Plan to Achieve 10 ppb Phosphorus

- Emergent Growth
- Submerged Aquatic Vegetation (SAV)
- Periphyton (PSTA)

100 ppb P → 25-50 ppb P → 10 ppb P

low phosphorus substrate
Overview

STA-1E Mesocosm Project

- Hypothesis of Periphyton Treatment Technology
- STA-1E PSTA Test Facility Layout
- Testing and Monitoring
- Results
- Summary
Natural System
Seasonal Dryout

- **CYANO DOMINANT**
  - Dry conditions
  - Summer/Fall

- **DIATOM DOMINANT**
  - Wet conditions
  - Winter/Spring

Corps PSTA
Repeated (forced) Dryouts
Activated Periphyton

- **CYANO DOMINANT**
  - Extreme conditions
Testing the unknown

- Substrate
  - High calcium carbonate
  - Low phosphorus content
  - Minimal bio-available phosphorous

- Hydraulic Retention Time

- Flow depth

- Community Size and Sustainability
PSTA Test Facility

10' X 100', Max Operating Depth 3'

- Cell 1 – riviera Sand .4 in3/ft2 lime sludge
- Cell 2 – lime rock
- Cell 3 – peat
- Cell 4 – lime rock over peat

Water Hyacinth

Test Facility Layout

Water Lettuce

C-51 Canal
PSTA Test Facility

- 10 ft x 100 ft, maximum operating depth: 3 ft
- Cell 1 – 1’ riviera sand, overlaid by 1” lime sludge
- Cell 2 – 1’ Ft. Thompson Formation limerock
- Cell 3 – 6” of onsite limerock over 6” of peat
- Cell 4 – 6” limerock over 6” peat
PSTA Test Facility Water Budget

Feed: 1-11 cms/day measured w/ rotameter

operating depth

1/100 foot depth accuracy

rainfall and evaporation monitoring

water budget
PSTA

Water Hyacinth

Periphyton mat

Calcareous Periphyton Mat (Cells 4 & 2)

LIMESTONE OVER PEAT
ON-SITE LIMESTONE OVER PEAT
LIMESTONE
LIME SLUDGE OVER RIVIERA SAND

Distance (ft)

0 15 30 45 60 75 90 100

4 3 2 1

Agricultural Ditch

~100 ppb P

C-51
Phosphorus Concentration in Cell 3
(On-site Limestone over Riviera Sand)
Flow Regimes 1 to 8

- Indicates Flow Regime (FR) End/Start
- Indicates No Flow Condition

7 day HRT, 0.5 ft
14 day HRT, 1 ft
7 day HRT, 1 ft
14 day HRT, 2 ft
7 day HRT, 2 ft
14 day HRT, 1.25 ft
1.25 ft

Total Phosphorus (ppb)
Average Total Phosphorus Concentrations at Input and Output of PSTA Cells 1, 3 & 4 for Flow Regimes 1-10 (3/2006 – 2/2008)
Summary

- PST lowers phosphorus levels from 40ppb to 10ppb or lower
- Locally available limestone w/ lower calcium carbonate was the best performing substrate
- Results sustained at HRT of 3.5 to 14 days
- Optimum water depth 1.25 feet
Questions?