The Influence of Altered Flow Regimes on Aquatic Ecosystem Metabolism in an Everglades Marsh

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I. Decompartmentalization Physical Model (DPM)
II. Aquatic ecosystem metabolism
III. Flow effects on aquatic metabolism
Ten 6-ft diameter gated culverts (S-152)
De compartmentalization Physical Model

South Flow-way

East Transect

RS1S (3.6 cm/s)

E250 (7.1 cm/s)
E400 (4.1 cm/s)
E500 (1.9 cm/s)
E800 (1.4 cm/s)

C1S (0.9 cm/s)
Hypothesis: Sites with high flow conditions will have increased productivity and respiration as compared to low flow sites.
- NAP = \( \Delta O_2/\Delta t - F \)
- GR = \( \Delta O_2/\Delta t \) at night
- GPP = NAP + GR

Staehr et al. 2010
<table>
<thead>
<tr>
<th></th>
<th>RS1S (cm/s)</th>
<th>C1S (cm/s)</th>
<th>RS2S (cm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean DO</td>
<td>3.55</td>
<td>4.72</td>
<td>7.73</td>
</tr>
<tr>
<td>Max. DO</td>
<td>4.52</td>
<td>6.84</td>
<td>6.97</td>
</tr>
<tr>
<td>Min. DO</td>
<td>2.97</td>
<td>2.83</td>
<td>2.85</td>
</tr>
</tbody>
</table>
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**East Transect**

- **E250 (7.1 cm/s)**
- **E400 (4.1 cm/s)**
- **E500 (1.9 cm/s)**
- **E800 (1.4 cm/s)**

**Graphs:**

- **DO (g m⁻³)**
  - E250
  - E400
  - E500
  - E800

**Time (d):**

- 12/13/16, 12/14/16, 12/15/16, 12/16/16
- 2/14/17, 2/15/17, 2/16/17, 2/17/17

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[Graph showing DO levels at different points along the transect over time.]
East Transect

Flow
12/2016

Post-flow
2/2017

GPP
(g O\textsubscript{2} m\textsuperscript{-3} d\textsuperscript{-1})

GR
(g O\textsubscript{2} m\textsuperscript{-3} d\textsuperscript{-1})

RSq = 0.96
P-Value <0.001

RSq = 0.93
P-Value <0.0001

RSq = 0.92
P-Value <0.0001

RSq = 0.75
P-Value = 0.0087

RSq = 0.93
P-Value <0.0001

E250  E400  E500  E800

E250  E400  E500  E800

A  A  B  C

A  B  C  A

A  AB  B  A

A  AB  B  A
Summary

• Productivity was net heterotrophic
  • (McCormick et al 1997, Hagerthy et al. 2010)
• GPP and GR decreased in response to flow
  • This may be do to “slough clearing”...
    • Loss and transport of periphyton community
    • Bed sediment scouring
  • Higher flows reduced DO diurnal variation
    • Result of increased water column mixing
• GPP and GR increased the further a site was from the S152 structure
• Post-flow GPP and GR at low and high flow sites did not differ
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• Univ. Hawaii, Florida International University, ...
Next Steps

• Researching flow paradigms in the Everglades
• Lateral flow inputs
• Slough’s porous boundaries
• Reduction in DO diel variation