745 cfs (Table 1).

Due to the rainfall across the surrounding watersheds, total outflows (minus evapotranspiration) for this week were zero, down from the previous weeks average daily cfs of 1,135 cfs. (Table 1). The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation was down slightly this week, at 0.13 inches.

Total lake inflows and outflows for the past week are detailed in Table 1, as well as the approximate change in lake stage from each major structure's total flows over the period. Figure 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 viable satellite imagery (June 11, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel OLCI sensor data showed bloom potential dissipated slightly across the lake, particularly in northern portions of the Lake, where potentially high cyanobacterial densities appear to have been dispersed by the heavy rains (Figure 6).

Water Management Recommendations

Lake Okeechobee stage is 11.21 feet NGVD, increasing 0.22 feet from the previous week and 0.02 ft higher than the previous month, but still 2.89 ft below the stage one year ago. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and has been staying roughly parallel with the Water Shortage sub-band, currently 0.38 feet above. The lake remains below the bottom of the ecological envelope (currently 0.79 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD (+/- 0.5 ft). With the onset of the wet season, lake stage ascension rates will become important in the recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone; high ascension rates will stress newly established plants and could dramatically reduce the beneficial effects of low lake stages experienced throughout the dry season. The lake was from June 11 and suggests that the recent rainstorms have decreased the immediate bloom risks in the north and northeast portions of the lake, which were previously medium-to medium-high.

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

| INFLOWS | Previous week Avg Daily CFS | Avg Daily Flow cfs | Equivalent Depth Week Total (in) | OUTFLOWS | Previous week Avg Daily CFS | Avg Daily Flow cfs | Equivalent Depth Week Total (in) |
|------------------|-----------------------------------|-----------------------|--|-------------|-----------------------------------|-----------------------|-------------------------------------|
| S-65E & S-65EX1 | 225 | 348 | 0.2 | S-77 | 17 | 0 | 0.0 |
| S-71 & S-72 | 19 | 264 | 0.1 | S-308 | 0 | 0 | 0.0 |
| S-84 & S-84X | 5 | 481 | 0.2 | S-351 | 607 | 0 | 0.0 |
| Fisheating Creek | 6 | 17 | 0.0 | S-352 | 530 | 0 | 0.0 |
| S-154 | 0 | 0 | 0.0 | S-354 | 65 | 0 | 0.0 |
| S-191 | 0 | 0 | 0.0 | L-8 Outflow | | | |
| S-133 P | 0 | 0 | 0.0 | ET | 2220 | 1945 | 0.9 |
| S-127 P | 0 | 0 | 0.0 | Total | 3439 | 1945 | 0.9 |
| S-129 P | 0 | 31 | 0.0 | | Provie | ional Data | |
| S-131 P | 0 | 34 | 0.0 | | 1 10013 | | |
| S-135 P | 0 | 0 | 0.0 | | | | |
| S-2 P | 0 | 0 | 0.0 | | | | |
| S-3 P | 0 | 0 | 0.0 | | | | |
| S-4 P | 0 | 0 | 0.0 | | | | |
| L-8 Backflow | 12 | 29 | 0.0 | | | | |
| Rainfall | 5087 | 3065 | 1.5 | | | | |
| Total | 5354 | 4270 | 2.1 | | | | |



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.



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.

ESTUARIES

St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 756 cfs (Figures 1 and 2) and last month inflow averaged about 466 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 | 378 |
| S-80 | 119 |
| S-308 | 0 |
| S-49 on C-24 | 80 |
| S-97 on C-23 | 64 |
| Gordy Rd. structure on Ten Mile Creek | 115 |

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

Over the past week, salinity decreased 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 estimated to be 18.8. 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) | 12.5 (14.0) | 17.1 (19.3) | NA ¹ |
| US1 Bridge | 18.2 (20.6) | 19.4 (21.7) | 10.0-26.0 |
| A1A Bridge | 26.5 (28.5) | 28.2 (29.6) | NA ¹ |

¹Envelope not applicable.

Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 2869 cfs (Figures 5 and 6) and last month inflow averaged about 1229 cfs. Last week's provisional averaged inflows from the structures are shown in Table 3.

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

| Location | Flow (cfs) |
|--------------------|------------|
| S-77 | 0 |
| S-78 | 875 |
| S-79 | 2742 |
| Tidal Basin Inflow | 126 |

Over the past week, salinity decreased throughout the estuary (Table 4, Figures 7 & 8). The seven-day average salinity values are estimated to be within the good range for adult eastern oysters at Cape Coral, Shell Point and Sanibel (Figure 9). The 30-day moving average surface salinity is 2.3 at Val I-75 and 8.3 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) | 0.5 (2.2) | 0.5 (2.3) | NA ¹ |
| Val I75 | 1.3 (3.4) | 1.4 (3.6) | 0.0-5.0 ² |
| Ft. Myers Yacht Basin | 6.0 (10.2) | 7.9 (11.2) | NA |
| Cape Coral | 15.2 (19.4) | 16.8 (20.7) | 10.0-30.0 |
| Shell Point | 27.9 (31.5) | 28.0 (31.2) | 10.0-30.0 |
| Sanibel | 29.4 (31.9) | EM ³ (33.2) | 10.0-30.0 |

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

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 1.5 to 4.2 at the end of the next two weeks for pulse release at S-79 ranging from 0 to 800 cfs and Tidal Basin inflows of 170 cfs.

| Scenario | Q79 | TB runoff | Daily | 30 day |
|----------|-------|-----------|----------|--------|
| | (cfs) | (cfs) | salinity | mean |
| A | 0 | 170 | 4.2 | 2.8 |
| В | 300 | 170 | 3.3 | 2.5 |
| С | 450 | 170 | 2.6 | 2.3 |
| D | 650 | 170 | 1.7 | 2.0 |
| E | 800 | 170 | 1.5 | 2.0 |

 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 June 14, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, not observed in samples collected Lee and Palm Beach counties (no samples from St. Lucie, Martin, Broward or Miami-Dade counties).

Water Management Recommendations

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



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



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



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



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



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



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



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



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







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

EVERGLADES

At the gauges monitored for this report the stages in the WCAs increased on average 0.13 feet last week. Individual gauge changes ranged from -0.02 feet (ENP NE-SRS) to +0.27 feet (WCA-3A central). Pan evaporation was estimated at 1.88 inches this week.

| Everglades Region | Rainfall (Inches) | Stage Change (feet) |
|----------------------|----------------------|---------------------------|
| WCA-1 | 3.18 | +0.16 |
| WCA-2A | 1.93 | -0.05 |
| WCA-2B | 1.58 | +0.04 |
| WCA-3A | 2.69 | +0.18 |
| WCA-3B | 2.55 | +0.14 |
| ENP | 3.76 | +0.36 |



Regulation Schedules: WCA-1: Gauge 1-8C just below the regulation line two weeks ago, rose steadily now 0.43 feet above the Zone A1 line. WCA-2A: S-11B Headwater stage has also risen steadily, just above the line three weeks ago the stage is 0.71 feet above the Zone A regulation line. WCA-3A: The three-gauge average rose into Zone E this week, 0.07 feet above that line and trending upwards. WCA-3A at gauge 62 (northwest corner) remains below schedule at 0.78 feet below the upper schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate stages in northeastern WCA-3A North are recovering, remain below ground but are stable. Conditions in WCA-1 look typical for this time of year, with stages lower in the north central regions of that basin. WCA-2A depths look typical to wet. Stages have risen in the western half of that basin as the wet season begins. WDAT difference output indicates that water level changes within the WCAs over the last month were mixed with stages rising slightly in most of WCA-2A and significantly so along the L-38 in that basin. Stages over the last month came up significantly in northeast WCA-3A. In the "1 Year" inset we see the difference between current depth conditions and those a year ago. The current depths are significantly lower across southern WCA-2A, eastern WCA-3A and along the western boundary of the L28-South.



Wading Bird Update bullets: Flight conducted on 6/17 over WCA-1, western WCA-2, WCA-3A North

- No wading birds were noted foraging across the northern Everglades after the recent reversal in stages across the system.
- Despite the lack of foraging 3-4,000 white ibis are initiating nesting in the WCAs and ENP
- Good year for small herons (little blue herons). Colonies continue along eastern WCA-1

Taylor Slough Water Levels: An average of 4 inches of rain fell over Taylor Slough and the ENP panhandle increasing water levels by 0.4 feet. Water levels are above ground throughout the slough now and are within 0.5 inches of the historic average for this time of year.

Florida Bay Salinities: After 2 weeks of ecologically stressful conditions, salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) decreased to 30 psu over the last week. The 30-day moving average continued to increase to 27.8 psu. If salinities decrease to below 25 psu this week, an exceedance of the MFL should be avoided. The weekly flow from the 5 creeks feeding Florida Bay was 8,400 acre-feet as a result mostly from local rain. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) increased to 196,248 which is less than the long-term average of 257,628 acre-feet but slightly above the 25th percentile (190,165 acre-feet). Creek flow is provisional data from the USGS and is highly variable.







Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) stayed at 37 psu for most of last week. The 30-day moving average increased to 26.9 psu as a result. The weekly flow from the 5 creeks feeding Florida Bay was negative (upstream) for all of last week and the weekly total flow was -8,200 acre-feet for the second week in a row. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) was 192,812 acre-feet which is less than the long-term average of 257,628 acre-feet but slightly above the 25th percentile (190,165 acre-feet). Creek flow is provisional data from the USGS and is highly variable.



Water Management Recommendations

Moderating accession rates in WCA-1, WCA-2A and WCA-3A South would have ecological benefit as wading birds are nesting in those basins. A rate of ascension less than 0.25 feet per week or less than 0.5 feet per 2 weeks is the general ecological recommendation. Recent Everglades Snail Kite activity and nesting remains high in southern WCA-3A. Moderating the ascension rate in that area would have an ecological benefit for both kite nesting and wading bird foraging. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

| SFWMD Everglades Ecological Recommendations, June 18th, 2019 (red is new) | | | |
|---|--|--|--|
| Area | Weekly change | Recommendation | Reasons |
| WCA-1 | Stage increased by 0.16' | Manage for a rate of ascencion less than +0.25' per week, or less than +0.5 per 2 weeks. | Protect tree islands, upstream/downstream habitat and wildlife. |
| WCA-2A | Stage decreased by 0.05' | Manage for a rate of ascencion less than +0.25' per week, or less than +0.5 per 2 weeks. | Protect tree islands, upstream/downstream habitat and wildlife. |
| WCA-2B | Stage increased by 0.04' | Maintain depths at regulation schedule. Manage for a rate of ascencion less than +0.25' per week, or less than +0.5 per 2 weeks. | Protect upstream/downstream habitat and wildlife. |
| WCA-3A NE | Stage increased by 0.28' | Manage for a rate of ascencion less than +0.25' per week, or less than +0.5 per 2 weeks. | Protect habitat including peat soil development and wildlife. |
| WCA-3A NW | Stage increased by 0.08' | Manage for a rate of ascencion less than +0.25' per week, or less than +0.5 per 2 weeks. | |
| Central WCA-3A S | Stage increased by 0.09' | Manage for a rate of ascencion less than +0.25' per week, or less than +0.5 per 2 weeks. | Protect tree islands, upstream/downstream habitat and wildlife. Protect conditions for snail kite nesting. |
| Southern WCA-3A S | Stage increased by 0.27' | | |
| WCA-3B | Stage increased by 0.10' | Manage for a rate of ascencion less than +0.25' per week, or less than +0.5 per 2 weeks. | Protect upstream/downstream habitat and wildlife. |
| ENP-SRS | Stage decreased by 0.02' | Make discharges to the Park according to the 2012 WCP rainfall plan. | Protect upstream/downstream habitat and wildlife. |
| Taylor Slough | Stage changes ranged from +0.17' to +0.72' | Move water southward as possible | When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP. |
| FB- Salinity | Salinity changes ranged -7.1 to +0.1 psu | Move water southward as possible | When available, provide freshwater to maintain low salinity buffer and promote water movement. |