Pre-commercial Thinning and Fuels Reduction

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Biologically, why pre-commercial thinning

- Growth on higher quality, faster growing trees.
- Reduces rotation or increases tree size at end of rotation
- Increases tree vigor (ability to withstand drought, insects etc.)
- Removes trees that will die anyway

Generally

- Same wood volume across a broad range of # tree per acre
- But if fewer trees, the individual trees grow faster
- If these fewer trees are the best quality, we are better able to market them at end of rotation
- Sawlogs are usually more valuable than pulp and larger pulp is easier to harvest

Why it isn’t done

- Costs with no immediate benefit
- Time
- Some species do not self-prune when stand in low number (maple)
Goals

• Look at the potential yield from a couple of stand types
  – Aspen
  – Oak
  – Red pine with balsam midstory

Example Aspen Coppice
15 year old

• 1362 TPA
• 43 sf BA
• 2.4 QMD

• This is a fairly normal stand of aspen

Aspen

Potential Pre-commercial Thinning

• Bulldozer
• Brush cutter
• Crusher
• ???
Precommercial thinning

- First thin to 550 stems per acre (10 year to now)
- Second thin at age 30 to 200 stems per acre
- Research shows that thinning can increase total rotation yield by 40% (Perala 1978)

Biomass in the Aspen

<table>
<thead>
<tr>
<th>Number</th>
<th>Size</th>
<th>kg</th>
<th>lbs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>812</td>
<td>2 inches</td>
<td>5.113302</td>
<td>11.24927</td>
<td>9134.403</td>
</tr>
</tbody>
</table>

This stand had about 4.5 tons dry weight of total pre-commercially removed biomass all too small for pulpwood

Formula used is $\text{Total} = \exp(-2.2094 + 2.3867 \times \text{LN}(5))$
Thin 15 years later

This stand had about 23.5 tons dry weight removed of which a portion is small pulpwood

Formula used is $=\exp(-2.2094+2.3867\times\ln(5))$

<table>
<thead>
<tr>
<th>Number</th>
<th>Size</th>
<th>kg</th>
<th>lbs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>98.6</td>
<td>4 inches</td>
<td>26.74052</td>
<td>58.82913</td>
<td>5800.553</td>
</tr>
<tr>
<td>267.7</td>
<td>6 inches</td>
<td>70.3796</td>
<td>154.8351</td>
<td>41449.36</td>
</tr>
</tbody>
</table>

Benefits and Problems

- At end of rotation, may have about the same amount of wood
- But this wood is larger (more saw logs and larger pulp)
- Part of the 30 year thinning is pulp
- May have increase issues of sunscald
- Will have fewer trees to “hedge bets”
- May be able to “capture mortality”

Questions

- Could this 15 year old material be economically harvested for biomass?
- The 30 year thinning is “commercial” but at least half of the material would normally be slash or too small
- Could this be more easily harvested for biomass?
Oak

Two to think about

- Thinning in quality oak stands to remove undesirable species or quality
- Thinning/primary market for low grade oak stands on outwash sands (scrub oak)

Concerns

- Releasing oak too early may promote branchiness
- Do not want to thin until has developed 1.5 clear logs (app. 6 inches diameter)
- At this size, this is potential pulp
- Price is still low for oak pulp but would be potentially competitive with pulp industry
- At 24 mmbtu per cord, could this be a resource?
- The slash?

What do you think?
Red Pine with Balsam Understory

Biomass in the Balsam

<table>
<thead>
<tr>
<th>Number</th>
<th>Size</th>
<th>cm</th>
<th>each kg</th>
<th>each lb</th>
<th>total</th>
</tr>
</thead>
<tbody>
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<td>75</td>
<td>2</td>
<td>5</td>
<td>4.285594</td>
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<td>707.1231</td>
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<tr>
<td>317</td>
<td>4</td>
<td>10</td>
<td>23.93243</td>
<td>52.65136</td>
<td>16690.48</td>
</tr>
<tr>
<td>27</td>
<td>6</td>
<td>15</td>
<td>65.45453</td>
<td>144</td>
<td>3887.999</td>
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<tr>
<td>3.1</td>
<td>8</td>
<td>20</td>
<td>133.6481</td>
<td>294.0258</td>
<td>911.4799</td>
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<td></td>
<td>22197.08</td>
</tr>
</tbody>
</table>

This stand had about 11 tons dry weight of total balsam (needles and all) - about half a cord of this is potential pulpwood (maybe)

Formula used is =EXP(-2.5384+2.4814*LN(G20))

Does it make sense?

- Reduces fire risk (ladder fuel)
- What percent would be harvestable?
- How much would this fuel treatment cost ($300??)?
- Would this defer cost of fuel treatment
Conclusion

• The benefits of pre-commercial thinning are well known
• A lot of foresters leave the thinning “until it is commercial”
• This may be fine, but biomass pushes the window of a “commercial thinning” earlier in the rotation
• Questions still remain as to economic potential