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:** April 30, 2019
- SUBJECT: Weekly Environmental Conditions for Systems Operations

#### Summary

#### Weather Conditions and Forecast

A wet day Thursday followed by daily seabreeze thunderstorm activity. An upper level low located over the southeastern Bahamas is bringing generally sinking air over the District. While this sinking air is expected to suppress shower development, some scattered light showers will still blow on shore along the east coast this morning and tonight and scattered showers are expected to pop up mainly over western areas this afternoon. As the Bahamas upper level low creeps closer to the District on Wednesday, moisture is forecast to increase over the District and help nurture some scattered shower development mainly over the southern half of the District Wednesday afternoon. The forecast for Thursday and Friday has become more complex. The upper level low is now forecast to move to near the southeast coast of the District Wednesday night before lifting north Thursday and Friday and then exiting northeast Saturday. A low and mid-level trough is forecast to develop across south Florida Thursday morning with the potential for a weak surface low to develop near the southern end of the District Thursday and then lift northward Thursday and Friday. While there remains some uncertainty about where and when this low will develop, this scenario is a wet pattern for the District so a significant increase in rains is forecast for Thursday and Friday. As the upper level low and surface low exit to the northeast, a pattern of daily afternoon seabreeze thunderstorms is forecast to set up over the District in their wake. If this pattern were to persist uninterrupted by any fronts or troughs over the next week or two, it has the potential to be the start of this year's wet season.

#### <u>Kissimmee</u>

Tuesday morning stages were 55.6 feet NGVD (0.6 feet below schedule) in East Lake Toho, 52.6 feet NGVD (0.6 feet below schedule) in Toho, and 49.4 feet NGVD (0.6 feet below schedule) in Kissimmee-Cypress-Hatchineha; headwater stages were 46.4 feet NGVD at S-65A and 25.8 feet NGVD at S-65D. Tuesday morning discharges were 414 cfs at S-65, 295 cfs at S-65A, 353 cfs at S-65D and 323 cfs at S-65E. Dissolved oxygen concentration in the Kissimmee River averaged 5.6 mg/L for the week. Kissimmee River mean floodplain depth on Sunday was 0.09 feet. There were no new recommendations this week.

#### Lake Okeechobee

Lake Okeechobee stage is 11.24 feet NGVD, decreasing 0.24 feet from the previous week. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is now 0.26 feet above the Water Shortage sub-band. The Lake remains below the bottom of the ecological envelope (currently 1.26 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD. Given the continued potential for above average rainfall (associated with a weak El Niño and the upcoming wet season) over the next few months, and the poor condition of SAV and EAV in the nearshore zone, these lower lake stages are ideal for vegetation recovery. However, low stages will reduce habitat for fish and wildlife in the near-

term and encourage spread of invasive vegetation in the upper marsh. Estimated algal bloom potential using satellite imagery suggests medium bloom risk in the north of the lake and along the western shore, particularly within Fisheating Bay and along the edge of Indian Prairie.

### **Estuaries**

Total inflow to the St. Lucie Estuary averaged 114 cfs over the past week with no flow coming from Lake Okeechobee. Over the past week, salinity increased 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 1,042 cfs over the past week with 730 cfs coming from the Lake. Over the past week, there was little change of salinity in the estuary. The 30-day moving average surface salinity is 0.4 at Val I-75 and 4.9 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 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 the areas further downstream.

#### **Stormwater Treatment Areas**

Over the past week, approximately 1,800 acre-feet of Lake water was delivered to the STA-1W expansion cells for start-up purposes. The total amount of Lake releases sent to the STAs/FEBs in WY2019 (since May 1, 2018) is approximately 455,000 acre-feet. The total amount of inflows to the STAs in WY2019 is approximately 1,519,000 acre-feet. Most STA cells are at or near target depths except STA-5/6 cells which are below target. 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. This week, if Lake releases are sent to the WCAs and conditions allow, releases will be sent to STA-2.

#### **Everglades**

Stage conditions across the Everglades are drying down as is typical for this time of year. Ecological areas of concern are the foraging conditions in WCA-2A and WCA-3A South and peat soils / fire risk in northern WCA-3A. Data delivery issues from Everglades National Park (ENP) were resolved on 4/26. Water depths in Taylor Slough and the ENP panhandle continue to decrease as is typical for this time of year. Salinity in the mangrove zone decreased over the week. Over the last week the number of white ibis nesting in WCA-3A's Alley North Colony decrease by approximately 4000 birds, conversely an increase in the number of wading birds nesting in WCA-1 was noted at Colony 99.

### **Supporting Information**

#### KISSIMMEE BASIN

#### **Kissimmee Basin Rainfall**

The Upper Kissimmee Basin received 0.04 inches of rainfall in the past week and the Lower Basin received 0.00 inches (SFWMD Daily Rainfall Report 4/29/2018).

#### **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.

Report Dute: 4/30/2013		7-day				Schedule			Daily	Departur	e (feet)		
Water Body	Structure	Average Discharge (cfs) <sup>1</sup>	Stage Monitoring Site <sup>2</sup>	Lake Stage (feet)	Schedule Type <sup>3</sup>	Stage (feet)	4/28/19	4/21/19	4/14/19	4/7/19	3/31/19	3/24/19	3/17/19
Lakes Hart and Mary Jane	S-62	0	LKMJ	60.0	R	60.2	-0.2	-0.2	-0.3	-0.4	-0.3	-0.4	-0.5
Lakes Myrtle, Preston, and Joel	S-57	0	S-57	60.3	R	60.4	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
Alligator Chain	S-60	23	ALLI	62.9	R	62.9	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.3
Lake Gentry	S-63	33	LKGT	60.4	R	60.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East Lake Toho	S-59	77	TOHOE	55.6	R	56.3	-0.7	-0.8	-1.0	-1.1	-1.2	-1.4	-1.5
Lake Toho	S-61	169	TOHOW, S-61	52.6	R	53.3	-0.7	-0.8	-1.0	-1.1	-1.2	-1.4	-1.6
Lakes Kissimmee, Cypress, and Hatchineha	S-65	438	KUB011, LKIS5B	49.5	R	50.1	-0.6	-0.7	-0.9	-0.9	-1.1	-0.9	-0.8

#### Report Date: 4/30/2019

<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:	4/30/2019											
		1-Day Average	Average for the Preceeding 7-Days <sup>1</sup>									
Wietric	Location	4/28/2019	4/28/19	4/21/19	4/14/19	4/7/19	3/31/19	3/24/19	3/17/19	3/10/19	3/3/19	2/24/19
Discharge (cfs)	S-65	416	438	525	710	434	452	833	529	513	1,368	2,386
Discharge (cfs)	S-65A <sup>2</sup>	294	313	397	559	334	353	699	420	409	1,190	2,280
Discharge (cfs)	S-65D <sup>2</sup>	430	466	584	703	367	563	859	505	1,103	2,310	3,097
Headwater Stage (feet NGVD)	S-65D <sup>2</sup>	25.76	25.76	25.78	25.77	25.73	25.76	25.77	25.78	25.72	25.76	25.77
Discharge (cfs)	S-65E <sup>2</sup>	423	441	563	679	330	539	855	497	1,026	2,167	2,945
Discharge (cfs)	S-67	105	107	110	106	0	9	162	0	51	30	53
DO (mg/L) <sup>3</sup>	Phase I river channel	5.4	5.6	6.0	6.3	6.9	7.4	6.7	5.9	5.6	4.1	3.6
Mean depth (feet) <sup>4</sup>	Phase I floodplain	0.09	0.12	0.16	0.18	0.16	0.21	0.34	0.29	0.43	0.86	1.20

<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 PC62 and PC33.

<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.























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

Rissimmee Basin Ad	daptive Recommendations and Operational Actions				
Date	Recommendation	Purpose	Outcome	Source	Report Date
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
4/1/2019	No new recommendations.		N/A		4/2/2019
3/25/2019	No new recommendations.		N/A		3/26/2019
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
	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.				
1/15/2019	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. Discharge and reversal guidelines are provided in	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	the Dry Season Operations slides. Discontinue 54 foot stage reduction target in Lake	lako Kissimmoo has alroady rison hy ~1.5 ft	Implemented	SFWMD Water Mgt/KB	1/8/2019
1,4,2013	Toho.	Lake Rissininee has aready riser by 1.5 ft.	Implemented	Ops	1/0/2015
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	65144 ID 14	11/13/2018
11/2/2018	Reduce S-65/S-65A discharge to approximately	To conserve stage in Lake Kissimmee.	Implemented	SFWMD Water Mgt/KB	11/6/2018
10/20/2010	250 cts.		N1/A	Ops	10/20/2010
10/30/2018	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-	Increase discharge from 1400 cfs to 3000 cfs, then	For flood control in Lake Kissimmee	Implemented	SFWMD Water Mgt/KB	7/31/2018
7/24/2018	3200 cfs and 3500 cfs.	. of nood control at Lake Missimmee.	mpicifienteu	Ops	1134/2010

Kissimmee Basin Adaptive Recommendations and Operational Actions

#### SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Dry Season Operations Slide 1 - 2018-2019 (NOTE revised discharge table)



Other Considerations

- KCH starting stage may vary; the maximum is 50.75 ft NGVD on Feb 15.
- Maintain S65/S65A discharge of at least 300 cfs.
- If outlook is for extreme dry conditions meet with KB staff to discuss modifications to this plan.

Version 1: January 14 2019

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Q (cfs)	Maximum rate of INCREASE (cfs/day)	Maximum rate of DECREASE (cfs/day)
0-300	100	-50
301-650	150	-75
651-1400	300	-150
1401-3000	600	-300
>3000	1000	-1000

Discharge Rate of Change Limits for S65/S65A (revised 1/14/19).

Figure 11A. Slide 1 of the 2018-2019 Dry Season Operations Plan for S-59, S-61, and S-65/S-65A.

#### SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Dry Season Operations Slide 2 - 2018-2019

East Lake (ELT) and Toho (WLT)

- East Toho and Toho Recessions:
  - Make releases to begin recessions on Jan 15 with lake stage approximately 0.4 ft below winter pool and continue to follow straight line recessions through May 31<sup>st</sup> to the extent practical
- East Toho and Toho Stage Reversals :
  - Adjust discharge to bring stage back to the recession line within about a week
  - Pre-storm releases may be used to lower stage below the recession line and create storage of about half of the forecast rain volume
  - If stage cannot be brought back to the recession line within about a week, the recession line may need to be reset following
    discussion with partner agencies
  - In general, the water released from ELT and WLT basins will be released to KHC (to the extent that hydraulic capacity is available) without consideration for Lake KHC stage. However, the priority of KCH is subject to change if more nesting occurs in KCH than Toho or East

#### Kissimmee-Cypress-Hatchineha (KCH)

KCH Recession:

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- Begin recession on February 15 (subject to change) starting no higher than 50.75 feet
- To the extent feasible considering discharge constraints, make releases to follow a straight-line recession through May 31
- In general, use the available storage in Lake KCH to keep flow at S-65D below 1,000 cfs; when possible keep flow below 600 cfs
- KCH Stage Reversals :
  - To address reversals, in general increase flow by 100 cfs for every 0.1 foot of rise above the recession line (e.g. from 300 cfs at the line to 800 cfs at 0.5 feet above the line)

Figure 11B. Slide 2 of the 2018-2019 Dry Season Operations Plan for S-59, S-61, and S-65/S-65A.



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 March 2019.

Area	KITES	TOTAL NESTS	SUCCESSFUL	ACTIVE NESTS
E TOHO	8	4	0	2
тоно	124	48	1	18
KISSIMMEE	235	37	9	27
Grand Total	367	89	10	47

# Survey 3: April 27-29, 2019



Figure 14. The Kissimmee Basin.

# LAKE OKEECHOBEE

According to the USACE web site, Lake Okeechobee average daily lake stage is at 11.24 feet NGVD for April 30, 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 0.68 feet lower than a month ago and 1.95 feet lower than a year ago when stages were still recovering from Hurricane Irma (Figure 1). The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is currently 0.26 feet above the Water Shortage sub-band (Figure 2). Lake stage is the lowest for this time of year since 2011, which followed a very dry rainy season in 2010 (Figure 3). According to RAINDAR, during the week of April 23-29, 2019, no rain fell directly over the Lake, and there was essentially no rainfall across the rest of the watershed either (Figure 4).

Average daily inflows (minus rainfall) to the Lake this week were lower than last week at 674 cfs compared to 865 cfs, respectively. The inflows from the Kissimmee River decreased slightly, going from 540 cfs to 427 cfs. Inflows from Lake Istokpoga into the Kissimmee River (via the S-84 structures) also decreased from the previous week, going from 292 cfs to 243 cfs. The L-8 canal at Canal Point had a net outflow from the Lake of 12 cfs, compared the previous weeks 8 cfs of outflow. Passive inflow from S-308 decreased slightly from the previous week, going from 148 cfs to 78 cfs this week (Table 1).

Total outflows (minus evapotranspiration) increased from the previous week, going from 1,107 average daily cfs to 3,259 cfs this past week mostly due to increased outflows south through the S-350 structures (Table 1). Outflows south increased from 906 cfs to 2,386 cfs. Outflows west via S-77 also increased from the previous week going from 342 cfs to 939 cfs. The corrected average daily evapotranspiration value for the week based on the L006 and LZ40 weather platform solar radiations was 0.18 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 (April 25, 2019) using NOAA's cyanobacteria monitoring product derived from EUMETSAT's Sentinel OLCI sensor data showed bloom potential is low for most of the Lake but is increasing and in the medium range along the north and western shores, particularly in Fisheating Bay and along Indian Prairie (Figure 6). The color scheme that classifies algal densities in the image has changed, so direct comparison between the latest image and earlier images is more difficult.

# Water Management Recommendations

Lake Okeechobee stage is 11.24 feet NGVD, decreasing 0.24 feet from the previous week. The Lake dropped into the Beneficial Use sub-band on March 7, 2019 and is now 0.26 feet above the Water Shortage sub-band. The lake remains below the bottom of the ecological envelope (currently 1.26 feet below), which varies seasonally from 12.5 – 15.5 feet NGVD. Given the continued potential for above average rainfall (associated with a weak El Niño and the upcoming wet season) over the next few months, and the poor condition of SAV and EAV in the nearshore zone, these lower lake stages are ideal for vegetation recovery. However, low stages will reduce habitat for fish and wildlife in the near-term and encourage spread of invasive vegetation in the upper marsh. Estimated algal bloom potential using satellite imagery suggests medium bloom risk in the north of the lake and along the western shore, particularly within Fisheating Bay and along the edge of Indian Prairie.

**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 Inflow cfs	Equivalent Depth Week Total (in)	OUTFLOWS	Previous Week Avg Daily cfs	Avg Daily Outflow cfs	Equivalent Depth Week Total (in)
S65E & S65EX1	540	427	0.2	S77	342	939	0.5
S71 & 72	26	0	0.0	S308	-148	-78	0.0
S84 & 84X	292	243	0.1	S351	193	1117	0.5
Fisheating Creek	7	4	0.0	S352	450	610	0.3
S15/	0	0	0.0	S354	264	659	0.3
5104	0	0	0.0	L8 Outflow	8	12	0.0
5191	0	0	0.0	ET	2190	2633	1.3
S133 P	0	0	0.0	Total	3298	5892	2.9
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		Provis	sional Data	
S3 P	0	0	0.0				
S4 P	0	0	0.0				
L8 Backflow							
Rainfall	1507	0	0.0				
Total	2372	674	0.3				







# Lake Okeechobee Water Level History and Projected Stages



# 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. **Note** new color scale on larger image. Gray indicates cloud cover. All data are experimental and unvalidated at this point in product development.

# **ESTUARIES**

#### St. Lucie Estuary:

Last week total inflow to the St. Lucie Estuary averaged approximately 114 cfs (Figures 1 and 2) and last month inflow averaged about 235 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	54
S-80	0
S-308	-78
S-49 on C-24	0
S-97 on C-23	0
Gordy Rd. structure on Ten Mile Creek	60

Table 1. Weekly average inflows (data are provi	sional).
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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) was 22.5. 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>18.1</b> (16.4)	<b>20.3</b> (18.8)	NA <sup>1</sup>
US1 Bridge	<b>22.2</b> (20.7)	<b>22.9</b> (NR <sup>2</sup> )	10.0-26.0
A1A Bridge	<b>29.3</b> (NR)	<b>31.5</b> (NR)	NA <sup>1</sup>

<sup>1</sup>Envelope not applicable and <sup>2</sup>Not Reporting

#### Caloosahatchee Estuary:

Last week total inflow to the Caloosahatchee Estuary averaged approximately 1,042 cfs (Figures 5 and 6) and last month inflow averaged about 1,088 cfs. Last week's provisional averaged inflows from the structures are shown in Table 3.

Location	Flow (cfs)
S-77	939
S-78	766
S-79	953
Tidal Basin Inflow	89

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

Over the past week in the estuary, salinity increased to Ft. Myers Yacht Basin and remained about the same 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). The seven-day average salinity value was not available at Sanibel. The 30-day moving average surface salinity is 0.4 at Val I-75 and 4.9 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>0.4</b> (0.2)	<b>0.4</b> (0.2)	NA <sup>1</sup>
Val 175	<b>0.4</b> (0.3)	<b>0.7</b> (0.3)	0.0-5.0 <sup>2</sup>
Ft. Myers Yacht Basin	<b>5.2 (</b> 4.3)	<b>8.4</b> (5.2)	NA
Cape Coral	<b>13.6</b> (13.8)	<b>17.0</b> (15.6)	10.0-30.0
Shell Point	<b>26.7</b> (27.0)	<b>27.0</b> (27.1)	10.0-30.0
Sanibel	<b>NR</b> <sup>3</sup> (NR)	<b>NR</b> (NR)	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>Not 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 1.1 to 4.5 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 75 cfs.

Scenario	Q79	TB runoff	Daily	30 day
	(cfs)	(cfs)	salinity	mean
А	0	75	4.5	1.9
В	300	75	2.7	0.9
С	450	75	2.2	0.8
D	650	75	1.6	0.7
E	800	75	1.1	0.6

#### **Red tide**

The Florida Fish and Wildlife Research Institute reported on April 26, 2019, that *Karenia brevis*, the Florida red tide dinoflagellate, was not observed in samples collected from or offshore of Lee, St. Lucie, Martin, or Palm Beach counties (no samples from 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 9. Seven-day mean salinity at Cape Coral, Shell Point, and Sanibel monitoring stations.



# **EVERGLADES**

At the gauges monitored for this report the stages in the Everglades declined on average 0.13 feet last week (up from +0.06). All of the basins receded faster than the optimal rate of recession for wading bird foraging except WCA-3B and ENP. The most extreme/moderate individual gauge changes ranged from -0.18 feet (NE WCA-3A) to -0.08 feet (ENP). Pan evaporation was estimated at 1.87 inches this week.

Everglades Region	Rainfall (Inches)	Stage Change (feet)		
WCA-1	0.00	-0.13		
WCA-2A	<0.01	-0.12		
WCA-2B	0.00	-0.18		
WCA-3A	<0.01	-0.16	Good	
WCA-3B	<0.01	-0.09	Fair	Recession rate for
ENP	0.38	-0.09	Poor	wading bird foraging



Regulation Schedules: WCA1: Gauge 1-8C is 0.10 feet below the Zone A1 regulation line and following the seasonal recession. WCA-2A: S-11B Headwater stage is now 0.51 feet below the Zone A regulation line and 0.01 feet below the floor and falling quickly. WCA-3A: The three-gauge average stage is 0.09 feet below Zone E1 regulation line. WCA-3A stage at gauge 62 (northwest corner) is 1.16 feet below the upper schedule.



Water Depths and Changes: The WDAT tool for spatial interpolation of depth monthly snapshots indicate stages in WCA-3A North are mostly below ground. Conditions in WCA-1 and WCA-2A look typical for this time of year. WDAT difference output indicates that water levels fell gradually across the majority of the Everglades during the last month except in most northern regions of WCA-3A and eastern WCA-2A. In the "1 Year" inset we see the difference between current depth conditions and those a year ago. Currently the depths are significantly greater across WCA-3A than they were a year ago, but lower in WCA-1 and WCA-2A. Conditions in the Lostman's slough region remain significantly wetter than they were a year ago.





Wildlife Update bullets:

- ~4000 less White Ibis nests were counted at the Alley North colony in NE WCA-3A (standing water was noted at the colony island on the most recent wading bird flight (4/29))
- Large flocks of wading birds were noted feeding in WCA-2A
- Currently 19 Snail Kite nests in WCA-3A

Taylor Slough Water Levels: Stages in Taylor Slough and the ENP panhandle are decreasing as is typical for this time of year. The weekly recession averaged 0.17 feet this past week to leave the marsh area averaging a depth of 0.22 feet by Sunday.

Florida Bay Salinities: All of the sensors in Florida Bay are back online as of 4/26. Salinity averaged a 0.7 psu increase from last week with individual stations changing less than 1.3 psu. Daily average salinities ranged from 31 psu in the northeast to 42 psu in the central bay and are approximately 3 psu above average for this time of year.







Florida Bay MFL: Salinity in the mangrove zone decreased 9 psu over the week to end the week at 11 psu. The 30-day moving decreased 1.5 psu to 20.7 psu. The weekly cumulative flow from the five creeks denoted by yellow stars on the map totaled about 2,700 acre-feet with negative flows only occurring 3 of the last 7 days. At this time of year, there is very little gravity driven downstream flow. The 365-day moving sum of flow from the five creeks (tracked as part of the Florida Bay MFL criteria) has increased about 6,500 acre-feet to 224,791 acre-feet (less than the long-term average of 257,628 acre-feet but above the 25th percentile). Creek flow is provisional data from the USGS and is highly variable.

![](_page_33_Figure_0.jpeg)

# Water Management Recommendations

The majority of WCA-3A North stages have gone below ground. Protecting peat soils in that sensitive region always has ecological benefit. The last week's recession rates at the gauges monitored for this report in WCA-2A (-0.12 feet) and WCA-3A South (-0.14 feet) were slightly faster than the optimal rates conducive to prey concentration and wading bird foraging success. Protecting those foraging conditions by curtailing reversals and moderating rates to between -0.05 and -0.09 for the remainder of the wading bird nesting season will provide ecological benefit. More specific recommendations appear in the summary table below. The red text represents new or modified information or recommendations.

SFWMD Everglades Ecological Recommendations, April 29th, 2019 (red is new)					
Area	Weekly change	Recommendation	Reasons		
WCA-1	Stage decreased by 0.13'	Maintain depths at regulation schedule. Manage recession rates not to exceed the recommended max rate for optimal wading bird foraging of -0.09 ft per week.	Protect upstream/downstream habitat and wildlife.		
WCA-2A	Stage decreased by 0.12'	Maintain depths at regulation schedule. Maintain 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 0.18'	Maintain depths at regulation schedule. Maintain recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.		
WCA-3A NE	Stage decreased by 0.18'	Maintain depths at regulation schedule. Maintain 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 and wildlife. Protect		
WCA-3A NW	Stage decreased by 0.16'	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.	nesting season.		
Central WCA-3A S	Stage decreased by 0.13'	Maintain depths at regulation schedule. Moderate	Protect tree islands, upstream/downstream habitat and wildlife. Protect conditions that provide wading bird foraging habitat later into the nesting season.		
Southern WCA-3A S	Stage decreased by 0.15'	for optimal wading bird foraging of -0.09 ft per week.			
WCA-3B	Stage decreased by 0.09'	Maintain depths at regulation schedule. Moderate recession rates to the extent possible.	Protect upstream/downstream habitat and wildlife.		
ENP-SRS	Stage decreased by 0.09'	Make discharges to the Park according to the 2012 WCP rainfall plan.	Protect upstream/downstream habitat and wildlife.		
Taylor Slough	Stages decreased on average 0.17	Move water southward as possible	When available, provide freshwater buffer for downstream conditions. Decrease potential for high phosphorus input to ENP.		
FB- Salinity	Salinity averaged a 0.7 psu increase	Move water southward as possible	When available, provide freshwater to maintain low salinity buffer and promote water movement.		