

Arthur R. Marshall Loxahatchee National Wildlife Refuge Total Phosphorus (TP) Compliance Status

Yellow highlighted and bolded months' geometric means were higher than the long term levels, which became effective on December 31, 2006.

Green highlighted and italicized months' levels were not applicable (N/A) because the average stages were less than 15.42 feet NGVD29.

Month-Year	TP Geometric Means (ppb)	Long-Term Level (ppb)	Average Stage (feet NGVD29)	TP Sample Data (n)	Stage Data (n)
Jan-2007	6.9	9.3	16.57	14	3
Feb-2007	6.2	10.4	16.34	13	3
Mar-2007	7.3	11.8	16.10	10	3
Apr-2007	8.0	N/A	15.30	3	3
May-2007	no data	N/A	14.68	0	3
Jun-2007	13.6	N/A	15.37	4	3
Jul-2007	10.4	13.5	15.86	13	3
Aug-2007	10.1	10.5	16.33	13	3
Sep-2007	8.5	9.2	16.59	14	3
Oct-2007	8.4	7.2	17.26	14	3
Nov-2007	7.0	7.2	17.19	14	3
Dec-2007	7.9	8.2	16.84	14	3
Jan-2008	6.3	8.9	16.68	14	3
Feb-2008	7.6	9.4	16.55	14	3
Mar-2008	6.7	9.4	16.54	14	3
Apr-2008	5.8	10.3	16.36	14	3
May-2008	9.1	14.3	15.76	9	3
Jun-2008	8.9	14.9	15.68	8	3
Jul-2008	9.2	10.3	16.37	14	3
Aug-2008	8.6	10.2	16.39	14	3
Sep-2008	7.7	8.3	16.81	14	3
Oct-2008	7.2	7.2	17.42	14	3
Nov-2008	7.4	7.2	17.22	14	3
Dec-2008	6.3	7.8	16.96	14	3
Jan-2009	7.0	8.8	16.68	14	3
Feb-2009	4.7	10.4	16.35	12	3
Mar-2009	7.5	13.5	15.86	9	3
Apr-2009	9.7	14.9	15.69	8	3
May-2009	11.0	N/A	15.01	1	3
Jun-2009	13.2	12.1	16.05	12	3
Jul-2009	7.4	9.8	16.47	14	3
Aug-2009	8.8	11.5	16.16	14	3
Sep-2009	8.1	8.9	16.68	14	3
Oct-2009	7.0	8.2	16.86	14	3
Nov-2009	6.9	9.4	16.55	14	3
Dec-2009	5.8	10.4	16.36	12	3
Jan-2010	5.2	8.9	16.68	14	3
Feb-2010	6.7	9.1	16.62	14	3
Mar-2010	5.9	9.0	16.65	14	3
Apr-2010	7.2	9.6	16.51	14	3
May-2010	7.8	10.4	16.35	14	3
Jun-2010	7.3	10.9	16.26	14	3
Jul-2010	6.9	10.7	16.29	14	3
Aug-2010	6.1	11.6	16.15	10	3
Sep-2010	6.5	8.5	16.76	14	3
Oct-2010	6.2	7.7	16.99	14	3
Nov-2010	6.6	8.2	16.83	14	3
Dec-2010	4.0	9.6	16.52	13	3
Jan-2011	5.1	10.7	16.29	10	3
Feb-2011	6.0	11.3	16.20	10	3
Mar-2011	8.1	14.0	15.79	8	3
Apr-2011	11.4	16.3	15.53	7	3
May-2011	no data	N/A	14.87	0	3
Jun-2011	no sampling	N/A	14.30	0	3
Jul-2011	20.2	N/A	15.11	4	3

Inflow TP Loads and Flow-weighted Mean Concentration (FWMC)

TP loads are calculated using "no ratio-adjustment" and "14-day maximum for auto sampler composite concentration" algorithm.

Month-Year	Inflow (kac-ft)	TP loads (metric tons)	Inflow FWMC (ppb)
Jan-2007	4	0.2	34
Feb-2007	1	0.05	31
Mar-2007	1	0.03	44
Apr-2007	0.03	0.002	53
May-2007	0.03	0.003	80
Jun-2007	1	0.1	69
Jul-2007	15	0.7	36
Aug-2007	35	2.0	46
Sep-2007	45	2.2	40
Oct-2007	64	3.1	39
Nov-2007	8	0.3	28
Dec-2007	5	0.2	32
Jan-2008	1	0.02	20
Feb-2008	24	1.0	33
Mar-2008	31	0.9	24
Apr-2008	15	0.4	22
May-2008	0.4	0.01	23
Jun-2008	30	0.8	21
Jul-2008	57	1.4	19
Aug-2008	127	4.7	30
Sep-2008	70	3.2	37
Oct-2008	43	1.9	36
Nov-2008	2	0.04	19
Dec-2008	4	0.1	15
Jan-2009	1	0.02	15
Feb-2009	0.3	0.01	16
Mar-2009	0.01	0.005	304*
Apr-2009	0.3	0.01	24
May-2009	42	3.0	59
Jun-2009	71	5.5	63
Jul-2009	44	2.2	41
Aug-2009	25	1.6	52
Sep-2009	36	1.9	43
Oct-2009	6	0.3	41
Nov-2009	1	0.05	38
Dec-2009	12	0.4	29
Jan-2010	4	0.2	36
Feb-2010	5	0.3	49
Mar-2010	53	5.0	76
Apr-2010	10	0.8	59
May-2010	2	0.1	45
Jun-2010	30	1.2	32
Jul-2010	19	0.6	25
Aug-2010	37	1.0	22
Sep-2010	39	1.0	20
Oct-2010	7	0.2	18
Nov-2010	1	0.01	15
Dec-2010	0.3	0.01	19
Jan-2011	7	0.3	32
Feb-2011	3	0.1	23
Mar-2011	3	0.1	31
Apr-2011	4	0.2	32
May-2011	5	0.1	21
Jun-2011	2	0.1	21
Jul-2011	31	1.1	30

Arthur R. Marshall Loxahatchee National Wildlife Refuge Total Phosphorus (TP) Compliance Status

Yellow highlighted and bolded months' geometric means were higher than the long term levels, which became effective on December 31, 2006.

Green highlighted and italicized months' levels were not applicable (N/A) because the average stages were less than 15.42 feet NGVD29.

Month-Year	TP Geometric Means (ppb)	Long-Term Level (ppb)	Average Stage (feet NGVD29)	TP Sample Data (n)	Stage Data (n)
Aug-2011	11.5	16.4	15.53	8	3
Sep-2011	9.8	13.8	15.83	11	3
Oct-2011	7.4	12.1	16.06	11	3
Nov-2011	7.8	9.2	16.59	14	3
Dec-2011	6.2	9.2	16.59	7	3
Jan-2012	6.0	10.0	16.43	14	3
Feb-2012	7.5	11.1	16.23	13	3
Mar-2012	6.3	12.8	15.96	10	3
Apr-2012	8.1	13.1	15.92	10	3
May-2012	7.2	11.7	16.13	12	3
Jun-2012	7.4	11.6	16.14	14	3
Jul-2012	6.0	12.5	16.00	14	3
Aug-2012	5.5	11.3	16.18	13	3
Sep-2012	7.0	7.2	17.38	14	3
Oct-2012	7.6	7.2	17.20	14	3
Nov-2012	6.1	7.3	17.11	14	3
Dec-2012	6.7	8.3	16.82	14	3
Jan-2013	7.2	9.1	16.62	14	3
Feb-2013	6.7	10.3	16.36	13	3
Mar-2013	5.8	10.0	16.42	14	3
Apr-2013	7.0	11.7	16.12	11	3
May-2013	8.0	11.5	16.15	10	3
Jun-2013	7.8	10.4	16.36	12	3
Jul-2013	6.5	9.8	16.48	14	3
Aug-2013	5.8	9.4	16.55	14	3
Sep-2013	7.0	10.3	16.38	14	3
Oct-2013	6.6	8.3	16.83	14	3
Nov-2013	5.6	9.1	16.62	14	3
Dec-2013	4.4	9.1	16.63	13	3
Jan-2014	5.2	10.1	16.41	12	3
Feb-2014	7.4	9.1	16.61	14	3
Mar-2014	6.1	9.7	16.49	14	3
Apr-2014	6.1	11.0	16.23	12	3
May-2014	8.1	14.1	15.79	9	3
Jun-2014	6.6	16.0	15.56	6	3
Jul-2014	7.7	11.3	16.19	12	3
Aug-2014	7.4	9.8	16.48	14	3
Sep-2014	7.2	10.1	16.40	14	3
Oct-2014	7.9	7.2	17.34	14	3
Nov-2014	6.0	7.3	17.10	14	3
Dec-2014	5.6	7.6	17.01	14	3
Jan-2015	8.1	7.9	16.92	14	3
Feb-2015	5.5	8.9	16.67	14	3
Mar-2015	7.0	9.3	16.57	14	3
Apr-2015	7.6	11.0	16.25	12	3
May-2015	8.2	13.1	15.91	10	3
Jun-2015	9.7	15.3	15.65	5	3
<i>Jul-2015</i>	<i>18.0</i>	<i>NA</i>	<i>15.19</i>	<i>2</i>	<i>3</i>
Aug-2015	12.3	14.1	15.78	8	3
Sep-2015	10.9	11.1	16.23	14	3
Oct-2015	7.4	7.9	16.92	14	3
Nov-2015	6.3	7.7	17.00	14	3
Dec-2015*	6.1 (5.9)	7.7 (7.6)	17.00 (17.02)	12 (14)	3
Jan-2016	6.5	7.2	17.15	14	3
Feb-2016	5.3	7.2	17.30	14	3

Inflow TP Loads and Flow-weighted Mean Concentration (FWMC)

TP loads are calculated using "no ratio-adjustment" and "14-day maximum for auto sampler composite concentration" algorithm.

Month-Year	Inflow (kac-ft)	TP loads (metric tons)	Inflow FWMC (ppb)
Aug-2011	21	0.5	20
Sep-2011	27	0.6	19
Oct-2011	36	0.9	20
Nov-2011	34	0.7	18
Dec-2011	4	0.1	24
Jan-2012	0.5	0.02	31
Feb-2012	1	0.1	30
Mar-2012	6	0.2	31
Apr-2012	3	0.1	28
May-2012	20	0.7	27
Jun-2012	31	0.8	22
Jul-2012	19	0.3	15
Aug-2012	100	9.0	72
Sep-2012	121	9.1	61
Oct-2012	30	1.2	32
Nov-2012	2	0.1	28
Dec-2012	9	0.7	65
Jan-2013	1	0.1	51
Feb-2013	19	1.2	51
Mar-2013	6	0.5	66
Apr-2013	7	0.3	36
May-2013	14	0.5	33
Jun-2013	106	9.0	69
Jul-2013	86	2.4	22
Aug-2013	20	0.9	34
Sep-2013	56	2.3	34
Oct-2013	42	1.3	25
Nov-2013	4	0.2	51
Dec-2013	7	0.4	40
Jan-2014	9	0.5	44
Feb-2014	32	1.6	40
Mar-2014	3	0.2	42
Apr-2014	2	0.1	42
May-2014	4	0.1	27
Jun-2014	41	1.3	26
Jul-2014	29	0.7	20
Aug-2014	58	1.2	17
Sep-2014	37	0.8	17
Oct-2014	33	0.9	21
Nov-2014	7	0.2	19
Dec-2014	25	0.5	16
Jan-2015	1	0.03	20
Feb-2015	3	0.1	22
Mar-2015	6	0.2	28
Apr-2015	1	0.04	24
May-2015	5	0.1	23
Jun-2015	4	0.2	37
<i>Jul-2015</i>	<i>6</i>	<i>0.1</i>	<i>15</i>
Aug-2015	28	0.6	16
Sep-2015	79	1.5	15
Oct-2015	42	0.8	16
Nov-2015	14	0.3	19
Dec-2015	28	0.6	17
Jan-2016	67	3.0	36
Feb-2016	50	3.6	58

Arthur R. Marshall Loxahatchee National Wildlife Refuge Total Phosphorus (TP) Compliance Status

Yellow highlighted and bolded months' geometric means were higher than the long term levels, which became effective on December 31, 2006.

Green highlighted and italicized months' levels were not applicable (N/A) because the average stages were less than 15.42 feet NGVD29.

Month-Year	TP Geometric Means (ppb)	Long-Term Level (ppb)	Average Stage (feet NGVD29)	TP Sample Data (n)	Stage Data (n)
Mar-2016	6.0	8.3	16.82	14	3
Apr-2016	6.9	10.3	16.36	14	3
May-2016	8.8	12.7	15.96	9	3
Jun-2016	7.2	12.7	15.97	9	3
Jul-2016	7.1	12.0	16.07	13	3
Aug-2016	6.6	13.1	15.92	6	3
Sep-2016	7.3	9.1	16.62	14	3
Oct-2016	6.1	7.8	16.96	14	3
Nov-2016	6.9	8.4	16.78	14	3
Dec-2016	5.6	9.0	16.64	14	3
Jan-2017	7.1	9.3	16.57	13	3
Feb-2017	4.4	9.6	16.52	13	3
Mar-2017	5.7	10.8	16.28	12	3
Apr-2017	6.5	12.1	16.06	7	3
May-2017	8.3	11.4	16.17	13	3
Jun-2017	7.9	7.9	16.93	14	3
Jul-2017	7.9	10.1	16.40	13	3
Aug-2017	6.6	8.8	16.69	14	3
Sep-2017	7.5	8.0	16.89	13	3
Oct-2017	7.6	7.2	17.50	14	3
Nov-2017	5.5	7.2	17.71	14	3
Dec-2017	7.2	7.2	17.43	14	3
Jan-2018	4.5	7.3	17.12	14	3
Feb-2018	5.8	8.2	16.85	14	3
Mar-2018	6.0	9.9	16.45	14	3
Apr-2018	9.2	12.5	16.00	9	3
May-2018	6.3	11.6	16.13	9	3
Jun-2018	7.4	8.9	16.66	14	3
Jul-2018	7.5	10.1	16.41	13	3
Aug-2018	7.0	10.8	16.27	12	3
Sep-2018	6.0	9.0	16.64	14	3
Oct-2018	6.2	9.4	16.55	14	3
Nov-2018	7.9	9.8	16.47	12	3
Dec-2018	6.0	10.4	16.36	11	3
Jan-2019	6.1	11.4	16.18	10	3
Feb-2019	9.1	9.1	16.62	14	3
Mar-2019	6.3	9.0	16.64	14	3
Apr-2019	7.4	11.0	16.24	12	3
May-2019	10.4	11.5	16.16	10	3
Jun-2019	8.6	12.2	16.04	9	3
Jul-2019	7.3	10.5	16.33	14	3
Aug-2019	7.1	9.3	16.58	14	3
Sep-2019	7.1	9.2	16.61	14	3

* December 2015 values for Refuge including resampled data (at LOX14 and LOX15) are presented in parentheses.

Compiled on January 2, 2020, by Cheol Mo, Ph.D., Water Quality Bureau, SFWMD, cmo@sfwmd.gov, (561) 682-2106

Inflow TP Loads and Flow-weighted Mean Concentration (FWMC)

TP loads are calculated using "no ratio-adjustment" and "14-day maximum for auto sampler composite concentration" algorithm.

Month-Year	Inflow (kac-ft)	TP loads (metric tons)	Inflow FWMC (ppb)
Mar-2016	9	0.3	30
Apr-2016	21	0.6	25
May-2016	40	1.3	27
Jun-2016	21	0.6	25
Jul-2016	8	0.2	22
Aug-2016	37	1.1	23
Sep-2016	40	0.9	18
Oct-2016	31	0.7	18
Nov-2016	13	0.2	14
Dec-2016	21	0.4	15
Jan-2017	10	0.3	20
Feb-2017	1	0.0	24
Mar-2017	2	0.1	27
Apr-2017	10	0.4	35
May-2017	26	0.8	26
Jun-2017	123	5.4	36
Jul-2017	7	0.2	28
Aug-2017	11	0.3	23
Sep-2017	70	5.5	63
Oct-2017	105	6.2	48
Nov-2017	28	1.5	43
Dec-2017	6	0.3	34
Jan-2018	3	0.1	25
Feb-2018	4	0.1	22
Mar-2018	6	0.1	18
Apr-2018	10	0.2	17
May-2018	93	4.7	41
Jun-2018	28	1.9	54
Jul-2018	30	1.0	27
Aug-2018	18	0.5	25
Sep-2018	30	0.9	23
Oct-2018	18	0.4	19
Nov-2018	15	0.3	17
Dec-2018	9	0.2	17
Jan-2019	24	1.1	35
Feb-2019	26	1.6	50
Mar-2019	5	0.2	36
Apr-2019	2	0.1	36
May-2019	22	0.8	30
Jun-2019	11	0.3	22
Jul-2019	43	1.1	21
Aug-2019	77	2.8	30
Sep-2019	27	1.2	36

* March 2009 inflow was too low to calculate inflow FWMC accurately.