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, Interim Assistant Executive Director, Executive Office Staff

FROM: SFWMD Staff Environmental Advisory Team

DATE: September 25, 2019

SUBJECT: Weekly Environmental Conditions for Systems Operations

### Summary

### Weather Conditions and Forecast

A vigorous upper-level trough located east of the Bahamas this morning should 'cut off' and drift westward as an upper-level low by Thursday. Strong convergence and large-scale sinking (subsidence) at upper levels behind the trough are associated with an abnormally dry air mass over Florida that is forecast to dominate the District's weather for the next few days. Despite the pronounced drying aloft and overall stable conditions, enough shallow moisture should be available to produce isolated light showers over parts of the east or southeast from time to time. Overall though, any rain from shower activity should be negligible, and no total District rainfall is predicted through Thursday. The upper low should reach the central Bahamas on Thursday, but unlike previous model runs, the latest guidance indicates that this feature should remain well east of the area through at least early this weekend. This trend and the stilllimited moisture predicted across the area suggest that, even though there could be some increase of shower activity in the east or southeast on Friday and Saturday, it may not amount to much. By early next week a weaker version of the upper low or a piece of it should approach the area from the east and possibly spread over Florida. Greater moisture and the dynamical support of the cold low could result in a greater increase of rains by that time, with the increase more likely conspicuous on Monday than it would be on Sunday. The enhanced northeasterly steering winds at that time would favor the greatest areal average rainfall in the east with some possible extension into the southwest, with the driest anomalies seen north and west of Lake Okeechobee. For the week ending next Tuesday morning, the deterministic total quantitative precipitation forecast (QPF) is a little under two tenths of an inch or slightly more than 10% of normal. The probabilistic model output indicates a likelihood of much below normal total District rainfall, with the total rainfall not likely to exceed a third of an inch. Given the forecast through the end of the month, it seems increasingly likely that September total District rainfall would fall under the all-time record minimum rainfall of 2.86" (1972) in the 88-year period of record.

# <u>Kissimmee</u>

Tuesday morning stages were 56.5 feet NGVD (0.4 feet below schedule) in East Lake Toho, 53.8 feet NGVD (0.1 feet below schedule) in Toho, and 50.4 feet NGVD (1.0 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.3 feet NGVD at S-65A and 27.1 feet NGVD at S-65D. Wednesday morning discharges were 716 cfs at S-65, 616 cfs at S-65A, 1,514 cfs at S-65D and 1,424 cfs S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 4.6 mg/L for the week through Sunday. Kissimmee River mean floodplain depth on Sunday was 0.64 feet. This week's recommendation (9/23/2019) is to reduce flow at S-65/S-65A by 300 cfs/day until minimum flow (300 cfs) is reached on Wednesday 9/25. The purpose is to reduce outflow from Kissimmee-Cypress-Hatchineha to slow the stage decline.

### Lake Okeechobee

Lake Okeechobee stage is 13.74 feet NGVD, decreasing 0.14 feet from the previous week but still 0.36 feet higher than last month. The Lake stage moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it remains this week. The Lake stage moved back into the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) at the start of August, after spending about 215 days below the envelope. Lake stage ascension rates remain important to the continued recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone and although there is a continued reversal this week an increase in lake stage in the future will stress newly established plants and could reduce the beneficial effects that recent low lake stages have had on these communities. The latest estimate of cyanobacteria bloom potential on the lake (September 22, 2019) shows low bloom potential in the west, however the latest pictures exhibit high cloud cover.

# **Estuaries**

Total inflow to the St. Lucie Estuary averaged 424 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinity increased throughout the estuary. Salinity at the US1 Bridge is in the good range for adult eastern oysters.

Total inflow to the Caloosahatchee Estuary averaged 610 cfs over the past week with no flow coming from the Lake. Salinity increased throughout the estuary. The 30-day moving average surface salinity is 0.3 at Val I-75 and 1.3 at Ft. Myers. Salinity conditions between Val I-75 and Ft. Myers are good for tape grass. Salinities 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, approximately 3,400 acre-feet of Lake Okeechobee water was delivered to the FEBs/STAs. The total amount of Lake releases sent to the FEBs/STAs in WY2020 (since May 1, 2019) is approximately 58,000 acre-feet. The total amount of inflows to the STAs in WY2020 is approximately 731,000 acre-feet. All STA cells are at or above target depths. 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-1W Northern Flow-way related to STA-1W Expansion #1 startup activities, in STA-5/6 Flow-way 1 to facilitate the Restoration Strategies grading project in Flow-way 2, and in STA-1E Central Flow-way and STA-2 Flow-way 3 for vegetation management activities. This week, if 2008 LORS recommends Lake releases to the WCAs and the conditions allow, releases will be sent to STA-1E, STA-2 and A-1 FEB/STA-3/4.

# **Everglades**

Stages changes at the gauges monitored for this report were primarily a moderate descent within the WCAs over the last week at the gauges monitored for this report except for northeastern WCA-3A (gauge 63) which dropped 0.40 feet. Depths in WCA-1 remain well below the regulation line; WCA-2A's stage continues to descend rapidly now significantly below the regulation line; WCA-3A remains just above the desired operational stage range now descending to the rising limb of the regulation schedule. Ascension rates should remain below 0.25 feet per week or 0.5 feet per 2 weeks to protect Apple Snail reproduction within the WCAs. Any depth change that exceeds this rate either on the ascent or descent is ecologically undesirable. This rate change was exceeded in WCA-2A (-0.63 over the last two weeks) and NE WCA-3A (-0.53 over the last two weeks) only in an unseasonable descent. Taylor Slough and Florida Bay received near average amount of rain this past week, and salinities fell in the Bay and nearshore but remain above average.

### **Supporting Information**

### KISSIMMEE BASIN

### **Kissimmee Basin Rainfall**

The Upper Kissimmee Basin received 0.15 inches of rainfall in the past week and the Lower Basin received 0.18 inches (SFWMD Daily Rainfall Report 9/23/2019).

### **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				Sche			Schedule Daily Departure (feet)						
Water Body	Structure	Average Discharge (cfs) <sup>1</sup>	Stage Monitoring Site <sup>2</sup>	Lake Stage Schedu (feet) Type <sup>3</sup>		Schedule Stage Type <sup>3</sup> (feet)		9/15/19	9/8/19	9/1/19	8/25/19	8/18/19	8/11/19
Lakes Hart and Mary Jane	S-62	0	LKMJ	59.9	R	60.0	-0.1	0.0	0.0	-0.2	-0.1	0.0	0.0
Lakes Myrtle, Preston, and Joel	S-57	0	S-57	61.0	R	61.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
Alligator Chain	S-60	0	ALLI	63.1	R	63.2	-0.1	-0.1	0.0	-0.2	0.0	0.0	0.1
Lake Gentry	S-63	0	LKGT	60.9	R	61.0	-0.1	-0.1	0.0	-0.2	0.0	-0.2	-0.1
East Lake Toho	S-59	0	TOHOE	56.5	R	56.9	-0.4	-0.2	-0.2	-0.2	0.0	0.3	0.5
Lake Toho	S-61	0	TOHOW, S-61	53.8	R	53.9	-0.1	0.1	0.0	-0.1	-0.1	0.1	0.2
Lakes Kissimmee, Cypress, and Hatchineha	S-65	1,337	KUB011, LKIS5B	50.5	R	51.4	-0.9	-0.4	-0.1	0.0	0.5	0.6	0.2

### Report Date: 9/24/2019

<sup>1</sup>Seven-day average of weighted daily means through midnight.

<sup>2</sup>Names of in-lake monitoring sites and structures used to determine lake stage; if more than one site is listed, an average is reported.

<sup>3</sup>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 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:	9/24/2019											
Motric	Location	1-Day Average Average for the Preceeding 7-Days <sup>1</sup>										
Wethc		9/22/2019	9/22/19	9/15/19	9/8/19	9/1/19	8/25/19	8/18/19	8/11/19	8/4/19	7/28/19	7/21/19
Discharge (cfs)	S-65	1,110	1,337	1,443	2,135	5,414	5,640	3,852	2,198	783	777	1,110
Discharge (cfs)	S-65A <sup>2</sup>	1,008	1,248	1,412	2,676	5,795	6,547	5,681	3,248	1,665	903	1,123
Discharge (cfs)	S-65D <sup>2</sup>	1,585	1,780	2,976	5,734	6,983	8,207	5,917	3,167	1,618	1,378	1,396
Headwater Stage (feet NGVD)	S-65D <sup>2</sup>	26.90	26.78	27.00	27.56	27.48	27.42	26.50	25.88	25.77	25.79	25.78
Discharge (cfs)	S-65E <sup>2</sup>	1,534	1,766	2,988	5,615	6,932	8,155	5,871	3,000	1,495	1,259	1,250
Discharge (cfs)	S-67	0	0	28	17	31	24	34	46	85	93	92
DO (mg/L) <sup>3</sup>	Phases I & II/III river channel	5.3	4.6	2.3	1.9	0.8	0.3	0.7	0.7	3.2	4.2	3.3
Mean depth (feet) <sup>4</sup>	Phase I floodplain	0.64	0.73	1.07	2.18	2.82	3.25	2.71	1.73	0.77	0.52	0.55

<sup>1</sup>Seven-day average of weighted daily means through Sunday midnight.

<sup>2</sup>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.

<sup>3</sup>DO is the average for sondes at KRBN, PC62, PC33, PD62R, and PD42R.

<sup>4</sup>1-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.











![](_page_5_Figure_1.jpeg)

![](_page_5_Figure_2.jpeg)

![](_page_5_Figure_3.jpeg)

gingi stage.

![](_page_6_Figure_0.jpeg)

**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.

![](_page_6_Figure_2.jpeg)

**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.

![](_page_7_Figure_0.jpeg)

Figure 10. Mean daily dissolved oxygen, discharge, temperature and rainfall in the Phases I/II/III river channel.

# Water Management Recommendations

9/23/2019     Reduce for at 5 40% 65 kb y 300 cfx/dyr unit minimum MK (000 cf) is reached on Wednesday y 107/2019     TBD     06 Dpst     9/24/2019       9/17/2019     Continue SGA diabarge of at least 1.400 cfx while stage in Lake Stimmers, Cyrees and Fickborkship wat teason 15-14-30 diabarge of at least 1.400 cfx while stage in Lake Stimmers, Cyrees and Fischborkship stage in Lake Stimmers, Cyrees and Cin Lake Stimmers, Cyrees and Fischb	кесоттеndation Date	Recommendation	Purpose	Outcome	Source	Report Date
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9/0/2001     Status 12.400 drives with the 2013 set season 15-14-50 discharge plan.     entime K8 floadplain inundation.     Implemented     K8 Ops     9/10/2019       9/2/2019     Medica 555A floadpage plan.     indice discharge to 1400 cfs (banful) gratianily acould straining fload number box 300 ds relater htt 400 ds (banful) set season 15-14-50 discharge plan.     indice discharge to 1400 cfs (banful) gratianily acould straining fload number box 300 ds relater htt 400 ds (banful) gratiani     indice discharge to 1400 cfs (banful) gratianily acould straining fload number box 300 ds relater htt 400 ds (banful) gratiani     indice discharge to 1400 cfs (banful) gratianily acould straining fload number box 300 ds relater htt 400 ds (banful) gratiani     N/A     9/10/2019       9/20010     Nonese recommendations.     N/A     <	9/17/2019	Continue S65A discharge of at least 1,400 cfs while stage in Lakes Kissimmee, Cypress and Hatchineha is above 50.0 feet NGVD, in accordance with the 2019 wet season IS-14-50 discharge plan.	Continue KR floodplain inundation.	TBD	KB Ops	9/17/2019
Beduce SEA flow by another 400 cfs today 9/5, therm make make two 300 cfs reductions tomorrow       Reduce discharge to 1400 cfs (banfull) gradually       Implemented       K8 Ops       9/10/2019         9/5/2013       Continue SGA Allscharge of the sean 1.400 cfs (banfull) gradually and useans 51-400 cfs (banfull) gradually and useans 51-400 cfs (banfull) gradually and useans 51-400 cfs (banfull) gradually       Implemented       K8 Ops       9/10/2019         9/5/2013       No new recommendations.       N/A       9/17/2019         8/7/2019       No new recommendations.       N/A       8/20/2019         8/7/2019       No new recommendations.       Switch 16 flod control operations as stage in KCH       Implemented       K3 Ops       6/13/2019         8/7/2019       Olders stage rise in Pool A by reducing 5-55 discharge.       Switch 16 flod control operation in Pool A in light of the toreas of the stage stage in KCH while maintaining moderate maintaining moderate maintaining moderate maintaining moderate maintaining moderate maintaining moderate maintaining flow of the toreas flow and dual to 70 flow strage of the 0.5 fm mar rise of 34 days is tage.       Strage stage in KCH while addressing much while addressing moderate maintaining moderate maintaining moderate maintaining moderate mai	9/10/2019	Continue S65A discharge of at least 1,400 cfs while stage in Lakes Kissimmee, Cypress and Hatchineha is above 50.0 feet NGVD, in accordance with the 2019 wet season IS-14-50 discharge plan.	Continue KR floodplain inundation.	Implemented	KB Ops	9/10/2019
9/3/2019       No new recommendations.       N/A       9/4/2019         8/2/2019       No new recommendations.       N/A       8/2/2019         8/19/2019       No new recommendations.       N/A       8/2/2019         8/19/2019       No new recommendations.       N/A       8/2/2019         8/7/2019       Manage discharge at 5-65 and 5-65 A to control rising stage in KCH.       Switch to filod control operations as stage in KCH       Implemented       KB Ops       8/13/2019         a) Attempt to hold flow at 5-65A steady during the rain forcca: other weekend.       b) if it is necessary to increase discharge further, try to follow the discharge reture in ange discharge.       Balance competing objectives while considering flood control in Pool A in light of the forecast for requested rate to the need to control stage rise in Pool A lowever, it yto minime the magnitude and duration of the exceedance after rainfall       Manage stage in KCH while maintaining moderate in Pool A lowever, it yto minime the regulation duration of the exceedance after rainfall       Manage stage in KCH while maintaining moderate in Pool A lowever, it yto minime the regulation and duration of the exceedance after rainfall       Manage stage in KCH while maintaining moderate in Pool A lowever, it yto minime the regulation and duration of the exceedance after rainfall       Implemented       KB Ops       7/30/2019         7/14/2019       Do not increase 5-65/5-565A flow today       Control rate of rise in KCH while addressing DO sig concerns.       Implemented       KB Ops       7/12/2019 <td>9/5/2019</td> <td>Reduce S65A flow by another 400 cfs today 9/5, then make make two 300 cfs reductions tomorrow 9/6, to arrive at 1400 cfs late in the day on 9/6. Continue S65A discharge of at least 1,400 cfs while stage in Lakes Kissimmee, Cypress and Hatchineha is above 50.0 feet NGVD, in accordance with the 2019 wet season IS-14-50 discharge plan.</td> <td>Reduce discharge to 1400 cfs (bankfull) gradually to avoid stranding fish/snails/other organisms as floodplain stage declines.</td> <td>Implemented</td> <td>KB Ops</td> <td>9/10/2019</td>	9/5/2019	Reduce S65A flow by another 400 cfs today 9/5, then make make two 300 cfs reductions tomorrow 9/6, to arrive at 1400 cfs late in the day on 9/6. Continue S65A discharge of at least 1,400 cfs while stage in Lakes Kissimmee, Cypress and Hatchineha is above 50.0 feet NGVD, in accordance with the 2019 wet season IS-14-50 discharge plan.	Reduce discharge to 1400 cfs (bankfull) gradually to avoid stranding fish/snails/other organisms as floodplain stage declines.	Implemented	KB Ops	9/10/2019
8/26/2013       No new recommendations.       N/A       8/27/2019         8/19/2019       No new recommendations.       N/A       8/27/2019         8/19/2019       Manage discharge at 5-65 and 5-65A to control rising stage in KCH.       Switch to flood control operations as stage in KCH reaches the regulation line.       Implemented       KB Ops       8/13/2019         8/17/2019       a) Attempt to hold flow at 5-65A to control rising stage in KCH.       Switch to flood control operations as stage in KCH       Implemented       KB Ops       8/13/2019         8/12/2019       b) fit it in necessary to increase discharge further, try to follow the discharge rate of change criteria to reduce effects on flood control in Pool A. In light of the forecast for discharge.       Implemented       SFWMD Water Management/KB Ops       8/6/2019         8/12/2019       Stage in KCH will likely rise faster than the requested rate due to the need to control stage rise in Pool A. However, try to minimus and duration of the exceedance after rainfall subaides.       Manage stage in KCH will learn rainfall subaides.       Implemented       KB Ops       7/30/2019         7/18/2019       Martage starts to decline. D) if KCH tage starts to decline. D) if K	9/3/2019	No new recommendations.		N/A		9/4/2019
8/19/2019     No new recommendations.     N/A     \$/2/2/2019       8/7/2019     Manage discharge at 5-65 and 5-65A to control resches the regulation line.     Implemented     KB Ops     \$/13/2019       8/7/2019     a) Attempt to hold flow at 5-55A steady during the rain forecast over the weekend. B) If its necessary to increase discharge further, try to follow the discharge at of the disge riter is to reduce effects on dissolved oxygen in the Kissimme River     Balance competing objectives while considering flood control in Pool A in light of the forecast for in Pool A. However, try to minimize the magnitude and duration of the exceedance after rainfall subsides.     Implemented     SFWMD Water Management/KB Ops     \$/6/2019       7/24/2019     Of stage tracts of forecast rainy period are known.     Manage stage in KCH while maintaining moderate lickharge from S65A.     Implemented     KB Ops     7/30/2019       7/18/2019     Do not increase 565/565A flow today     Of stage tracts of decline, D) BY (K1 stage starts to decline, totay the discharge from S55A.     Sign of the sceedance of the 0.5 f max rise per 14 days is part took at 565A to avoid reducing flow to minimum till is necessary.     Implemented     KB Ops/SFWMD Water Management.     7/23/2019       7/18/2019     Do not increase 565/555A flow today     O control rate of stage rise in KCH while addressing to 0.9 ag concerns.     Implemented     KB Ops     7/16/2019       7/11/2019     Increase 565/555A flow today     O control rate of stage rise in KCH while addressing to 0.9 ag concerns.     Implemented     KB Ops	8/26/2019	No new recommendations.		N/A		8/27/2019
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a) Hold KCH stage steady until the risk of an exceedance of the 0.5 ft max rise per 14 days is past OR stage starts to decline. b) if KCH stage starts to decline, ramp down at 150 cfs/day over several days to 750 cfs. If this doesn't stop the decline we will regroup to discuss options.Balance rate of rise in KCH against reduction of flow at S65A to avoid reducing flow to minimum until it is necessary.ImplementedKB Ops/SFWMD Water Management7/23/20197/14/2019Do not increase S-65/S-S65A flow today Cfs/.Control rate of stage rise in KCH while addressing DO sag concerns.ImplementedSFWMD Water Management/KB Ops7/16/20197/11/2019Postpone second 150 cfs increase today (total 150 cfs).Control rate of stage rise in KCH while addressing DO sag concerns.ImplementedKB Ops7/16/20197/11/2019Increase S-65/S-S65A flow by 150 cfs today (double the rampup guidelines).Control rate of stage rise in KCH while addressing DO sag concerns.ImplementedKB Ops7/16/20197/11/2019Increase S-65/S-S65A flow by 150 cfs today (double the rampup guidelines).Control rate of stage rise in KCH while addressing DO sag concerns.ImplementedKB Ops7/16/20197/11/2019Increase S-65/S-S65A flow by 150 cfs today (double the rampup guidelines).Control rate of stage rise in KCH while addressing DO sag concerns.ImplementedKB Ops7/16/20197/11/2019Increase S-65/S-S65A flow by 150 cfs today (double the rampup guidelines).Control rate of stage rise in KCH while addressing DO sag concerns.ImplementedKB Ops7/16/20197/10/2019Increase S-65	7/24/2019	Maintain flow of at least 750-800 cfs or higher at S65A until the effects of forecast rainy period are known.	Manage stage in KCH while maintaining moderate discharge from S65A.	Implemented	KB Ops	7/30/2019
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7/10/2019     Increase 5-65/S-565A flow by 150 cfs today (double the rampup guidelines).     Control rate of stage rise in KCH while addressing DO sag concerns.     Implemented     KB Ops     7/16/2019       7/8/2019     No new recommendations.     N/A     7/9/2019       6/27/2019     Continue discharge reductions at S-65A at up to double the normal rampdown rate, as possible.     Reduce river channel stage to allow DO recovery.     TBD     KB Ops     7/2/2019       6/27/2019     Manage S65 discharge to slow stage ascension to the trate of stage ascension in KCH.     TBD     KB Ops     7/2/2019	7/11/2019	Increase S-65/S-S65A flow by 150 cfs today (double the rampup guidelines).	Control rate of stage rise in KCH while addressing DO sag concerns.	Implemented	KB Ops	7/16/2019
7/8/2019     No new recommendations.     N/A     7/9/2019       6/27/2019     Continue discharge reductions at S-65A at up to double the normal rampdown rate, as possible.     Reduce river channel stage to allow DO recovery.     TBD     KB Ops     7/2/2019       6/27/2019     Manage S65 discharge to slow stage ascension to double the normal rampdown rate, as possible.     Slow the rate of stage ascension in KCH.     TBD     KB Ops     7/2/2019	7/10/2019	Increase S-65/S-S65A flow by 150 cfs today (double the rampup guidelines)	Control rate of stage rise in KCH while addressing	Implemented	KB Ops	7/16/2019
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the extent possible	6/27/2019	double the normal rampdown rate, as possible. Manage S65 discharge to slow stage ascension to the extent possible.	Slow the rate of stage ascension in KCH.	TBD	KB Ops	7/2/2019

![](_page_9_Figure_0.jpeg)

![](_page_9_Figure_1.jpeg)

![](_page_9_Figure_2.jpeg)

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

![](_page_10_Figure_0.jpeg)

Figure 13. The Kissimmee Basin.

# LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 13.74 feet NGVD for September 23, 2019 decreasing 0.14 feet from the previous week. This value is based on the use of four interior lake stations (L001, L005, L006 and LZ40) and four perimeter stations (S-308, S-352, S-4 and S-133). The Lake is now 0.36 feet higher than a month ago and 0.95 feet lower than a year ago (Figure 1) when stages were about a foot above the top of the preferred ecological envelope (Figure 2). The Lake moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it remains this week (Figure 3). With the recent reversal, Lake stage is now just slightly lower than, and paralleling, the 2010 levels (Figure 4). According to RAINDAR, during the week of September 17 to September 23, 2019, 0.19 inches of rain fell directly over the Lake, compared to 0.61 inches the previous week. During that same time period, 0.236 inches of rain fell District-wide, compared to 0.828 inches the previous week. This week, most of the watershed received less than 0.5 inches of rain with the exception of the southern tip which received up to 3 inches of rain (Figure 5).

The average daily inflows (minus rainfall) to the Lake decreased for the third consecutive week going from 2,995 cfs to 1,755 cfs. All source inflows decreased with the Kissimmee River (S-65E & S-65EX1) going from 2,749 cfs to 1,651 cfs, those from Lake Istokpoga (via S-84 and S71) going from 103 cfs to 26 cfs, inflows from Fisheating Creek decreased from 83 cfs to 63 cfs and flow from the various S-100 pumps decreased from 60 cfs to 15 cfs. No passive backflow from the L8 at Canal Point (via CLV10A) occurred this week (Table 1).

Outflow (minus evapotranspiration) decreased from 3,544 cfs to 1,572 cfs with 1,504 cfs going south through the S-350 structures and the L8 at Canal Point (via CLV10A) for water supply and 69 cfs released west through S-77. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiation decreased from the previous week going from 1.13 inches to 1.02 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 6 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 (September 22, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel 3 OLCI sensor data had cloud cover over the eastern half of the lake but appears to show low bloom potential in the west (Figure 7).

# Water Management Recommendations

Lake Okeechobee stage is 13.74 feet NGVD, decreasing 0.14 feet from the previous week but still 0.36 feet higher than last month. The Lake moved up into the Low sub-band on September 4, 2019 then moved back down into the Base Flow sub-band on September 11, 2019 where it remains this week. The lake moved back into the ecological envelope (which varies seasonally from 12.5 – 15.5 feet NGVD +/- 0.5 feet) at the start of August, after spending about 215 days below the envelope. Lake stage ascension rates remain important to the continued recovery of SAV and EAV (Submerged and Emergent Aquatic Vegetation) in the nearshore zone and although there is a continued reversal this week an increase in lake stage in the future will stress newly established plants and could reduce the beneficial effects that recent low lake stages have had on these communities. The latest estimate of cyanobacteria bloom potential on the lake (September 22, 2019) shows low bloom potential in the west, however the latest pictures exhibit high cloud cover.

**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 <u>)</u>	OUTFLOWS	Previous week Avg Daily CFS	Avg Daily Flow cfs	Equivalent Depth Week Total (in)
S-65E & S-65EX1	2749	1651	0.7	S-77	352	69	0.0
S-71 & S-72	32	7	0.0	S-308	0	0	0.0
S-84 & S-84X	71	19	0.0	S-351	834	579	0.2
Fisheating Creek	83	63	0.0	S-352	870	464	0.2
S 1E/	18	15	0.0	S-354	1488	440	0.2
3-134	11	13	0.0	L-8 Outflow		21	0.0
S-191	11	0	0.0	ET	2478	2412	1.0
S-133 P	20	0	0.0	Total	6022	3984	1.7
S-127 P	11	0	0.0				
S-129 P	0	0	0.0				
S-131 P	0	0	0.0				
S-135 P	0	0	0.0				
S-2 P	0	0	0.0		Provis	ional Data	
S-3 P	0	0	0.0				
S-4 P	0	0	0.0				
L-8 Backflow	0						
Rainfall	889	438	0.2				

Total

3884

2193

0.9

![](_page_13_Figure_0.jpeg)

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

![](_page_14_Figure_0.jpeg)

# Lake Okeechobee Stage vs Ecological Envelope

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

![](_page_15_Figure_0.jpeg)

# Lake Okeechobee Water Level History and Projected Stages

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

![](_page_16_Figure_0.jpeg)

# Lake Okeechobee Water Level Comparison

Figure 4. Select annual stage hydrographs for Lake Okeechobee from 2010 – 2019.

![](_page_17_Figure_0.jpeg)

Figure 5. Rainfall estimates by basin.

![](_page_17_Figure_2.jpeg)

**Figure 6.** 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.

![](_page_18_Picture_0.jpeg)

**Figure 7.** Potential for cyanobacterial blooms on Lake Okeechobee in 2019, 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 424 cfs (Figures 1 and 2) and last month inflow averaged about 1,588 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	192
S-80	76
S-308	0
S-49 on C-24	26
S-97 on C-23	1
Gordy Rd. structure on Ten Mile Creek	129

Table 1. Wee	kly average inflows	s (data are	provisional)	).

Over the past week, salinity increased throughout the estuary (Table 2, Figures 3 and 4). The sevenday moving average of the water column (an average of the surface and bottom salinity) at the US1 Bridge is estimated to be 12.0. 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)	<b>9.4</b> (4.1)	<b>13.1</b> (8.0)	NA <sup>1</sup>
US1 Bridge	<b>8.5</b> (6.6)	<b>15.5</b> (11.9)	10.0-26.0
A1A Bridge	<b>25.0</b> (21.7)	EM <sup>2</sup> (EM)	NA <sup>1</sup>

<sup>1</sup>Envelope not applicable and <sup>2</sup>Equipment Malfunction.

### Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 610 cfs (Figures 5 and 6) and last month inflow averaged about 2,130 cfs. Last week's provisional averaged inflows from the structures are shown in Table 3.

Location	Flow (cfs)
S-77	69
S-78	0
S-79	338
Tidal Basin Inflow	272

Table 3.	Weekly	/ average i	nflows	(data is	provisional	).
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Over the past week, salinity increased throughout the estuary (Table 4, Figures 7 & 8). The seven-day average salinity values 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 0.3 at Val I-75 and 1.3 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)	<b>0.3</b> (0.2)	<b>0.3</b> (0.2)	NA <sup>1</sup>
Val 175	<b>0.6</b> (0.3)	<b>1.0</b> (0.4)	0.0-5.0 <sup>2</sup>
Ft. Myers Yacht Basin	<b>3.6</b> (1.2)	<b>4.7</b> (1.5)	NA
Cape Coral	<b>9.4</b> (6.6)	<b>11.6</b> (9.2)	10.0-30.0
Shell Point	<b>22.6</b> (20.6)	<b>23.8</b> (22.2)	10.0-30.0
Sanibel	<b>27.9</b> (27.2)	<b>28.9</b> (28.2)	10.0-30.0

<sup>1</sup>Envelope not applicable, <sup>2</sup>Envelope is based on a 30-day average, and <sup>3</sup>Equipment 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 1.1 to 3.5 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
А	0	170	3.5	1.2
В	300	170	2.5	0.9
С	450	170	2.0	0.8
D	650	170	1.4	0.7
E	800	170	1.1	0.6

Table 5. Predicted salinity at Val I-75 at the end of forecast pe	riod
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### Red tide

The Florida Fish and Wildlife Research Institute reported on September 20, 2019, that *Karenia brevis,* the Florida red tide dinoflagellate, was not observed in samples collected from or offshore of Lee, Palm Beach or Miami-Dade counties (no samples were analyzed this week from St. Lucie, Martin, or Broward counties).

### Water Management Recommendations

Lake stage is in the Base Flow sub-band. Tributary conditions are normal. 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.

![](_page_21_Figure_0.jpeg)

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

![](_page_21_Figure_2.jpeg)

**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.

![](_page_22_Figure_0.jpeg)

![](_page_22_Figure_1.jpeg)

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

![](_page_23_Figure_0.jpeg)

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

![](_page_23_Figure_2.jpeg)

**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.

![](_page_24_Figure_0.jpeg)

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

![](_page_24_Figure_2.jpeg)

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

![](_page_25_Figure_0.jpeg)

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

![](_page_25_Figure_2.jpeg)

### EVERGLADES

Rainfall was consistent and well below average across the WCAs, with more falling in Everglades National Park. The average stage across all the gauges monitored for this report fell 0.12. Pan evaporation was estimated at 1.79 inches and the Rainfall Plan continues to call for the maximum release.

Everglades Region	Rainfall (Inches)	Stage Change (feet)
WCA-1	0.13	-0.12
WCA-2A	0.09	-0.23
WCA-2B	0.15	-0.12
WCA-3A	0.06	-0.19
WCA-3B	0.15	-0.05
ENP	0.82	+0.01

![](_page_27_Figure_0.jpeg)

Regulation Schedules: WCA-1: The three-gauge average remains below the Zone A1 line falling away from the rising limb, currently 1.03 feet below the A1 Zone regulation line. WCA-2A: Gauge 2A-17 fell quickly to below schedule over the two weeks, now 0.39 feet below. WCA-3A: The three-gauge average stage moved closer to the rising Zone A regulation line at 0.12 feet above the desired operational band. WCA-3A at gauge 62 (northwest corner) is back below schedule at 0.91 feet below the upper schedule and descending.

![](_page_28_Figure_0.jpeg)

Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots relatively stable conditions over the past two months. There is potential for depths at ground surface along the northern stretches of the Miami Canal and increased spatial extent of ponding along the L-67 canal in WCA-3A. Ponding has increased out into central WCA-3A South, however gauge data there remains below the 2.5' threshold indicating tree island stress. Depths are building in headwaters of Shark River Slough. WDAT difference maps indicate that in general conditions are consistently deeper in stage within the L-67 region of WCA-3A South and 2B; and significantly drier in northwest WCA-3A North now compared to a month ago. At this time last year, the WCAs were nearing the end of a highwater emergency order due to conditions in WCA-3A. Stages are significantly lower in southern WCA-2A and WCA-3B. Stage changes are mixed within WCA-1 differences from a year ago look to be associated with inflow and outflow from that basin.

![](_page_29_Figure_0.jpeg)

![](_page_29_Figure_1.jpeg)

Taylor Slough Water Levels: An average of 1.59 inches of rain fell over Taylor Slough and Florida Bay this past week with the highest amount of 3.37 inches at P37 in northern Taylor Slough. Stage changes ranged -0.18 feet to +0.17 feet with only TSB showing a decrease this week (opposite of last week). Stages are still 1.5 inches higher than average for this time of year, and higher stages are desirable.

Florida Bay Salinities: Average salinity in Florida Bay was 31 psu, 1 psu lower than last week. The average for the northern shoreline has decreased to 29 psu, finally below 30 psu for the first time this water year. Conditions are still 6 psu above average for this time of year.

![](_page_30_Figure_2.jpeg)

![](_page_30_Figure_3.jpeg)

![](_page_31_Figure_0.jpeg)

![](_page_31_Figure_1.jpeg)

Florida Bay MFL: Salinity at the TR station in the mangrove zone (tracked for the Florida Bay MFL) remained near-fresh at 0.5 psu. The 30-day moving average decreased 0.1 psu to end at 5.2 psu. Weekly flow from the 5 creeks identified by yellow stars on the map totaled 16,000 acre-feet this past week which is 4,000 acre-feet higher than the historical average for this time of year. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) increased 5,000 acre-feet to 184,077 acre-feet and continues to hover near the 25th percentile (190,165 acrefeet). Creek flow are provisional USGS data.

### Water Management Recommendations

Stages are relatively low compared to average. Allowing current stages to run higher in all the WCAs may have ecological value, deeper water during the wet season allows the prey base to build to optimal densities prior to the dry season and wading bird nesting season. Deeper dry season depths also mean that the seasonal drawdown that concentrates prey for easier foraging can extend throughout the nesting season. WCA-3A North has a high potential for good wading bird foraging this year as a fire in that basin, near the Alley North colony, may have opened up the sloughs making it easier for wading birds to forage for prev in that critical region. While perhaps less than desirable operationally the current elevated stage in WCA-3A could prove beneficial ecologically. The entirety of the marsh within WCA-3A North is inundated and the 2.5-foot threshold at Gauge 65 which indicates flooding stress to tree islands has not been exceeded and steady discharges from WCA-3A are making it into the major sloughs of Everglades National Park. Overall conserving water within the WCAs, allowing stages to ascend to peak conditions and moving low nutrient water south has water has many ecological benefits. Water flowing through isn't ponding and flows towards Taylor Slough and Florida Bay and will freshen salinity conditions within the nearshore areas of Florida Bay and decrease the currently stressful conditions for seagrasses and fauna as nearshore salinities remain elevated. A potential indicator of stress in the Taylor Slough mangrove zone is the minimum that the 30-day moving average salinity reaches during the peak of the wet season, compared to salinities of one and two years ago current conditions are elevated. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, September 24th, 2019 (red is new)				
Area	Weekly change	Recommendation	Reasons	
WCA-1	Stage decreased by 0.12'	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 apple snail reproduction.	
WCA-2A	Stage decreased by 0.23'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths has potential ecological benefit. Manage for a rate of change less than +0.25' per week, or less than +0.5 per 2 weeks.	Protect upstream/downstream habitat and wildlife. Protect conditions for apple snail reproduction.	
WCA-2B	Stage decreased by 0.12'	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. Protect conditions for apple snail reproduction.	
WCA-3A NE	Stage decreased by 0.40'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths has potential ecological benefit. Manage for a rate of change less than +0.25' per week, or less than +0.5 per 2 weeks.	e Protect tree islands, upstream/downstream habitat and wildlife. Protect	
WCA-3A NW	Stage decreased by 0.22'	Conserving water in this basin has ecological benefit as we near the seasonal peak for water depths has potential ecological benefit. Manage for a rate of change less than +0.25' per week, or less than +0.5 per 2 weeks.	conditions for apple snail reproduction.	
Central WCA-3A S	Stage decreased by 0.11'	Manage for a rate of ascencion less than +0.25' per week,	Protect tree islands, upstream/downstream habitat and wildlife. Protect conditions for apple snail reproduction.	
Southern WCA-3A S	Stage decreased by 0.04'	or less than +0.5 per 2 weeks.		
WCA-3B	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 upstream/downstream habitat and wildlife. Protect conditions for apple snail reproduction.	
ENP-SRS	Stage increased by 0.01'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.	
Taylor Slough	Stage changes ranged from -0.18' to +0.17'	Move water southward as possible	When available, provide freshwater buffer for downstream conditions.	
FB- Salinity	Salinity changes ranged -6.2 to +1.8 psu	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.	