

Settlement Agreement Report

Third Quarter
July - September 2016

Prepared for the
Technical Oversight Committee

July 7, 2017
(Original on January 25, 2017)



This report is revised from earlier versions to include Shark River Slough compliance results using the final approved flow data for federal Water Year 2016 (October 1, 2015 – September 30, 2016).

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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 NGVD29 | 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 2016 (July - September 2016). 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 geometric mean TP concentrations were below the long-term levels for July, August, and September 2016.
- **Shark River Slough:** The 12-month TP flow-weighted mean concentrations (FWMCs) calculated using either Method 1 or Method 2 were below the 12-month long-term limit during the federal water year (WY), WY 2016 (October 1, 2015 – September 30, 2016).
- **Taylor Slough and Coastal Basins:** The TP 12-month FWMCs were below the 12-month long-term limit during the federal water year, WY 2016.

Table 1. Third quarter 2016 TP compliance for the Refuge, Shark River Slough, and Taylor Slough and Coastal Basins.

| Month | Geometric Mean TP Concentration (ppb) | Long-term Level (ppb) | Mean Stage (feet NGVD29) | Number of Samples | |
|--|---------------------------------------|--|--------------------------|--|--------------------|
| Arthur R. Marshall Loxahatchee National Wildlife Refuge | | | | | |
| Jul 2016 | 7.1 | 12.0 | 16.07 | 13 | |
| Aug 2016 | 6.6 | 13.1 | 15.92 | 6 | |
| Sep 2016 | 7.3 | 9.1 | 16.62 | 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 2016 | 1,250 (1,303) | 7.1 (7.1) | 7.6 (7.6) | 40.1 (40.1) | 18.2 (18.2) |
| Aug 2016 | 1,341 (1,397) | 7.2 (7.2) | 7.6 (7.6) | 40.1 (40.1) | 16.7 (16.7) |
| <i>Sep 2016</i> | <i>1,445 (1,495)</i> | <i>7.2 (7.2)</i> | <i>7.6 (7.6)</i> | <i>40.1 (40.1)</i> | <i>15.4 (15.4)</i> |
| Everglades National Park – Taylor Slough and Coastal Basins | | | | | |
| Jul 2016 | 300.7 | 5.2 | 11.0 | 53.1 | 0.0 |
| Aug 2016 | 330.9 | 5.2 | 11.0 | 53.1 | 0.0 |
| <i>Sep 2016</i> | <i>361.3</i> | <i>5.3</i> | <i>11.0</i> | <i>53.1</i> | <i>0.0</i> |

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 NGVD29 = elevation in feet relative to the National Geodetic Vertical Datum of 1929.
- kac-ft = thousand acre-feet.
- Compliance for inflows to ENP (Shark River Slough, and 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.
- Shark River Slough results: Method 1 (left values) FWMC computed as S12s+(S333+S355A+S355B-S334) and Method 2 (values in parentheses) FWMC computed as S12s+(S333+S355A+S355B+S356-S334) using all flow and TP grabs on biweekly compliance sampling dates. Neither method excludes S334 flow from the total flow for long-term limit calculations.

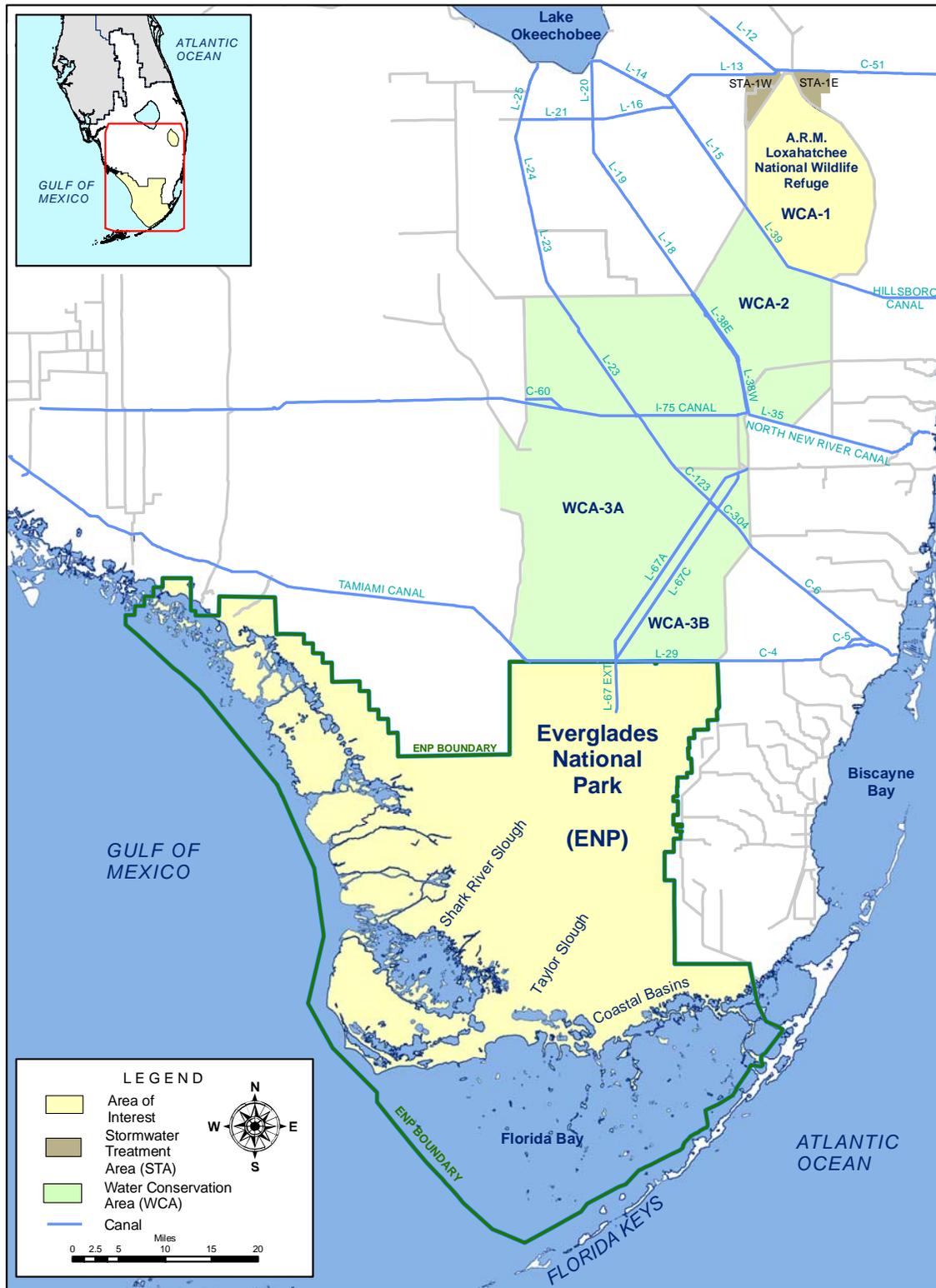


Figure 1. Areas of interest.

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 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 gaging 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 (NGVD29). 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

The number of stations sampled during the reporting period were as follows: 13 stations in July 2016, 6 stations in August 2016, and all 14 stations in September 2016. TP samples were not collected at LOX16 in July 2016 and at LOX3 to LOX10 stations in August 2016 because the water depth was less than 0.1 meter at those stations.

Sampling day average stages in the Refuge were 16.07, 15.92, and 16.62 feet NGVD29 in July, August, and September 2016, respectively (**Figure 3** and **Table 2**). The geometric means calculated from TP concentrations measured in water samples collected in July, August, and September 2016, were 7.1, 6.6, and 7.3 parts per billion (ppb), respectively. The geometric mean TP concentrations were below the long-term level for July, August, and September 2016.

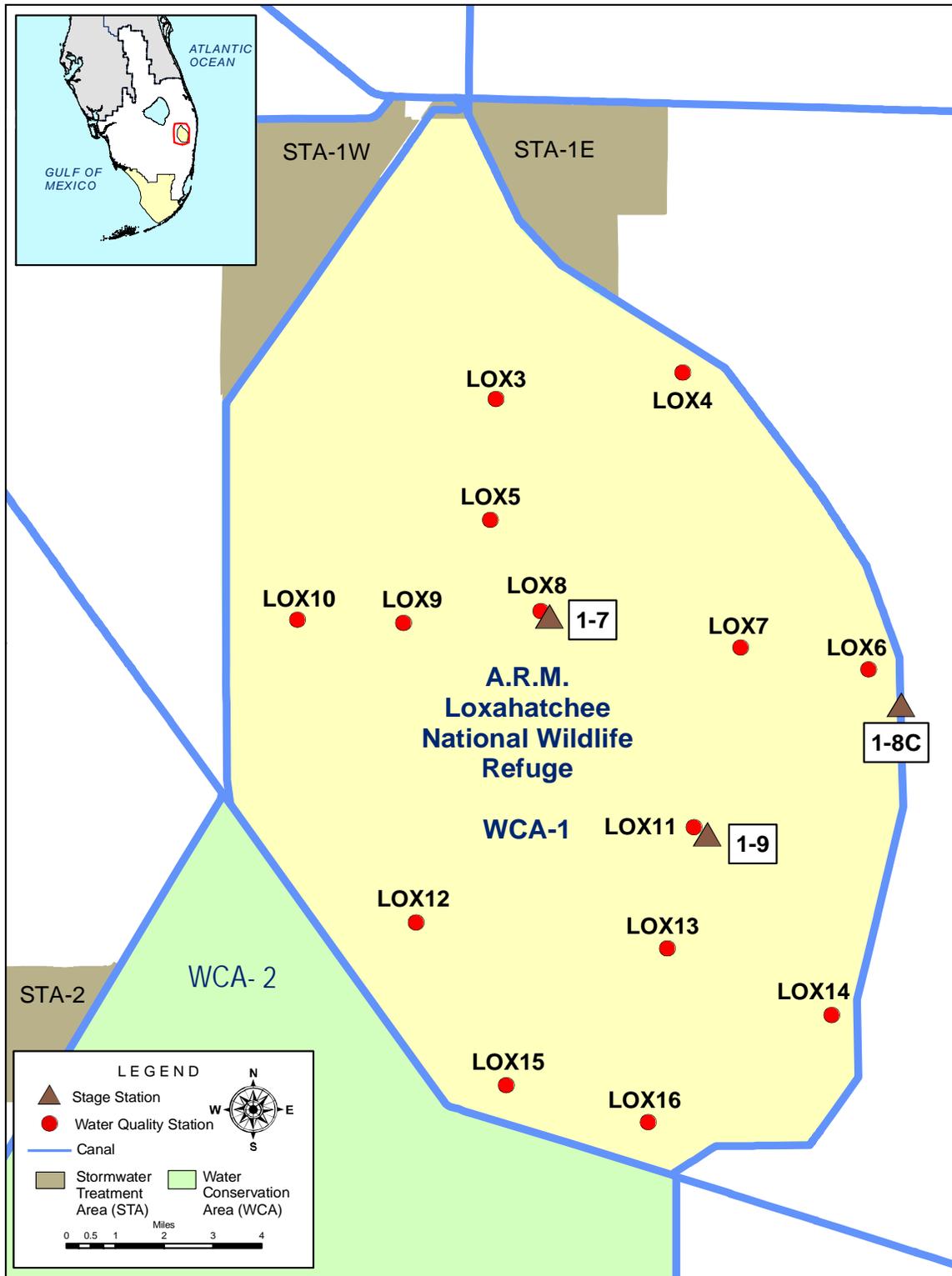


Figure 2. Refuge water quality sampling and stage measurement stations.

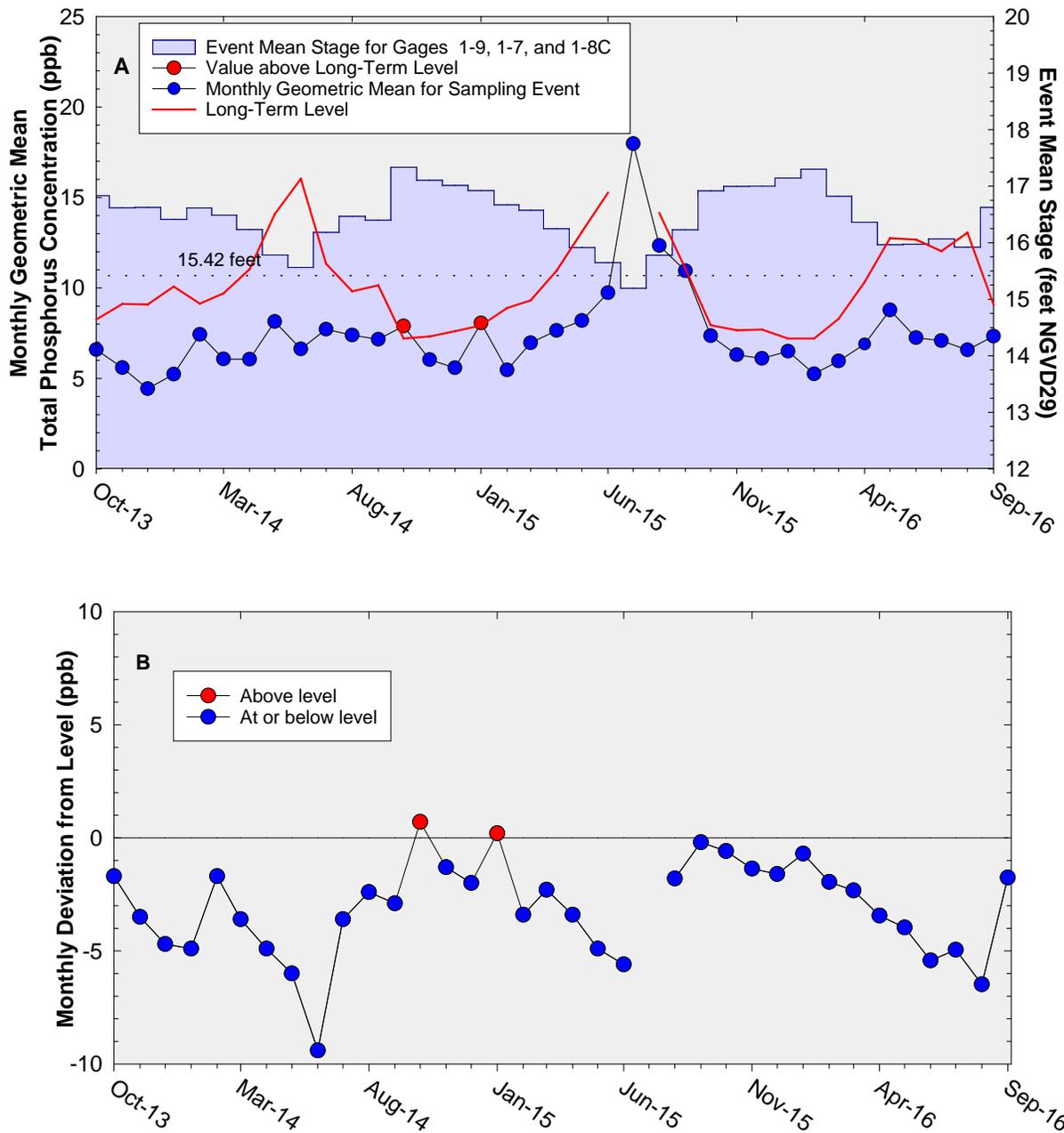


Figure 3. (A) Monthly TP geometric mean concentrations for the Refuge compared to calculated long-term levels, which are adjusted for fluctuations in stage. The geometric mean TP concentrations were above the long-term level in October 2014 and January 2015. The long-term level was not applicable for July 2015 because the sampling event average stage was less than 15.42 feet NGVD29. **(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 Everglades Technical Oversight Committee 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 NGVD29) | Number of Samples |
|------------------------|---------------------------------------|---|--|-------------------|
| Oct-2013 | 6.6 | 8.3 ^b | 16.83 ^b | 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 |
| <i>Oct-2014</i> | <i>7.9</i> | <i>7.2</i> | <i>17.34</i> | <i>14</i> |
| Nov-2014 | 6.0 | 7.3 | 17.10 | 14 |
| Dec-2014 | 5.6 | 7.6 | 17.01 | 14 |
| <i>Jan-2015</i> | <i>8.1</i> | <i>7.9</i> | <i>16.92</i> | <i>14</i> |
| 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 |
| Oct-2015 | 7.4 | 7.9 | 16.92 | 14 |
| Nov-2015 | 6.3 | 7.7 | 17.00 | 14 |
| Dec-2015 ^c | 6.1 (5.9) | 7.7 (7.6) | 17.00 (17.02) | 12 (14) |
| Jan-2016 | 6.5 | 7.2 | 17.15 | 14 |
| Feb-2016 | 5.3 | 7.2 | 17.30 | 14 |
| Mar-2016 | 6.0 | 8.3 | 16.82 | 14 |
| Apr-2016 | 6.9 | 10.3 | 16.36 | 14 |
| May-2016 | 8.8 | 12.7 | 15.96 | 9 |
| Jun-2016 | 7.2 | 12.7 | 15.97 | 9 |
| Jul-2016 | 7.1 | 12.0 | 16.07 | 13 |
| Aug-2016 | 6.6 | 13.1 | 15.92 | 6 |
| Sep-2016 | 7.3 | 9.1 | 16.62 | 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 NGVD29 = 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. 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.

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

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.

Two alternative methods for the water year compliance calculations are presented: Method 1 TP flow-weighted mean concentration (FWMC) computed as $S12s + (S333 + S355A + S355B - S334)$ and Method 2 TP FWMC computed as $S12s + (S333 + S355A + S355B + S356 - S334)$ using all flow and TP grabs on biweekly compliance sampling dates. Neither method excludes S334 flow from the total flow for long-term limit calculations.

The 12-month TP FWMC results calculated using either Method 1 or Method 2 were 7.2 ppb and below the 12-month long term limits (both 7.6 ppb) during the federal water year (WY), WY 2016 (October 1, 2015 - September 30, 2016).

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**.

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

Beginning with the 12-month period ending October 2015, both Method 1 and Method 2 values (in parenthesis) have been presented.

For the 12-month periods ending in July, August, and September 2016, the 12-month flow-weighted mean TP concentrations were 7.1 (7.1), 7.2 (7.2), and 7.2 (7.2) ppb, respectively. The 12-month long-term limits, based on the total flow into Shark River Slough, were all 7.6 (7.6) ppb 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 12-month periods ending July, August, and September 2016, the sampling event TP concentration greater than 10 ppb were 18.2 (18.2), 16.7 (16.7), and 15.4 (15.4) percent for July, August, and September 2016, respectively.

The observed percentages of 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 2016 (**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**.

Daily flows through the individual Shark River Slough structures from October 2014 through September 2016 are presented in **Figures 7 and 9**.

A total of 950,540 acre-feet of water was discharged through the S12 structures; 476,952 acre-feet through the S333 structure; 397 acre-feet through S355A gates; 16,637 acre-feet through S355B gates and temporary pumps; and 50,306 acre-feet through S356 during WY 2016. 178,356 acre-feet of the water from L-29 Canal 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 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**.

² <http://w3.saj.usace.army.mil/h2o/plots.htm>

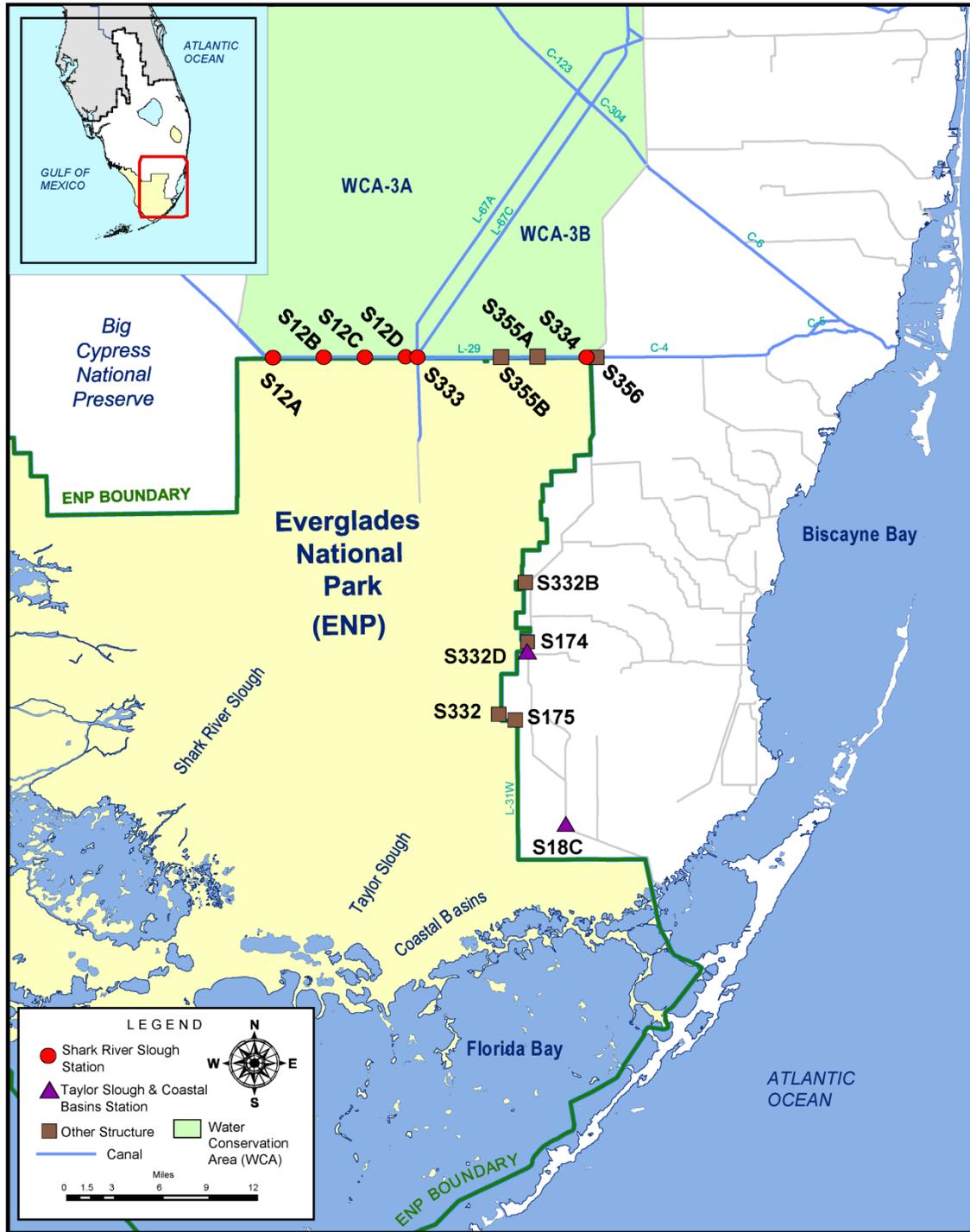


Figure 4. ENP flow structures.

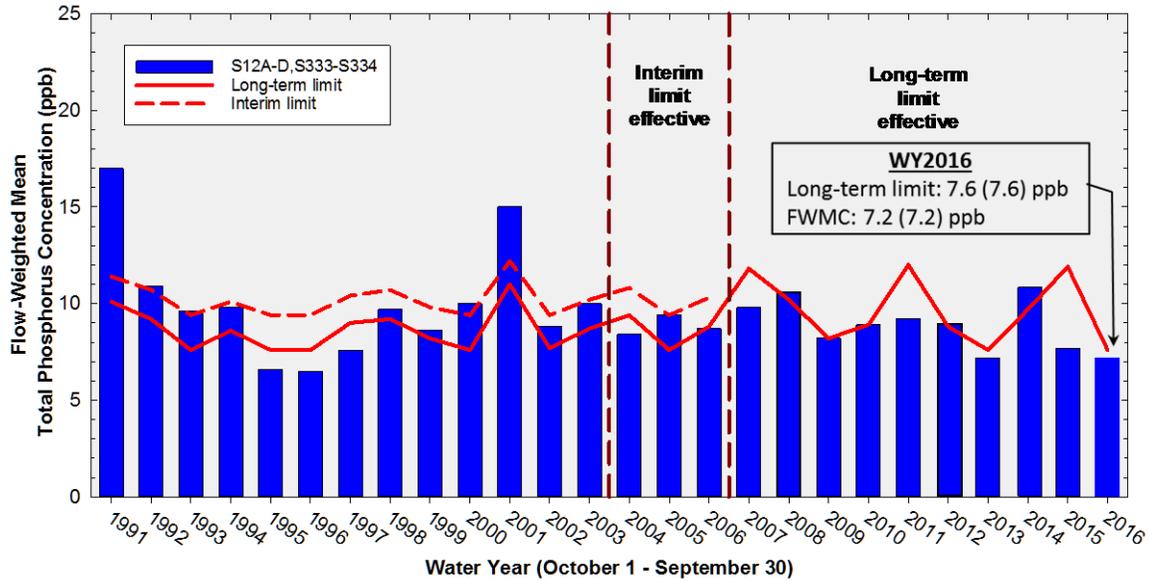


Figure 5. The 12-month flow-weighted mean total phosphorus concentrations at inflows to Everglades National Park through Shark River Slough at the end of each water year compared to the interim and long-term total phosphorus limits. The WY 2008 concentration was above the long-term limit but the TOC 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, representatives of the TOC reached consensus that no remedies in addition to those currently planned and/or underway are necessary to address the WY 2014 exceedance. For WY 2016, FWMCs calculated using Method 1 and Method 2 (in parentheses) were both 7.2 ppb.

Table 3. Shark River Slough TP compliance tracking.

| 12-Month Period | Total Flow (kac-ft) | Flow-Weighted Mean TP Concentration (ppb) | Long-Term Limit (ppb) <i>Effective 12/31/2006</i> | Percent of Sampling Events Greater than 10 ppb | |
|-----------------------------------|---------------------------------|---|--|--|---------------------------|
| | | | | Guideline | Observed |
| 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 | 1,025.1 | 7.5 | 7.8 | 40.9 | 26.1 |
| May 2013 - Apr 2014 | 1,017.3 | 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 |
| <i>Oct 2013 - Sep 2014</i> | <i>649.0</i> | <i>10.8</i> | <i>9.7</i> | <i>50.6</i> | <i>40.9</i> |
| Nov 2013 - Oct 2014 | 608.2 | 11.4 | 9.9 | 51.8 | 40.9 |
| Dec 2013 - Nov 2014 | 611.4 | 11.5 | 9.9 | 51.7 | 40.9 |
| Jan 2014 - Dec 2014 | 594.3 | 11.6 | 10.0 | 52.3 | 39.1 |
| Feb 2014 - Jan 2015 | 601.0 | 11.6 | 10.0 | 52.1 | 37.5 |
| Mar 2014 - Feb 2015 | 572.8 | 11.7 | 10.1 | 52.9 | 37.5 |
| Apr 2014 - Mar 2015 | 526.5 | 12.0 | 10.4 | 54.4 | 41.7 |
| May 2014 - Apr 2015 | 524.2 | 12.0 | 10.4 | 54.5 | 39.1 |
| Jun 2014 - May 2015 | 507.3 | 12.0 | 10.5 | 55.0 | 33.3 |
| Jul 2014 - Jun 2015 | 491.6 | 11.0 | 10.6 | 55.5 | 26.3 |
| Aug 2014 - Jul 2015 | 429.7 | 8.8 | 10.9 | 57.6 | 17.6 |
| Sep 2014 - Aug 2015 | 354.2 | 8.0 | 11.4 | 60.2 | 6.7 |
| <i>Oct 2014 - Sep 2015</i> | <i>267.0</i> | <i>7.7</i> | <i>11.9</i> | <i>63.4</i> | <i>7.7</i> |
| Nov 2014 - Oct 2015 | 288.7 (303.8) | 8.5 (8.5) | 11.8 (11.7) | 62.6 (62.0) | 15.4 (15.4) |
| Dec 2014 - Nov 2015 | 254.4 (285.3) | 8.8 (8.7) | 12.0 (11.8) | 63.9 (62.7) | 15.4 (15.4) |
| Jan 2015 - Dec 2015 | 356.8 (398.3) | 8.1 (7.9) | 11.4 (11.1) | 60.1 (58.7) | 15.4 (15.4) |
| Feb 2015 - Jan 2016 | 458.9 (511.3) | 7.6 (7.4) | 10.8 (10.5) | 56.6 (54.9) | 15.4 (15.4) |
| Mar 2015 - Feb 2016 | 639.4 (691.9) | 6.9 (6.8) | 9.8 (9.5) | 50.9 (49.4) | 15.4 (15.4) |
| Apr 2015 - Mar 2016 | 848.3 (900.8) | 6.6 (6.5) | 8.7 (8.4) | 45.1 (43.8) | 7.7 (7.7) |
| May 2015 - Apr 2016 | 995.3 (1,047.9) | 6.7 (6.6) | 7.9 (7.7) | 41.6 (40.4) | 6.7 (6.7) |
| Jun 2015 - May 2016 | 1,076.9 (1,129.6) | 6.8 (6.8) | 7.6 (7.6) | 40.1 (40.1) | 11.1 (11.1) |
| Jul 2015 - Jun 2016 | 1,147.8 (1,200.5) | 7.0 (6.9) | 7.6 (7.6) | 40.1 (40.1) | 15.0 (15.0) |
| Aug 2015 - Jul 2016 | 1,250.3 (1,303.1) | 7.1 (7.1) | 7.6 (7.6) | 40.1 (40.1) | 18.2 (18.2) |
| Sep 2015 - Aug 2016 | 1,341.4 (1,397.3) | 7.2 (7.2) | 7.6 (7.6) | 40.1 (40.1) | 16.7 (16.7) |
| <i>Oct 2015 - Sep 2016</i> | <i>1,444.5 (1,494.8)</i> | <i>7.2 (7.2)</i> | <i>7.6 (7.6)</i> | <i>40.1 (40.1)</i> | <i>15.4 (15.4)</i> |

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.
- From the 12-month period ending October 2015, results of both Method 1 and Method 2 (in parentheses) are presented. (See text on page 7 for the explanation of methods.)
- * At the October 27, 2015, meeting, representatives of the TOC reached consensus that no remedies beyond those currently planned or underway are necessary to address the WY 2014 exceedance.

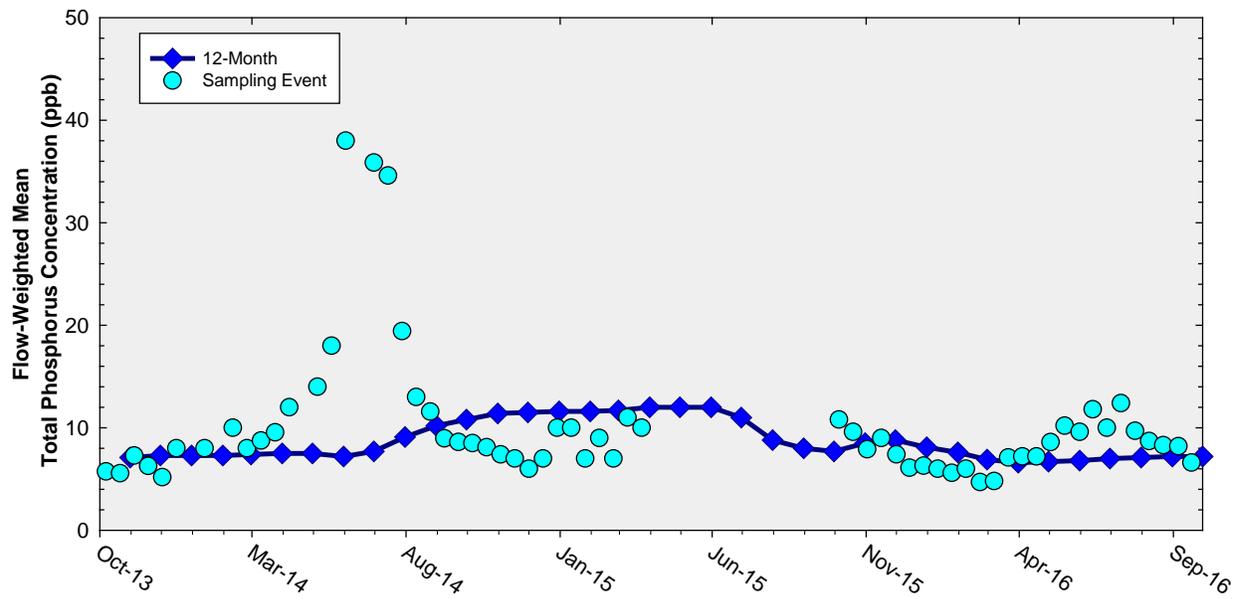


Figure 6. The 12-month flow-weighted mean TP concentrations in inflows to Everglades National Park through Shark River Slough at the end of each month and the flow-weighted mean concentration for each sampling event using Method 1. There were no sampling event values for some months because there was little or no flow in those periods.

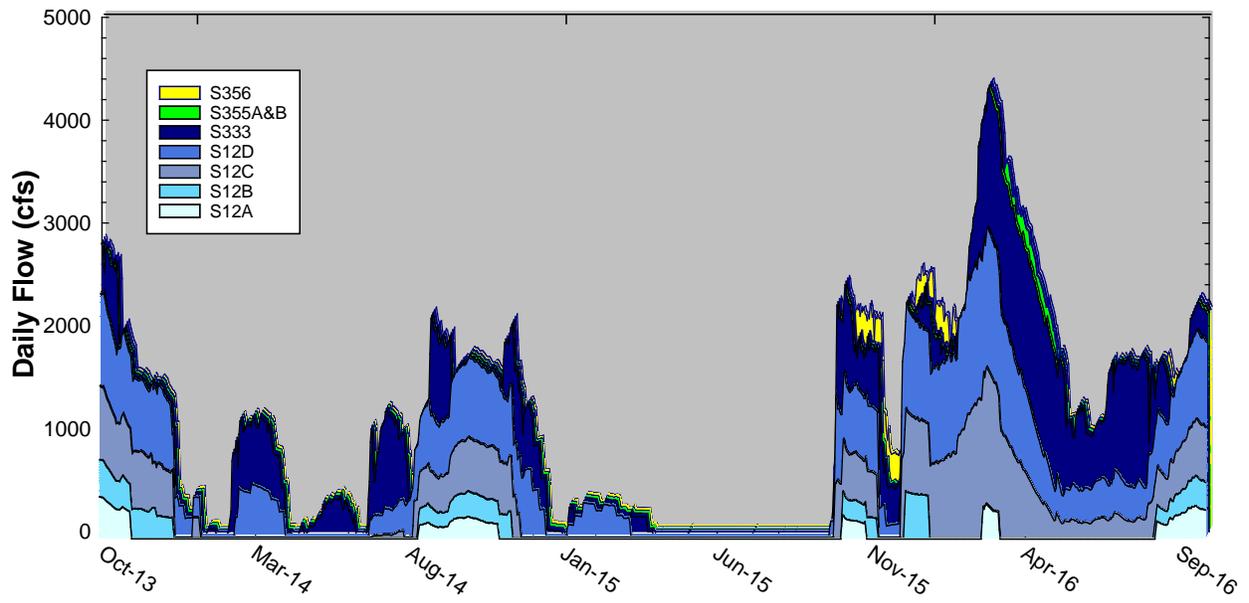


Figure 7. Daily flows at Shark River Slough structures as a stacked sum of all inflows.

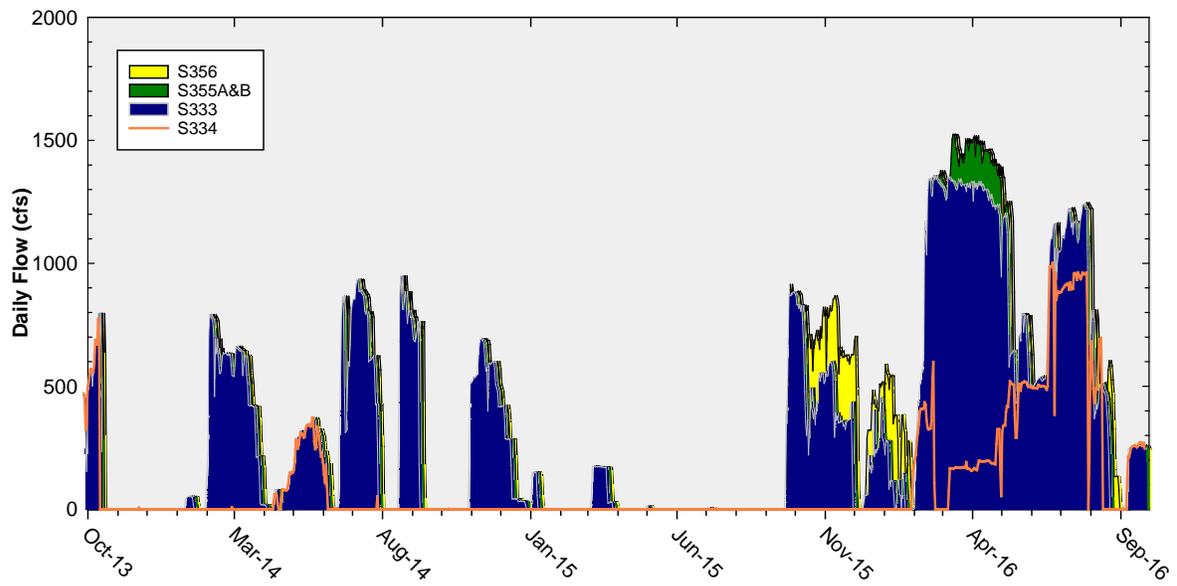


Figure 8. Daily flows into and out of the L-29 Canal.

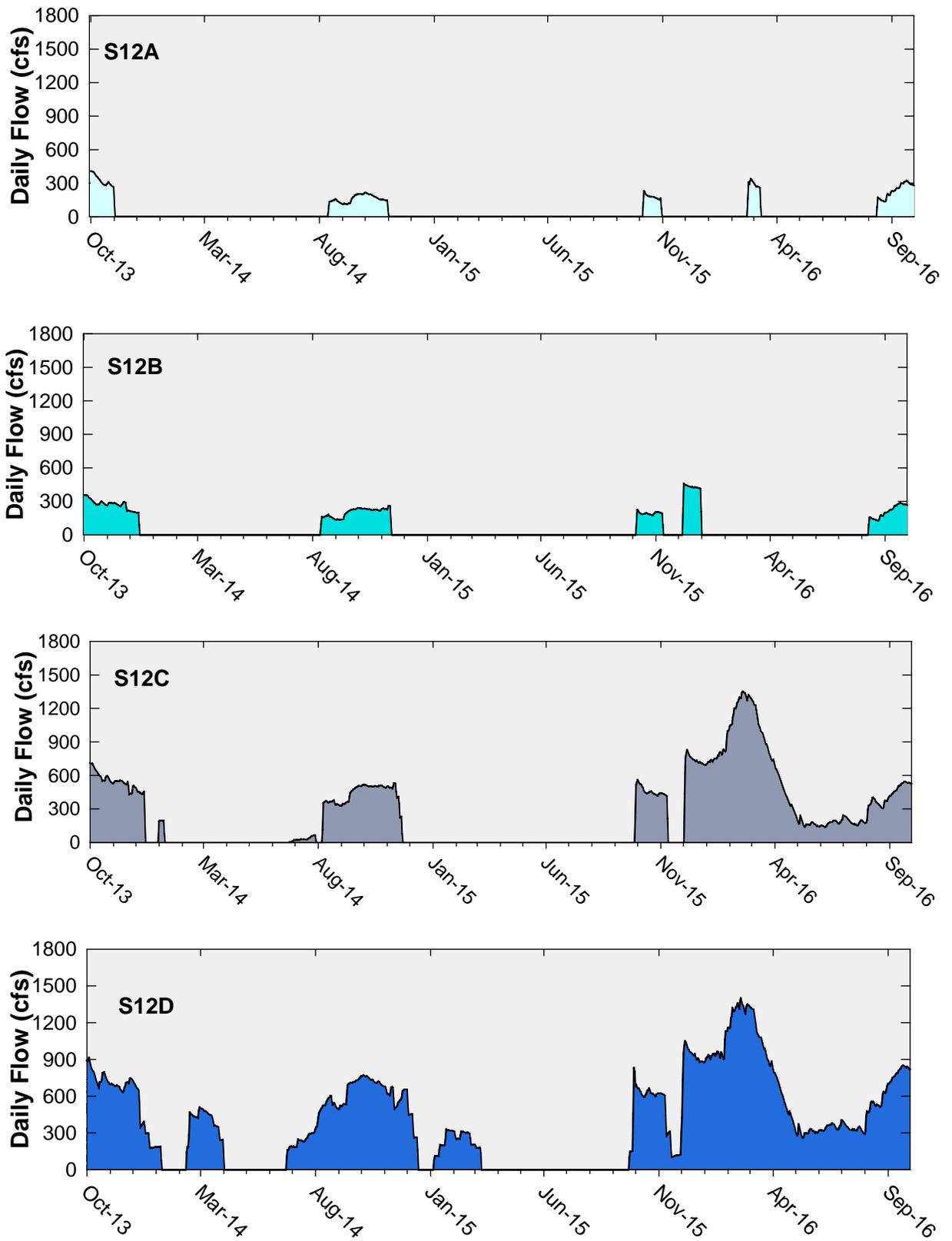


Figure 9. Daily flows at S12 structures to Shark River Slough.

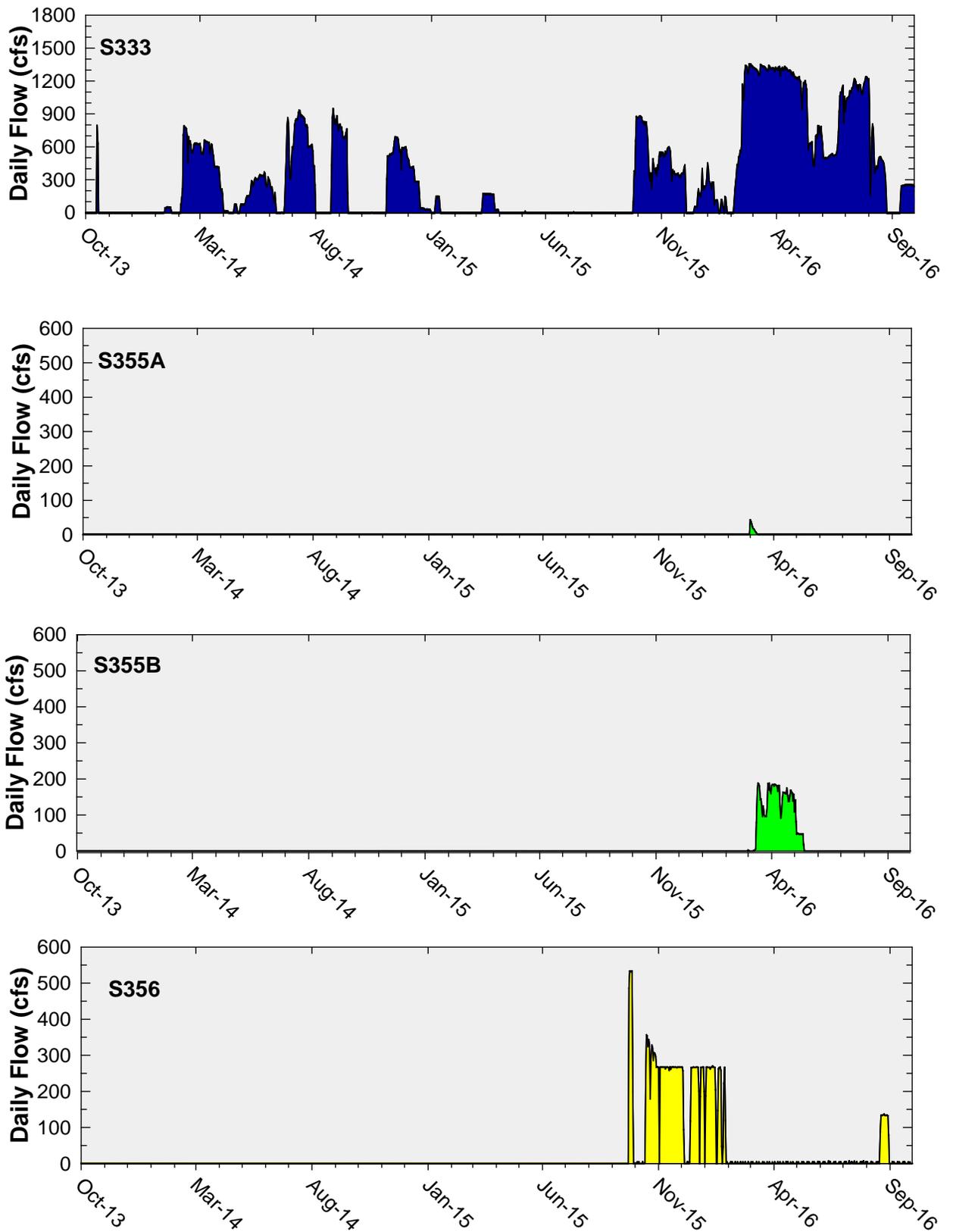


Figure 10. Daily flows at individual inflow structures to the L-29 Canal.

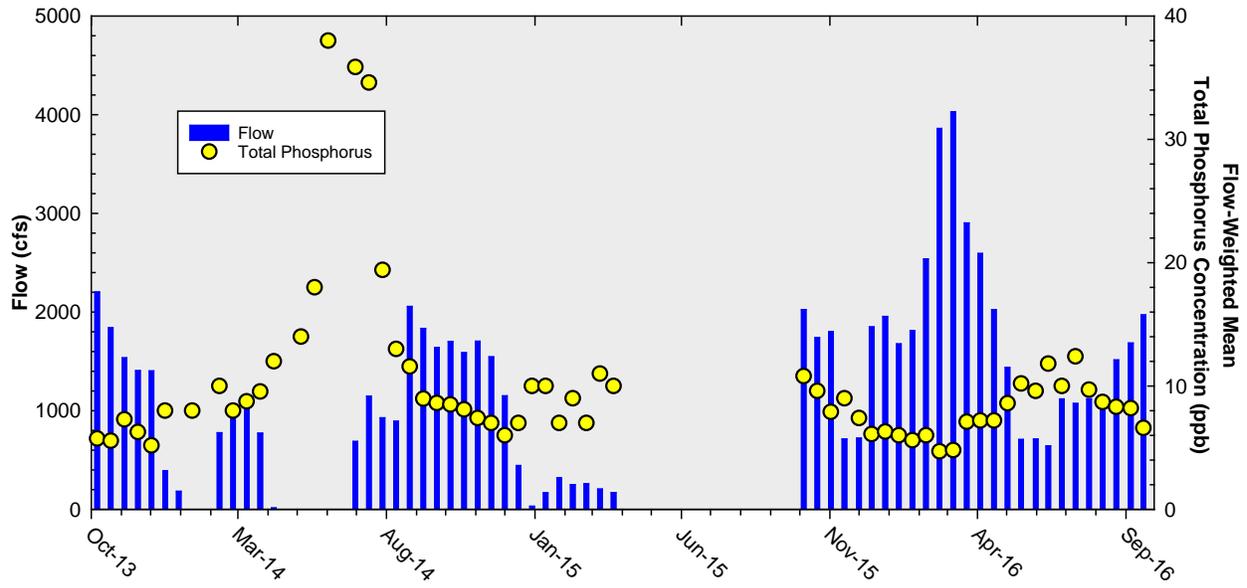


Figure 11. Flow at Shark River Slough structures on the day of sampling and the corresponding flow-weighted mean total phosphorus concentrations for individual sampling events using Method 1. There were no sampling event values from April to September 2015 because there was no flow during sampling events in this period.

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 12**). The narrow bars in **Figure 12** 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 2015 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 (5.3 ppb) was lower than the long-term limit (11.0 ppb) for the 12-month period ending on September 30, 2016. Therefore, inflows to Taylor Slough and Coastal Basins met the TP limit for WY 2016 (October 1, 2015 – September 30, 2016).

Reporting Period Update

Figure 13 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 14** and **15**. For the combined flow through S332D and S18C, the 12-month flow-weighted mean TP concentrations for the periods ending July, August, and September 2016, were 5.2, 5.2, and 5.3 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 2016, there was no sampling event TP concentrations greater than 10 ppb.

Figure 16 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 5.0 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.

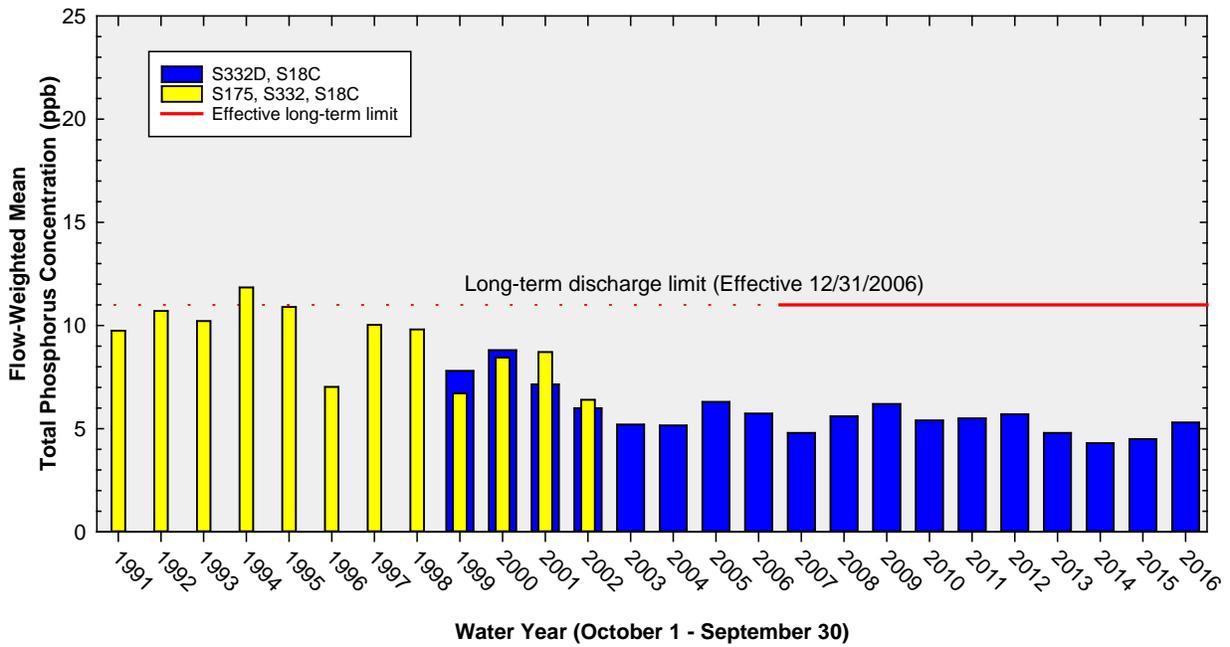


Figure 12. The 12-month flow-weighted mean TP concentrations in inflows to ENP through Taylor Slough and Coastal Basins at the end of each water year compared to the 11 ppb long-term TP limit. Blue bars show S332D, S174, and S18C for WY 1999 through WY 2007, and S332D and S18C from WY 2008 to WY 2016.

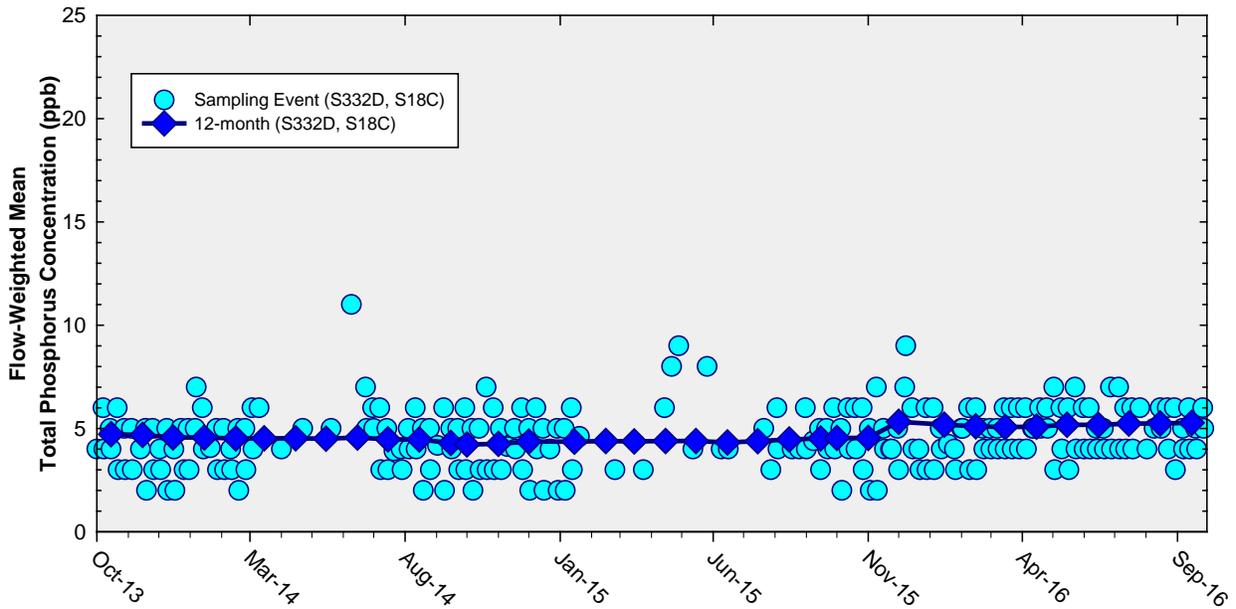


Figure 13. The 12-month flow-weighted mean TP concentrations in inflows to ENP through Taylor Slough and Coastal Basins at the end of each month and the flow-weighted mean TP concentration for each sampling event.

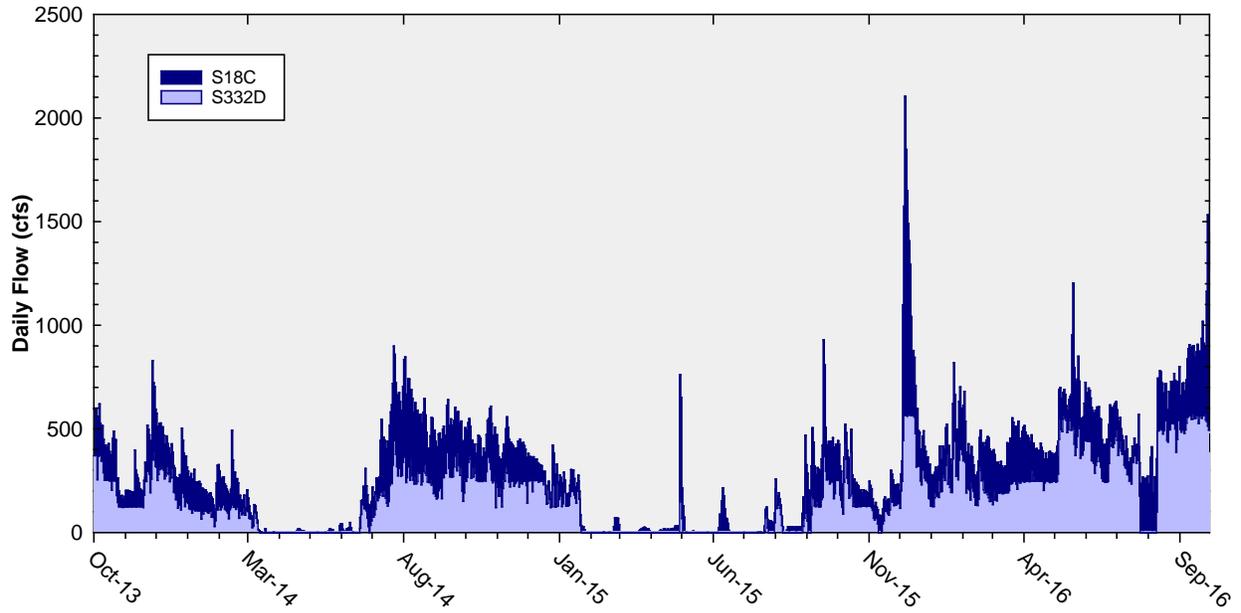


Figure 14. Daily flows measured in cubic feet per second (cfs) into ENP as a stacked sum of Taylor Slough (structure S332D) and Coastal Basins (structure S18C).

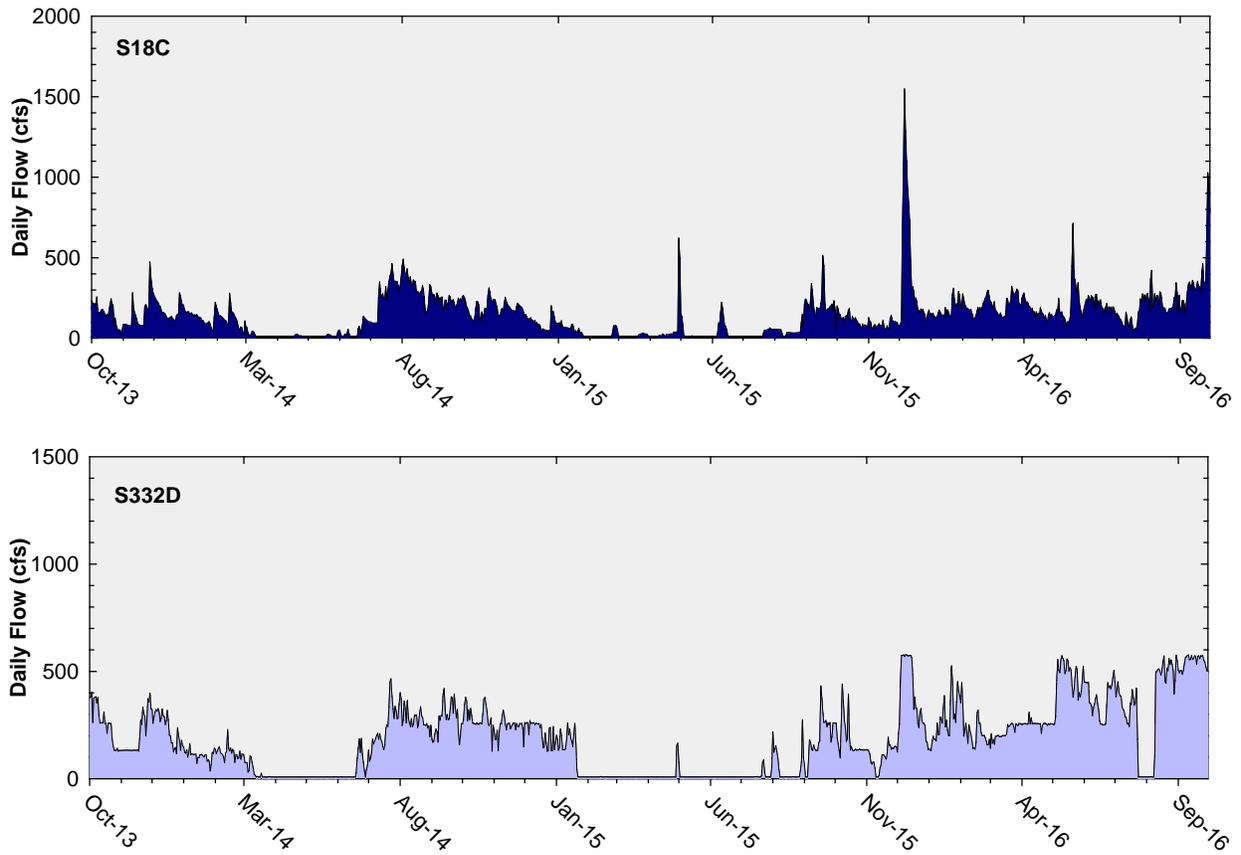


Figure 15. Daily flows at individual Coastal Basins (S18C) and Taylor Slough (S332D) structures into ENP.

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) <i>Effective 12/31/2006</i> | Percent of Sampling Events Greater than 10 ppb | |
|-----------------------------------|---------------------|---|--|--|-------------------|
| | | | | Guideline | Observed |
| 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 |
| <i>Oct 2013 - Sep 2014</i> | <i>196.5</i> | <i>4.3</i> | <i>11.0</i> | <i>53.1</i> | <i>1.3</i> |
| 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 |
| <i>Oct 2014 - Sep 2015</i> | <i>117.8</i> | <i>4.5</i> | <i>11.0</i> | <i>53.1</i> | <i>0.0</i> |
| Nov 2014 - Oct 2015 | 107.3 | 4.5 | 11.0 | 53.1 | 0.0 |
| Dec 2014 - Nov 2015 | 93.1 | 4.5 | 11.0 | 53.1 | 0.0 |
| Jan 2014 - Dec 2015 | 122.4 | 5.3 | 11.0 | 53.1 | 0.0 |
| Feb 2015 - Jan 2016 | 139.4 | 5.2 | 11.0 | 53.1 | 0.0 |
| Mar 2015 - Feb 2016 | 162.2 | 5.1 | 11.0 | 53.1 | 0.0 |
| Apr 2015 - Mar 2016 | 187.2 | 5.1 | 11.0 | 53.1 | 0.0 |
| May 2015 - Apr 2016 | 207.9 | 5.1 | 11.0 | 53.1 | 0.0 |
| Jun 2015 - May 2016 | 247.2 | 5.2 | 11.0 | 53.1 | 0.0 |
| Jul 2015 - Jun 2016 | 278.4 | 5.2 | 11.0 | 53.1 | 0.0 |
| Aug 2015 - Jul 2016 | 300.7 | 5.2 | 11.0 | 53.1 | 0.0 |
| Sep 2015 - Aug 2016 | 330.9 | 5.2 | 11.0 | 53.1 | 0.0 |
| <i>Oct 2015 - Sep 2016</i> | <i>361.3</i> | <i>5.3</i> | <i>11.0</i> | <i>53.1</i> | <i>0.0</i> |

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.

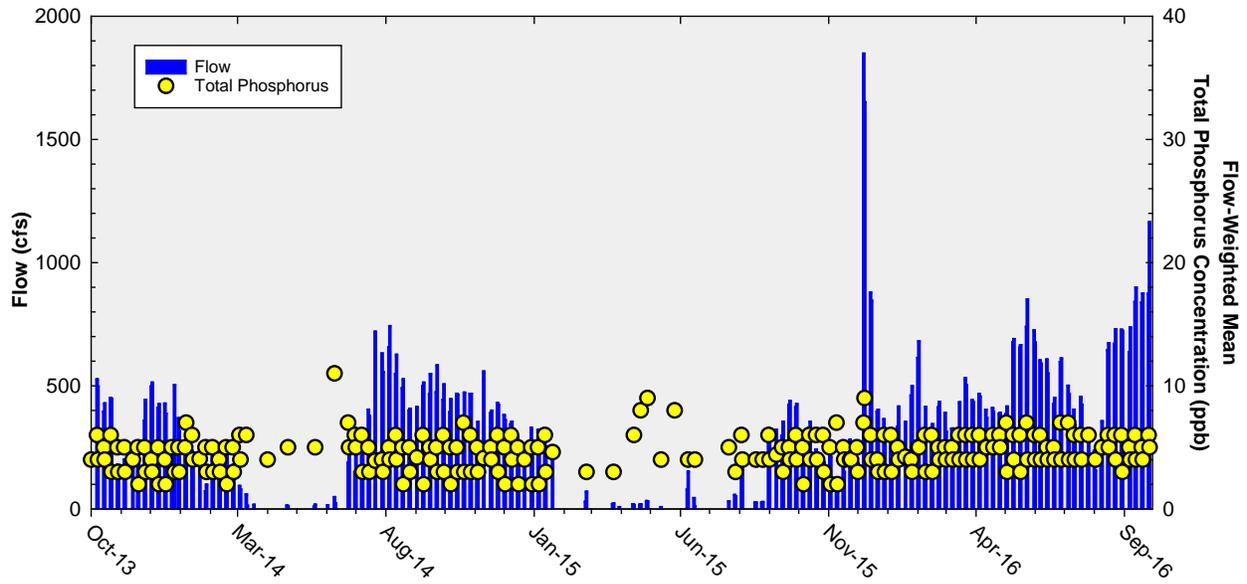


Figure 16. Flow from Taylor Slough and Coastal Basins structures (S332D and S18C) on the days of sampling, and the corresponding flow-weighted mean TP concentrations for individual sampling events.

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://my.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-2016'+and+date_collected+<+'01-OCT-2016'+and+sample_type_new+=+'SAMP'&v_target_code=file_csv](http://my.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-2016'+and+date_collected+<+'01-OCT-2016'+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://my.sfwmd.gov/dbhydroplsql/web_io.report_process?v_period=uspec&v_start_date=20160701&v_end_date=20160930&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 TP data (parts per billion).

| Month-Year | LOX3 | LOX4 | LOX5 | LOX6 | LOX7 | LOX8 | LOX9 | LOX10 | LOX11 | LOX12 | LOX13 | LOX14 | LOX15 | LOX16 |
|------------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|
| 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 |
| Oct-2015 | 9 | 8 | 12 | 8 | 7 | 7 | 7 | 8 | 6 | 6 | 6 | 5 | 6 | 11 |
| Nov-2015 | 6 | 6 | 6 | 5 | 7 | 6 | 7 | 7 | 7 | 6 | 7 | 5 | 6 | 8 |
| Dec-2015 | 5 | 5 | 6 | 5 | 15 | 6 | 5 | 6 | 6 | 6 | 5 | (4) | (6) | 7 |
| Jan-2016 | 8 | 8 | 8 | 6 | 7 | 7 | 6 | 7 | 6 | 7 | 6 | 5 | 5 | 6 |
| Feb-2016 | 5 | 8 | 6 | 4 | 5 | 7 | 5 | 5 | 5 | 5 | 6 | 4 | 4 | 6 |
| Mar-2016 | 5 | 6 | 6 | 8 | 7 | 8 | 6 | 7 | 5 | 5 | 4 | 6 | 5 | 7 |
| Apr-2016 | 8 | 7 | 8 | 7 | 7 | 8 | 8 | 8 | 5 | 8 | 7 | 5 | 5 | 7 |
| May-2016 | --- | 0 | --- | 9 | 14 | 10 | --- | --- | 10 | 8 | 8 | 8 | 6 | 8 |
| Jun-2016 | --- | 15 | --- | 7 | 8 | --- | --- | --- | 7 | 7 | 7 | 8 | 4 | 6 |
| Jul-2016 | 8 | 12 | 10 | 6 | 6 | 8 | 8 | 7 | 7 | 6 | 7 | 5 | 5 | --- |
| Aug-2016 | --- | --- | --- | --- | --- | --- | --- | --- | 5 | 6 | 7 | 6 | 8 | 8 |
| Sep-2016 | 10 | 11 | 8 | 5 | 6 | 6 | 9 | 10 | 7 | 8 | 6 | 5 | 6 | 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.)

() LOX14 and LOX15 water quality samples taken on December 2, 2015, were discarded due to processing errors and resampled on December 3, 2015.

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://my.sfwmd.gov/dbhydroplsql/water_quality_data.report_full?v_where_clause=where+
station_id+in+('S12A','S12B','S12C','S12D','S333','S355A','S355B','S356-
334')+and+test_number+=+25+and+collect_method+=+'G'+and+date_collected+>='01-JUL-
2016'+and+date_collected+<+'01-OCT-
2016'+and+sample_type_new+=+'SAMP'&v_target_code=file_csv
```

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

The "Preferred DBKEY" daily mean flow data for stations S12A, S12B, S12C, S12D, S333, and S334 and the daily mean flow data for stations S355A, S355B, S355B Temporary Pumps, and S356 during the reporting period can be retrieved by copying and pasting the following link into the address field of a web browser:

```
http://my.sfwmd.gov/dbhydroplsql/web_io.report_process?v_period=uspec&v_start_date=2
0160701&v_end_date=20160930&v_report_type=format7&v_target_code=file_csv&v_run_mod
e=onLine&v_js_flag=Y&v_dbkey=
FE771/FE772/FE773/FE774/MQ895/MQ896/AM173/64136/15042/FB752
```

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

| Date | S12A | S12B | S12C | S12D | S333 | S355A | S355B | S356 | Remarks |
|------------|------|------|------|------|------|-------|-------|------|-----------------|
| 10/05/2015 | 12 | --- | 9 | 8 | 14 | --- | --- | 9 | Compliance date |
| 10/12/2015 | 6 | 6 | 8 | 16 | 13 | --- | --- | 12 | N/A |
| 10/19/2015 | 6 | 6 | 8 | 13 | 9 | --- | --- | 7 | Compliance date |
| 10/26/2015 | 5 | 5 | 7 | 9 | 9 | --- | --- | 7 | N/A |
| 11/02/2015 | 11 | 9 | 7 | 8 | 8 | --- | --- | 6 | Compliance date |
| 11/09/2015 | 14 | 10 | 6 | 9 | 10 | --- | --- | 7 | N/A |
| 11/16/2015 | 13 | --- | --- | 9 | 9 | --- | --- | 7 | Compliance date |
| 11/23/2015 | 11 | --- | --- | 10 | 12 | --- | --- | 7 | N/A |
| 12/01/2015 | 8 | --- | --- | 8 | 7 | --- | --- | 6 | Compliance date |
| 12/07/2015 | 11 | 7 | 7 | 9 | 8 | --- | --- | 9 | N/A |
| 12/14/2015 | 10 | 6 | 5 | 7 | 8 | --- | --- | 4 | Compliance date |
| 12/21/2015 | 8 | 6 | 5 | 8 | 7 | --- | --- | 5 | N/A |
| 12/28/2015 | 9 | 6 | 4 | 8 | 7 | --- | --- | 6 | Compliance date |
| 01/04/2016 | 11 | --- | 6 | 8 | 8 | --- | --- | 5 | N/A |
| 01/11/2016 | 8 | --- | 6 | 6 | 6 | --- | --- | 5 | Compliance date |
| 01/19/2016 | 8 | --- | 4 | 7 | 6 | --- | --- | 6 | N/A |
| 01/25/2016 | 7 | --- | 5 | 6 | 6 | --- | --- | 7 | Compliance date |
| 02/01/2016 | 5 | --- | 5 | 8 | 7 | --- | --- | 7 | N/A |
| 02/08/2016 | 6 | --- | 5 | 7 | 6 | --- | --- | 10 | Compliance date |
| 02/15/2016 | 6 | --- | 4 | 6 | 5 | --- | --- | 6 | N/A |
| 02/22/2016 | 7 | --- | 4 | 4 | 6 | --- | --- | 7 | Compliance date |
| 02/29/2016 | 6 | --- | 4 | 4 | 7 | --- | --- | 8 | N/A |
| 03/03/2016 | --- | --- | --- | --- | --- | 6 | 6 | --- | N/A |
| 03/07/2016 | 7 | --- | 5 | 4 | 5 | --- | --- | 8 | Compliance date |
| 03/14/2016 | 8 | --- | 7 | 8 | 8 | --- | --- | 6 | N/A |
| 03/17/2016 | --- | --- | --- | --- | --- | --- | 6 | --- | N/A |
| 03/21/2016 | 11 | --- | 7 | 6 | 8 | --- | --- | 7 | Compliance date |
| 03/28/2016 | 8 | --- | 6 | 6 | 7 | --- | 6 | 8 | N/A |
| 04/04/2016 | 8 | --- | 6 | 4 | 10 | --- | --- | 8 | Compliance date |
| 04/12/2016 | 8 | --- | 6 | 5 | 8 | --- | --- | 8 | N/A |
| 04/13/2016 | --- | --- | --- | --- | --- | 6 | 8 | --- | N/A |
| 04/18/2016 | 9 | --- | 5 | 7 | 8 | --- | --- | 8 | Compliance date |
| 04/25/2016 | 10 | --- | 6 | 7 | 6 | --- | --- | 6 | N/A |
| 04/26/2016 | --- | --- | --- | --- | --- | --- | 16 | --- | N/A |
| 05/02/2016 | 8 | --- | 6 | 6 | 10 | --- | --- | 6 | Compliance date |
| 05/09/2016 | 8 | --- | 7 | 6 | 10 | 7 | 11 | 8 | N/A |
| 05/16/2016 | 12 | --- | 7 | 12 | 10 | --- | --- | 10 | Compliance date |
| 05/23/2016 | 11 | --- | 8 | 12 | 15 | 7 | 14 | 12 | N/A |
| 05/31/2016 | 15 | --- | 9 | 9 | 11 | --- | --- | 10 | Compliance date |
| 06/06/2016 | 14 | --- | 10 | 14 | 14 | 8 | 11 | 11 | N/A |
| 06/13/2016 | 14 | --- | 11 | 12 | 15 | --- | --- | 12 | Compliance date |
| 06/20/2016 | 13 | --- | 10 | 12 | 13 | --- | --- | 12 | N/A |
| 06/27/2016 | 12 | --- | 8 | 9 | 15 | --- | --- | 22 | Compliance date |
| 07/05/2016 | 11 | --- | 6 | 10 | 15 | --- | --- | 15 | N/A |
| 07/11/2016 | 10 | --- | 7 | 7 | 24 | 8 | 13 | 16 | Compliance date |
| 07/18/2016 | 11 | --- | 7 | 12 | 13 | --- | --- | 13 | N/A |
| 07/25/2016 | 9 | --- | 5 | 7 | 19 | --- | --- | 14 | Compliance date |
| 08/01/2016 | 10 | --- | 7 | 6 | 15 | --- | --- | 17 | N/A |
| 08/08/2016 | 10 | --- | 7 | 10 | 9 | --- | --- | 10 | Compliance date |
| 08/15/2016 | 7 | 6 | 8 | 10 | 10 | --- | --- | 11 | N/A |
| 08/22/2016 | 6 | 7 | 8 | 8 | 10 | 9 | 11 | 7 | Compliance date |
| 08/29/2016 | 6 | 6 | 8 | 12 | 9 | --- | --- | 6 | N/A |
| 09/06/2016 | 7 | 6 | 7 | 10 | 9 | 6 | 9 | 15 | Compliance date |
| 09/12/2016 | 6 | 8 | 9 | 10 | 8 | --- | --- | 14 | N/A |
| 09/19/2016 | 5 | 5 | 6 | 8 | 7 | --- | --- | 11 | Compliance date |
| 09/26/2016 | 6 | 6 | 7 | 8 | 8 | --- | --- | 11 | N/A |

Notes:

--- indicates water sample was not collected.

"Compliance date" indicates biweekly sampling date for Consent Decree calculation.

"N/A" indicates sampling data presented for informational purposes only.

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://my.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-2016'+and+date_collected+<+'01-OCT-2016'+and+sample_type_new+=+'SAMP'&v_target_code=file_csv](http://my.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-2016'+and+date_collected+<+'01-OCT-2016'+and+sample_type_new+=+'SAMP'&v_target_code=file_csv)

The link only generates data that have not been qualified. Qualified 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://my.sfwmd.gov/dbhydroplsql/web_io.report_process?v_period=uspec&v_start_date=20160701&v_end_date=20160930&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 TP data (parts per billion) for Taylor Slough and Coastal Basins.

| Date | S332DX | S18C | Date | S332DX | S18C |
|------------|--------|------|------------|--------|------|
| 10/05/2015 | 5 | -- | 04/04/2016 | 6 | -- |
| 10/06/2015 | -- | 2 | 04/05/2016 | -- | 4 |
| 10/12/2015 | 6 | -- | 04/11/2016 | 5 | -- |
| 10/13/2015 | -- | 4 | 04/12/2016 | -- | 5 |
| 10/19/2015 | 6 | -- | 04/18/2016 | 6 | -- |
| 10/20/2015 | -- | 4 | 04/19/2016 | -- | 5 |
| 10/26/2015 | 6 | -- | 04/25/2016 | 6 | -- |
| 10/27/2015 | -- | 3 | 04/26/2016 | -- | 5 |
| 11/02/2015 | 5 | -- | 05/02/2016 | 7 | -- |
| 11/03/2015 | -- | 2 | 05/03/2016 | -- | 3 |
| 11/09/2015 | 7 | -- | 05/09/2016 | 6 | -- |
| 11/10/2015 | -- | 2 | 05/10/2016 | -- | 4 |
| 11/16/2015 | 5 | -- | 05/16/2016 | 6 | -- |
| 11/17/2015 | -- | 4 | 05/17/2016 | -- | 3 |
| 11/23/2015 | 4 | -- | 05/23/2016 | 7 | -- |
| 11/24/2015 | -- | 4 | 05/24/2016 | -- | 4 |
| 11/30/2015 | 5 | -- | 05/31/2016 | 6 | -- |
| 12/01/2015 | -- | 3 | 06/01/2016 | -- | 4 |
| 12/07/2015 | 7 | -- | 06/06/2016 | 6 | -- |
| 12/08/2015 | -- | 9 | 06/07/2016 | -- | 4 |
| 12/14/2015 | 6 | -- | 06/13/2016 | 5 | -- |
| 12/15/2015 | -- | 4 | 06/14/2016 | -- | 4 |
| 12/21/2015 | 4 | -- | 06/20/2016 | 5 | -- |
| 12/22/2015 | -- | 3 | 06/21/2016 | -- | 4 |
| 12/28/2015 | 6 | -- | 06/27/2016 | 7 | -- |
| 12/29/2015 | -- | 3 | 06/28/2016 | -- | 4 |
| 01/04/2016 | 6 | -- | 07/05/2016 | 7 | -- |
| 01/05/2016 | -- | 3 | 07/06/2016 | -- | 4 |
| 01/11/2016 | 5 | -- | 07/11/2016 | 6 | -- |
| 01/12/2016 | -- | 4 | 07/12/2016 | -- | 4 |
| 01/19/2016 | 5 | 3 | 07/18/2016 | 6 | -- |
| 01/25/2016 | 4 | -- | 07/19/2016 | -- | 4 |
| 01/26/2016 | -- | 3 | 07/25/2016 | 8 | -- |
| 02/01/2016 | 5 | -- | 07/26/2016 | -- | 6 |
| 02/02/2016 | -- | 5 | 08/01/2016 | 7 | -- |
| 02/08/2016 | 6 | -- | 08/02/2016 | -- | 4 |
| 02/09/2016 | -- | 3 | 08/08/2016 | 6 | -- |
| 02/15/2016 | 6 | -- | 08/09/2016 | -- | 5 |
| 02/16/2016 | -- | 3 | 08/15/2016 | 6 | -- |
| 02/22/2016 | 5 | -- | 08/16/2016 | -- | 5 |
| 02/23/2016 | -- | 4 | 08/22/2016 | 6 | -- |
| 02/29/2016 | 5 | -- | 08/23/2016 | -- | 4 |
| 03/01/2016 | -- | 4 | 08/29/2016 | 6 | -- |
| 03/07/2016 | 5 | -- | 08/30/2016 | -- | 3 |
| 03/08/2016 | -- | 4 | 09/06/2016 | 5 | -- |
| 03/14/2016 | 6 | -- | 09/07/2016 | -- | 4 |
| 03/15/2016 | -- | 4 | 09/12/2016 | 6 | -- |
| 03/21/2016 | 6 | -- | 09/13/2016 | -- | 4 |
| 03/22/2016 | -- | 4 | 09/19/2016 | 5 | -- |
| 03/28/2016 | 6 | -- | 09/20/2016 | -- | 4 |
| 03/29/2016 | -- | 4 | 09/26/2016 | 6 | -- |
| | | | 09/27/2016 | -- | 5 |

Notes:

-- 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:

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

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)

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 |
|--|--|---|
| July 7, 2017 | | |
| Cover | 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 2016 (October 1, 2015 – September 30, 2016) results 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 2016 (October 1, 2015 – September 30, 2016). |
| Table of Contents | | <i>(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, 10, and 11.)</i> |
| Page 1 Executive Summary | <ul style="list-style-type: none"> • Shark River Slough: The provisional results shown are based upon provisional data and two calculation methods to bracket results. These methods currently indicate provisional 12-month flow-weighted mean TP concentrations were below the 12-month long-term limit during the federal water year, WY2016. | <ul style="list-style-type: none"> • Shark River Slough: The 12-month flow-weighted mean TP concentration was above the 12-month long-term limit during the federal Water Year (WY) 2014 (October 1, 2013 – September 30, 2014). |
| Page 1 Table 1 | <p>Table 1. Third quarter 2016 TP compliance for the Refuge and Taylor Slough and Coastal Basins. Provisional third quarter 2016 calculation results for Shark River Slough.</p> <p>Everglades National Park – Shark River Slough – PROVISIONAL DATA and RESULTS</p> <p><i>(The 12-moving compliance values for the quarter calculated using the provisional flow data and the methods described in the following notes were presented.)</i></p> | <p>Table 1. Third quarter 2016 TP compliance for the Refuge, Shark River Slough, and Taylor Slough and Coastal Basins.</p> <p>Everglades National Park – Shark River Slough.</p> <p><i>(The 12-moving compliance values for the quarter calculated using the final approved flow data and the methods described in the following notes were presented.)</i></p> |
| Page 1 Table 1 Notes | <ul style="list-style-type: none"> • Shark River Slough PROVISIONAL RESULTS: Method 1 (left values) computed as $S_{12s} + (S_{333} - S_{334})$ and Method 2 (right values) computed as $S_{12s} + (S_{333} - S_{334}) + S_{355A} + S_{355B} + S_{356}$ using all flow and TP grabs on bi-weekly compliance sampling dates. | <ul style="list-style-type: none"> • Shark River Slough provisional results: Method 1 (left values) computed as $S_{12s} + (S_{333} + S_{355A} + S_{355B} - S_{334})$ and Method 2 (values in parentheses) computed as $S_{12s} + (S_{333} + S_{355A} + S_{355B} + S_{356} - S_{334})$ using all flow and TP grabs on biweekly compliance sampling dates |
| 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 federal water year, WY 2016 (October 1, 2015 – September 30, 2016). | Two alternative methods for the water year compliance calculations were presented: Method 1 TP flow-weighted mean concentration (FWMC) computed as $S_{12s} + (S_{333} + S_{355A} + S_{355B} - S_{334})$ and Method 2 FWMC computed as $S_{12s} + (S_{333} + S_{355A} + S_{355B} + S_{356} - S_{334})$ using all flow and TP grabs on biweekly compliance sampling dates. Neither method excludes S334 flow from the total flow for long-term limit calculations. |

| | | |
|---|---|--|
| <p>Page 7-16 Everglades National Park Shark River Slough Reporting Period Updates</p> <p>Page 17-22 Everglades National Park Taylor Slough and Coastal Basins</p> <p>Page B-1 Appendix B</p> <p>Page D-3 Note</p> | <p><i>(DBKEYS and a URL to retrieve the provisional flow data used in this report for WY 2016 for stations at Shark River Slough, S12A, S12B, S12C, S12D, S333, S334, S355A, S355B, S355B Temporary Pumps, and S356 were provided.)</i></p> <p>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 S12s shall be added to the flows and loads of S333, S355A and B minus the flow and load discharged from S334 to determine the Shark River Slough limits.</p> | <p>The 12-month TP FWMCs calculated using either Method 1 or Method 2 were 7.2 ppb and below the 12-month long term limits (both 7.6 ppb) during the federal water year (WY), WY 2016 (October 1, 2015 – September 30, 2016).</p> <p>The 5-year average WY 2012 to WY 2016 was 8.4 ppb for both methods.</p> <p><i>(The entire section was updated to present the third quarter 2016, inclusive of WY 2016 compliance values, calculated using the approved final flow data. Table 3, and Figures 5, 6, 7, 8, 9, and 10 were added.)</i></p> <p><i>(Figure numbers and Table numbers were adjusted to reflect the addition of the figures and tables in the Shark River Slough Section.)</i></p> <p><i>(DBKEYS and a URL to retrieve the final approved flow data used in this report for WY 2016 for stations at Shark River Slough, S12A, S12B, S12C, S12D, S333, S334, S355A, S355B, S355B Temporary Pumps, and S356 were provided.)</i></p> <p>(The entire note was removed)</p> |
|---|---|--|