Role of Vegetation on Phosphorus Reduction in the Everglades Stormwater Treatment Areas

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Presentation Overview

• Importance and role of vegetation in STAs
• Vegetation mapping and monitoring in the STAs
• Phosphorus Flux vegetation study initial findings
Importance of Vegetation in the STAs

Provides:

- Hydraulic resistance
- Surface for periphyton/microbial colonization and activity
- Direct nutrient uptake and burial
- Nutrient storage
STA Vegetation Types

- Emergent Aquatic Vegetation (EAV)
- Submerged Aquatic Vegetation (SAV)
- Floating Aquatic Vegetation (FAV)

Chara, Ceratophyllum, Potamogeton, Hydrilla, & Najas

Typha, Cladium, & Schoenoplectus
Vegetation Mapping and Monitoring

- Annual aerial mapping of EAV and SAV coverage
- Monthly flights to monitor vegetation conditions
- Bi-annual SAV ground surveys
Restoration Strategies Science Plan: Phosphorus Flux Vegetation Assessments

- Relate plant communities to water column P concentrations, floc and soil P storage, and P-cycling
- Bi-annual SAV harvesting and annual EAV harvesting in selected flow-ways
- First sampling events in Nov. 2015 and Sept. 2016
Vegetation Study Sites

STA-2 Cell 3 SAV
- Inflow: Spirogyra, Hydrilla, Ceratophyllum
- Midflow: Chara
- Outflow: Chara, Potamegeton, Ceratophyllum, Najas

STA-2 Cell 1 EAV
- Inflow: Typha
- Midflow: Typha, Cladium
- Outflow: Typha, Cladium

<table>
<thead>
<tr>
<th>Sites</th>
<th>STA-2 Cell 3 SAV species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflow</td>
<td>Spirogyra, Hydrilla, Ceratophyllum</td>
</tr>
<tr>
<td>Midflow</td>
<td>Chara</td>
</tr>
<tr>
<td>Outflow</td>
<td>Chara, Potamegeton, Ceratophyllum, Najas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>SAV</th>
<th>EAV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information collected</td>
<td>% coverage and species composition</td>
<td>% coverage and species composition</td>
</tr>
<tr>
<td></td>
<td>Total Phosphorus (TP)</td>
<td>Total Phosphorus (TP)</td>
</tr>
<tr>
<td></td>
<td>Total Carbon (TC)</td>
<td>Total Carbon (TC)</td>
</tr>
<tr>
<td></td>
<td>Total Nitrogen (TN)</td>
<td>Total Nitrogen (TN)</td>
</tr>
<tr>
<td></td>
<td>Ash content</td>
<td>Ash content</td>
</tr>
<tr>
<td></td>
<td>Total Calcium (Tca)</td>
<td>Total Calcium (Tca)</td>
</tr>
</tbody>
</table>

SAV quadrat
Typha Total Biomass

Comparison of *Typha* biomass between events

<table>
<thead>
<tr>
<th>Location</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflow</td>
<td>5000</td>
<td>6000</td>
</tr>
<tr>
<td>Midflow</td>
<td>3000</td>
<td>4000</td>
</tr>
<tr>
<td>Outflow</td>
<td>2500</td>
<td>3000</td>
</tr>
</tbody>
</table>

Inflow, Midflow, Outflow
SAV Biomass and Species

**Comparison of SAV Biomass between events**

- **Inflow**: 0 g/m²
- **Midflow**: 400 g/m² in 2015, 200 g/m² in 2016
- **Outflow**: 600 g/m² in 2015, 400 g/m² in 2016

**Species Present**

- **Inflow**: Hydrilla, Ceratophyllum, & Spirogyra
- **Midflow**: Chara
- **Outflow**: Chara, Najas, & Potamegeton
EAV Tissue TP Concentration and Storage

November 2015

September 2016

Typha Average TP Storage by component

- Shootbases: 37%
- Live Leaves: 26%
- Dead Leaves: 25%
- Roots: 5%
- Rhizomes: 7%
Tissue TP Concentration Comparison

- EAV and SAV TP concentrations showed declining gradient from inflow to outflow for both events.
- SAV had higher TP concentrations at the inflow compared to EAV.
Tissue TP Storage Comparison

- EAV had higher TP storage at inflow compared to mid and outflow.
- EAV had higher TP storage than SAV.
- SAV TP storage relatively consistent spatially and temporally.
## Vegetation Nutrient Analyses

<table>
<thead>
<tr>
<th>Location</th>
<th>EAV 2015</th>
<th>EAV 2016</th>
<th>SAV 2015</th>
<th>SAV 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflow</td>
<td>10</td>
<td>10</td>
<td>32</td>
<td>27</td>
</tr>
<tr>
<td>Midflow</td>
<td>9</td>
<td>10</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Outflow</td>
<td>7</td>
<td>8</td>
<td>11</td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Nitrogen (g/kg)</th>
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</thead>
<tbody>
<tr>
<td>Inflow</td>
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<tr>
<td>Midflow</td>
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<tr>
<td>Outflow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Carbon (g/kg)</th>
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<tbody>
<tr>
<td>Inflow</td>
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<tr>
<td>Midflow</td>
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<tr>
<td>Outflow</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Ash Content (%)</th>
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</thead>
<tbody>
<tr>
<td>Inflow</td>
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<tr>
<td>Midflow</td>
</tr>
<tr>
<td>Outflow</td>
</tr>
</tbody>
</table>

- TN concentrations
  - Remained relatively consistent across events
  - Declining gradient from inflow to outflow
- TC concentrations
  - Remained relatively consistent across events & vegetation types
- Ash Content
  - Higher % in SAV than EAV
- Total Calcium
  - No clear trends in SAV
Summary

• EAV biomass higher at front end of flow-way while SAV was lower at front end

• Both EAV and SAV flow-ways showed a declining gradient in tissue TP concentrations from inflow to outflow
  – SAV higher tissue TP concentration at front end

• EAV substantially higher tissue TP storage at front end and compared to SAV

• Ongoing sampling and analyses to understand role of vegetation in phosphorus reduction
  – Seasonality
  – SAV speciation including shifts over time
  – Nutrients, ratios, storage capacity
THANK YOU

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