Effects of Varied Flows on Near Shore Physical and Biological Parameters: Results and Recommendations

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Introduction & Background


- 2005 fall flows designed to evaluate sediment transport under steady vs. low fluctuating flows.

- Opportunity to evaluate biological response to flows
Objectives

To determine if physical and biological parameters differed between flows and habitats.
Parameters

Physical
- Temperature
- Turbidity
- Specific conductivity
- pH
- Salinity
- Velocity

Biological
- Abundance and composition of:
  - Phytoplankton
  - Benthic invertebrates
  - Fishes
### Hydrology

#### Collection Dates and Release Information

<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>

![Graph showing daily discharge, cubic feet per second](image-url)
### Physical parameters

<table>
<thead>
<tr>
<th>Surface water temp (°C)</th>
<th>Fluctuating BW</th>
<th>Fluctuating shoreline</th>
<th>Steady BW</th>
<th>Steady Shoreline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.5 ± 0.5 s.e.</td>
<td>18.1 ± 0.3 s.e.</td>
<td>18.4 ± 0.4 s.e.</td>
<td>17.3 ± 0.5 s.e.</td>
</tr>
</tbody>
</table>

Temperatures were lower during steady flows relative to fluctuating flows. Likely due to changes in day length/solar radiation

Water temperatures in backwaters were approximately 1°C warmer than shorelines.

Not certain of biological significance.
## Physical parameters

<table>
<thead>
<tr>
<th>Turbidity (NTU)</th>
<th>Fluctuating BW</th>
<th>Fluctuating Shoreline</th>
<th>Steady BW</th>
<th>Steady Shoreline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.6 ± 2.4 s.e.</td>
<td>25.3 ± 3.3 s.e.</td>
<td>5.6 ± 0.4 s.e.</td>
<td>3.9 ± 0.4 s.e.</td>
</tr>
</tbody>
</table>

Turbidity was higher during fluctuating flows than under steady flows

- Spates from Paria, LCR during first trip
Plankton densities were significantly higher under fluctuating flows than under steady flows in backwaters and shoreline habitats.

Likely associated with antecedent flows + reservoir stratification

Plankton densities between habitats were not significantly different under either flow.
Shoreline Macroinvertebrates

Shoreline Macroinvertebrate Density during Varied Flows

Total Macroinvertebrate densities were not different between flows or habitats

- Turbidity during first trip, antecedent conditions
- Life cycles & duration of flows insufficient to have an effect
- High variance in samples
Bluehead sucker relative abundance in backwaters was higher during steady flows relative to fluctuating flows.

- Lower turbidity during steady flow treatment?
- Tributary spates and fish entering mainstem?

Relative abundance for all other fish did not differ between flows.
Overall Conclusions

- Reliable conclusions about flows and biological resource interactions are limited.
  - Treatment duration too short
  - Antecedent conditions
  - Local hydrology and change in day length

- Biological and physical parameters measured were similar between flows with the exception of:
  - Temperatures were higher in backwaters and declined over time.
  - Turbidity was higher under fluctuating flows in both habitats
  - Plankton densities were higher under fluctuating flows.
  - Bluehead sucker relative abundances increased under steady flow treatment.
Recommendations

- Studying in lab situation first
- Extend duration of treatment
- Conduct earlier in year (e.g., late spring, summer)
- Limit collections to areas of importance for native fishes (e.g., LCR confluence) and collect more frequently