Application of the Lake Okeechobee Regulation Schedule (LORS2008) on 4/18/2016 (El Nino Condition)

Lake Okeechobee Net Inflow Outlook:

The Lake Okeechobee Net Inflow Outlook has been computed using 4 methods: Croley's method¹, the SFWMD empirical method², a sub-sampling of El Nino years³ and a sub-sampling of warm years of the Atlantic Multi-decadal Oscillation (AMO) in combination with El Nino ENSO years⁴. The results for Croley's method and the SFWMD empirical method are based on the <u>CPC Outlook</u>.

Table of the Lake Okeechobee Net Inflow Outlooks in feet of equivalent depth. All methods are updated on a weekly basis with observed net inflow for the current month.

Season	Cı Me	roley's ethod ^{1*}	SFWMD Empirical Method ²		Sub-s El Nii Y	Sub-sampling of El Nino ENSO Years ³		ampling of Warm + El o ENSO ears ⁴
	Value (ft)	<u>Condition</u>	Value (ft)	Condition	Value (ft)	Condition	Value (ft)	<u>Condition</u>
Current (Apr- Sep)	N/A	N/A	1.82	Wet	1.72	Wet	2.81	Very Wet
Multi Seasonal (May- Apr)	N/A	N/A	2.53	Wet	3.99	Wet	6.05	Very Wet

*Croley's Method Not Produced For This Report

See <u>Seasonal</u> and <u>Multi-Seasonal</u> tables for the classification of Lake Okeechobee Outlooks.

The recommended methods and values for estimating the Lake Okeechobee Net Inflow Outlook are shaded and should be used in the LORS2008 Release Guidance Flow Charts.

Tributary Hydrologic Conditions Graph:

-597 cfs 14-day running average for Lake Okeechobee Net Inflow through 4/18/2016. According to the classification in <u>Tributary Hydrologic Conditions</u> table, this condition is Dry.

-0.36 for Palmer Index on 4/17/2016.

According to the classification in <u>Tributary Hydrologic Conditions</u> table, this condition is Normal.

The wetter of the two conditions above is Normal.

LORS2008 Classification Tables:

Lake Okeechobee Stage on 4/18/2016

Lake Okeechobee Stage: 14.68 feet

USACE Report for Lake Okeechobee

Lake Okeechobee Stage Hydrograph

Lake Okeechob Zone/	ee Management 'Band	Bottom Elevation (feet, NGVD)	Current Lake Stage
High Lake Manage	ement Band	16.90	
Operational Band	High sub-band	16.22	
	Intermediate sub-band	15.36	
	Low sub-band	13.48	← 14.68
Base Flow sub-ba	nd	12.60	
Beneficial Use sub	o-band	11.27	
Water Shortage M	anagement Band		

Part C of LORS2008: Discharge to WCA's

Release Guidance Flow Chart Outcome: Up to Maximum Releases to the WCAs if Desirable or with Minimum Everglades Impacts

Part D of LORS2008: Discharge to Tidewater

Release Guidance Flow Chart Outcome: S-79 up to 3000 cfs and S-80 up to 1170 cfs

Technical Input Summaries from:

- Lake Okeechobee Division
- Coastal Ecosystems
- Everglades Ecosystems Division
- Water Supply Department
- Water Resource Management Release Recommendation
- Kissimmee Watershed Environmental Conditions
- Operations Department

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LORS2008 Implementation on 4/18/2016 (ENSO El Nino Condition):

Water Supply Department Technical Input

Water Supply Outlook:

District wide, Raindar rainfall 0.59 inches for the week ending 4/19/2016. Lake stage on 4/18/2016 is 14.68 ft, down 0.21 ft from last week.

The updated April 2016 SFWMM Dynamic Position Analysis <u>percentile graph</u> and <u>tracking chart</u> for Lake Okeechobee show that the lake stage is in the Low Operational Sub-Band.

The LORS2008 tributary <u>indices</u> are classified as **Normal**. The PDSI indicates normal condition and the LONIN is Dry. The classification is based on the wetter of the two.

Water Supply Risk Evaluation

Area	Indicator	Value	Color Coded Scoring Scheme
	Projected LOK Stage for the next two months	Low Sub-Band	М
LOK	Palmer Index for LOK Tributary Conditions	-0.36 (Normal)	L
	CPC Procipitation Outlook	1 month: Normal	L
	CFC Frecipitation Outlook	3 months: Above Normal	L
	LOK Seasonal Net Inflow Forecast AMO warm/El Nino	1.72 ft (Normal to Extremely Wet)	L
	LOK Multi-Seasonal Net Inflow Forecast AMO warm/El Nino	3.99 ft (Normal)	L
	WCA 1: Site 1-7, Site 1-8T, & Site 1-9 Average	Above Line 1 (16.11 ft)	L
WCAs	WCA 2A: Site 2-17 HW	Above Line1 (11.76 ft)	L
	WCA-3A: 3 Station Average (Site 63, 64 and 65)	Above Line 1 (10.06 ft)	L
	Service Area 1	Year-Round Irrigation Rule in effect	L
LEC	Service Area 2	Year-Round Irrigation Rule in effect	L
	Service Area 3	Year-Round Irrigation Rule in effect	L

Note: The water supply risk classification based on the Palmer index, as well as the LOK seasonal and multi-seasonal net inflow forecasts use slightly different classification intervals than those used by the 2008-LORS.

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Lake Okeechobee SFWMM April 2016 Position Analysis



(See assumptions on the Position Analysis Results website)

Tributary Basin Condition Indicators as of April 18 2016

Palmer Index



Tue Apr 19 07:50:53 EDT 2016

Flow (cfs)

2008 LORS

Part C: Establish Allowable Lake Okeechobee Releases to the Water Conservation Areas



2008 LORS

Part D: Establish Allowable Lake Okeechobee Releases to Tide (Estuaries)



2008 LORS FORECAST

Part C: Establish Allowable Lake Okeechobee Releases to the Water Conservation Areas



2008 LORS FORECAST

Part D: Establish Allowable Lake Okeechobee Releases to Tide (Estuaries)



Lake Okeechobee Water Level History and Projected Stages



Adopted by USACE 28-April-2008

Projected Stage Percentiles From SFWMD-HESM Position Analysis

U. S. Army Corps of Engineers, Jacksonville District Lake Okeechobee and Vicinity Report ** Preliminary Data - Subject to Revision ** Data Ending 2400 hours 17 APR 2016 Okeechobee Lake Regulation Elevation Last Year 2YRS Ago (ft-NGVD) (ft-NGVD) (ft-NGVD) *Okeechobee Lake Elevation 14.68 13.68 13.24 (Official Elv) Bottom of High Lake Mngmt= 16.92 Top of Water Short Mngmt= 11.28 Currently in Operational Management Band Simulated Average LORS2008 [1965-2000] 12.69 Difference from Average LORS2008 1.99 17APR (1965-2007) Period of Record Average 13.92 Difference from POR Average 0.76 Today Lake Okeechobee elevation is determined from the 4 Int & 4 Edge stations ++Navigation Depth (Based on 2007 Channel Condition Survey) Route 1 ÷ 8.62' ++Navigation Depth (Based on 2008 Channel Condition Survey) Route 2 ÷ 6.82' Bridge Clearance = 49.26' 4 Interior and 4 Edge Okeechobee Lake Average (Avg-Daily values): L001 L005 L006 LZ40 S4 S352 S308 S133 14.42 14.86 14.77 14.68 15.01 14.75 14.51 14.44 *Combination Okeechobee Avg-Daily Lake Average = 14.68 (*See Note) Okeechobee Inflows (cfs): S65E 2424 C5 0 Fisheating Cr -NR-S154 0 S191 0 S135 Pumps 0 0 S84 0 S133 Pumps S2 Pumps 0 0 0 S84X 632 S127 Pumps S3 Pumps 59 0 0 S71 S129 Pumps S4 Pumps 0 S72 16 S131 Pumps Total Inflows: 3131 Okeechobee Outflows (cfs): S135 Culverts 0 S354 230 S77 (Not Used) S127 Culverts 0 S351 975 S77Below 2244 (USED) S129 Culverts -NR- S352 514 S308 (Not Used)

S131 Culverts -NR- L8 Canal Pt 189 S308Below 716 (USED) Total Outflows: 4868 ****S77 Structure outflow is being used to compute Total Outflow. ****S308 Structure outflow is being used to compute Total Outflow. Okeechobee Pan Evaporation (inches): S77 0.19 S308 0.44 Average Pan Evap x 0.75 Pan Coefficient = 0.24" = 0.02' Lake Average Precipitation using NEXRAD: = 0.00" = 0.00' Evaporation - Precipitation: = 0.24" = 0.02'Evaporation - Precipitation using Lake Area of 730 square miles is equal to 4637 cfs out of the lake. Lake Okeechobee (Change in Storage) Flow is -10588 cfs or -21000 AC-FT

Note: Headwater, tailwater, and stage values below are instantaneous values unless otherwise specified.

	Headwater	Tailwater				Gat	te Pos	sitior	ns	
	Elevation	Elevation	Disch	#1	#2	#3	#4	#5	#6 #	7
#8										
	(ft-msl)	(ft-msl)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft) (f	t)
(ft)		(-								
North Foat Ch	2070	(1) see i	iote al	L DOLI	LOIII				
S133 Pumps	: 13.43	14.46	0	0	0	0	0	0	(cfs)	
S191:	18.92	14.47	0	0.0	0.0	0.0				
S135 Pumps	:	-NR-	0	0	0	0	0		(cfs)	
S135 Culver	rts:		0	-NR-	-NR-					
North West Sh	nore									
S65E:	20.94	14.27	2424	0.7	1.0	1.0	1.0	1.0	1.0	
S127 Pumps	: 13.49	14.53	0	0	0	0	0	0	(cfs)	
S127 Culve	rt:		0	0.0						
S129 Pumps	: 12.93	14.80	0	0	0	0			(cfs)	
S129 Culver	rt:		-NR-	-NR-						
S131 Pumps	: 12.81	14.84	0	0	0				(cfs)	
S131 Culver	rt:		-NR-							
Fisheating	Creek									
nr Palmda nr Lakepo	ale ort		-NR-							
C5:	14.65	15.02	0	0.0 0).0 (0.0				

South Shore S4 Pumps: S169: S310:	11.07 14.99 14.80	14.92 11.05	0 0 10	0 0.0	0 0.0	0 0.0		(cfs)
S3 Pumps:	10.49	14.94	0	0	0	0		(cfs)
S354. S2 Pumps:	14.94	10.49	230 0	2.2	2.2	0	0	(cfs)
S351: S352:	14.87 14.82	11.09 10.95	975 514	1.3 1.0	$1.3 \\ 1.2$	1.1		
C10A: L8 Canal PT	-NR-	13.75 13.56	189	0.0	0.0	4.0	0.0	0.0
	S351	and S352	Tempora	ary Pum	ps/S3	54 Spil	lway	
\$351:	11.09	14.87	975	-NRN	RNR	NRN	RNR-	
S352: S354:	10.95	14.82 14.94	514 230	-NRN	RNR RNR	NR- NR-		

Caloosahatchee River (S77, S78 S47B: 12.18 10.96 S47D: 11.00 10.98 S77:	, S79) 24	0.0 4.9	0.0					
Spillway and Sector Flow: 14.66 11.05 Flow Due to Lockages+:	2244 6	2.5	2.5	2.5	2.5			
S77 Below USGS Flow Gage	2244							
S78: Spillway and Sector Flow: 11.04 2.82 Flow Due to Lockages+:	2248 12	2.0	2.5	2.5	0.0			
S79: Spillway and Sector Flow: 2.94 0.97 1.0	2805	1.0	1.0	1.0	2.0	1.0	1.0	1.0
Flow Due to Lockages+: Percent of flow from S77 Chloride (ppm)	10 85% 50							
St. Lucie Canal (S308, S80) S308:								
Spillway and Sector Flow: 14.60 14.24 Flow Due to Lockages+:	716 1	4.0	3.0 3	3.0 3	3.0			
S308 Below USGS Flow Gage S153: 18.92 14.07 S80:	716 0	0.0	0.0					
Spillway and Sector Flow: 14.03 2.09 Flow Due to Lockages+: Percent of flow from S308	942 19 104%	0.0	0.6	0.6	0.0	0.6	0.6	0.0

Steele	Point	Top Salinity	(mg/ml)	* * * *
Steele	Point	Bottom Salinity	(mg/ml)	* * * *
			, <u>,</u>	
Speedy	Point	Top Salinity	(mg/ml)	* * * *

+ Flow Due to lockages is computed utilizing average daily headwater and tailwater along with total number of lockages for the day to calculate a volume which is then converted to an average discharge in cfs.

-				Wi	.nd
- Daily Precipitation Totals Speed	1-Day	3-Day	7-Day	Directio	n
	(inches) (inches)	(inches)	(Deqø)	
(mph)		, , , ,	. , ,		
S133 Pump Station:	-NR-	0.00	0.00		
s193:	-NR-	0.00	0.00	-NR-	-NR-
Okeechobee Field Station:	-NR-	0.00	0.00		
S135 Pump Station:	-NR-	0.00	0.00		
S127 Pump Station:	-NR-	0.00	0.00		
S129 Pump Station:	-NR-	0.00	0.00		
S131 Pump Station:	-NR-	0.00	0.00		
s77:	0.00	0.00	1.01	75	2
S78:	0.00	0.00	0.00	85	1
S79:	0.00	0.07	0.07	111	2
S4 Pump Station:	-NR-	0.00	0.00		
Clewiston Field Station:	-NR-	0.00	0.00		
S3 Pump Station:	-NR-	0.00	0.00		
S2 Pump Station:	-NR-	0.00	0.00		
S308:	* * * * * * *	* * * * * * *	* * * * * * *	315	0
S80:	0.00	0.03	1.32	88	5
Okeechobee Average	* * * * * * *	5411.85	* * * * * * *		
(Sites S78, S79 and	S80 not	included)			
Oke Nexrad Basin Avg	0.00	0.05	0.62		

_										
Okeechobee	Lake	e Elev	vations	17	APR	2016	14	4.68	Difference	from
17APR16										
17APR16	-1	Day	=	16	APR	2016	14	4.73		0.05
17APR16	-2	Days	=	15	APR	2016	14	4.78		0.10
17APR16	-3	Days	=	14	APR	2016	14	4.75		0.07
17APR16	-4	Days	=	13	APR	2016	14	4.78		0.10
17APR16	-5	Days	=	12	APR	2016	14	4.83		0.15
17APR16	-б	Days	=	11	APR	2016	14	4.86		0.18
17APR16	-7	Days	=	10	APR	2016	14	4.89		0.21
17APR16	-30	Days	=	18	MAR	2016	15	5.24		0.56
17APR16	-1	Year	=	17	APR	2015	13	3.68		-1.00
17APR16	-2	Year	=	17	APR	2014	13	3.24		-1.44

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Lake Okeechobee Net Inflow (LONIN) Average Flow over the previous 14 days Avg-Daily Flow Today = 17 APR 2016 -531 MON 17APR16 -5719 -339 SUN 17APR16 -1 Dav = 16 APR 2016 -6142 17APR16 -2 Days = 596 SAT 15 APR 2016 9055 17APR16 -3 Days = 209 FRI 14 APR 2016 -380 17APR16-3Days =14APR2016209FRI17APR16-4Days =13APR2016711THU17APR16-5Days =12APR20161470WED17APR16-6Days =11APR20161526TUE17APR16-6Days =10APR20161804MON17APR16-7Days =09APR20162338SUN17APR16-9Days =08APR20162889SAT17APR16-10Days =07APR20163313FRI17APR16-11Days =06APR20163012THU17APR16-12Days =05APR20161879TUE17APR16-13Days =04APR20161879TUE -NR--NR-336 -4556 -5424 804 4876 -1989 926 1837 S65E Average Flow over previous 14 days Avg-Daily Flow 17 APR 2016 3884 MON Today= 17APR16 2424 17APR16 -1 Day = 16 APR 2016 4057 SUN 2502 17APR16 -2 Days = 15 APR 2016 4162 SAT 2757 17APR16-2Days=15APR20164162SAT17APR16-3Days=14APR20164191FRI17APR16-4Days=13APR20164162THU17APR16-4Days=12APR20164081WED17APR16-5Days=12APR20163979TUE17APR16-6Days=10APR20163831MON17APR16-7Days=09APR20163656SUN17APR16-8Days=08APR20163428SAT17APR16-9Days=07APR20163164FRI17APR16-11Days=06APR20162866THU17APR16-12Days=05APR20162528WED17APR16-13Days=04APR20162184TUE 2871 3192 3386 3867 4086 4378 4496 4792 5136 5212 5276

Long Term Mean 30day Avearge ET for Lake Alfred (Inches) = -NR-

Lake Okeechobee Outlets Last 14 Days

		S-77	S-77	Below S-77	S-78	S-78	S-79
		Discharge	Discharge	Discharge	Discharge	Discharge	Discharge
		(0700-2100)	(ALL DAY)	(ALL-DAY)	(0700 - 2100)	(ALL DAY)	(ALL DAY)
	DATE	E (AC-FT)	(AC-FT)	(AC-FT)	(AC-FT)	(AC-FT)	(AC-FT)
17	APR	2016		4449	-NR-	4482	5582
16	APR	2016		3221	-NR-	3460	4830
15	APR	2016		3790	-NR-	2907	3757
14	APR	2016		6223	-NR-	5602	7031
13	APR	2016		8144	-NR-	6765	7963
12	APR	2016		6818	-NR-	5440	6536
11	APR	2016		6642	-NR-	5372	5761
10	APR	2016		6155	-NR-	5044	5797
09	APR	2016		4101	-NR-	3514	4433
08	APR	2016		4498	-NR-	3508	4302

07 06 05 04	APR APR APR APR	2016 2016 2016 2016	5		7743 8092 6096 4425	- NR - - NR - - NR - - NR -	6347 6501 5475 4279	6968 8321 7281 5694
17 16 15 14 13 12 11 10 09 08 07 06	DATE APR APR APR APR APR APR APR APR APR APR	2016 2016 2016 2016 2016 2016 2016 2016	S-310 Discharge (ALL DAY) (AC-FT) 5 19 5 62 5 44 5 185 5 263 5 251 5 179 5 175 5 228 5 335 5 278 5 20	S-351 Discharge (ALL DAY) (AC-FT) 1933 2263 0 1045 -NR- 2368 2316 2437 2116 1495 482	S-352 Discharge (ALL DAY) (AC-FT) 1019 1289 121 656 1047 1077 863 722 886 777 432 331	S-354 Discharge (ALL DAY) (AC-FT) 456 1001 109 886 1668 1620 1269 815 982 984 990 803	L8 Canal Pt Discharge (ALL DAY) (AC-FT) 376 373 386 390 395 401 349 336 354 340 332 310	
05	APR	2016	5 65 5 0	204	254	920 869	344	
17 16 15 14 13 12 11 10 09 08 07 06 05 04	DATE APR APR APR APR APR APR APR APR APR APR	2016 2016 2016 2016 2016 2016 2016 2016	S-308 Discharge (ALL DAY) (AC-FT)	Below S-308 Discharge (ALL-DAY) (AC-FT) 1420 669 953 2643 2991 2712 2073 1717 1480 1377 2977 3233 2616 2035	B S-80 Discharg (ALL-DAY (AC-FT) 1083 807 911 1798 2216 1756 1431 1138 894 893 1779 2239 1775 1446	e)		
*** Sec	* NC ctor)TE:	1) Discha Gate I	arge from (0' Discharges fi	700-2100) i	s computed s to 2100 h	using Spillway rs.	y and
and	ł		2) Discha	ges Discharge	Y) is compu	ted using S 5 hrs to 24	pillway, Secto 00 hrs.	or Gate
) – F	rlows	preceeded	l by "I" sian	nify an ins	tantaneous		

flow computed from the single value reported for the day

- * On 11 May 1999, Lake Okeechobee Elevation was switched from

Instantaneous 2400 value to an average-daily lake average. On 14 Mar 2001, due to the isolation of various gages within the standard 10 stations, the average of the interior 4 station gages was used as the Lake Okeechobee Elevation. On 05 November 2010, Lake Okeechobee Elevation was switched to a 9 gage mix of interior and edge gages to obtain a more reliable representation of the lake level. On 09 May 2011, Lake Okeechobee Elevation was switched to a 8 gage mix of interior and edge gages to obtain a more reliable representation of the lake level due to isolation of S135 from low lake levels. Today Lake Okechobee elevation is determined from the 4 Int & 4 Edge stations ++ For more information see the Jacksonville District Navigation website at http://www.saj.usace.army.mil/ \$ For information regarding Lake Okeechobee Service Area water restrictions please refer to www.sfwmd.gov

Report Generated 18APR2016 @ 10:15 ** Preliminary Data - Subject to Revision **

Classification Tables

Supplemental Tables used in conjunction with the LORS2008 Release

Guidance Flow Charts

• Class Limits for Tributary Hydrologic Conditions

Table K-2 in the Lake Okeechobee Water Control Plan

<u>6-15 Day Precipitation Outlook Categories</u>

Table ?? in the Lake Okeechobee Water Control Plan

<u>Classification of Lake Okeechobee Net Inflow for Seasonal</u>

<u>Outlook</u>

 Table K-3 in the Lake Okeechobee Water Control Plan

<u>Classification of Lake Okeechobee Net Inflow for Multi-</u>

Seasonal Outlook

 Table K-4 in the Lake Okeechobee Water Control Plan

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Tributary Hydrologic	Palmer Index	2-wk Mean L.O. Net
Classification*	Class Limits	Inflow Class Limits
Very Wet	3.0 or greater	Greater >= 6000 cfs
Wet	1.5 to 2.99	2500 - 5999 cfs
Near Normal	-1.49 to 1.49	500 - 2499 cfs
Dry	-2.99 to -1.5	-5000 – 500 cfs
Very Dry	-3.0 or less	Less than -5000 cfs

* use the wettest of the two indicators

Classification of Lake Okeechobee Net Inflow Seasonal Outlook*

Lake Net Inflow Prediction	Equivalent Depth**	Lake Okeechobee
[million acre-feet]	[feet]	Net Inflow
		Seasonal Outlook
> 0.93	> 2.0	Very Wet
0.71 to 0.93	1.51 to 2.0	Wet
0.35 to 0.70	0.75 to 1.5	Normal
< 0.35	< 0.75	Dry

**Volume-depth conversion based on average lake surface area of 467,000 acres

Classification of Lake Okeechobee Net Inflow Multi-Seasonal Outlook*

Lake Net Inflow Prediction	Equivalent Depth**	Lake Okeechobee
[million acre-feet]	[feet]	Net Inflow
[]		Multi-Seasonal Outlook
> 2.0	> 4.3	Very Wet
1.18 to 2.0	2.51 to 4.3	Wet
0.5 to 1.17	1.1 to 2.5	Normal
< 0.5	< 1.1	Dry

**Volume-depth conversion based on average lake surface area of 467,000 acres

6-15 Day Precipitation Outlook Categories*

6-15 Day Precipitation Outlook Categories	WSE Decision Tree Categories
Above Normal	Wet to Very Wet
Normal	Normal
Below Normal	Dry

* Corresponds to Table 7-6 in the Lake Okeechobee Water Control Plan

Under Construction