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Eelgrass donor sites: potentially overlooked impacts of restoration in Puget Sound

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Speaker
John Vavrinec, Amy Borde, Jeffrey Gaecle, Valerie Cullinan, Susan Southard, Kate Hall, and Lara Aston
Eelgrass Donor Sites: potentially overlooked impacts of restoration in Puget Sound?

John Vavrinec (PNNL)
Amy Borde (PNNL)
Jeff Gaeckle (DNR)
Val Cullinan (PNNL)
Sue Southard (PNNL)
Kate Hall (PNNL)
Lara Aston (PNNL)
Eelgrass (Zostera marina)
Mitigation

- No net loss
- Mitigation ratios
Restoration
Donor plants in storage

PNNL Marine Sciences Lab (Sequim)
Donor meadows
Donor harvest best practices

- Choose substantial meadows
- Hand harvest
- No more than 5% of plants
- Spread out effort
Site selection

- Healthy meadows with good density
- Near existing restoration project
- If possible, good depth distribution
- 2 regions
Regional differences?
Donor impact experiment

- Randomized block design
- 5 blocks per site
- 5 harvest levels (0, 10, 20, 30, and 50%)
Methodology
Methodology

- Evaluate in 1 & 2 years
Eelgrass Densities (T₁)

Anderson Island  Port Gamble

Density (shoots m⁻²)

Treatment Site 0 10 20 30 50 0 10 20 30 50
AI 0 10 20 30 50
PG 0 10 20 30 50
Proportional change in density ($T_1$)

![Box plot showing the proportional change in density for Anderson Island and Port Gamble.](chart.png)
Eelgrass Densities ($T_2$)

Anderson Island | Port Gamble

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Site</th>
<th>PG</th>
<th>AI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>100</td>
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<td>10</td>
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<td>20</td>
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<tr>
<td>50</td>
<td>5</td>
<td>0</td>
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</tbody>
</table>

T2 (Count/m²)
Proportional change from harvest ($T_2$)

![Graph showing the proportional growth from harvest condition for Anderson Island and Port Gamble. The x-axis represents different treatments and sites, while the y-axis shows the proportional growth.](image-url)
Should we harvest more than 50%?

NO!
Caveats

We chose sites with higher densities
Caveats

- We harvested small patches
## Post Harvest Densities (T₀)

<table>
<thead>
<tr>
<th>Site</th>
<th>Treatment</th>
<th>PG</th>
<th>AI</th>
<th>50</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>0</th>
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<tbody>
<tr>
<td>Anderson Island</td>
<td>0</td>
<td>120</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Port Gamble</td>
<td>0</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>20</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Significant difference*
Conclusions

- Donor sites can probably recover quickly at moderate harvest rates

- Should conservatively harvest no more than 15 or 20% in dense areas

- Use best practices:
  - Remove small patches
  - Do not harvest the edges
  - Avoid low density areas
Still needs study

- Other regional/local differences
  - Conditions
  - Donor population
- Impacts on edges and at lower densities
- Impacts of various techniques
- Repeated harvesting of the same meadow
Thanks!

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