STA Performance

• All operational years: 64-85% reduction in total phosphorus concentrations

• Over the past 10 years, performance has improved

• Frequently achieved 19 ppb or better
## Key Factors & Challenges Affecting STA Performance

<table>
<thead>
<tr>
<th>Factors</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic and phosphorus loading</td>
<td>Variable</td>
</tr>
<tr>
<td>Hydraulic retention time</td>
<td>Variable</td>
</tr>
</tbody>
</table>
| Vegetation composition & condition | • Maintaining target species  
                                  | • Natural senescence  
                                  | • Loss of or unhealthy vegetation |
| Soil characteristics            | Can release phosphorus back to the water column |
| Water chemistry                 | Composition can be variable                     |
Permitted Water Quality-Based Effluent Limits

Total Phosphorus concentrations in the discharge from each STA shall not exceed:

- 19 ppb as an annual flow-weighted mean in any water year
- 13 ppb as an annual flow-weighted mean in more than 3 out of 5 water years on a rolling basis
Purpose of the Science Plan

- Specified in Restoration Strategies
- Investigate the key factors and mechanisms that influence phosphorus reduction
- Results → enhance the operation & management of STAs
Areas of Investigation

- Internal STA processes & factors related to phosphorus treatment
- Wildlife and fisheries
- Management of vegetation-based treatment systems
- Engineering and operational components
Results from Initial Studies
• PSTA cell consistently achieves ≤13 ppb

• Cell features:
  ▪ Scraped muck
  ▪ SAV and periphyton
  ▪ Low inflow concentration

• Stable performance despite variable operational conditions

• Limerock capping as an alternative to muck removal
Soil Amendments or Management to Control Release of Phosphorus from Soil

• Several soil amendments could potentially sequester phosphorus
  ▪ uncertainties, high costs, and potential impacts on STA operation & downstream marsh

• No further evaluation of chemical amendments is planned at this time

• Benefits of soil inversion to be evaluated at STA-1W Expansion #1
Influence of Canals on STA Inflow & Outflow TP Concentrations

• High flows in STA-1 West inflow canal results in TP export
  – supports the role of FEBs upstream of STAs to reduce peak flows

• No significant input of phosphorus in the other inflow & outflow canals investigated
Other Ongoing Studies

1. Characterize phosphorus sources, cycling, and transport in STAs

2. Determine inundation depth and duration for cattail sustainability

3. Role of rooted floating aquatic vegetation

4. Evaluation of sampling methodologies for total phosphorus (*presented to WRAC*)

5. STA water and phosphorus budget improvements
Future WRAC presentations planned on research studies

Questions?