Preliminary Analysis of Factors Contributing to Exceedances of Interim P Levels in A.R.M. Loxahatchee National Wildlife Refuge

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Consent Decree Interim P Levels for LNWR Marsh

Objective:

- Provide Water Quality Equivalent to 1978-1979 Base Period for Outstanding Florida Waters
- Effective February 1999

Based upon Geometric Mean of Data from 14 Sites Monitored in 1978-1983

Statistical Model Accounts for Variations Present in the 1978-1983 Data:

- Water Level (Stage)
- Increasing Trend
- Other Random Variations (Natural, Man-Induced, Sampling, etc.)

Interim Levels Set at 90th Percentile of 1978-1979 Data
Interim Level = 90th Percentile of 1978-1979 Data
Monthly "Exceedance" if Marsh P > Interim Level & Stage > 15.1 ft

If More Than One Exceedance Occurs in a 12-Sample Interval:

TOC members determine whether there is:

"substantial evidence of error or extraordinary natural phenomena"

Then Make Appropriate Recommendations to Their CD Principals:

potential actions: none, diagnostic, remedial, etc.
Compliance with Interim Marsh P Levels

Geo Mean TP (ppb)

Data
Interim Level
1-Month
12-Month

STA-1W--->
STA-2--->

Levels
Exceeded

01/99 07/99 02/00 08/00 03/01 09/01 04/02 11/02 05/03
Data vs. Confidence Interval for 1978-1979 Conditions

Geo Mean TP (ppb)

Interim Level

Data vs. Confidence Interval for 1978-1979 Conditions

Data

90%

50%

10%

Interim Level

Geo Mean TP (ppb)

1/99

7/99

2/00

8/00

3/01

9/01

4/02

11/02

5/03
Exceedances vs. Marsh Stage

Stage (feet)

- Interim Level Exceeded
- Marsh Stage (7 & 9)
- Average Stage (7, 9, 8C)

Compliance Not Tested
Exceedances vs. Stage & Phosphorus Load

Stage

Exceedance

S6 Diverted

Total P Load to Refuge (kg/d)

Marsh Stage (ft)
Exceedances vs. Stage Differential – East Side
Exceedences vs. Stage Differential – West Side
Recent Performance of STA-1 West

Outflow P Conc (ppb)

0 10 20 30 40 50 60 70 80
01/99 07/99 02/00 08/00 03/01 09/01 04/02 11/02 05/03

--- Full-Scale Operation ---

Phase 1 Treatment Goal
Long-term Goal

Outflow P Load (mt/yr)

0 10 20 30 40 50 60 70
01/99 07/99 02/00 08/00 03/01 09/01 04/02 11/02 05/03

Equivalent to 85% Reduction in Refuge P Load

90-Day Avg
365-Day Avg

90-Day Avg
365-Day Avg

Equivalant to 85% Reduction in Refuge P Load
Comparison with Long-term Levels

Geo Mean TP (ppb)

Levels Exceeded

STA-1W ---> STA-2 --->

Data

Longterm Level

1-Month

12-Month

01/99 07/99 02/00 08/00 03/01 09/01 04/02 11/02 05/03
Consent Decree Interim P Levels LNWR for Marsh

Questions for TOC Consideration:

Is there?

"substantial evidence of error or extraordinary natural phenomena"

Recommended Actions?

none
diagnostic
remedial