Effects of Increased Flow and associated P loads on Microbial Responses

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Hypotheses

- The P-limited native Everglades periphyton community will respond quickly to changes in P load, caused by changes in flow (P supply)
  - Increased loads will increase P contents
  - Increased loads will increase primary productivity
  - If the threshold P load is exceeded, P sensitive species will be replaced by those requiring higher P thresholds
Where: The Decompartmentalization Physical Model (DPM)

1.4 cm/s
1.9 cm/s
4.1 cm/s
7.1 cm/s

Gates opened 10/17/2016
Gates closed 2/2/2017
How: Methods

Flow
- Continuous- Acoustic Doppler velocimeters (ADV’s)
- Point flow tracker measurements

Surface Water
- TP and phosphatase activity (monthly)
- Continuous water depth
- Aquatic metabolism

Periphyton Response
1 month deployments of acrylic plates and dowels
- Community composition
- Primary productivity
- P content
- Phosphatase activity
### Surface water P concentrations during and after flow

<table>
<thead>
<tr>
<th>Date</th>
<th>TP (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/01/2016</td>
<td>E250: 0</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>E400: 2</td>
</tr>
<tr>
<td>02/01/2017</td>
<td>E500: 4</td>
</tr>
<tr>
<td>03/01/2017</td>
<td>E800: 6</td>
</tr>
<tr>
<td>04/01/2017</td>
<td>E250: 8</td>
</tr>
</tbody>
</table>

**Graph:**
- **Y-axis:** TP (μg/L)
- **X-axis:** Date
- **Legend:**
  - E250
  - E400
  - E500
  - E800
- **Legend Note:** No Flow
Biological P limitation in the water column

Phosphatase Activity (nM/min)

No Flow

TP (μg/L)
E250- closest to inflow, less periphyton *in situ*, high accumulation
Increased P load associated with changes in algal community
Periphyton still dominant at low flow site
P tolerant and sensitive responses

<table>
<thead>
<tr>
<th>Site</th>
<th>E250</th>
<th>E400</th>
<th>E500</th>
<th>E800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mougeotia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No flow</td>
<td></td>
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</tbody>
</table>

Percent of total biovolume (%)

Date

Percent of total biovolume (%)

Schizothrix

Komvophoron
Gross primary production response to flow

See more on ecosystem metabolism
Erik Tate-Boldt
This session 2:15 pm
P uptake by periphyton
P specific responses by periphyton

Phosphatase activity (mg pNPP/g dw)

Site
- E250
- E400
- E500
- E800

No Flow

Date
- 12/01/2016
- 01/01/2017
- 02/01/2017
- 03/01/2017

Legend:
- E250
- E400
- E500
- E800

No Flow
Periphyton growth pre and post flow

Flow - 31 Jan 2017

No Flow - 28 Feb 2017

E250  E400  E500  E800
Summary and next steps

• Preliminary analyses show higher flows cause significant shifts in algal community composition, metabolism and P storage; however, quantitative connections between velocity/load and response are still to be determined

• One month post-flow, many of these responses are still present, but decreasing in significance

• Need to calculate site specific TP loads to further evaluate the effects of TP

• Need to scale up effects to slough/landscape level and consider *in situ* conditions
  • Role of periphyton collapse, e.g., phosphatase at E500 vs E800