Settlement Agreement Report

Third Quarter
July - September 2015

Prepared for the
Technical Oversight Committee

January 22, 2016

Shark River Slough compliance results are published annually in this report when the final approved flow data for a federal water year (WY) are available. The WY 2015 (October 1, 2014 – September 30, 2015) results will be published at that time.

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PURPOSE

The South Florida Water Management District has prepared this report to provide a quarterly update to the Everglades 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	Everglades 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 2015 (July - September 2015). Total phosphorus (TP) compliance highlights for this period are summarized below for the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) and inflows to Everglades National Park (ENP) (**Table 1** and **Figure 1**):

- **Refuge:** The long-term level was not applicable for July 2015 because the sampling day average stage was below 15.42 feet NGVD 29. The geometric mean TP concentrations were below the long-term levels for August and September 2015.
- **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 are available for the current federal water year (WY), WY 2015 (October 1, 2014 – September 30, 2015).
- **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 2015.

Table 1. TP compliance, third quarter 2015.

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 2015	18.0	NA	15.19	2
Aug 2015	12.3	14.1	15.78	8
Sep 2015	10.9	11.1	16.23	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 2015					
Aug 2015					
Sep 2015					
Everglades National Park – Taylor Slough and Coastal Basins					
Jul 2015	154.4	4.4	11.0	53.1	0.0
Aug 2015	124.1	4.5	11.0	53.1	0.0
Sep 2015	117.8	4.5	11.0	53.1	0.0

The quarterly flow and TP data for this table are posted separately on the TOC website. The annual compliance result for the 12-month flow-weighted mean TP concentration for the federal water year ending on September 30 will be published in this report when the final approved flow data are available.

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.

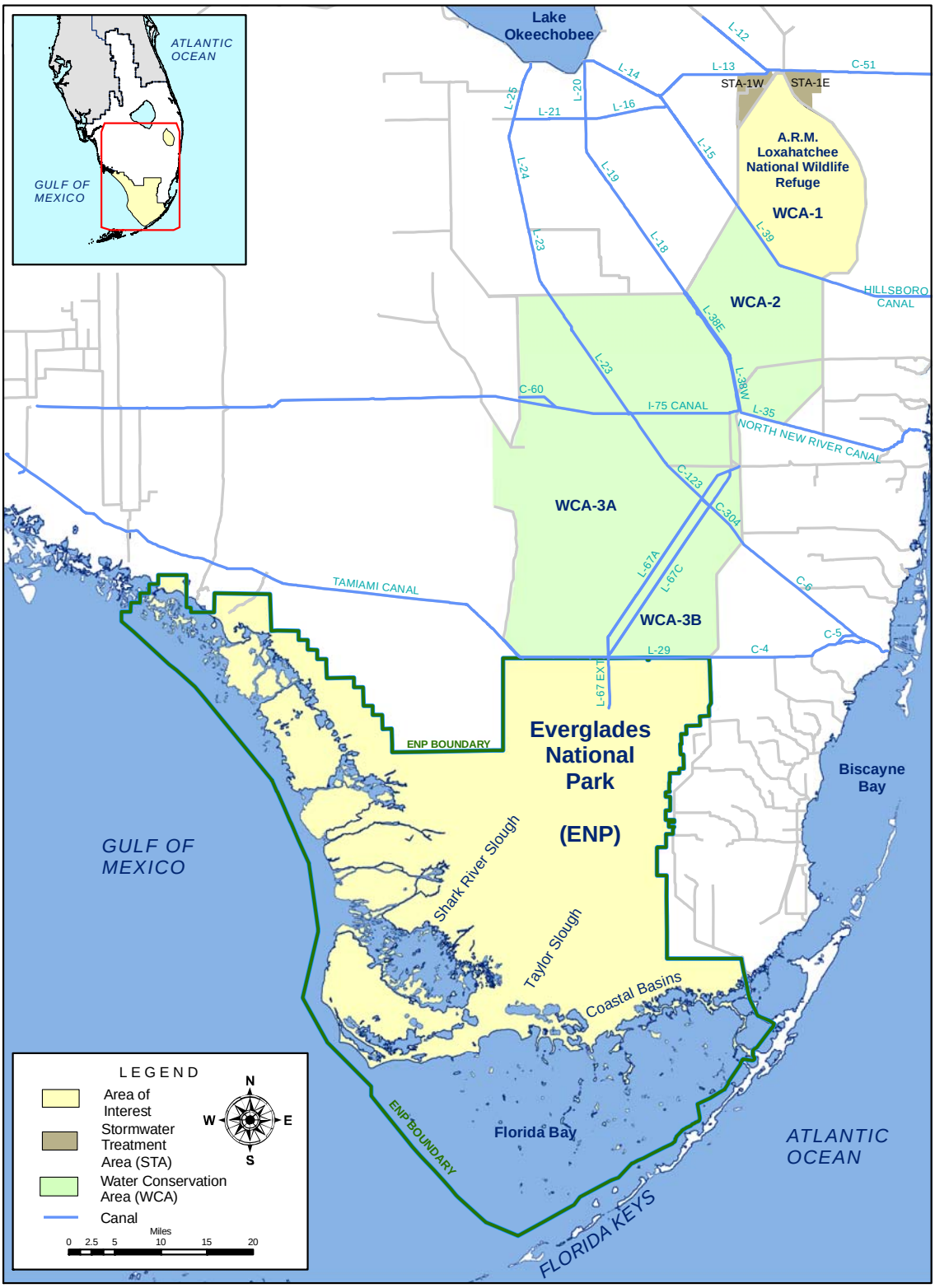

Figure 1. Areas of interest.

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 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

TP samples were collected at 2 stations in July, 8 stations in August, and 14 stations in September 2015. The July sampling trip for the northern zone of the Refuge (LOX3 to LOX5, LOX7, LOX9, and LOX10), which was scheduled on July 6, 2015, was suspended due to low stage, following the guidance for suspending marsh sampling[1, 2]. A sampling trip for the zone is not required if the average stage of the Refuge (1-7, 1-8C, and 1-9) is less than 15.30 feet NGVD 29. The average stage on that day was 15.13 feet NGVD 29. TP samples were collected only at two stations (LOX12 and LOX14) because the water depth was less than 0.1 meters at other stations during the subsequent sampling trips for the lower zones of the Refuge (LOX6, LOX8, and LOX11 to LOX16). TP samples were not collected at LOX3, LOX5, LOX6, LOX9, LOX10, and LOX13 stations in August because the water depth was less than 0.1 meters at those stations. All 14 stations were sampled in September.

Sampling day average stages in the Refuge were 15.19, 15.78, and 16.23 feet NGVD 29 in July, August, and September 2015, respectively (**Figure 3** and **Table 2**). The geometric means, calculated from TP concentrations measured in water samples collected in July, August, and September 2015 were 18.0, 12.3, and 10.9 parts per billion (ppb), respectively. The long-term level was not applicable in July 2015 because the sampling day average stage was below 15.42 feet NGVD 29. The geometric mean TP concentrations were below the long-term level for August and September 2015.

[1] Technical Workshop: Suspending Marsh Monitoring Based on Stage Data, Presentation to TOC at the May 18, 2010, quarterly meeting, Pete Rawlik, South Florida Water Management District.
[2] Monitoring Issues, An Update for the TOC, Presentation to the TOC at the September 14, 2011, quarterly meeting, Pete Rawlik, South Florida Water Management District.

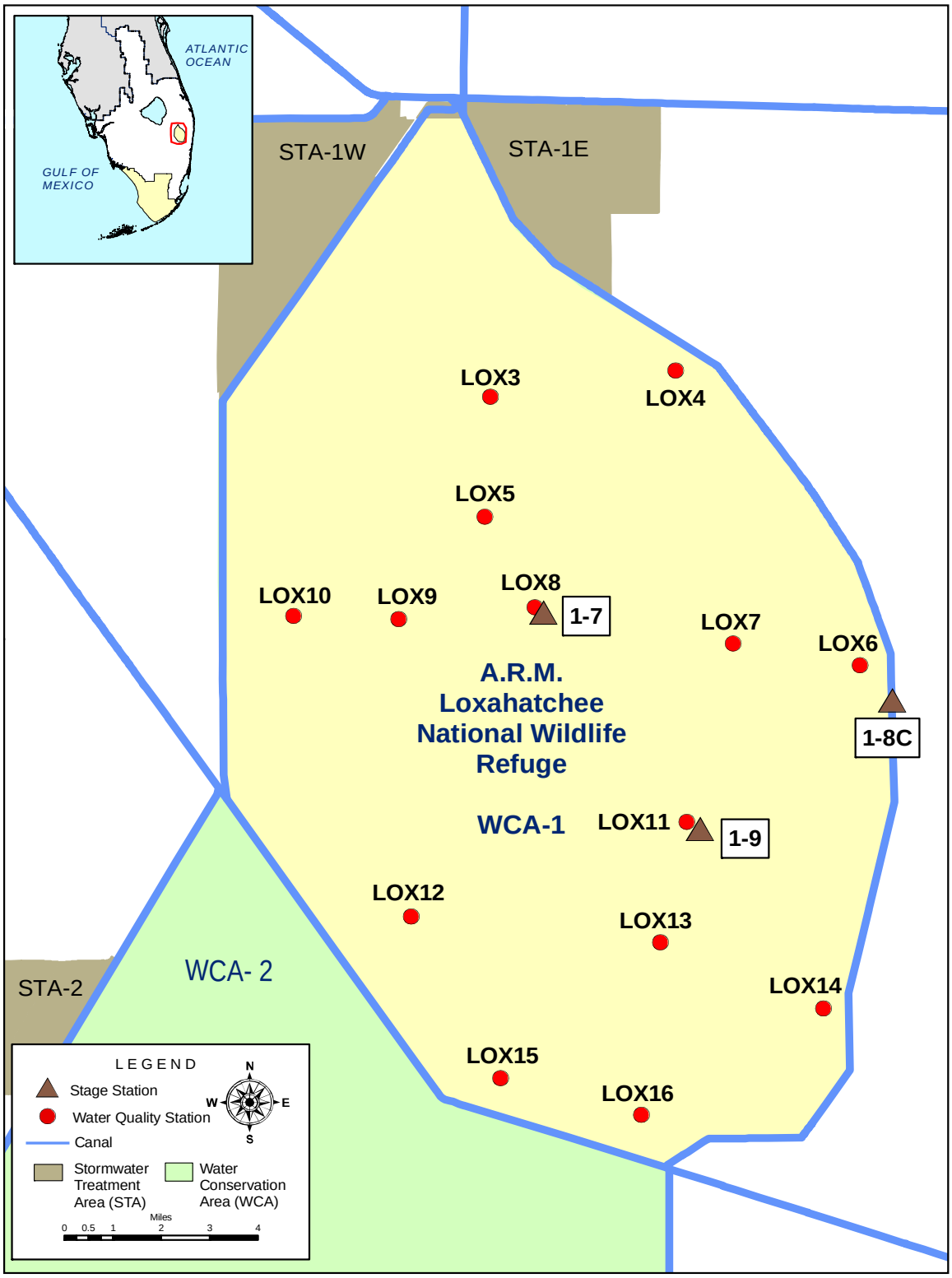

Figure 2. Refuge water quality sampling and stage measurement stations.

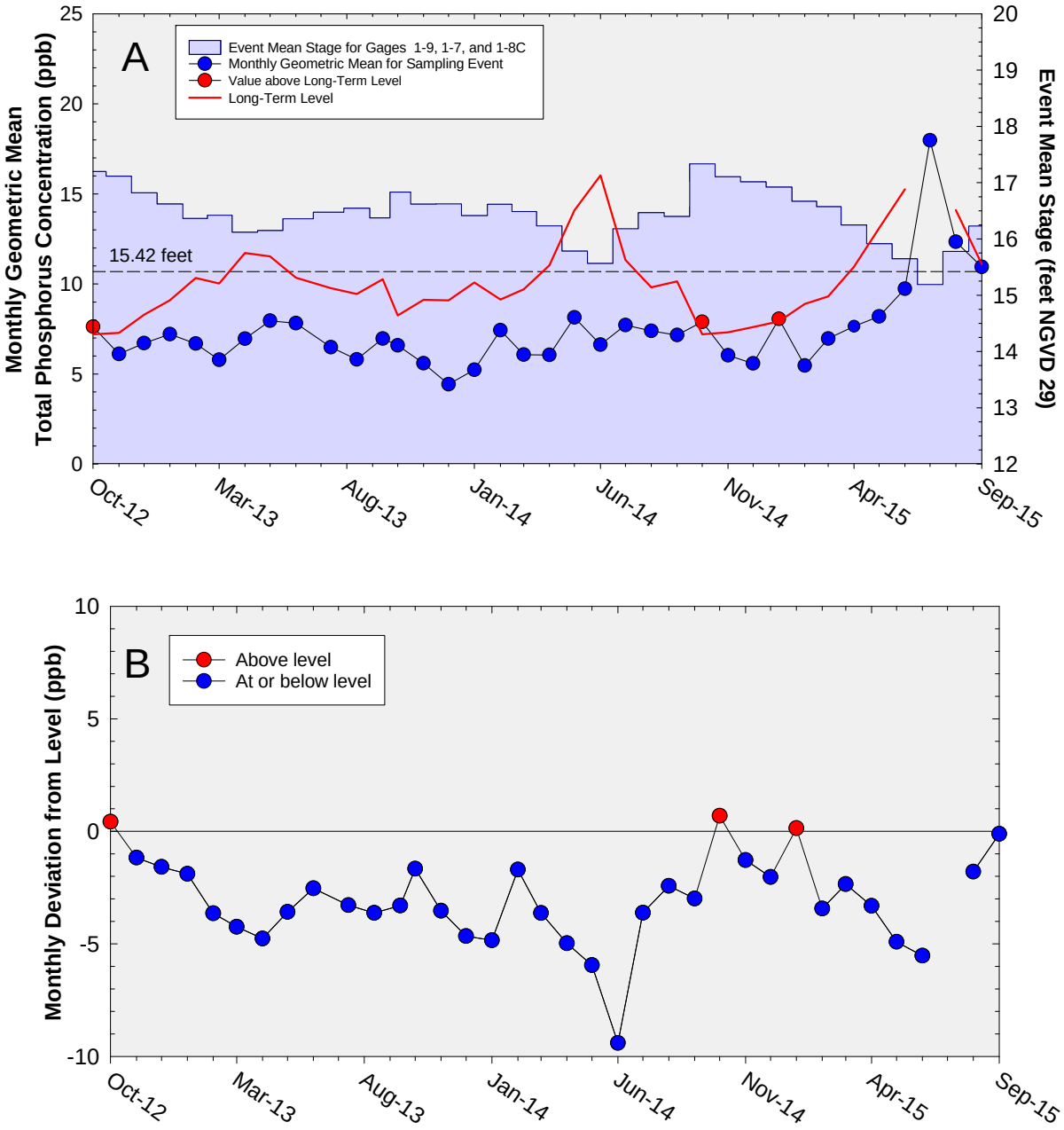

Figure 3. (A) Monthly TP geometric mean concentrations for the Refuge compared to calculated long-term levels, which are adjusted for fluctuations in stage. The geometric mean TP concentrations were above the long-term level in October 2012, October 2014, and January 2015. The long-term level was not applicable for July 2015 because the average stage was less than 15.42 feet. **(B)** Deviation of monthly geometric mean TP concentrations from calculated long-term levels. Negative values indicate that the geometric mean was lower than the long-term level.
The TOC reached a consensus at the October 27, 2015, quarterly meeting on a recommendation that no additional remedies are needed at this time to address the two Refuge excursions that occurred in October 2014 and January 2015.

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-2012	***7.6[b]***	***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[c]	16.83[c]	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
Oct-2014	***7.9[b]***	***7.2***	***17.34***	***14***
Nov-2014	6.0	7.3	17.10	14
Dec-2014	5.6	7.6	17.01	14
Jan-2015	***8.1[b]***	***7.9***	***16.92***	***14***
Feb-2015	5.5	8.9	16.67	14
Mar-2015	7.0	9.3	16.57	14
Apr-2015	7.6	11.0	16.25	12
May-2015	8.2	13.1	15.91	10
Jun-2015	9.7	15.3	15.65	5
Jul-2015	18.0	NA	15.19	2
Aug-2015	12.3	14.1	15.78	8
Sep-2015	10.9	11.1	16.23	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.

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

[b] The geometric mean was greater than the long-term level.

[c] 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 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 (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 2015 (October 1, 2014 – September 30, 2015).

Reporting Period Update

Pursuant to agreement among all Everglades Technical Oversight Committee (TOC) members at the May 14, 2013, TOC meeting, the following three changes are made to the quarterly Settlement Agreement Report: 1) publishing of the quarterly 12-month flow-weighted mean TP concentrations for Shark River Slough is discontinued, 2) provisional quarterly 12-month flow-weighted mean TP concentrations are posted separately to the TOC website, http://www.sfwmd.gov/toc, and 3) the annual 12-month flow-weighted mean TP concentration for the current water year ending on September 30 will be published once the final approved flow data for the S12A, S12B, S12C, and S12D structures becomes available. These changes have been implemented beginning with the January – March 2013 first quarter report.

The current water year began on October 1, 2014, and ended on September 30, 2015. It is anticipated that the final approved flow data for the water year will be available in April 2016, and the annual 12-month flow-weighted mean TP concentration to determine compliance with the long-term limit will be published as a revision to the July – September 2015 third quarter report.

In addition to the provisional quarterly 12-month flow-weighted mean TP concentrations that are posted separately to the TOC website, the water quality data for Shark River Slough are available in **Appendix B** of this report.

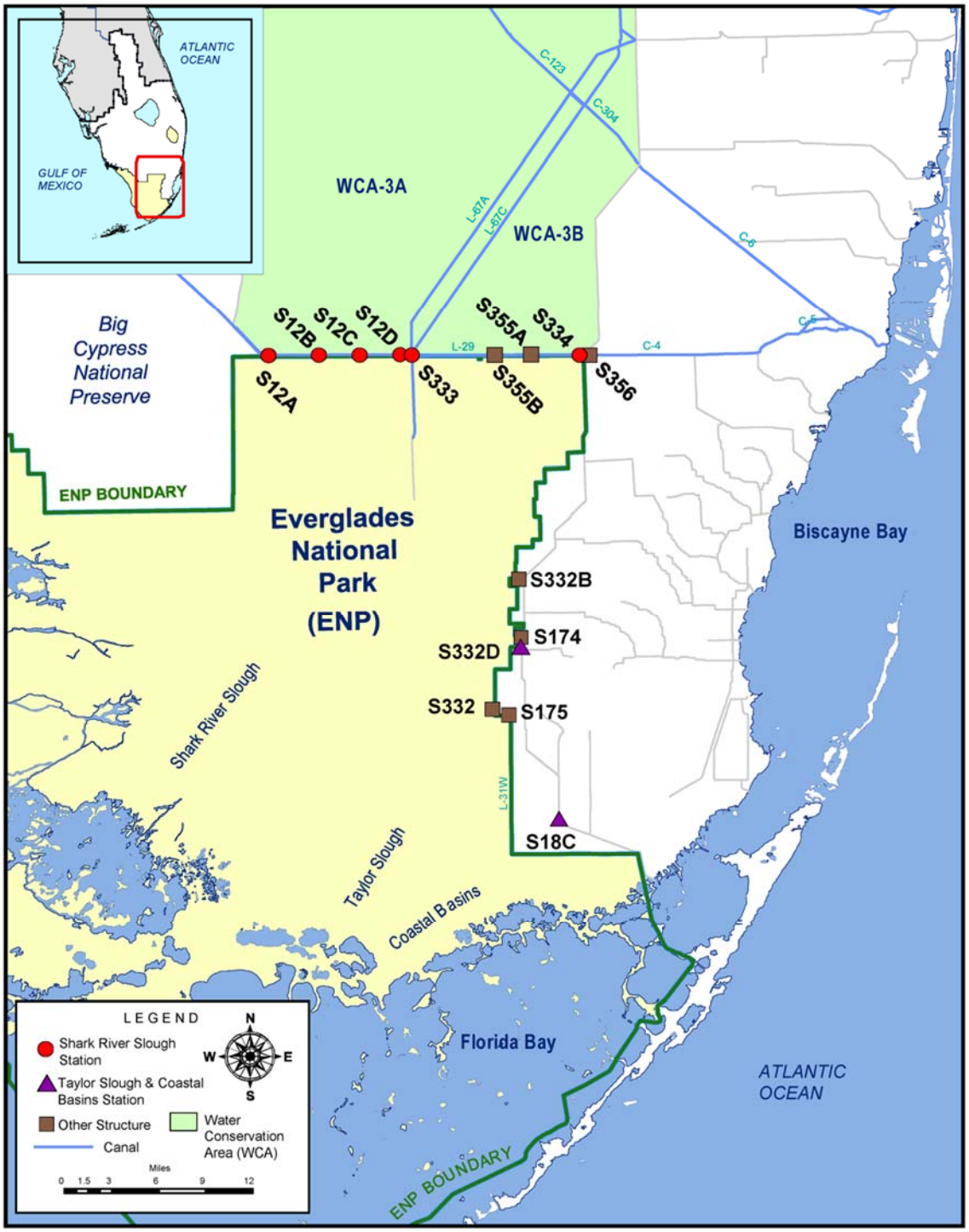

Figure 4. ENP flow structures.

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 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 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 2014 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 (4.5 ppb) was lower than the long-term limit (11.0 ppb) for the 12-month period ending on September 30, 2015. Therefore, inflows to Taylor Slough and Coastal Basins met the TP limit for WY 2015 (October 1, 2014 – September 30, 2015).

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 2015 were 4.4, 4.5, and 4.5 ppb, respectively (**Table 3**).

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 2015, there was no sampling event TP concentration greater than 10 ppb.

Figure 9 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 sampling event flow-weighted mean TP concentrations was 4.5 ppb in the third quarter, while it was also 4.5 ppb in the water year.

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.

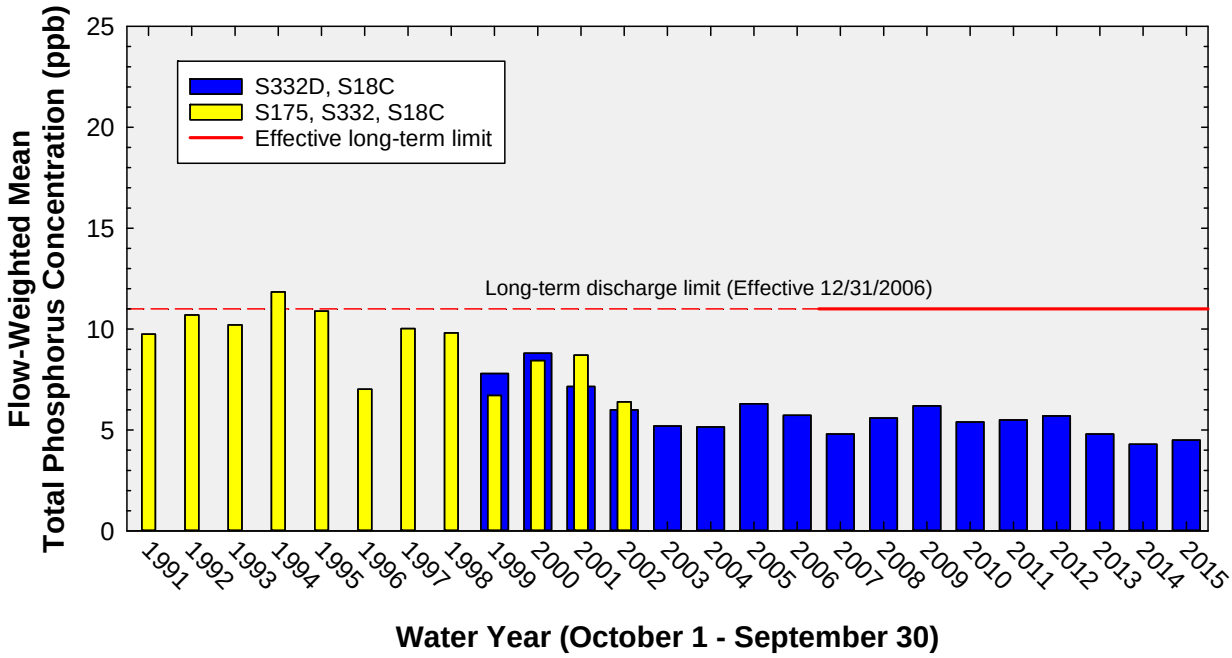

Figure 5. The 12-month flow-weighted mean TP concentrations in inflows to ENP through Taylor Slough and Coastal Basins at the end of each water year compared to the 11 ppb long-term TP limit. Blue bars show S332D, S174, and S18C for WY 2002 through WY 2007 and S332D and S18C from WY 2008.

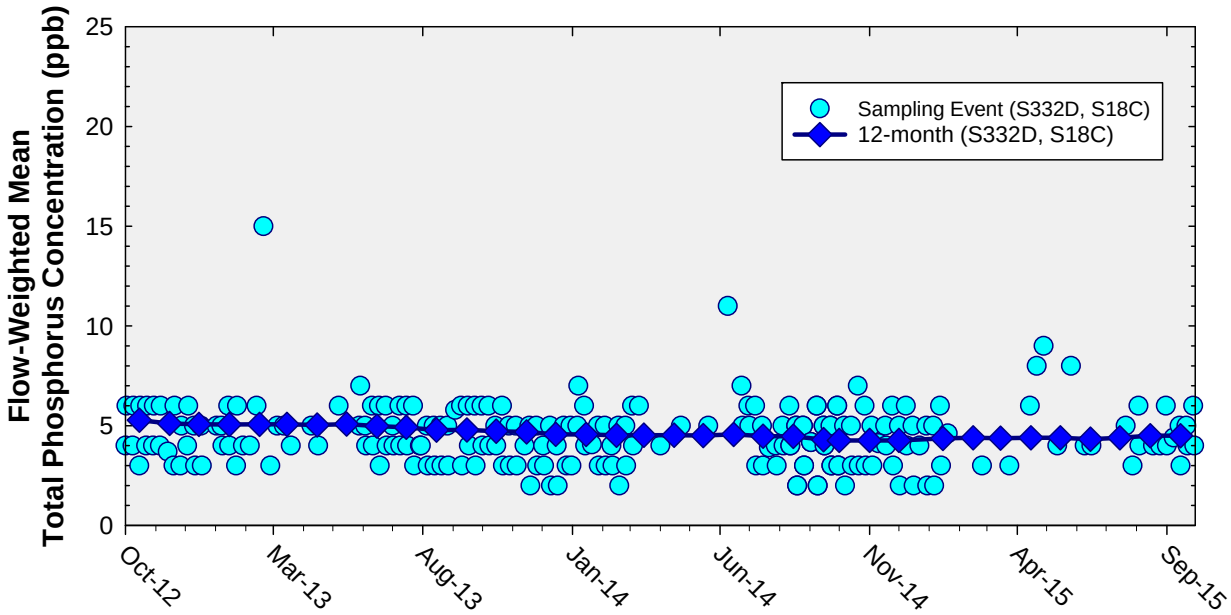

Figure 6. The 12-month flow-weighted mean TP concentrations in inflows to ENP through Taylor Slough and Coastal Basins at the end of each month and the flow-weighted mean TP concentration for each sampling event.

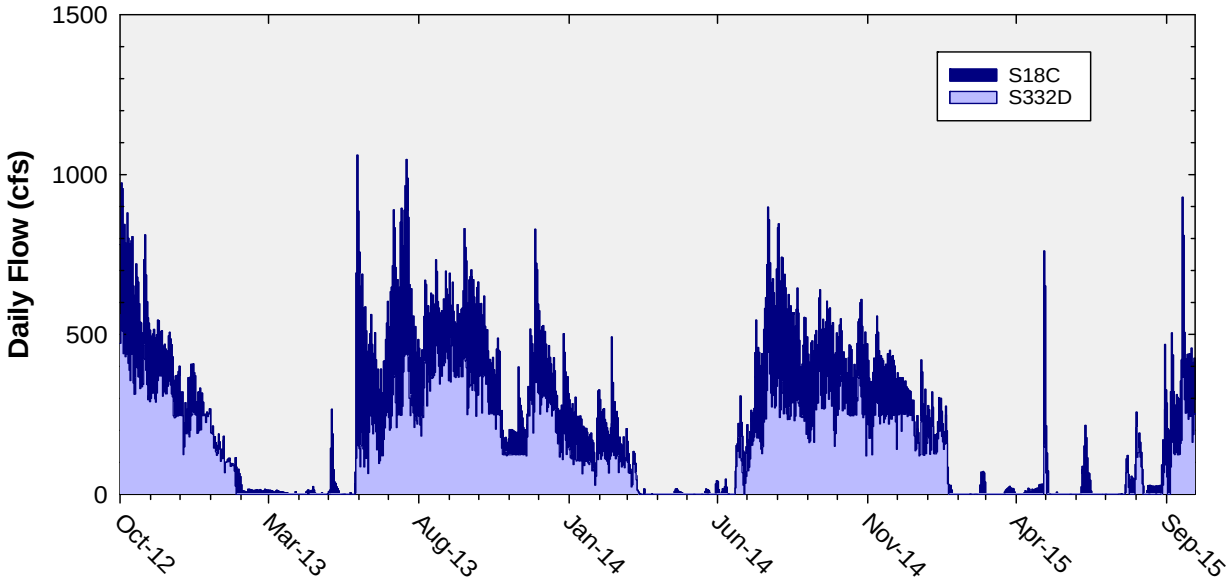

Figure 7. Daily flows measured in cubic feet per second (cfs) into ENP as a stacked sum of Taylor Slough (structure S332D) and Coastal Basins (structure S18C).

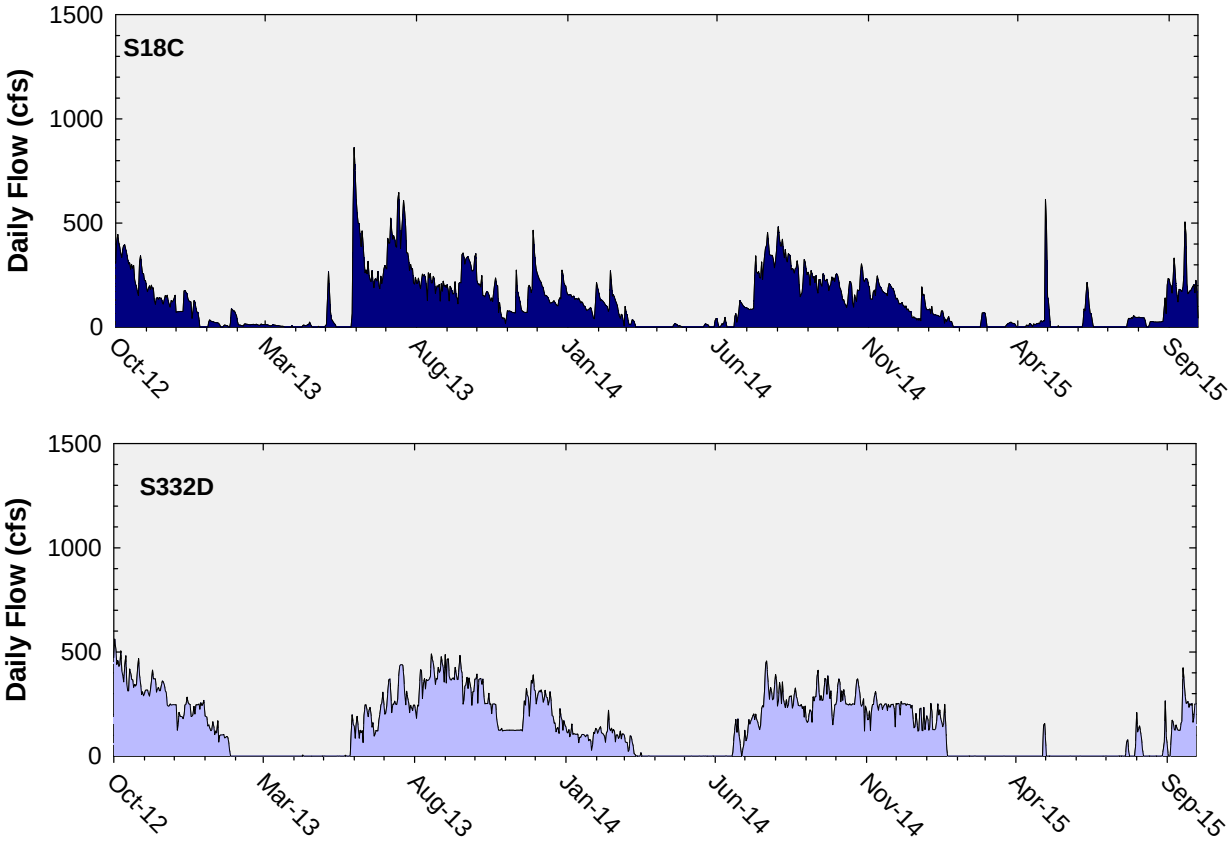

Figure 8. Daily flows at individual Coastal Basins (S18C) and Taylor Slough (S332D) structures into ENP.

Table 3. 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 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***
Nov 2013 - Oct 2014	200.6	4.2	11.0	53.1	1.3
Dec 2013 - Nov 2014	204.9	4.3	11.0	53.1	1.3
Jan 2014 - Dec 2014	198.6	4.4	11.0	53.1	1.4
Feb 2014 - Jan 2015	194.8	4.4	11.0	53.1	1.5
Mar 2014 - Feb 2015	183.0	4.4	11.0	53.1	1.6
Apr 2014 - Mar 2015	181.4	4.4	11.0	53.1	1.6
May 2014 - Apr 2015	184.6	4.4	11.0	53.1	1.6
Jun 2014 - May 2015	185.2	4.4	11.0	53.1	1.5
Jul 2014 - Jun 2015	182.9	4.3	11.0	53.1	0.0
Aug 2014 - Jul 2015	154.4	4.4	11.0	53.1	0.0
Sep 2014 - Aug 2015	124.1	4.5	11.0	53.1	0.0
Oct 2014 - Sep 2015	***117.8***	***4.5***	***11.0***	***53.1***	***0.0***

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.

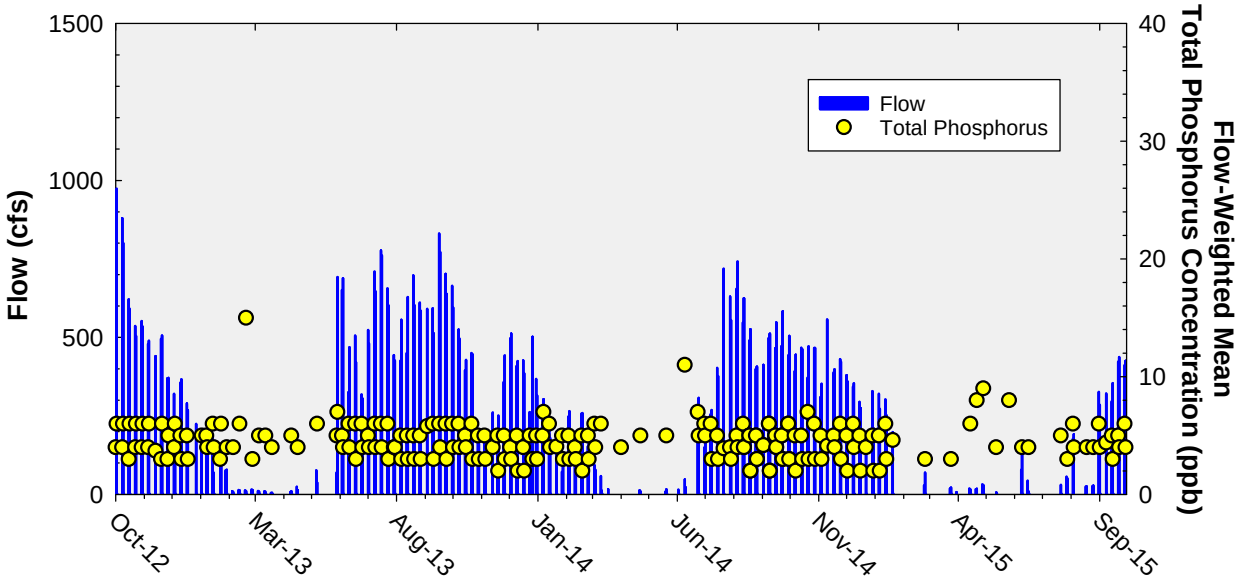

Figure 9. Flow from Taylor Slough and Coastal Basins structures (S332D and S18C) on the day of sampling, and the corresponding flow-weighted mean TP concentrations for individual sampling events.

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-2015'+and+date_collected+<+'01-OCT-2015%'+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=20150701&v_end_date=20150930&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-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
Oct-2014	8	12	7	6	13	11	8	6	7	8	6	7	7	8
Nov-2014	6	7	7	5	7	8	8	6	5	4	5	6	6	6
Dec-2014	6	7	6	4	7	7	8	6	4	5	6	5	4	5
Jan-2015	9	9	10	6	9	9	9	7	9	8	7	7	7	8
Feb-2015	10	6	9	4	6	9	6	4	5	5	4	5	3	5
Mar-2015	11	9	10	6	7	7	9	4	6	7	6	6	5	8
Apr-2015	---	7	12	6	8	12	10	---	6	7	7	8	5	7
May-2015	---	10	---	11	7	12	---	---	7	7	9	7	6	8
Jun-2015	---	---	---	---	---	---	---	---	---	11	9	14	7	9
Jul-2015	++	++	++	---	++	---	++	++	---	19	---	17	---	---
Aug-2015	---	18	---	---	9	14	---	---	15	12	---	15	8	11
Sep-2015	13	23	9	16	9	10	10	15	9	12	10	9	7	9

Notes:

--- indicates sample was not collected due to insufficient water depth.

++ indicates the sampling trip was suspended due to low stage, following the guidance for suspending marsh sampling. (See page 3 for detail.)

* 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-2015'+and+date_collected+<+'01-OCT-2015'+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 provisional daily mean flow data for stations S12A, S12B, S12C, S12D, and the "Preferred DBKEY" daily mean flow data for stations S333, and S334, 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=20150701&v_end_date=20150930&v_report_type=format7&v_target_code=file_csv&v_run_mode=onLine&v_js_flag=Y&v_dbkey= 03620/03626/03632/03638/15042/FB752

The "Preferred DBKEY" daily mean flow data for S12A, S12B, S12C, and S12D structures will be available for retrieval upon completion of the final approved flow data (expected April 2016).

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

Date	S12A	S12B	S12C	S12D	S333	Remarks
10/06/2014	7	6	8	10	9	Compliance data
10/13/2014	5	7	7	8	8	N/A
10/20/2014	7	6	8	9	7	Compliance data
10/27/2014	6	6	7	8	8	N/A
11/03/2014	9	6	7	8	8	Compliance data
11/10/2014	14	8	6	9	8	N/A
11/17/2014	12	---	7	*	7	Compliance data
11/24/2014	8	---	---	7	7	N/A
12/01/2014	8	---	---	6	6	Compliance data
12/08/2014	8	9	7	7	7	N/A
12/15/2014	9	---	---	7	7	Compliance data
12/22/2014	7	---	---	---	8	N/A
12/29/2014	13	---	---	---	10	Compliance data
01/05/2015	14	---	---	---	10	N/A
01/12/2015	10	---	---	10	10	Compliance data
01/20/2015	16	---	---	9	11	N/A
01/26/2015	11	---	---	7	---	Compliance data
02/02/2015	8	---	---	8	---	N/A
02/09/2015	9	---	---	9	---	Compliance data
02/16/2015	8	---	---	8	---	N/A
02/23/2015	7	---	---	7	---	Compliance data
03/02/2015	9	---	---	11	---	N/A
03/09/2015	12	---	---	11	11	Compliance data
03/16/2015	15	---	---	---	11	N/A
03/23/2015	17	---	---	---	10	Compliance data
03/30/2015	12	---	---	---	12	N/A
04/06/2015	15	---	---	---	11	Compliance data
04/13/2015	20	---	---	---	10	N/A
04/20/2015	24	---	---	---	11	Compliance data
04/27/2015	21	---	---	---	10	N/A
05/04/2015	19	---	---	---	14	Compliance data
05/11/2015	23	---	---	---	12	N/A
05/18/2015	20	---	---	---	27	Compliance data
05/26/2015	30	---	---	---	11	N/A
06/01/2015	23	---	---	---	13	Compliance data
06/08/2015	34	---	---	---	19	N/A
06/15/2015	26	---	---	---	9	Compliance data
06/22/2015	37	---	---	---	12	N/A
06/29/2015	39	---	---	---	13	Compliance data
07/06/2015	30	---	---	---	15	N/A
07/13/2015	36	---	---	---	15	Compliance data
07/20/2015	45	---	---	---	18	N/A
07/27/2015	36	---	---	---	15	Compliance data
08/03/2015	31	---	---	---	15	N/A
08/10/2015	21	---	---	---	15	Compliance data
08/17/2015	15	---	---	---	15	N/A
08/24/2015	17	---	---	---	15	Compliance data
08/31/2015	18	---	---	---	12	N/A
09/08/2015	17	---	---	---	13	Compliance data
09/14/2015	13	---	---	---	14	N/A
09/21/2015	11	---	---	---	13	Compliance data
09/28/2015	14	---	---	---	11	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.
* The provisional flow data indicated that there was flow at S12D on November 17, 2014. 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-2015'+and+date_collected+<+'01-OCT-2015'+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=20150701&v_end_date=20150930&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 (parts per billion) for Taylor Slough and Coastal Basins.

Date	S332DX	S18C
10/06/2014	5	--
10/07/2014	--	2
10/13/2014	5	--
10/14/2014	--	3
10/20/2014	7	--
10/21/2014	--	3
10/27/2014	6	--
10/28/2014	--	3
11/03/2014	5	--
11/04/2014	--	3
11/10/2014	5	3
11/17/2014	5	--
11/18/2014	--	4
11/24/2014	6	--
11/25/2014	--	3
12/01/2014	5	--
12/02/2014	--	2
12/08/2014	6	--
12/09/2014	--	4
12/15/2014	5	--
12/16/2014	--	2
12/22/2014	4	--
12/13/2014	--	**G**
12/29/2014	5	--
12/30/2014	--	2
01/05/2015	5	--
01/06/2015	--	2
01/12/2015	6	--
01/13/2015	--	3
01/20/2015	5	3
01/26/2015	5	--
01/27/2015	--	3
02/02/2015	5	--
02/03/2015	--	2
02/09/2015	7	--
02/10/2015	--	2
02/16/2015	6	--
02/17/2015	--	3
02/23/2015	5	--
02/24/2015	--	3
03/02/2015	5	--
03/03/2015	--	4
03/09/2015	8	--
03/10/2015	--	3
03/16/2015	8	--
03/17/2015	--	4
03/23/2015	10	--
03/24/2015	--	3
03/30/2015	9	--
03/31/2015	--	7

Date	S332DX	S18C
04/06/2015	10	---
04/07/2015	---	12
04/13/2015	9	---
04/14/2015	---	6
04/20/2015	12	---
04/21/2015	---	8
04/27/2015	10	---
04/28/2015	---	9
05/04/2015	8	---
05/05/2015	---	7
05/11/2015	6	---
05/12/2015	---	4
05/18/2015	8	---
05/19/2015	---	5
05/26/2015	8	---
05/27/2015	---	5
06/01/2015	10	---
06/02/2015	---	3
06/08/2015	16	---
06/09/2015	---	4
06/15/2015	9	---
06/16/2015	---	4
06/22/2015	8	---
06/23/2015	---	4
06/29/2015	7	---
06/30/2015	---	5
07/06/2015	9	--
07/07/2015	--	4
07/13/2015	9	--
07/14/2015	--	6
07/20/2015	10	--
07/21/2015	--	5
07/27/2015	7	--
07/28/2015	--	3
08/03/2015	6	--
08/04/2015	--	4
08/10/2015	6	--
08/11/2015	--	4
08/17/2015	6	--
08/18/2015	--	4
08/24/2015	4	--
08/25/2015	--	4
08/31/2015	6	--
09/01/2015	--	4
09/08/2015	5	4
09/14/2015	5	--
09/15/2015	--	3
09/21/2015	5	--
09/22/2015	--	4
09/28/2015	6	--
09/29/2015	--	4

Notes:

-- indicates water sample was not collected.

G: indicates that the analyte was detected at or above the method detection limit in both the sample and the associated equipment blank (EB), field blank (FB), or trip blank (TB), and the blank value was greater than 10% of the associated sample value.

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:

$$C = 11.16 - 0.00465Q + 1.397\sqrt{6.377 - 0.00591Q + 0.0000043 6Q^2}$$

Long-Term Discharge Limit & OFW Standard:

$$C = 11.38 - 0.00538Q + 1.397\sqrt{2.493 - 0.00231Q + 0.0000017 0Q^2}$$

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: Technical Oversight Committee members agreed to the set of 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