Near Shore Biological Sampling
During Fluctuating and Steady Releases in September and October 2005

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U.S. Geological Survey
Introduction & Background

- Temperature and available habitat are two parameters associated with fish growth and survivorship
    - Growth response to Sunday steady flows
    - Changes in abundance with changes in release volumes and base flow
Purpose

Determine if physical and biological data collected under minor fluctuations varied from data collected under steady releases.

- Water temperature & other abiotic parameters
- Benthic composition & density
- Plankton composition & density
- Fish composition and abundance
Methods

• Trip dates Sept 4-16, Sept 22-Oct 7, 2005.

• 12 Paired samples during each trip
  • Backwater
  • Shoreline
<table>
<thead>
<tr>
<th>Collection Dates</th>
<th>Maximum Releases (ft³/s)</th>
<th>Minimum Releases (ft³/s)</th>
<th>Range (ft³/s)</th>
<th>Median Release (ft³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. 4 - 16, 2005</td>
<td>9310</td>
<td>6690</td>
<td>2620</td>
<td>8830</td>
</tr>
<tr>
<td>Sept 22 – Oct 7, 2005</td>
<td>9010</td>
<td>8040</td>
<td>970</td>
<td>8360</td>
</tr>
</tbody>
</table>
## Results – Physical parameters

<table>
<thead>
<tr>
<th></th>
<th>Fluctuating BW</th>
<th>Steady BW</th>
<th>Fluctuating Shoreline</th>
<th>Steady Shoreline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface water temp (°C)</strong></td>
<td>19.5 ± 0.5 s.e.</td>
<td>18.4 ± 0.4 s.e.</td>
<td>18.1 ± 0.3 s.e.</td>
<td>17.3 ± 0.5 s.e.</td>
</tr>
<tr>
<td><strong>Dissolve Oxygen (mg/L)</strong></td>
<td>9.2 ± 0.1 s.e</td>
<td>9.7 ± 0.2 s.e</td>
<td>9.5 ± 0.1 s.e</td>
<td>9.4 ± 0.2 s.e</td>
</tr>
</tbody>
</table>
## Results – Physical parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Fluctuating BW</th>
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<th>Steady Shoreline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity (NTU)</td>
<td>21.6 ± 2.4 s.e.</td>
<td>5.6 ± 0.4 s.e.</td>
<td>25.3 ± 3.3 s.e.</td>
<td>3.9 ± 0.4 s.e.</td>
</tr>
<tr>
<td>Velocity (m/s)</td>
<td>0.04</td>
<td>0.02</td>
<td>0.13</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Physical parameter conclusions

- No statistical difference between flows within habitats

- Temperatures declined between trips
  - Possibly due to changes in day length/solar radiation

- Shoreline and backwater temperatures differed by 1°C with shorelines significantly colder (t-test p<0.05)

- Shoreline velocities varied between trips
  - Associated with stage elevation of sample period

- Turbidity decreased between trips
  - Spates from Paria, LCR during first trip
Results – Backwater Phytoplankton

Backwater phytoplankton

# / liter

Specie

Species

Achnanthes
Biddulphia
Chlamydomonas
Chroomona
Cladophora
Cocconeis
Cryptomonas
Cyclotella
Cymbella
Diatoma
Dinobryon
Elakathorix
Fragilariopsis
Glenodinium
Gyrosigma
Meirimopedia
Navicula
Oscillatoria
Rhoicosphenia
Scenedesmus
Spyrogyra
Staurastrum
Synechocystis
Trachelomonas

Fluctuating Flows

Steady Flows
Results – Shoreline Phytoplankton

Shoreline Phytoplankton

Species

# / liter

Fluctuating Flows
Steady Flows

USGS
Phytoplankton conclusions

- Plankton densities were significantly different between trips in both habitats (t-test p<0.05)
  - Associated with antecedent flows & tributary inputs
- Plankton densities between habitats were not significantly different during either flow
Results – Backwater Macroinvertebrates

Backwater Macroinvertebrate Density during Varied Flows

Density (#/sq m)

Family

Fluctuating Flow
Steady Flow
Results – Shoreline Macroinvertebrates

Shoreline Macroinvertebrate Density during Varied Flows

Density (# / sq. m)

Family

ANN AMISC MITE CHIL CHIP DIPL GAM GAS HYD HYDL NEM NZM SML SIMP TCHI TCOL TDI TSPI TMISC

USGS
Macroinvertebrate conclusions

- Total Macroinvertebrate densities were not significantly different between trips in both habitats.

- Total Macroinvertebrate densities between habitats also did not differ significantly between trips.
  - Observed changes in densities may be due to turbidity during first trip and antecedent conditions.
Backwater fish abundance

Backwater Seining Catch-per-unit-effort

Species

CPUE (fish/m²)

Fluctuating Flow
Steady Flow

USGS
Shoreline Fish Abundance

Shoreline Electrofishing Catch-per-unit-effort

Species

BBH  BHS  CCF  CRP  FHM  FMS  HBC  PKF  RBT  RSH  SPD

CPUE (fish/s)

Fluctuating Flow
Steady Flow
Fish Abundance conclusions

- Mean Catch effort for all fish did not differ between flows except for Bluehead Suckers.
  - Bluehead sucker catch effort increased during the second trip in backwaters \((t-test_{(1-tailed)} p<0.05)\).

- Differences in catch effort may be associated with turbidity values during first trip and fish being flushed into mainstem.
Overall Conclusions

- Biological and physical parameters measured were comparable between flows
  - Temperatures varied between habitats
  - Plankton densities varied between trips
- Limited conclusions can be made about physical and biological variables.
  - Antecedent conditions
  - Local weather
  - Time between treatments likely too short
- Recommend studying in lab situation first