Poplar Plantation Management for Biomass Production in the Pacific Northwest
AHB Phase I poplar demonstration farms
AHB Phase I poplar demonstration farms - Objectives

- Quantify biomass yields
- Evaluate management practices
- Evaluate production costs
- Refine harvesting systems
- Pilot scale testing of selected genotypes
- Provide a testing ground for related research
AHB Phase I poplar demonstration farms - sites
# AHB Phase I poplar demonstration farms - sites

<table>
<thead>
<tr>
<th>Location</th>
<th>Precip (mm)</th>
<th>Elev. (m)</th>
<th>Physiographic location</th>
<th>Soil</th>
<th>Topography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jefferson, OR</td>
<td>1153</td>
<td>82</td>
<td>Willamette valley alluvial terrace</td>
<td>Clay loam</td>
<td>Flat to &lt; 5% slopes</td>
</tr>
<tr>
<td>Hayden, ID</td>
<td>668</td>
<td>700</td>
<td>Hayden valley alluvial terrace</td>
<td>Silty loam with coarse gravel fraction</td>
<td>Flat</td>
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<tr>
<td>Clarksburg, CA</td>
<td>457</td>
<td>1</td>
<td>Sacramento valley flood plain</td>
<td>Clay</td>
<td>Flat</td>
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<tr>
<td>Mt. Vernon, WA</td>
<td>828</td>
<td>213</td>
<td>Cascades range piedmont</td>
<td>Clay loam with coarse gravel fraction</td>
<td>Rolling hills to &lt; 10% slopes</td>
</tr>
</tbody>
</table>
Replicated trials within AHB Phase I poplar demonstration farm sites

1. Evaluation of hybrid poplar clones for bioenergy use

2. Hybrid poplar biomass productivity trials

3. Preliminary evaluation of red alder inter-specific hybridization
Biomass productivity trials

- Full factorial, Split-plot design
  - Jefferson, OR
    - 2 Harvest seasons (Dormant, Active) whole plots
    - 2 Planting densities (2691, 5381 TPHA) sub-plots
    - 2 Alder intercropping (yes, no) sub-plots
    - 4 Replications (Clones), 132 trees/trt plot, 40 trees/measurement plot
  - Hayden, ID
    - 2 Harvest seasons (Dormant, Active) whole plots
    - 3 Planting densities (2691, 3588, 5381 TPHA) sub-plots
    - 5 Replications (Clones), 132 trees/trt plot, 40 trees/measurement plot
# Biomass productivity trial (Jefferson, OR)

<table>
<thead>
<tr>
<th>Rep 1</th>
<th>Rep 2</th>
<th>Rep 3</th>
<th>Rep 4</th>
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<tbody>
<tr>
<td>Dormant</td>
<td>Active</td>
<td>Dormant</td>
<td>Active</td>
</tr>
<tr>
<td>10 x 2 (int.)</td>
<td>10 x 4 (int.)</td>
<td>10 x 4 (No int.)</td>
<td>10 x 4 (Int.)</td>
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<tr>
<td>10 x 4 (No int.)</td>
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## = Plot number; (int.) = alder intercropping; (No int.) = no alder intercropping

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Site specific management practices

Jefferson, OR

Mt. Vernon, WA
Year 1
Year 2
Yield by planting density after 2 years

![Graph showing yield by planting density after 2 years. The x-axis represents planting density (TPHA) with values 2691, 3588, and 5382. The y-axis represents yield (BDMT/ha) with values ranging from 0 to 11. The graph includes bars for Jefferson, OR, and Hayden, ID, with error bars indicating variability.](image-url)
Yield by clone after 2 years

Clones planted at Jefferson, OR:
- 1428: Yield (BDMT/ha)
- 4491: Yield (BDMT/ha)
- 6320: Yield (BDMT/ha)
- 7476: Yield (BDMT/ha)

Clones planted at Hayden, ID:
- BC79: Yield (BDMT/ha)
- BC81: Yield (BDMT/ha)
- BC82: Yield (BDMT/ha)
- OP367: Yield (BDMT/ha)
- Simplot: Yield (BDMT/ha)
Planting density effect on diameter

- **Jefferson**
  - 2691 TPHA
  - 3588 TPHA
  - 5382 TPHA

- **Hayden**
  - 2691 TPHA
  - 3588 TPHA
  - 5382 TPHA

DBH (cm)

Sites
Quantification of Yields

\[ y = 0.2096x^{2.279} \]

\[ R^2 = 0.973 \]
Stem to Branch Ratio

Jefferson, OR

<table>
<thead>
<tr>
<th>Clones</th>
<th>2691 TPHA</th>
<th>5382 TPHA</th>
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</thead>
<tbody>
<tr>
<td>1428</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4491</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6320</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7476</td>
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Stem to Branch Ratio

Hayden, ID

Clones

BC79  BC81  BC82  OP367  SIMPLOT

2691 TPHA
3588 TPHA
5382 TPHA

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Opportunities for genetic selection
Effect of Alder intercropping on poplar yield after 2 years
Intercropped alder yield after 2 years

![Graph showing intercropped alder yield after 2 years.](image-url)
Conclusions

- Significant site differences in productivity
- Clonal selection is a key factor to increase productivity
- More trees = Higher yield (at more productive site, age 2)
- Density dependent diameter differentiation showing at this early age
- Greater diameter impact on yields achieved at DBH > 8 cm
- Higher planting density leads to higher wood:branch in some clones
- Clonal selection for specific gravity could potentially increase yields
- Alder intercropping not affecting Poplar productivity (adds 1 BDMT/ha)