
Stuart Van Horn, P.E.
Water Resources Division

Technical Oversight Committee Meeting
July 19, 2016 (slide revisions September 23, 2016)
Long Term Trend Goals

A.R.M. Loxahatchee NWR

Consent Decree - long term concentration expectation (Appendix B, page B-3)

• “The long term concentration levels will apply to all 14 stations.”

• “Compliance with these concentration levels is expected to provide a long term average 14 station interior marsh concentration of approximately 7 ppb.”

Consent Decree - long term compliance to be met by December 31, 2006 (Appendix B, page B-4)

Everglades National Park

Consent Decree - long term concentration expectation (Appendix A, page A-2)

• “Phosphorus limits apply to flow-weighted mean concentrations computed on an annual Water Year basis.”

• “Compliance with these limits is expected to provide a long term average flow-weighted mean inflow concentration of approximately 8 ppb for Shark River Slough Basin and 6 ppb for the Taylor Slough and Coastal Basins.”

Consent Decree - long term inflow limits effective December 31, 2006 (Appendix A, page A-2)
A.R.M. Loxahatchee NWR Marsh Sites

Federal Consent Decree (Appendix B)

- 5 years Feb 1999 – Jan 2004 average ~1.1 ppb below LTL
  - Average ~8.9 ppb
- 5 years Apr 2011 – Mar 2016 average ~3.2 ppb below LTL
  - Average ~7.2 ppb
  - 95% of months below level by 3.4 ppb
  - 5% of months above level by 0.4 ppb

Monthly 14-Station Geometric Mean TP Concentrations
Deviation from Long-term Levels (LTL) in ppb
(5-year period April 2011 – March 2016)

<table>
<thead>
<tr>
<th>In-Compliance (below level)</th>
<th>Number of Months</th>
<th>Minimum Difference</th>
<th>Maximum Difference</th>
<th>Average Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Compliance (below level)</td>
<td>53</td>
<td>-0.2</td>
<td>-9.4</td>
<td>-3.4</td>
</tr>
<tr>
<td>Excursion (above level)</td>
<td>3</td>
<td>0.1</td>
<td>0.7</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Notes:
- The laboratory margin of error is +/- 2 ppb
- Four months in this period were not applicable (NA) due to stage being outside compliance equation range

Exceedance Event TP Differences in ppb

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Long-term Level</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008 Nov</td>
<td>7.4</td>
<td>7.2</td>
<td>0.2</td>
</tr>
<tr>
<td>2009 Jun</td>
<td>13.2</td>
<td>12.1</td>
<td>1.1</td>
</tr>
<tr>
<td>2014 Oct</td>
<td>7.9</td>
<td>7.2</td>
<td>0.7</td>
</tr>
<tr>
<td>2015 Jan</td>
<td>8.1</td>
<td>7.9</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Note: Two monthly Excursions in 12-month period result in an Exceedance of long-term compliance level.
Status of TP at A.R.M. Loxahatchee NWR Marsh Sites

April 2011 – March 2016

Compliance with [long-term level] concentrations is expected to provide a long term average 14 station interior marsh concentration of approximately 7 ppb (Settlement Agreement, 1991, Appendix B, Page B-3).
Status of TP at WCA3 Marsh Sites

April 2011 – March 2016

* Sites CA35 and CA314 transitioned from Impacted to Unimpacted per State P-Rule WY2014
  - Grey shaded sites (CA36, CA324, and CA33) remain Impacted

* Sites CA35 and CA314 transitioned from Impacted to Unimpacted per State P-Rule WY2014
  - Grey shaded sites (CA36, CA324, and CA33) remain Impacted
Shark River Slough Compliance History and Total Phosphorus (TP) Trends

Federal Consent Decree (Appendix A)

Exceedance Event TP Differences in ppb

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Long-term Limit</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>10.6</td>
<td>10.2</td>
<td>0.4</td>
</tr>
<tr>
<td>2012</td>
<td>8.9</td>
<td>8.8</td>
<td>0.1</td>
</tr>
<tr>
<td>2014</td>
<td>10.8</td>
<td>9.7</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Notes: The laboratory margin of error is +/- 2 ppb; FWM – flow weighted mean concentration.
Taylor Slough/Coastal Basins Compliance History and Total Phosphorus (TP) Trends

Federal Consent Decree (Appendix A)

FWMC – flow weighted mean concentration
“Compliance with these limits is expected to provide a long term average flow-weighted mean inflow concentration of approximately 8 ppb for Shark River Slough Basin and 6 ppb for the Taylor Slough and Coastal Basins.” (Settlement Agreement, 1991, Appendix A, Page A-2).
Long Term Trend Observations

A.R.M. Loxahatchee NWR

- Downward trend in the average TP concentration for LNWR continued through 2015 (last 5 years at ~ 7ppb)

- >2 ppb drop in concentration from relative to LTL 1999-2004 to 2011-2016

- Seasonal fluctuations are expected in interior marsh concentrations

- Since 2007 (long-term limit effective):
  - 6 excursions observed or ~ 6% of monthly GM period of record
  - 5 out of the 6 excursions are within ~1 ppb of the expected long-term average concentration of 7 ppb.

Everglades National Park

- Shark River Slough
  - 5-yr average inflow 8.8 ppb
  - Average Long-term Limit 10.0 ppb
  - 3 exceedances average 0.5 ppb

- Taylor Slough/Coastal Basins
  - 5-yr period average inflow 5.5 ppb
  - Long-term Limit fixed at 11.0 ppb
  - 44% reduction from Base Period

- Marsh sites in and surrounding (ENP) and upstream (WCA3) of Shark River Slough much lower than 8 ppb goal

- Marsh sites in Taylor Slough/Coastal Basins areas much less than 6 ppb goal
Discussion
Revisions Summary

The following revisions were made to correct this presentation September 23, 2016.

- **Slide 3**: Chart legend has been expanded to include 12-month moving, Seasonal Kendall Trend, and Linear trend lines.
- **Slide 8**: Erroneous indicator for data point at 19 ppb off chart deleted. Incorrect appendix reference corrected.
- **Slide 9**: Typo “3 years” corrected to “5 years”. Typo “7 ppb goal” corrected to “6 ppb goal”.