Settlement Agreement Report

Third Quarter
July - September 2014

Prepared for the
Technical Oversight Committee

April 14, 2016
(First revision on April 10, 2015)
(Original on January 27, 2015)

This report was revised on April 14, 2016, to include the TOC consensus about Shark River Slough.
This report was revised from an earlier version on April 10, 2015, to include Shark River Slough compliance results using the final approved flow data for federal Water Year 2014 (October 1, 2013 – September 30, 2014).

Prepared by:

Cheol Mo, Violeta Ciuca, and Stuart Van Horn

Compliance Assessment and Reporting Section
Water Quality Bureau
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406

PURPOSE

The South Florida Water Management District has prepared this report to provide a quarterly update to the Technical Oversight Committee on the compliance status with total phosphorus levels or limits defined in the 1991 Settlement Agreement, entered as a Consent Decree in 1992, and modified in 1995. The areas of interest in this report include the interior marsh stations in the Arthur R. Marshall Loxahatchee National Wildlife Refuge and two discharges to Everglades National Park: inflows to Shark River Slough and inflows to Taylor Slough and Coastal Basins.

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ACRONYMS AND ABBREVIATIONS

cfs	cubic feet per second
ENP	Everglades National Park
feet NGVD 29	feet relative to the National Geodetic Vertical Datum of 1929
kac-ft	thousand acre feet
ppb	parts per billion
Refuge	Arthur R. Marshall Loxahatchee National Wildlife Refuge
TOC	Technical Oversight Committee
TP	total phosphorus
µg/L	micrograms per liter
WCA	Water Conservation Area

EXECUTIVE SUMMARY

This report fulfills the South Florida Water Management District's reporting requirements under the 1991 Settlement Agreement, entered as a Consent Decree in 1992 and modified in 1995, for the third quarter of 2014 (July – September 2014). Total phosphorus (TP) compliance highlights for this period are summarized below for the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) and inflows to the Everglades National Park (ENP) (**Table 1** and **Figure 1**):

- **Refuge:** The geometric mean TP concentration was below the long-term level in July, August, and September 2014.
- **Shark River Slough:** The 12-month flow-weighted mean TP concentration was above the 12-month long-term limit during the federal Water Year 2014 (October 1, 2013 – September 30, 2014).
- **Taylor Slough and Coastal Basins:** The 12-month flow-weighted mean TP concentrations were below the 12-month long-term limit during the federal water year, WY 2014.

Table 1. TP compliance, third quarter 2014.

Month	Geometric Mean TP Concentration (ppb)	Long-term Level (ppb)	Mean Stage (feet NGVD 29)	Number of Samples
Arthur R. Marshall Loxahatchee National Wildlife Refuge				
Jul 2014	7.7	11.3	16.18	12
Aug 2014	7.4	9.8	16.47	14
Sep 2014	7.2	10.1	16.40	14

12-Month Period Ending	Total Flow (kac-ft)	12-Month Flow-weighted Mean TP Concentration (ppb)	Long-term Limit (ppb)	Percent of Sampling Events Greater than 10 ppb	
				Guideline	Observed
Everglades National Park – Shark River Slough					
Jul 2014	825.5	9.1	8.8	45.7	31.8
Aug 2014	698.6	10.2	9.4	49.2	40.9
Sep 2014	649.0	10.8	9.7	50.6	40.9
Everglades National Park – Taylor Slough and Coastal Basins					
Jul 2014	203.2	4.5	11.0	53.1	1.3
Aug 2014	203.8	4.5	11.0	53.1	1.3
Sep 2014	196.5	4.3	11.0	53.1	1.3

Notes:
- ppb = parts per billion. Values are actually in µg/L (micrograms per liter), which, for the purposes of this report, is equivalent to ppb.
- feet NGVD 29 = elevation in feet relative to the National Geodetic Vertical Datum of 1929.
- kac-ft = thousand acre feet.
- Compliance for inflows to Everglades National Park (Shark River Slough, Taylor Slough and Coastal Basins) is evaluated annually based on the 12-month flow-weighted mean TP concentration for the federal water year ending on September 30.

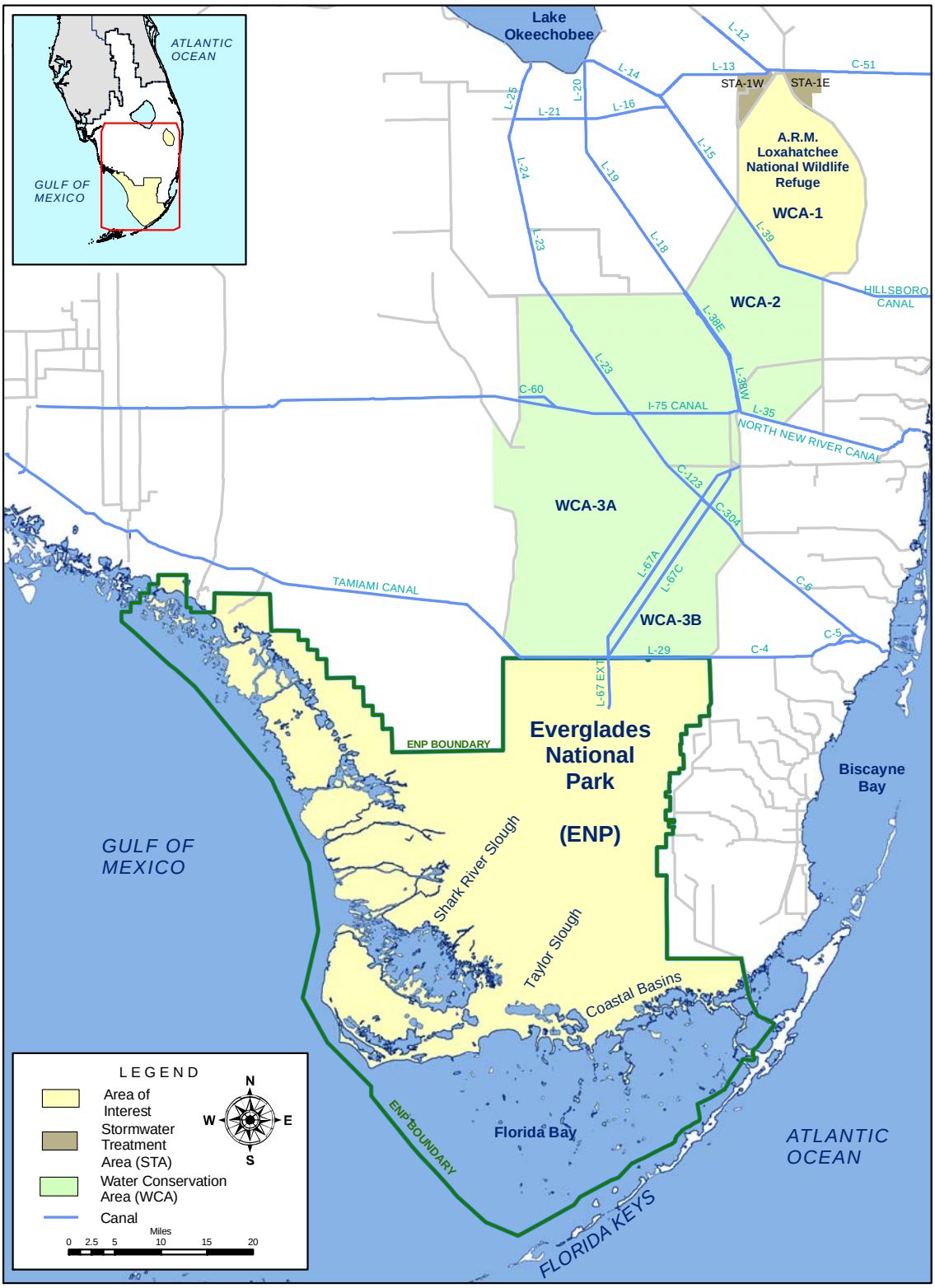

Figure 1. Areas of interest.

ARTHUR R. MARSHALL LOXAHATCHEE NATIONAL WILDLIFE REFUGE

Background

The 1991 Settlement Agreement ended the Everglades lawsuit and was entered into by the federal government, the State of Florida, and the South Florida Water Management District. The subsequent Consent Decree, as modified in 1995, specified that interim and long-term total phosphorus (TP) concentration levels for the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) must be met by February 1, 1999, and December 31, 2006, respectively. Both the interim and long-term concentration levels vary monthly because they are calculated as a function of water stage measured at gauging stations 1-7, 1-8C, and 1-9 within the Refuge. The stage range within which the interim and long-term concentration levels are applicable is 15.42 to 17.14 feet relative to the National Geodetic Vertical Datum of 1929 (feet NGVD 29). The monthly TP concentrations are determined from water samples collected at 14 interior marsh stations, LOX3 through LOX16 (**Figure 2**). As required in the Consent Decree, the concentrations are converted to a geometric mean, which is compared to the long-term concentration level. Monthly TP data for each station for the past 36 months are provided in **Appendix A**. The calculation methods specified in the Consent Decree are provided in **Appendix D**.

Reporting Period Update

Average sampling day stages in the Refuge were 16.18, 16.47, and 16.40 feet NGVD 29 in July, August, and September 2014, respectively (**Figure 3** and **Table 2**). The geometric means, calculated from TP concentrations measured in water samples collected in July, August, and September 2014, were 7.7, 7.4, and 7.2 parts per billion (ppb), respectively. The geometric mean TP concentration was below the long-term level for the months of July, August, and September 2014.

TP samples were collected at 12 stations for July 2014. Samples were not collected at LOX3 and LOX10 stations in July 2014, because the water depth was less than 0.1 meters. Samples were collected at all 14 stations in August and in September 2014.

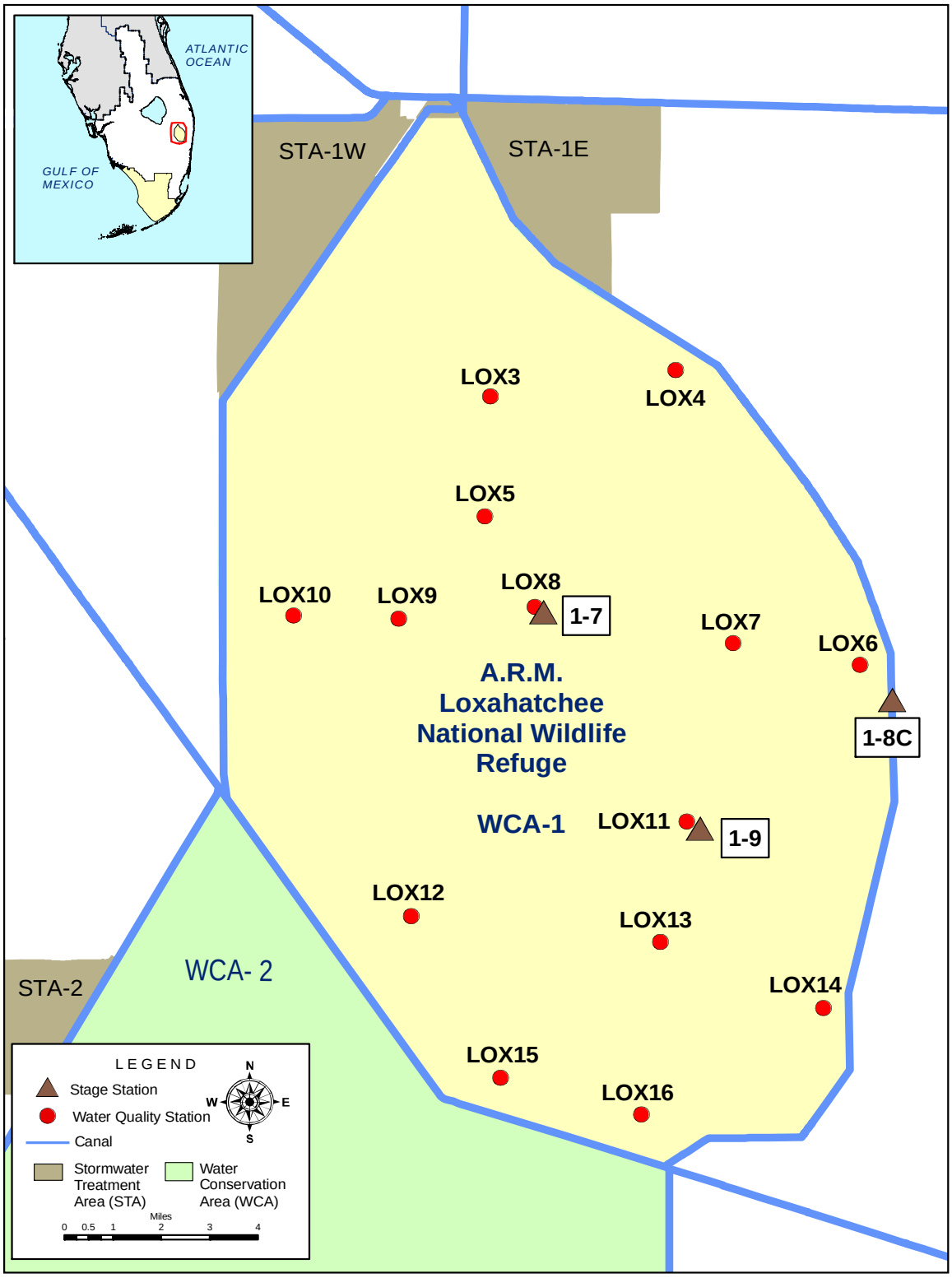

Figure 2. Refuge water quality sampling and stage measurement stations.

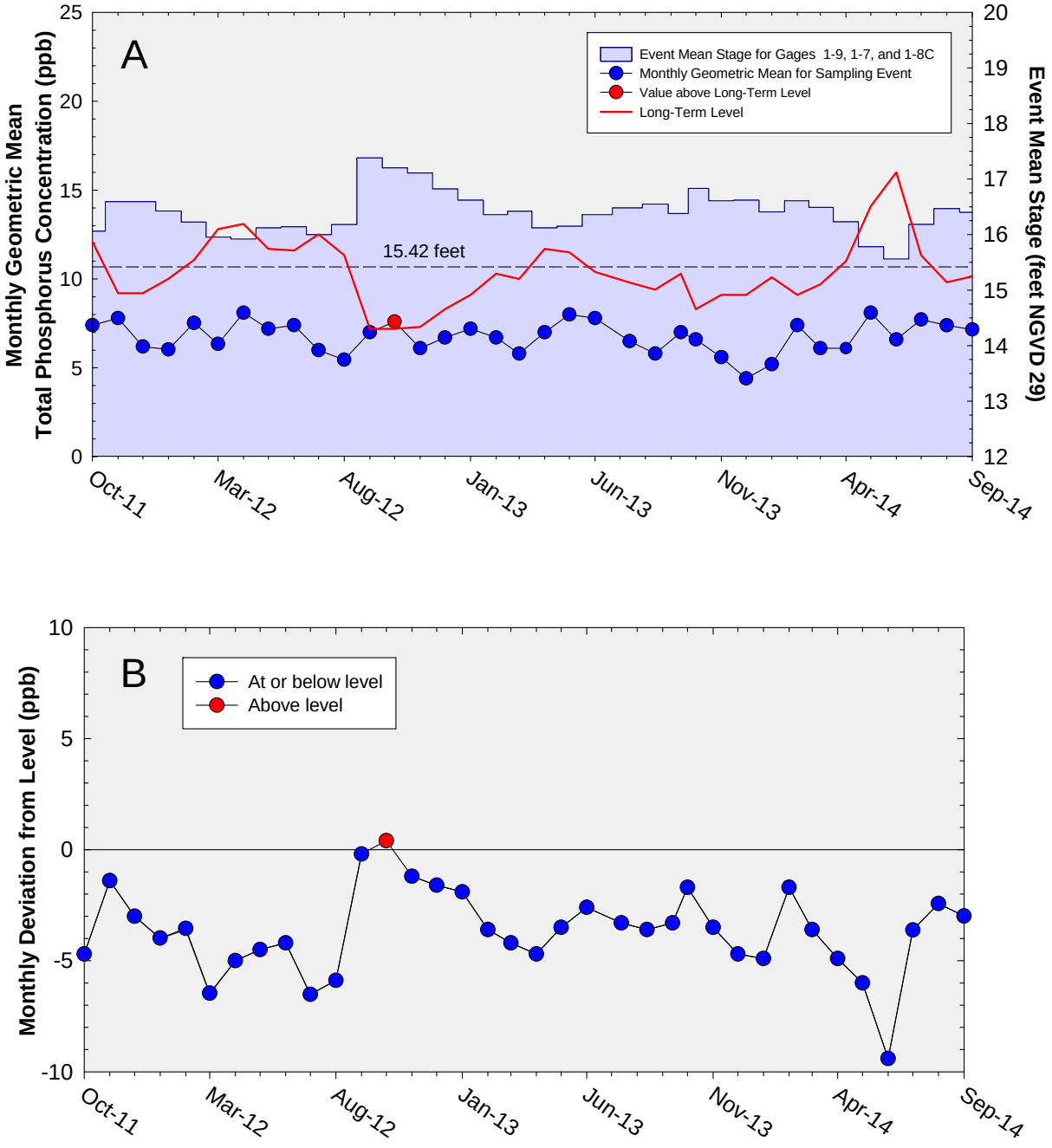

Figure 3. (A) Monthly TP geometric mean concentrations for the Refuge compared to calculated long-term levels, which are adjusted for fluctuations in stage. The geometric mean TP concentration was above the long-term level in October 2012. (**B)** Deviation of monthly geometric mean TP concentrations with calculated long-term levels. Values smaller than zero indicate that the geometric mean was lower than the long-term level.

Table 2. Refuge TP compliance tracking.

Month	Geometric Mean TP Concentration (ppb)	Long-Term Level (ppb) Effective 12/31/2006	Average Stage[a] (ft NGVD 29)	Number of Samples
Oct-2011	7.4	12.1	16.06	11
Nov-2011	7.8	9.2	16.59	14
Dec-2011	6.2	9.2	16.59	7
Jan-2012	6.0	10.0	16.43	14
Feb-2012	7.5	11.1	16.23	13
Mar-2012	6.3	12.8	15.96	10
Apr-2012	8.1	13.1	15.92	10
May-2012	7.2	11.7	16.12	12
Jun-2012	7.4	11.6	16.14	14
Jul-2012	6.0	12.5	16.00	14
Aug-2012	5.5	11.3	16.18	13
Sep-2012	7.0	7.2	17.38	14
Oct-2012	***7.6****	***7.2***	***17.20***	***14***
Nov-2012	6.1	7.3	17.11	14
Dec-2012	6.7	8.3	16.82	14
Jan-2013	7.2	9.1	16.62	14
Feb-2013	6.7	10.3	16.36	13
Mar-2013	5.8	10.0	16.42	14
Apr-2013	7.0	11.7	16.12	11
May-2013	8.0	11.5	16.15	10
Jun-2013	7.8	10.4	16.36	12
Jul-2013	6.5	9.8	16.48	14
Aug-2013	5.8	9.4	16.55	14
Sep-2013	7.0	10.3	16.38	14
Oct-2013	6.6	8.3**	16.83**	14
Nov-2013	5.6	9.1	16.61	14
Dec-2013	4.4	9.1	16.62	13
Jan-2014	5.2	10.1	16.41	12
Feb-2014	7.4	9.1	16.61	14
Mar-2014	6.1	9.7	16.49	14
Apr-2014	6.1	11.0	16.23	12
May-2014	8.1	14.1	15.79	9
Jun-2014	6.6	16.0	15.56	6
Jul-2014	7.7	11.3	16.18	12
Aug-2014	7.4	9.8	16.47	14
Sep-2014	7.2	10.1	16.40	14

Notes:
ppb = parts per billion. Values are actually in µg/L (micrograms per liter), which, for the purposes of this report, is equivalent to ppb.
- feet NGVD 29 = elevation in feet relative to the National Geodetic Vertical Datum of 1929.
- Highlighted rows with bold, italicized text indicate when an excursion over the long-term level occurred.
- The seven "J" flag qualified data collected on December 13, 2011, were excluded from the December 2011 geometric mean calculation following the TOC's decision at the May 30, 2012 quarterly meeting.

[a] Average stage is calculated using stage elevations at stations 1-7, 1-8C, and 1-9 for a given sampling date.

* The geometric mean was greater than the long-term level.

****** 1-9 gage stage datum for October 22, 2013, sampling event was missing and the October 23, 2013 stage datum at 1-9 was used for the daily stage for both October 22 and 23, 2013, to calculate the sampling event mean stage in previous reports. The datum became available on October 20, 2014, and was subsequently evaluated. The inclusion of this datum did not result in any change to the previously reported average stage calculation.

EVERGLADES NATIONAL PARK

Shark River Slough

Background

The Settlement Agreement/Consent Decree (1995) specified that interim and long-term TP concentration limits for discharges into the ENP (**Figure 4**) through Shark River Slough be met by October 1, 2003, and December 31, 2006, respectively. It was specified that the TP concentrations be presented as 12-month flow-weighted means. Only the TP concentrations for the water year ending September 30 are evaluated for compliance with the Consent Decree limits (**Appendix D**). The long-term TP concentration limit for inflows to Shark River Slough is represented by concentrations delivered through S12A, S12B, S12C, and S12D during the Outstanding Florida Waters baseline period of March 1, 1978, to March 1, 1979, and is adjusted for variations in flow. Inflow concentrations of TP through S12A, S12B, S12C, S12D, and S333 are compared to the interim and long-term limits at the end of each water year (October 1 through September 30). The long-term limit went into effect in WY 2007.

The 12-month flow-weighted mean TP concentration (10.8 ppb) was above the 12-month long-term limit (9.7 ppb) for WY 2014 ending on September 30, 2014.

At the October 27, 2015, meeting, TOC Representatives reached consensus that no remedies in addition to those currently planned and/or underway are necessary to address the WY 2014 exceedance.

Reporting Period Update

Table 3 presents the 12-month flow-weighted mean concentrations for each month with the corresponding long-term TP concentration limits calculated using the 12-month period flow. Routine monitoring was changed to weekly for all Shark River Slough sites beginning in August 2007. In accordance with Appendix A of the Consent Decree, only the every-other-week grab concentration data were used for the flow-weighted mean calculations from October 2007 forward[1]. Weekly TP data for each station for the past 12 months are provided in **Appendix B**. For the 12-month periods ending in July, August, and September 2014, the 12-month flow-weighted mean TP concentrations were 9.1, 10.2, and 10.8 ppb, respectively. The 12-month long-term limits, based on the total flow into Shark River Slough, were 8.8, 9.4, and 9.7 ppb, respectively, for the periods.

The Consent Decree stipulates that the percentage of flow-weighted mean TP concentrations greater than 10 ppb from each sampling event in any 12-month period must not exceed a guideline value based on flow into Shark River Slough for the same 12-month period. For the

[1] S12A and S333 are sampled weekly if flowing, otherwise monthly. S12B, S12C, and S12D are sampled weekly if flowing.

12-month periods ending July, August, and September 2014, the sampling event TP concentration greater than 10 ppb were 31.8 percent for July and 40.9 percent for August and September 2014.

The observed percentages of the sampling event flow-weighted mean TP concentrations greater than 10 ppb were lower than the guideline for the 12-month periods ending in July, August, and September 2014 (**Table 3**). The 12-month flow-weighted mean TP concentrations and the flow-weighted mean TP concentrations for individual sampling events are presented in **Figure 6**.

The daily flows through the individual Shark River Slough structures from October 2011 through September 2014 are presented in **Figures 7 and 9**. The stage in Water Conservation Area 3A (WCA-3A) was gradually raised to Zone A (flood releases) during the reporting quarter.

A total of 161,627 acre-feet of water was discharged through the S12 structures and 77,408 acre-feet of water was discharged through the S333 structure during the third quarter. Almost none (0.14 percent, 105 acre-feet) of the water through S333 was discharged through S334 during the quarter. A total of 460,512 acre-feet of water was discharged through the S12 structures and 188,507 acre-feet of water was discharged through the S333 structure during WY 2014. About 22 percent (40,691 acre-feet) of the water through S333 was discharged through S334 during the water year (**Figure 8**).

For additional information on the Water Conservation Area 3A regulation schedule, please refer to the United States Army Corps of Engineers – Jacksonville District's website[2].

The relationship between the sum of the daily flows at Shark River Slough structures and corresponding flow-weighted mean TP concentrations for individual sampling events is presented in **Figure 10**. The average of the flow-weighted mean TP concentrations was 16.0 ppb during the third quarter while 13.5 ppb during WY 2014 (**Figure 10**).

[2] http://w3.saj.usace.army.mil/h2o/plots.htm

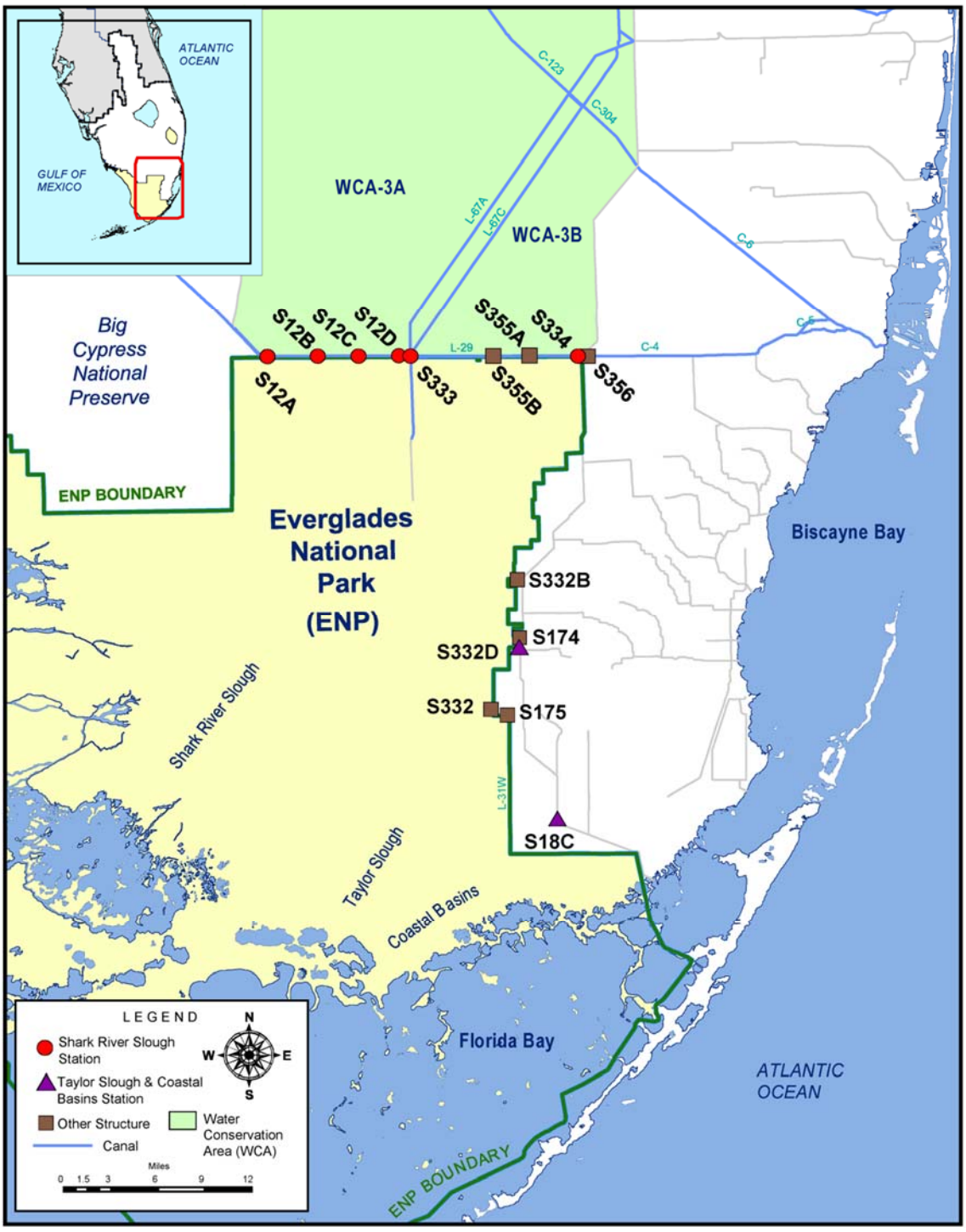

Figure 4. ENP flow structures.

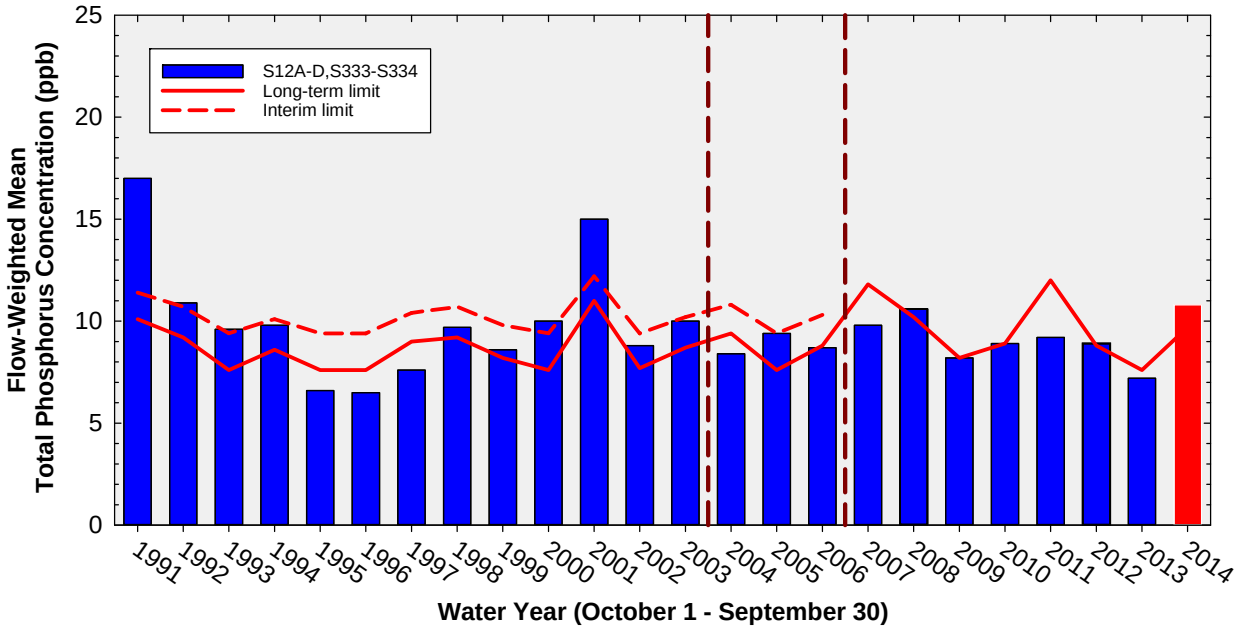

Figure 5. The 12-month flow-weighted mean total phosphorus concentrations at inflows to Everglades National Park through Shark River Slough at the end of each water year compared to the interim and long-term total phosphorus limits. The WY 2008 concentration was above the long-term limit but the TOC at the March 1, 2011, quarterly meeting determined substantial evidence indicates this exceedance was due to error. The WY 2012 concentration was above the long-term limit without a resampled datum, and met the long-term limit with the resampled datum. The TOC reached a consensus at the April 1, 2014, quarterly meeting on a recommendation that no further technical analysis for WY 2012 was necessary. The WY 2014 concentration was above the long-term limit. At the October 27, 2015, meeting, TOC Representatives reached consensus that no remedies in addition to those currently planned and/or underway are necessary to address the WY 2014 exceedance.

Table 3. Shark River Slough total phosphorus compliance tracking.

12-Month Period	Total Flow (kac-ft)	Flow-Weighted Mean TP Concentration (ppb)	Long-Term Limit (ppb) *Effective 12/31/2006*	Percent of Sampling Events Greater than 10 ppb	
				Guideline	Observed
Nov 2010 - Oct 2011	235.6	11.3	12.1	64.6	68.4[a]
Dec 2010 - Nov 2011	373.8	10.0	11.3	59.5	68.4[a]
Jan 2011 - Dec 2011	479.2	9.3	10.7	55.9	68.4[a]
Feb 2011 - Jan 2012	506.3	9.2	10.5	55.0	61.9[a]
Mar 2011 - Feb 2012	513.2	9.3	10.5	54.8	63.6[a]
Apr 2011 - Mar 2012	503.4	9.3	10.5	55.1	57.1[a]
May 2011 - Apr 2012	498.5	9.2	10.6	55.3	55.0
Jun 2011 - May 2012	508.6	9.5	10.5	55.0	50.0
Jul 2011 - Jun 2012	561.7	9.6	10.2	53.3	52.4
Aug 2011 - July 2012	644.9	9.3	9.7	50.7	45.8
Sep 2011 - Aug 2012	731.1	9.2	9.3	48.2	40.0
Oct 2011 - Sep 2012	***818.3***	***8.9 (8.8)***[b]	***8.8***	***45.9***	***36.0***
Nov 2011 - Oct 2012	909.7	8.3	8.4	43.6	28.0
Dec 2011 - Nov 2012	881.6	7.9	8.5	44.3	28.0
Jan 2012 - Dec 2012	874.8	7.8	8.5	44.4	28.0
Feb 2012 - Jan 2013	882.3	7.8	8.5	44.3	28.0
Mar 2012 - Feb 2013	883.9	7.7	8.5	44.2	24.0
Apr 2012 - Mar 2013	891.3	7.7	8.5	44.0	20.0
May 2012 - Apr 2013	892.7	7.7	8.4	44.0	20.0
Jun 2012 - May 2013	933.7	7.7	8.2	43.0	24.0
Jul 2012 - Jun 2013	965.7	7.7	8.1	42.3	20.0
Aug 2012 - Jul 2013	1007.7	7.9	7.9	41.3	28.0
Sep 2012 - Aug 2013	1122.7	7.6	7.6	40.1	28.0
Oct 2012 - Sep 2013	***1152.5***	***7.2***	***7.6***	***40.1***	***24.0***
Nov 2012 - Oct 2013	1114.0	7.1	7.6	40.1	24.0
Dec 2012 - Nov 2013	1055.9	7.3	7.6	40.2	24.0
Jan 2013 - Dec 2013	991.0	7.3	8.0	41.7	24.0
Feb 2013 - Jan 2014	957.2	7.3	8.1	42.5	26.1
Mar 2013 - Feb 2014	985.6	7.4	8.0	41.8	26.1
Apr 2013 - Mar 2014	1025.1	7.5	7.8	40.9	26.1
May 2013- Apr 2014	1017.3	7.5	7.8	41.1	26.1
Jun 2013 - May 2014	964.2	7.2	8.1	42.3	26.1
Jul 2013 - Jun 2014	888.8	7.7	8.5	44.1	30.4
Aug 2013 - Jul 2014	825.5	9.1	8.8	45.7	31.8
Sep 2013 - Aug 2014	698.6	10.2	9.4	49.2	40.9
Oct 2013 - Sep 2014	***649.0***	***10.8***[c]	***9.7***	***50.6***	***40.9***

Notes:
- kac-feet = thousand acre feet.
- ppb = parts per billion. Values are actually in µg/L (micrograms per liter), which, for the purposes of this report, is equivalent to ppb.
- Compliance is evaluated annually based on the 12-month flow-weighted mean (FWM) TP concentration for the federal water year ending on September 30. The compliance periods are shown as highlighted rows with bold, italicized text.

[a] Value exceeded the guideline percentage.

[b] 12-month FWM calculation including a resampled datum (7 ppb) at S12D on December 8, 2011 (see Table B-1) is presented in parentheses. The WY2012 FWM was 8.9 ppb without the resampled datum. The long-term limit was 8.8 ppb. The representatives of the TOC reached consensus on a recommendation concerning WY2012 compliance and agreed that no further technical analysis is necessary (TOC recommendation, April 1, 2014, quarterly TOC meeting).

[c] At the October 27, 2015, meeting, TOC Representatives reached consensus that no remedies in addition to those currently planned and/or underway are necessary to address the WY 2014 exceedance.

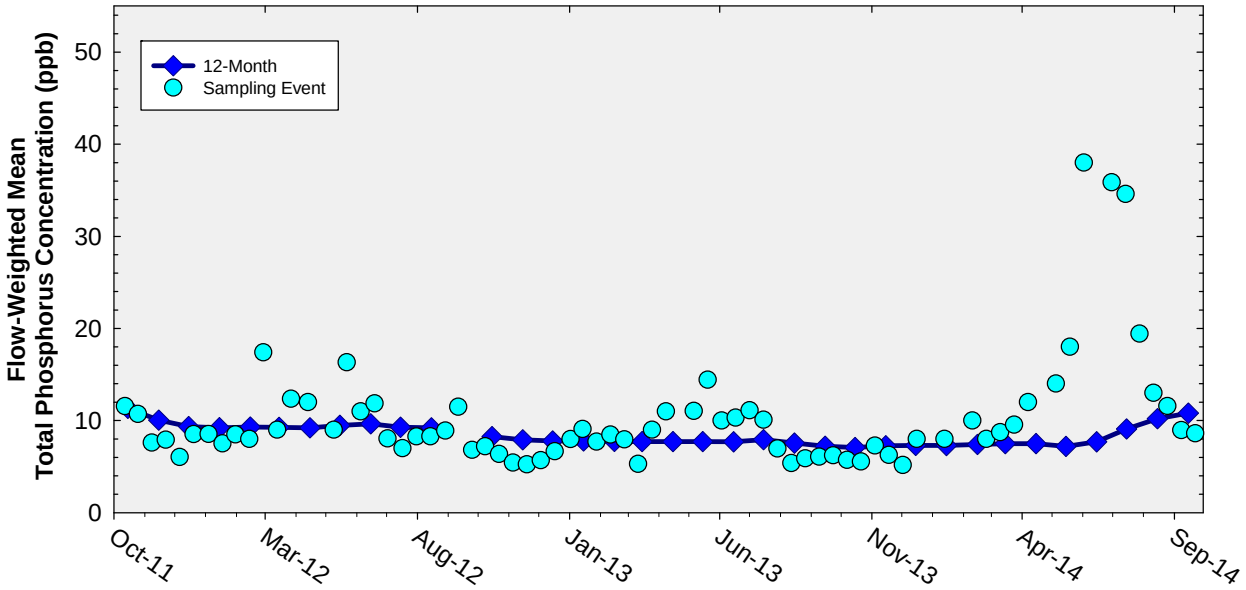

Figure 6. The 12-month flow-weighted mean TP concentrations in inflows to Everglades National Park through Shark River Slough at the end of each month and the flow-weighted mean concentration for each sampling event. There are no sampling event values for some months because there was little or no flow in those periods.

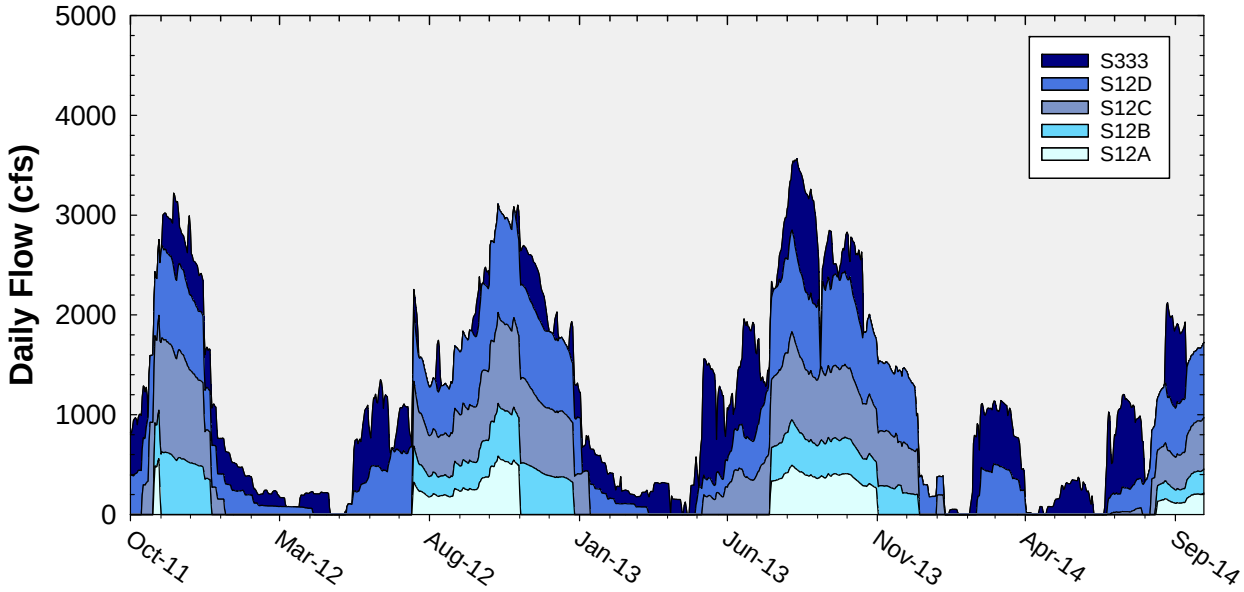

Figure 7. Daily flows as cubic feet per second (cfs) at Shark River Slough structures as a stacked sum of five inflows.

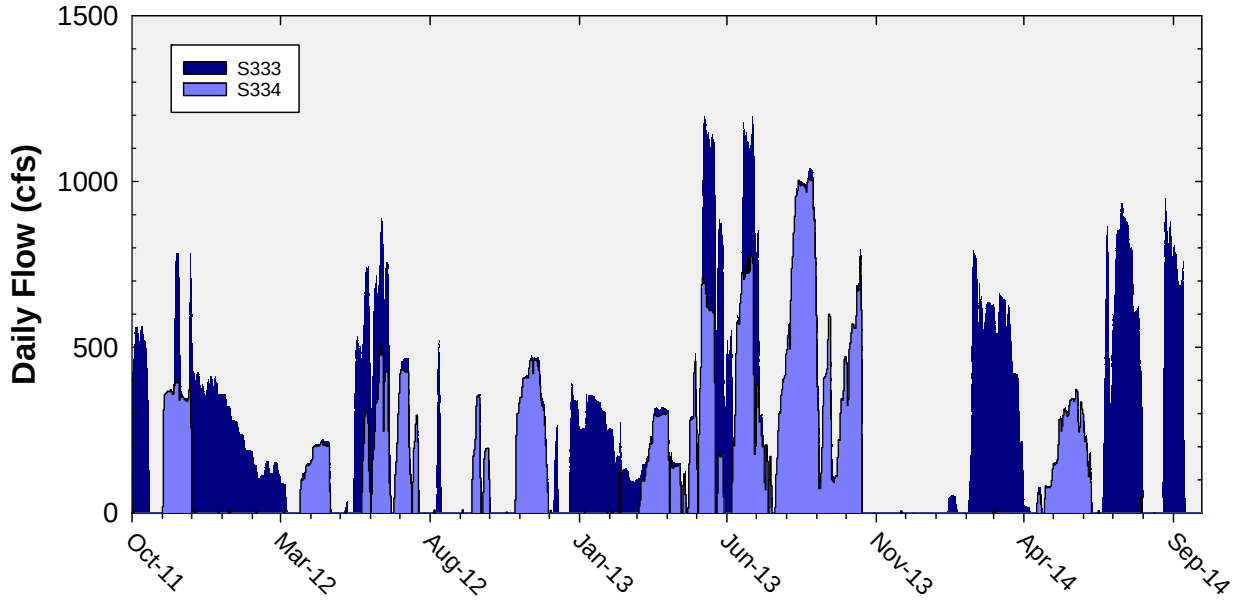

Figure 8. Daily flows at structures S333 and S334.

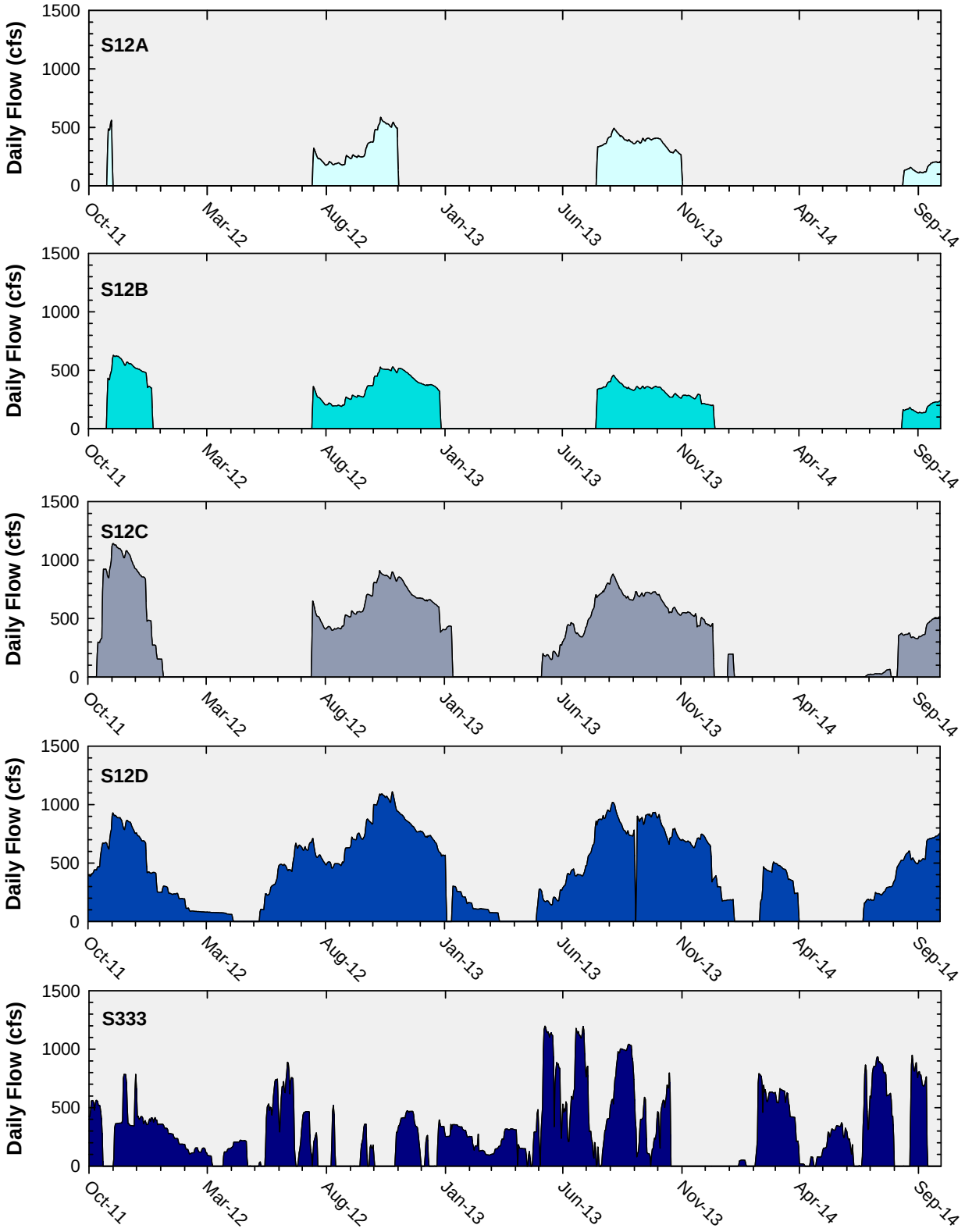

Figure 9. Daily flows at individual inflow structures to Shark River Slough. These figures include most of the data illustrated in Figures 7 and 8.

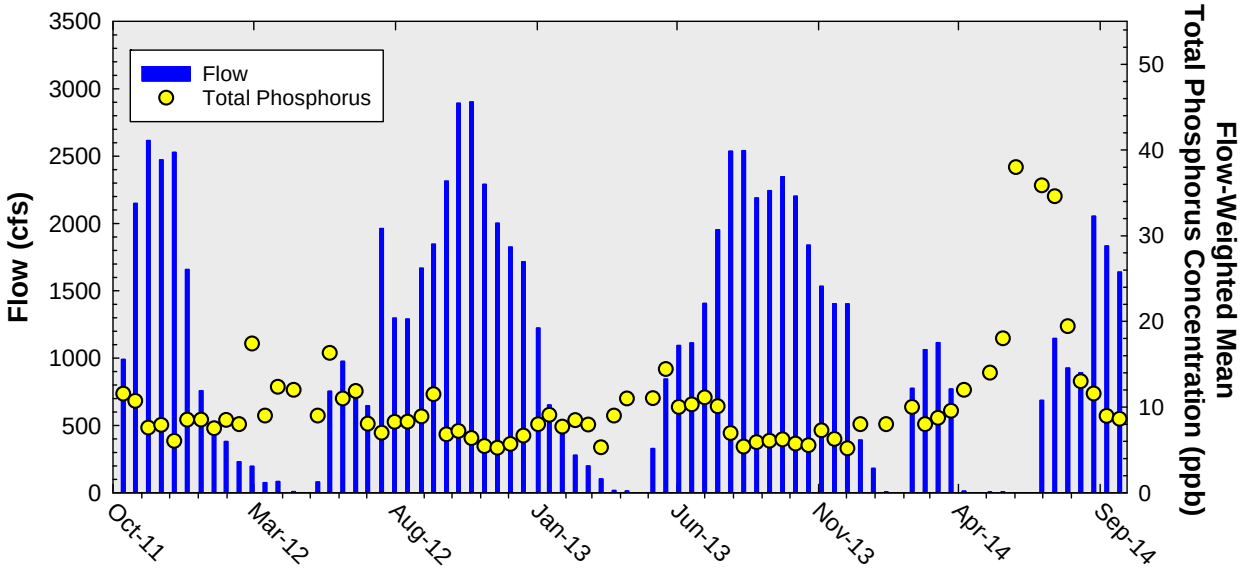

Figure 10. Flow at Shark River Slough structures on the day of sampling and the corresponding flow-weighted mean total phosphorus concentrations for individual sampling events.

Taylor Slough and Coastal Basins

Background

Under the Consent Decree, a single TP long-term limit of 11 ppb, to be met by December 31, 2006, was set for the two points of inflow to Taylor Slough (S332 and S175) and the inflow point to the Coastal Basins (S18C) (see **Appendix C**). The 12-month flow-weighted mean concentrations have consistently been lower than the long-term limit of 11 ppb.

Inflow TP concentrations to ENP through Taylor Slough and the Coastal Basins are compared to the 11 ppb limit at the end of each water year using data from both the old (S175, S332, and S18C) and new (S174, S332D, and S18C) combinations of structures (**Figure 5**). The narrow bars in **Figure 5** represent the 12-month flow-weighted mean TP concentrations from S332, S175, and S18C for WY 1991 through WY 2002. The wider bars for WY 1999 through WY 2013 represent the new combination of structures.

TP and flow data from both sets of structures presented in prior editions of this report through December 2001 (April 2002 report) showed that, beginning in October 2000, the 12-month moving total flow for S332D, S174, and S18C was consistently greater than flow at S332, S175, and S18C. There was also a shift in flow-weighted mean TP concentration data whereby S332D, S174, and S18C concentrations became equal to, and then consistently lower than, the concentrations at S332, S175, and S18C. These changes reflected the switch from S332 to S332D for water delivery to Taylor Slough between July 3 and July 5, 2000. Furthermore, the S174 site was plugged in September 2007, preventing any additional flow. Consequently, for WY 2002 through WY 2007, compliance tracking was represented by S332D, S174, and S18C. Since WY 2008, S332D and S18C have represented the compliance tracking structures.

The 12-month flow-weighted mean TP concentration (4.3 ppb) was lower than the long-term limit (11.0 ppb) for the 12-month period ending on September 30, 2014. Therefore, inflow to Taylor Slough and Coastal Basins met the TP limit for the current federal water year, WY 2014 (October 1, 2013 – September 30, 2014).

Reporting Period Update

Figure 6 presents the 12-month and individual sampling event flow-weighted mean TP concentrations at the S332D and S18C structures. All TP grab sample concentrations taken on positive flow days reported for surface water monitoring at the sites were used for the compliance calculations.

The daily flows into ENP through S332D and S18C are presented in **Figures 7** and **8**.

For the combined flow through S332D and S18C, the 12-month flow-weighted mean TP concentrations for the periods ending July, August, and September 2014 were 4.5, 4.5, and 4.3 ppb, respectively **(Table 4).**

The Consent Decree stipulates that the percent of flow-weighted mean TP concentrations greater than 10 ppb from each sampling event in any 12-month period must not exceed a fixed guideline of 53.1 percent. For the 12-month periods ending July, August, and September 2014, the sampling event TP concentrations greater than 10 ppb were 1.3, 1.3, and 1.3 percent, respectively.

Figure 12 shows the relationship between the daily inflows and the corresponding flow-weighted mean TP concentrations for each sampling event. The sampling event flow-weighted mean concentrations generally remained very low. The average of the flow-weighted mean TP concentrations was 4.2 ppb in the third quarter.

The United States Army Corps of Engineers authorized the C-111 Spreader Canal project in 1995 to restore more natural hydrologic conditions in Taylor Slough and to maintain flood protection to the east of the L-31N and C-111 canals. The original project facilities consisted of pump stations (S332B, S332C, and S332D), detention cells (Cell 1 through Cell 5), a connector cell between Cell 2 and Cell 3, a flow-way cell originating at Berm 3 of Cell 5, and four diversion structures (DS1 through DS4). Upon completion of a United States Army Corps of Engineers construction project in 2009, an interconnected detention system now exists, starting at the S332B west discharge and continuing to the S332D high head cell.

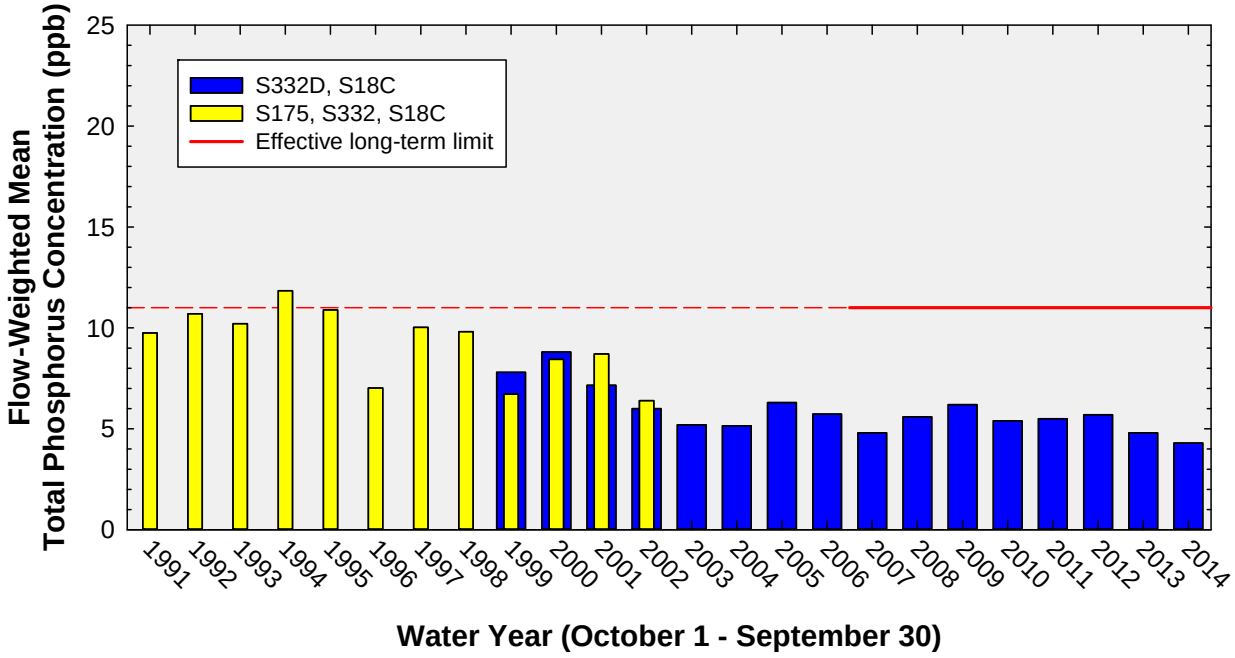

Figure 11. The 12-month flow-weighted mean TP concentrations in inflows to ENP through Taylor Slough and Coastal Basins at the end of each water year compared to the 11 ppb long-term TP limit.

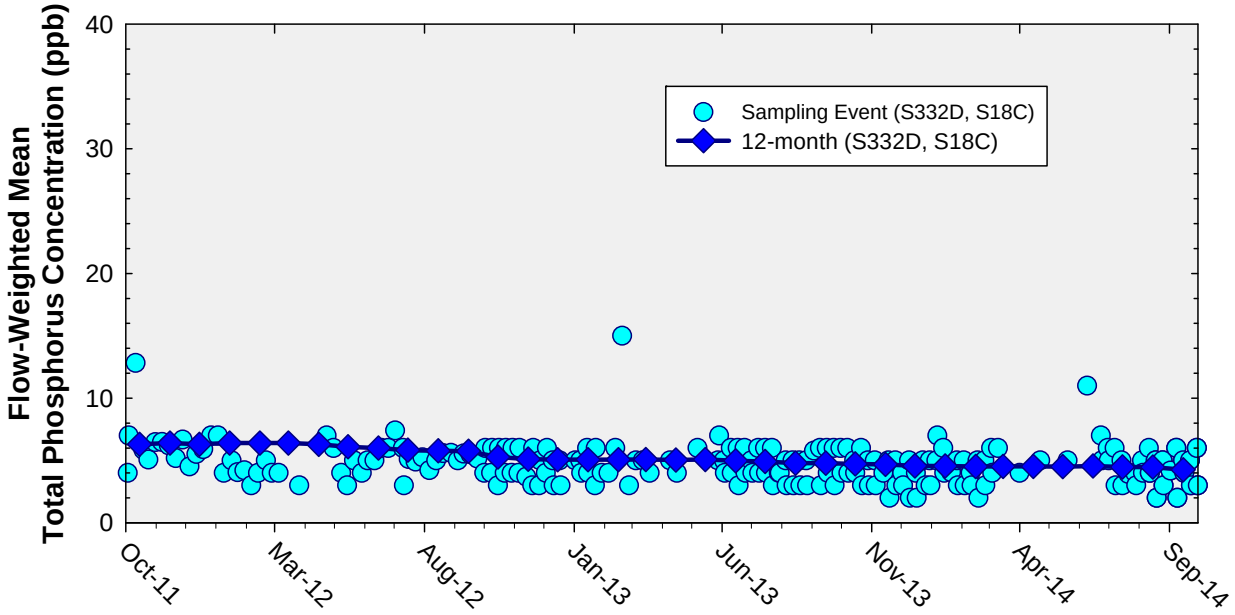

Figure 12. The 12-month flow-weighted mean TP concentrations in inflows to ENP through Taylor Slough and Coastal Basins at the end of each month and the flow-weighted mean TP concentration for each sampling event.

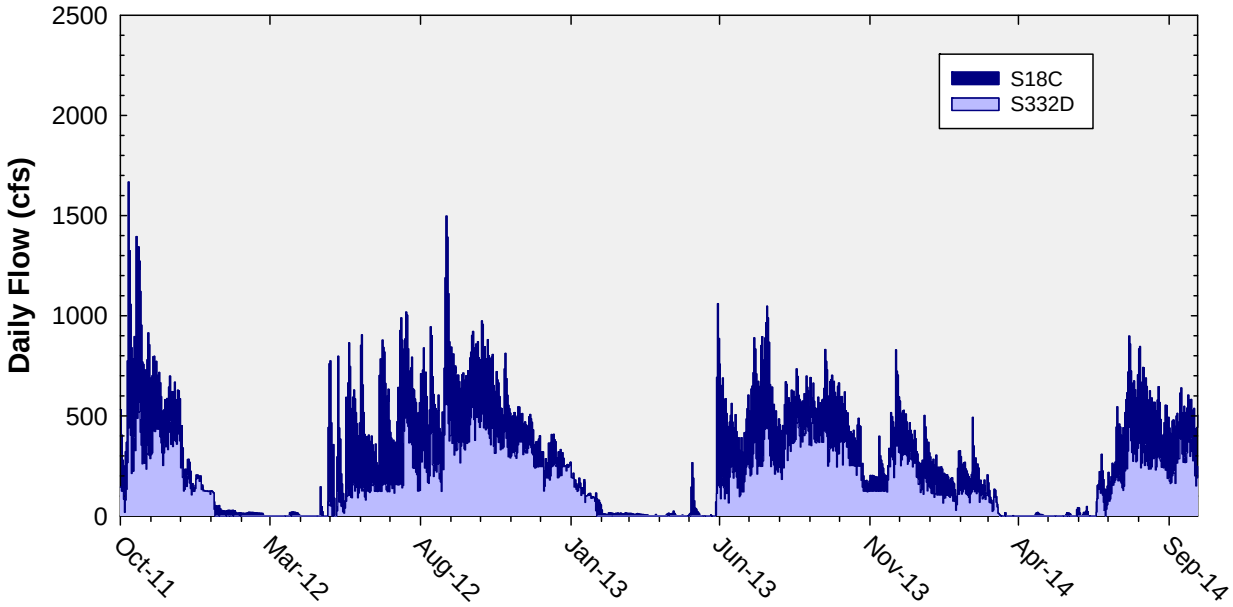

Figure 13. Daily flows measured in cubic feet per second (cfs) into ENP as a stacked sum of Taylor Slough (structure S332D) and Coastal Basins (structure S18C).

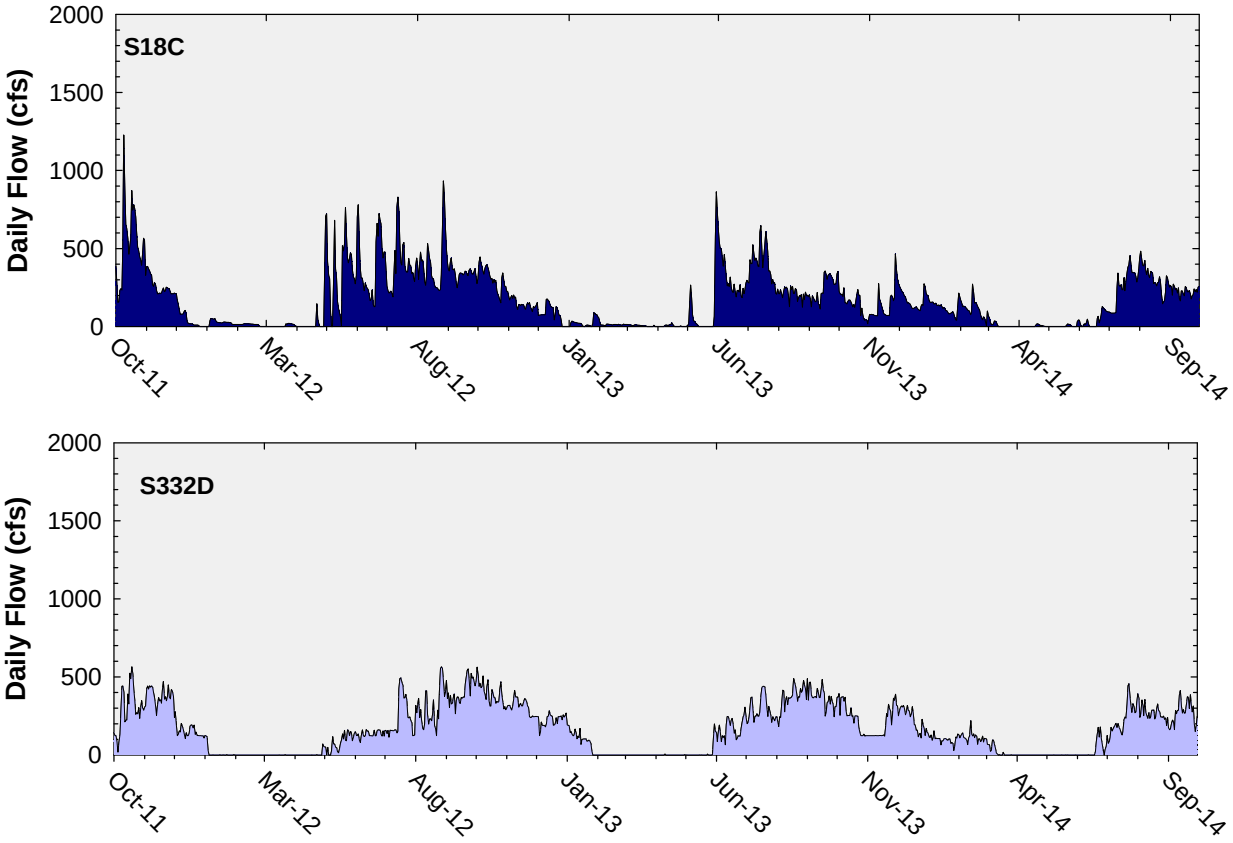

Figure 14. Daily flows at individual Coastal Basins (S18C) and Taylor Slough (S332D) structures into ENP.

Table 4. Taylor Slough and Coastal Basins TP compliance tracking.

12-Month Period	Total Flow (kac-ft)	Flow-Weighted Mean TP Concentration (ppb)	Long-Term Limit (ppb) *Effective 12/31/2006*	Percent of Sampling Events Greater than 10 ppb	
				Guideline	Observed
Nov 2010 - Oct 2011	134.6	6.3	11.0	53.1	12.1
Dec 2010 - Nov 2011	157.9	6.4	11.0	53.1	12.5
Jan 2011 - Dec 2011	170.2	6.3	11.0	53.1	11.1
Feb 2011 - Jan 2012	169.5	6.4	11.0	53.1	10.0
Mar 2011 - Feb 2012	170.2	6.4	11.0	53.1	9.3
Apr 2011 - Mar 2012	169.5	6.4	11.0	53.1	9.5
May 2011 - Apr 2012	170.3	6.3	11.0	53.1	10.0
Jun 2011 - May 2012	193.5	6.1	11.0	53.1	2.5
Jul 2011 - Jun 2012	224.6	6.0	11.0	53.1	2.3
Aug 2011 - July 2012	255.1	5.8	11.0	53.1	2.1
Sep 2011 - Aug 2012	273.0	5.8	11.0	53.1	2.0
Oct 2011 - Sep 2012	***290.7***	***5.7***	***11.0***	***53.1***	***2.0***
Nov 2011 - Oct 2012	283.6	5.3	11.0	53.1	0.0
Dec 2011 - Nov 2012	273.0	5.1	11.0	53.1	0.0
Jan 2012 - Dec 2012	279.6	5.1	11.0	53.1	0.0
Feb 2012 - Jan 2013	284.9	5.1	11.0	53.1	0.0
Mar 2012 - Feb 2013	284.9	5.1	11.0	53.1	1.6
Apr 2012 - Mar 2013	284.9	5.1	11.0	53.1	1.6
May 2012 - Apr 2013	282.4	5.0	11.0	53.1	1.6
Jun 2012 - May 2013	263.5	5.1	11.0	53.1	1.6
Jul 2012 - Jun 2013	260.4	5.0	11.0	53.1	1.5
Aug 2012 - Jul 2013	264.0	4.9	11.0	53.1	1.4
Sep 2012 - Aug 2013	255.8	4.8	11.0	53.1	1.4
Oct 2012 - Sep 2013	***248.0***	***4.8***	***11.0***	***53.1***	***1.3***
Nov 2012 - Oct 2013	228.9	4.7	11.0	53.1	1.3
Dec 2012 - Nov 2013	221.7	4.7	11.0	53.1	1.3
Jan 2013 - Dec 2013	227.5	4.6	11.0	53.1	1.3
Feb 2013 - Jan 2014	233.2	4.6	11.0	53.1	1.3
Mar 2013 - Feb 2014	245.1	4.5	11.0	53.1	0.0
Apr 2013 - Mar 2014	246.7	4.5	11.0	53.1	0.0
May 2013 - Apr 2014	246.6	4.5	11.0	53.1	0.0
Jun 2013 - May 2014	239.9	4.5	11.0	53.1	0.0
July 2013 - Jun 2014	215.9	4.6	11.0	53.1	1.3
Aug 2013 - Jul 2014	203.2	4.5	11.0	53.1	1.3
Sep 2013 - Aug 2014	203.8	4.5	11.0	53.1	1.3
Oct 2013 - Sep 2014	***196.5***	***4.3***	***11.0***	***53.1***	***1.3***

Notes:

- kac-ft = thousand acre feet.
- ppb = parts per billion. Values are actually in µg/L (micrograms per liter), which, for the purposes of this report, is equivalent to ppb.
- Compliance is evaluated annually based on the 12-month flow-weighted mean TP concentration for the federal water year ending on September 30. The compliance periods are shown as highlighted rows with bold, italicized text.

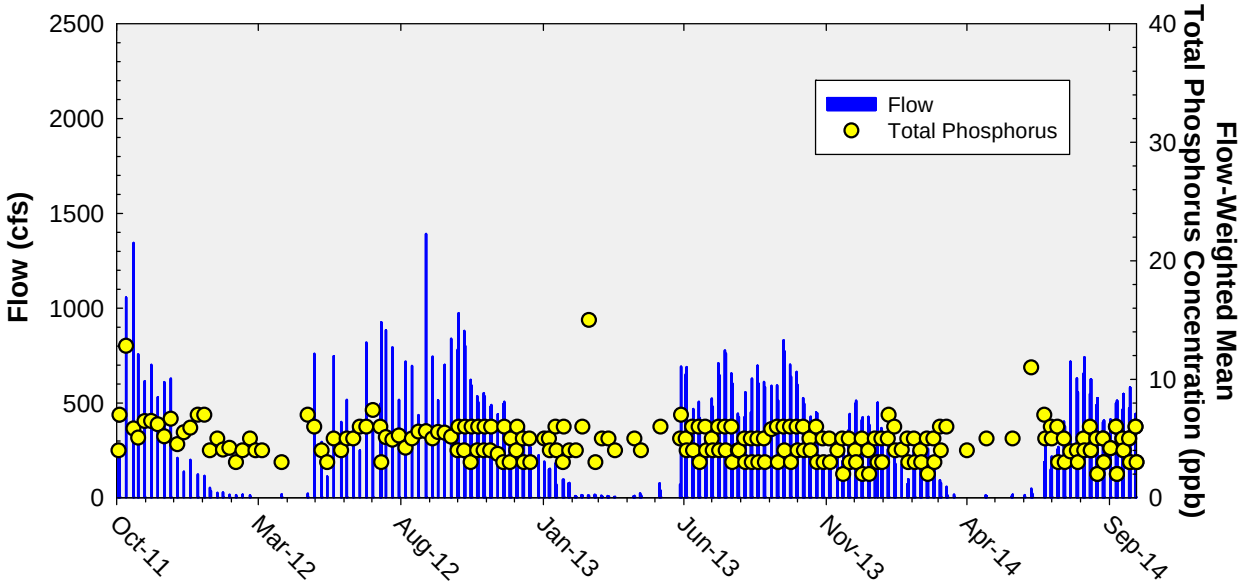

Figure 15. Flow from Taylor Slough and Coastal Basins structures (S332D and S18C) on the day of sampling, and the corresponding flow-weighted mean TP concentrations for individual sampling events.

APPENDIX A

MONTHLY TOTAL PHOSPHORUS CONCENTRATION DATA FOR THE ARTHUR R. MARSHALL LOXAHATCHEE NATIONAL WILDLIFE REFUGE

Total phosphorus concentration data used in this report can be directly retrieved from the South Florida Water Management District DBHYDRO database by copying and pasting the following link into the address field of a web browser:
http://www.sfwmd.gov/dbhydroplsql/water_quality_data.report_full?v_where_clause=where+station_id+like+('LOX%25')+and+station_id+not+like+('LOXA%25')+and+test_number+=+25+and+date_collected+>=+'01-JUL-2014'+and+date_collected+<+'01-OCT-2014'+and+sample_type_new+=+'SAMP'&v_target_code=file_csv

The link above only generates data that have not been qualified. Qualified water quality data must be retrieved interactively via the DBHYDRO Browser.

Stage data for stations 1-7, 1-8C, and 1-9 from the reporting quarter can be retrieved by copying and pasting the following link into the address field of a web browser:
http://www.sfwmd.gov/dbhydroplsql/web_io.report_process?v_period=uspec&v_start_date=20140701&v_end_date=20140930&v_report_type=format7&v_target_code=file_csv&v_run_mode=onLine&v_js_flag=Y&v_dbkey=FE775/FE776/FE777

Table A-1. Arthur Marshall Loxahatchee National Wildlife Refuge monthly total phosphorus data (parts per billion).

Month-Year	LOX3	LOX4	LOX5	LOX6	LOX7	LOX8	LOX9	LOX10	LOX11	LOX12	LOX13	LOX14	LOX15	LOX16
Oct-2011	---	11	---	6	5	8	6	10	7	8	---	7	7	8
Nov-2011	7	18	7	6	7	10	7	8	9	7	9	6	6	7
Dec-2011	7 (J)	10 (J)	6 (J)	5	7 (J)	9 (J)	8 (J)	8 (J)	7	6	8	6	5	7
Jan-2012	5	9	6	5	6	8	3	8	7	6	6	6	6	6
Feb-2012	---	10	9	5	9	10	9	11	7	6	6	7	5	7
Mar-2012	---	6	---	5	8	10	---	---	6	5	7	6	5	7
Apr-2012	---	11	---	5	10	13	---	---	8	8	7	7	6	9
May-2012	---	9	---	5	8	8	9	9	7	6	7	6	6	8
Jun-2012	10	9	9	6	9	10	10	7	7	6	7	5	5	6
Jul-2012	5	7	6	5	5	7	6	6	5	6	8	5	7	7
Aug-2012	5	6	7	4	5	5	6	6	5	7	---	4	6	6
Sep-2012	8	15	8	6	8	7	7	7	5	6	5	7	6	7
Oct-2012	5	7	7	8	9	6	9	8	8	9	8	8	8	8
Nov-2012	7	7	7	5	7	8	6	7	7	6	6	4	5	5
Dec-2012	6	6	8	6	8	7	8	8	6	7	6	5	8	6
Jan-2013	6	8	8	6	9	10	7	9	7	8	8	5	5	7
Feb-2013	---	8	10	4	9	8	9	8	6	6	6	5	5	6
Mar-2013	6	6	8	5	6	9	7	9	4	4	5	4	6	5
Apr-2013	---	7	---	7	7	11	9	---	6	7	6	6	6	6
May-2013	---	8	---	7	8	10	7	---	*	8	8	8	9	7
Jun-2013	---	9	---	6	8	8	9	12	5	8	5	10	7	10
Jul-2013	7	6	7	7	7	7	5	5	5	5	6	8	7	11
Aug-2013	7	5	5	5	5	8	5	6	6	6	7	3	7	9
Sep-2013	6	7	6	6	6	8	6	9	6	8	7	6	8	10
Oct-2013	5	10	4	6	5	8	7	6	6	7	8	9	6	8
Nov-2013	7	7	4	4	4	7	6	7	5	6	7	5	5	6
Dec-2013	---	5	4	3	5	4	3	7	4	5	5	5	4	5
Jan-2014	---	6	---	5	6	7	7	4	4	5	5	4	5	6
Feb-2014	11	12	9	4	6	9	9	7	6	8	8	6	6	7
Mar-2014	7	7	6	5	6	8	5	5	6	7	7	6	5	6
Apr-2014	---	6	6	3	7	9	7	---	7	5	7	6	5	7
May-2014	---	---	---	8	9	10	---	---	9	8	8	7	6	9
Jun-2014	---	---	---	---	---	---	---	---	7	8	7	6	6	6
Jul-2014	---	11	11	7	8	13	7	---	7	7	7	6	5	7
Aug-2014	8	14	8	7	7	8	7	6	6	7	7	7	6	8
Sep-2014	6	11	6	6	6	9	7	7	8	8	8	6	6	8

Notes:

--- indicates sample was not collected due to insufficient water depth. (J) indicates analyte detected in field blank and/or associated sample.

* LOX11 water quality sample for May 2013 was accidentally discarded during processing. The resampling guideline protocol was initiated to resample the station. However, due to weather conditions, resampling could not be accomplished within the 72-hour maximum time frame specified in the protocol.

APPENDIX B

WEEKLY GRAB TOTAL PHOSPHORUS CONCENTRATION DATA FOR SHARK RIVER SLOUGH

Total phosphorus concentration data used in this report can be directly retrieved from the South Florida Water Management District DBHYDRO database by copying and pasting the following link into the address field of a web browser:
http://www.sfwmd.gov/dbhydroplsql/water_quality_data.report_full?v_where_clause=where+station_id+in+('S12A','S12B','S12C','S12D','S333')+and+test_number+=+25+and+collect_method+=+'G'+and+date_collected+>=+'01-JUL-2014'+and+date_collected+<+'01-OCT-2014'+and+sample_type_new+=+'SAMP'&v_target_code=file_csv

The link only generates data that have not been flagged. Flagged water quality data must be retrieved interactively via the DBHYDRO Browser.

The "Preferred DBKEY" daily mean flow data used in this report for Water Year 2014 for stations at Shark River Slough (S12A, S12B, S12C, S12D, S333, and S334) can be retrieved by copying and pasting the following link into the address field of a web browser:
http://www.sfwmd.gov/dbhydroplsql/web_io.report_process?v_period=uspec&v_start_date=20131001&v_end_date=20140930&v_report_type=format7&v_target_code=file_csv&v_run_mode=onLine&v_js_flag=Y&v_dbkey=FE771/FE775/FE773/FE774/15042/FB752

Table B-1. Weekly grab total phosphorus concentration data for Shark River Slough (parts per billion).

Date	S12A	S12B	S12C	S12D	S333	Remarks
10/07/2013	4	4	6	7	7	Compliance data
10/14/2013	4	4	5	6	6	N/A
10/21/2013	5	4	6	6	6	Compliance data
10/28/2013	5	4	6	7	7	N/A
11/04/2013	8	8	6	8	8	Compliance data
11/12/2013	10	7	6	7	6	N/A
11/18/2013	11	7	5	7	7	Compliance data
11/25/2013	8	6	6	7	8	N/A
12/02/2013	7	5	4	6	6	Compliance data
12/09/2013	11	5	4	6	7	N/A
12/16/2013	6	---	---	8	7	Compliance data
12/23/2013	7	---	---	7	6	N/A
12/30/2013	8	---	---	*	8	Compliance data
01/06/2014	11	---	---	7	7	N/A
01/13/2014	9	---	---	---	8	Compliance data
01/21/2014	8	---	---	---	5	N/A
01/27/2014	12	---	---	---	7	Compliance data
02/03/2014	8	---	---	---	5	N/A
02/10/2014	12	---	---	---	10	Compliance data
02/17/2014	8	---	---	6	8	N/A
02/24/2014	9	---	---	8	8	Compliance data
03/03/2014	11	---	---	7	9	N/A
03/10/2014	12	---	---	7	10	Compliance data
03/17/2014	14	---	---	8	8	N/A
03/24/2014	17	---	---	9	10	Compliance data
03/31/2014	21	---	---	12	11	N/A
04/07/2014	23	---	---	---	12	Compliance data
04/14/2014	23	---	---	---	10	N/A
04/21/2014	24	---	---	---	11	Compliance data
04/28/2014	21	---	---	---	13	N/A
05/05/2014	31	---	---	---	14	Compliance data
05/12/2014	41	---	---	---	15	N/A
05/19/2014	40	---	---	---	18	Compliance data
05/27/2014	50	---	---	---	30	N/A
06/02/2014	65	---	---	---	38	Compliance data
06/09/2014	62	---	---	---	34	N/A
06/16/2014	48	---	---	---	37	Compliance data
06/23/2014	43	---	---	---	41	N/A
06/30/2014	44	---	19	35	37	Compliance data
07/07/2014	43	---	19	17	35	N/A
07/14/2014	36	---	12	17	40	Compliance data
07/21/2014	23	---	15	18	26	N/A
07/28/2014	22	---	17	15	22	Compliance data
08/04/2014	22	19	16	13	16	N/A
08/11/2014	22	17	13	13	12	Compliance data
08/18/2014	10	10	12	12	11	N/A
08/25/2014	7	6	7	10	16	Compliance data
09/02/2014	7	7	8	11	22	N/A
09/08/2014	8	7	8	9	10	Compliance data
09/15/2014	9	7	9	10	8	N/A
09/22/2014	7	7	8	10	7	Compliance data
09/29/2014	8	6	9	8	9	N/A

Notes:

--- indicates water sample was not collected because the spillway gates were closed at the time of the site visit.
"Compliance data" indicates bi-weekly sampling data used for consent decree calculation.
"N/A" indicates bi-weekly sampling data presented for informational purposes only and not used for consent decree calculation.
* Flow data indicated that there was flow at S12D on December 30, 2013. However, the gate was closed at the time of the site visit for the sampling.

APPENDIX C

WEEKLY GRAB TOTAL PHOSPHORUS CONCENTRATION DATA FOR TAYLOR SLOUGH AND COASTAL BASINS

Total phosphorus concentration data used in this report can be directly retrieved from the South Florida Water Management District DBHYDRO database by copying and pasting the following link into the address field of a web browser:
http://www.sfwmd.gov/dbhydroplsql/water_quality_data.report_full?v_where_clause=where+station_id+in+('S332DX','S18C',)+and+test_number+=+25+and+collect_method+=+'G'+and+date_collected+>=+'01-JUL-2014'+and+date_collected+<+'01-OCT-2014'+and+sample_type_new+=+'SAMP'&v_target_code=file_csv

The link only generates data that have not been flagged. Flagged water quality data must be retrieved interactively via the DBHYDRO Browser.

The "Preferred DBKEY" daily mean flow data for stations at Taylor Slough (S332D), and the Coastal Basins (S18C), during the reporting quarter can be retrieved by copying and pasting the following link into the address field of a web browser:
http://www.sfwmd.gov/dbhydroplsql/web_io.report_process?v_period=uspec&v_start_date=20140701&v_end_date=20140930&v_report_type=format7&v_target_code=file_csv&v_run_mode=onLine&v_js_flag=Y&v_dbkey=15760/TA413

Table C-1. Weekly grab total phosphorus concentration data for Taylor Slough and Coastal Basins (parts per billion).

Date	S332DX	S18C
10/01/2013	--	4
10/07/2013	6	--
10/08/2013	--	4
10/14/2013	5	--
10/15/2013	--	4
10/21/2013	6	--
10/22/2013	--	3
10/28/2013	5	--
10/29/2013	--	3
11/04/2013	5	--
11/05/2013	--	3
11/13/2013	4	4
11/18/2013	5	--
11/19/2013	--	2
11/25/2013	5	--
11/26/2013	--	3
12/02/2013	4	--
12/03/2013	--	3
12/09/2013	5	--
12/10/2013	--	2
12/16/2013	4	--
12/17/2013	--	2
12/23/2013	5	--
12/26/2013	--	3
12/30/2013	5	--
12/31/2013	--	3
01/06/2014	5	
01/07/2014	--	7
01/13/2014	6	--
01/14/2014	--	4
01/21/2014	5	3
01/27/2014	5	--
01/28/2014	--	3
02/03/2014	5	--
02/04/2014	--	3
02/10/2014	4	--
02/11/2014	--	3
02/17/2014	5	--
02/18/2014	--	2
02/24/2014	5	--
02/25/2014	--	3
03/03/2014	6	--
03/04/2014	--	4
03/10/2014	6	--
03/11/2014	--	3
03/17/2014	5	--
03/18/2014	--	4
03/24/2014	7	--
03/25/2014	--	4
03/31/2014	7	--
12/30/2013	5	--
12/31/2013	--	3

Date	S332DX	S18C
04/01/2014	--	4
04/07/2014	4	--
04/08/2014	--	4
04/14/2014	5	6
04/21/2014	6	--
04/22/2014	--	5
04/28/2014	6	--
04/29/2014	--	4
05/05/2014	8	--
05/06/2014	--	5
05/12/2014	8	--
05/13/2014	--	6
05/19/2014	13	--
05/20/2014	--	5
05/27/2014	14	7
06/02/2014	12	--
06/03/2014	--	8
06/09/2014	--	11
06/10/2014	18	--
06/16/2014	12	--
06/17/2014	--	7
06/23/2014	7	--
06/24/2014	--	5
06/30/2014	6	--
07/01/2014	--	5
07/07/2014	6	--
07/08/2014	--	3
07/14/2014	5	--
07/15/2014	--	3
07/21/2014	5	3
07/28/2014	4	--
07/29/2014	--	3
08/04/2014	5	--
08/05/2014	--	4
08/11/2014	6	--
08/12/2014	--	4
08/18/2014	5	--
08/19/2014	--	2
08/25/2014	5	--
08/26/2014	--	3
09/02/2014	6	3
09/08/2014	6	--
09/09/2014	--	2
09/15/2014	5	--
09/16/2014	--	4
09/22/2014	5	--
09/23/2014	--	3
09/29/2014	6	--
09/30/2014	--	3

Note: -- indicates water sample was not collected.

APPENDIX D

CALCULATION METHODS

Long Term Marsh Concentration Levels for Loxahatchee National Wildlife Refuge

Long Term Marsh Concentration Levels:

$$C = 10.7172 - 0.541156S + 1.372\sqrt{7.5819 - 0.9310S + 0.02902216\,S^2}$$

Terms:

C = the natural log of the geometric mean total phosphorus concentration across 14 marsh stations.

S = average stage measured at gauges CA1-9, CA1-7, and CA1-8C on sampling date (feet).

This equation is applicable over a stage range of 15.42 to 17.14 feet. If the stage on any sampling date exceeds 17.14 feet, a stage of 17.14 feet should be used in calculating the long term concentration levels. The equation shall not apply to dates when the average stage is less than 15.42 feet.

(*1991 Settlement Agreement entered as a Consent Decree in 1992 and modified in 1995, Exhibit B, Appendix B, Attachment II, page B-7*)

Discharge Limits and OFW Standards for Shark River Slough

Interim Discharge Limit:

$$C = 11.16 - 0.00465Q + 1.397\sqrt{6.377 - 0.00591Q + 0.00000436Q^2}$$

Long-Term Discharge Limit & OFW Standard:

$$C = 11.38 - 0.00538Q + 1.397\sqrt{2.493 - 0.00231Q + 0.00000170Q^2}$$

Frequency Exceedance:

$$F = 48.411 - 0.02896Q + 1.397\sqrt{330.1 - 0.3071Q + 0.0002254Q^2}$$

Terms:

Water Year = October through September

Q = total inflow to Shark River Slough for water year, S-12s + S-333 + any additional inflow from the WCAs established in the future, thousand acre-ft/yr (Kac-ft/yr).

C = limit on maximum flow-weighted-mean inflow concentration for any Water Year, composite of all inflows to Shark Slough (ppb).

F = exceedance for maximum frequency (percent) of inflow concentrations exceeding 10 ppb, computed from the time series of concentrations composited across all inflow structures on each sampling date with positive flow in a given Water Year.

The range of flow (Q) used in deriving the limits is 117 to 1061 Kac-ft/yr. If the total flow for any water year exceeds 1061 Kac-ft/yr, a flow of 1061 Kac-ft/yr should be used in calculating the discharge limits.

(*1991 Settlement Agreement entered as a Consent Decree in 1992 and modified in 1995, Exhibit B, Appendix A, Attachment I, page A-5*)

Note: TOC members agreed to modify the inflow structures used to determine the phosphorus limits for the inflows to Shark River Slough in March 16, 1999, and May 25, 1999, meetings. The combined flows and loads of the S-12s shall be added to the flows and loads of S-333, S355A and B minus the flow and load discharged from S-334 to determine the Shark River Slough limits.

Discharge Limits and OFW Standards for Taylor Slough and Coastal Basins

Long-Term Flow-Weighted Discharge Limit & OFW Standard = 11.0 ppb

Frequency Exceedance:

Frequency of values > 10 ppb must be less than 53.1%.

Terms:

Limits are defined on a Water Year basis, October through September.

Basin flow is the total flow through structures S-332, S-175, S-18C, plus any new release points from this basin established in the future, thousand acre-ft/yr (Kac-ft/yr).

Limits apply to the flow-weighted-mean concentration for any Water Year, composite of all inflows to Taylor Slough (S-332) and Coastal Basin (S-18C).

Frequency exceedance is the exceedance for maximum frequency (percent) of inflow concentrations exceeding 10 ppb, computed from the time series of concentrations composited across all inflow structures on each sampling date with positive flow in a given Water Year.

(*1991 Settlement Agreement entered as a Consent Decree in 1992 and modified in 1995, Exhibit B, Appendix A, Attachment II, page A-6*)

APPENDIX E

DOCUMENT REVISIONS

Table E-1. Revisions to this report since initial publication.

Page/Date	Original	Revision
April 10, 2015		
Cover	The Shark River Slough compliance results are published annually in this report when the final approved flow data for a federal water year are available. The October 1, 2013 – September 30, 2014 water year will be published at that time.	This report is revised from the earlier versions to include the Shark River Slough compliance results using the final approved flow data for the federal Water Year 2014 (October 1, 2013 – September 30, 2014).
Table of Contents		*(Table of Contents was revised to reflect the revisions of the Shark River Slough Section and the addition of Table 3, and Figures 5, 6, 7, 8, 9 and 10.)*
Page 1 Executive Summary	• **Shark River Slough:** The 12-month flow weighted mean TP concentration (annual compliance result) will be published at a later date when the final approved flow data is available for the current federal water year (October 1, 2013 – September 30, 2014).	• **Shark River Slough**: The 12-month flow-weighted mean TP concentration was above the 12-month long-term limit during the federal Water Year 2014 (October 1, 2013 – September 30, 2014).
Page 1 Table 1 Everglades National Park – Shark River Slough	The quarterly flow and TP data for this table is posted separately on the TOC website. The annual compliance result will be published in this report for the 12-month flow-weighted mean TP concentration for the federal water year ending on September 30 when the final approved flow data is available.	(*The 12-moving compliance values for the quarter calculated using the final approved flow data were presented*.)
Page 1 Table 1 Notes		*(Following footnote was added.)* Compliance for inflows to Everglades National Park (Shark River Slough, Taylor Slough and Coastal Basins) is evaluated annually based on the 12-month flow-weighted mean TP concentration for the federal water year ending on September 30.
Page 7 Everglades National Park Shark River Slough Background	The 12-month flow weighted mean TP concentration (annual compliance result) will be published at a later date when the final approved flow data are available for the current federal water year, WY 2014 (October 1, 2013 – September 30, 2014).	The 12-month flow-weighted mean TP concentration (10.8 ppb) was above the long-term limit (9.7 ppb) for WY 2014 ending on September 30, 2014.

Page 7-15 Everglades National Park Shark River Slough Reporting Period Updates		(*The entire section was updated to present the third quarter 2014, inclusive of WY2014 compliance values, calculated using the approved final flow data. Table 3, and Figures 5, 6, 7, 8, 9 and 10 were added.)*
Page B-1 Appendix B		*(DBKEYS and a URL to retrieve the flow data used in this report for Water Year 2013 for stations at Shark River Slough, S12A, S12B, S12C, S12D, S333, and S334 were provided.)*
Page B-1 Table B-1 Notes	The provisional flow data indicated that there was flow at S12D on December 30, 2013.	Flow data indicated that there was flow at S12D on December 30, 2013.
Page D-3 Note	(none)	Note: TOC members agreed to modify the inflow structures used to determine the phosphorus limits for the inflows to Shark River Slough in March 16, 1999, and May 25, 1999, meetings. The combined flows and loads of the S-12s shall be added to the flows and loads of S-333, S355A and B minus the flow and load discharged from S-334 to determine the Shark River Slough limits.
Cover		April 10, 2015
Page 7, 14, B-2	April 9, 2015	Font color changed to black.
Page E-2	Font color blue. April xx, 2015.	April 10, 2015.
Cover		April 14, 2016 This report was revised on April 14, 2016, to include the TOC consensus about Shark River Slough.
Page 7, 10, 11	This report was revised on April 10, 2015, from an earlier versions to include the Shark River Slough compliance results using the final approved flow data for the federal Water Year 2014 (October 1, 2013 – September 30, 2014).	At the October 27, 2015, meeting, TOC Representatives reached consensus that no remedies in addition to those currently planned and/or underway are necessary to address the WY 2014 exceedance.