The Effects of Timber Harvesting on Stream Invertebrate Populations

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Purpose
- This long term study is examining physical & biological effects of logging on streams by monitoring conditions before and after logging in 2012 in Trask River headwaters (Fig. 1).
- My project focused on responses of stream invertebrates in 2014

Study sites
- At 3 sub-basins of the upper Trask Watershed: Pothole 3 and 4*, Gus 3, and Upper Main 1 and 3*(Figure 1): One logged and one unlogged site per sub-basin (6 sites total)

*Aerial photos of logged sites

Indicator Species
- Indicator species reflect characteristics of the environment where they live
- Used by researchers in order to gauge the health of an ecosystem
- In this study, we examined three indicator insect orders especially sensitive to water and habitat quality organisms: Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively called EPTs

Field Sampling
- Benthic (stream bottom) samples were collected in spring & summer. This study focused on summer samples
- At each site, samples were collected at 6 random points along a 30m stream section using a specialized net called a Surber sampler (Figure 2)
- Individual samples per site combined: Total sample area = 0.54 m²
- The combined sample was frozen for later sub-sampling and analysis

Laboratory Sub-sampling
- Sample split in half
- One half dried and weighed to obtain biomass
- Other half subsampled for = 500 organisms using a gridded sieve: I counted EPTs plus all other stream invertebrates in the subsample

Hypotheses
- Logging will have a negative impact and will result in fewer indicator organisms (EPT)
- Increased light after tree removal will boost productivity and result in higher invertebrate densities and/or biomass

Results
- I detected a dramatic difference in %EPT after logging at the Gus sites (Figure 3), especially among Plecoptera (Table 1)
- At Pothole sites % EPT was higher at logged sites, especially Ephemeroptera & Plecoptera (Table 1)
- Upper Main sites look relatively similar but there were significant differences between individual orders (Table 1)

Table 1. Comparison of %EPT at uncut and logged sites

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Site</th>
<th>%EPT Mayflies</th>
<th>%EPT Plecoptera</th>
<th>%EPT Trichoptera</th>
<th>%EPT mayflies</th>
<th>%EPT Plecoptera</th>
<th>%EPT Trichoptera</th>
<th>Invertebrates counted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncut</td>
<td>GS1</td>
<td>78.8%</td>
<td>50.4%</td>
<td>4.8%</td>
<td>37.1%</td>
<td>7.1%</td>
<td>11.1%</td>
<td>356</td>
</tr>
<tr>
<td>Logged</td>
<td>GS3</td>
<td>6.2%</td>
<td>3.1%</td>
<td>0.0%</td>
<td>54.7%</td>
<td>8.1%</td>
<td>13.1%</td>
<td>785</td>
</tr>
<tr>
<td>Logged</td>
<td>UM3</td>
<td>28.3%</td>
<td>39.3%</td>
<td>3.1%</td>
<td>48.3%</td>
<td>28.3%</td>
<td>13.1%</td>
<td>925</td>
</tr>
<tr>
<td>Uncut</td>
<td>UM3</td>
<td>6.2%</td>
<td>11.1%</td>
<td>4.8%</td>
<td>77.8%</td>
<td>11.1%</td>
<td>3.1%</td>
<td>949</td>
</tr>
</tbody>
</table>

- Looking at trends over time invertebrate responses post-harvest varied between sub-basins
- Gus 3 showed a continuing dramatic post-harvest decrease in %EPT in 2013 & 2014 (Figure 4)
- In Upper Main 3 %EPT increased.
- At Pothole sites, %EPT did not change at either logged or uncut sites
- Density showed a continuing post-harvest increase at Gus 3 in 2013 & 2014 but biomass was highest in 2013. Increased abundances of low biomass non-EPTs, particularly true flies (order Diptera) in 2014 could account for this pattern

Conclusions
- Though combined data from three sub-basins did not support either hypothesis, early results suggest that riparian conditions may strongly affect benthic invertebrate responses to logging

Promise Experience

Internship
- Working in the Department of Fisheries and Wildlife under Bill Gerth in the lab and field experience with Linda Ashkenas
- The study looks at the effects of current logging practices on stream ecosystems
- Learned how to classify invertebrates and their role in research

Professional Goals
- Gain and improve my skills in the filed of research
- Meet others in research and connect with them
- Experience a new field of science

Skills
- Microscope Skills
- Emergence Sample Collection
- Data Analysis

Professional Development
- Improved crucial skills like effective communication and networking and allowed me to meet a diverse group of people
- Let me explore new ideas and ways of thinking through my interactions with my peers and mentors

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- Promise Program for supporting my internship experience
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