Residual Piling Best Practices

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Agenda

- Terminology
- Units of measure
- Machinery
- Residue composition
- Residual harvest techniques
- Pile management
- Contaminants
- Post harvest
Terminology
Common language

- Why do we need to clarify the language?
  - Different units of measure
  - Different machinery
  - Different products
Common biomass / woody debris language

Biomass
- Organic matter, especially plant matter, that can be converted to fuel and is therefore regarded as a potential energy source.
- Usually we include pulp and OSB chips as well
- Covers far more than just the forestry world

Woody debris
- No set definition but for our purposes can include fibre residues from logging, sortyards, log storage yard, pulp mills and sawmills.
- Can include bark, needles and whitewood
- Large variety of particle sizes and forms
Common biomass / woody debris language

Comminution

- The action of reducing a material to minute particles or fragments.
- Why?
  - To reduce transportation and storage costs by increasing bulk density
  - To produce an acceptable biomass fuel or a feedstock for other processes (e.g., wood chips for combustion in boilers or material for pellets and briquettes)
Units of Measure
Common units of measure

- Why is understanding units of measure important?
  - Improve communication and prevent confusion
  - Improve accuracy in calculations
  - Help us understand what questions to ask when discussing biomass with other professionals
  - Supports fairer and more accurate biomass trade/payment systems (between suppliers and users of biomass --> nobody feels cheated)
Common units of measure

- Common units of measure
  - Cubic metres (solid)
  - Cubic metres (loose)
  - Tonnes – oven dry and green
  - Volumetric units
  - Wood density
  - Bulk density

- Refer to Woody Debris Workshop presentations soon to be available on FLNRORD website
Common Products
Common products

- Hog fuel
- Chips
- Firewood
- Pellets?
Machinery
Machinery

Horizontal grinders

- Large machine that smashes debris into small enough pieces that they will pass through a screen
- High productivity
- High fuel consumption
- High maintenance requirement
- Requires a companion loader
Machinery

Horizontal grinders

- **Tracked grinders**
  - Versatility
  - Can move to the residue
  - Operated through remote control
  - More expensive than wheeled

- **Wheeled grinders**
  - Less maneuverable
  - Must be moved with another machine
  - Cheaper
Grinding Techniques

Grind to Truck

- Means that residues are placed into the grinder, comminuted, and then trucks are filled directly with the grinder’s conveyor (front to back)

- Grinding directly to truck is usually the cheapest method and produces the smallest amount of contamination due to the smallest amount of handling
Grinding Techniques

Grind to Ground

- The comminuted residues are conveyed to the ground where they are loaded onto trucks at a later date
- Sometimes appropriate if trucks are in short supply
- Studies have shown that 10% of the comminuted volume must be left on the ground to avoid introducing contaminants
Grinding Costs and Productivity

- Average cost for grinding (including loader) is usually around $20-$25 per oven dry tonne
- Average productivity is usually around 25 odt per productive hour
- Note: these costs vary with operator experience, terrain, moisture content, machine size, etc
Machinery

Tub grinders

- Usually wheeled
- Can work well for short pieces and brush
- Longer pieces can cause blockage problems
Machinery

Loaders

- Grinders typically need a companion loader to place residue onto the infeed system
- Excavators and butt ‘n’ top loaders are most common
- A power grapple is the preferred attachment
Machinery

Portable chippers

- Chippers are similar to grinders in productivity but utilize a system of knives to slice chips off of woody pieces.
- There are two common types of portable chippers: Those with flails to remove bark and branches and those without flails.
- Chippers may or may not need a companion loader but usually need a support machine to bring them feedstock.
Chipping Technique

Residue chipping

- Relatively new to BC (at least in recent times)
- Tops and possibly long butts are transported to the chipper
- Residues are debarked and chipped
- Chips can be blown directly into trucks or possibly onto the ground (with 10% loss if chipping onto dirt)
- Tracked chippers are starting to emerge and have the same flexibility as tracked grinder, eliminating or reducing the need for support machines
- Users need to consider waste bark and branches from the delimming/debarking process
Chipping Costs and Productivity

- Average residue chipping costs is around $30 per oven dry tonne
- Average chipping residue productivity is between 15-25 odt per productive hour
- Like grinding, these costs and productivities are highly variable
Unprocessed Collection

Unprocessed collection

- Includes loading residues into bins or onto hayracks to be comminuted at a secondary location
- The difficulty in loading bins comes from the creation of air space (different sized and shaped pieces)
- Hayracks can be very effective at transport, but require a loader to both load and unload the truck
- Also, hayrack have difficulty transporting small pieces (long butts)
Logging Residue Composition
Residue composition

- Composition can vary greatly due to a variety of factors:
  - Merchantability specifications
  - Harvest prescriptions
  - Operator technique
  - Species harvested
  - Terrain

- Most piles are made of a composition of tops, long butts and brush
Residue composition

Tops

- Refers to the uppermost piece of a tree leftover after the sawlog and/or pulp logs have been removed
Residue composition

Long butts

- Refers to the lowermost piece of a tree that is often cut off and disposed of due to quality problems such as rot or excessive sweep
Residue composition

Brush

- Refers to the branches, needles and loose bark that removed from a tree stem during the processing phase of logging
Residue composition

- In an average second growth stand (but can vary greatly):
  - 75 - 85% tops
  - 10 - 15% long butts
  - 5 - 10% brush

- In an average old growth stand (can also vary greatly):
  - 40 - 50% tops
  - 35 - 45% long butts
  - 15 - 25% brush
Piling Best Practices
Common biomass / woody debris language

Burn piles

- Residue from timber harvesting that is piled into a shape or structure conducive to burning
- Commonly call ‘waste piles’, ‘haystacks’ or ‘stick piles’
- Historically burnt in the fall each year to meet fire abatement regulations
Traditional piling practices

- Residue burned to eliminate or reduce fire hazard created by the presence of the residue
- Burn piles are very difficult for secondary harvesters to extract
Common biomass / woody debris language

Oriented piles

- Logging residues that have been handled carefully to create a neatly stacked ‘deck-like’ formation that is much easier for secondary harvesters to handle
Piling Best Practices

- Piling formations depend on the end use, the road grade and the cut or fill slope
- FPI has developed an operator card to assist decision making in the field (it’s the last two pages of the guidebook)
Primary harvester – Pile formation

Grinding

- Keep tops aligned (don’t have to be perfect, just roughly parallel)
- Keep long butts separate if grinding for pellet feedstock (co-gen hog can be mixed)
Primary harvester – Pile formation

Grinding

- Two studies, one in the interior and one on the coast, demonstrated that there was no loss of productivity in the processing stage when operators dropped tops neatly.
Primary harvester – Pile formation

In-wood chipping

- Keep tops aligned (just like for grinding)
- Some operators may attempt to chip long butts, if so, then long butts should be piled separately from brush
- Brush is not used to make pulp chips and should be spread to avoid concentrations (and need to burn)
Primary harvester – Pile formation

Unprocessed collection

- Keep tops aligned (just like for grinding and chipping)
- Long butts should be piled separately from brush
- Brush should be scattered to avoid concentration and to provide nutrients for reforestation
Piling best practices

Processor or loader operators

- Try to align tops loosely (doesn’t have to be perfect)
- Avoid incorporating contaminants into the feedstock. This includes: sand, rocks, metal, snow, oil buckets, tires etc
- Where possible, avoid placing long butts and brush in front of tops decks, place to the side instead
- If brush is not being collected, try to scatter concentrations to avoid creating a fire fuel hazard or impediment to reforestation
Piling best practices

- Does it work?
- Recent trial work showed the following results:
  - Reduced piling costs ~ $2-3 per odt (licensee)
  - Reduced hoechucking costs ~ $5.50 per odt (secondary harvester)
  - Reduced loading costs ~ $10 per odt (unprocessed, chipping)
  - Reduced grinding costs ~ $2 per odt
Piling best practices

Road grades

- Road grades can limit areas accessible to secondary harvesters
- Communication is key! The guidelines below are just guidelines, consult your secondary harvester about any limits they may have.

<table>
<thead>
<tr>
<th>Road Grade</th>
<th>Piling Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10%</td>
<td>Pile for grinding</td>
</tr>
<tr>
<td>10-15%</td>
<td>Pile with secondary harvester agreement only</td>
</tr>
<tr>
<td>&gt;15%</td>
<td>Pile for burning if 15% pitches are longer than 50 metres</td>
</tr>
</tbody>
</table>
Piling best practices

Cutslope height

- Cutslope height above the road or fill slope below the road can determine whether secondary harvest can occur.
- As with the road slopes in the last slide, the guidelines below are just guidelines, consult your secondary harvester about any limits they may have.

<table>
<thead>
<tr>
<th>Cutslope Height</th>
<th>Piling Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 metres</td>
<td>Pile for grinding</td>
</tr>
<tr>
<td>3 to 5 metres</td>
<td>Pile with secondary harvester agreement only</td>
</tr>
<tr>
<td>&gt;5 metres</td>
<td>Pile for burning</td>
</tr>
</tbody>
</table>
Contaminants
Contaminants

- In woody debris, contaminants are considered to be anything that isn’t wood fibre: salt, rocks, sand, metal, oil and snow, etc.
- Large rocks or metal can severely damage comminution machinery.
- Sand and gravel can cause wear and damage at processing facilities.
Contaminants - Prevention

- Primary harvesters should take care not to incorporate contaminants in piles
- Pile stumps separately from potential feedstocks
- Avoid adding plastic from lunches or maintenance as plastic causes major problems in the pulping process. This applies to residues destined for the hog fuel pile as plastics can easily blown across a storage yard
- Secondary harvesters should also take care not to incorporate contaminants in feedstock. If piles are filled with dirt and other contaminants they should be left for alternate disposal
Contaminants

- Moisture is also considered a contaminant but is often difficult to control
- Snow can cause problems with the feedstock freezing in the trailer
- Excessive moisture in the feedstock is costly for haulers and in drying costs associated with pellet production
Contaminants - Prevention

- Processor or loader operators should attempt to pile residues as high as possible in snow heavy areas.
- Tarping residues with biodegradable wrappers has been successful in Europe and eastern Canada for reducing or maintaining low moisture content in residue piles.
Post Secondary Harvesting
Post secondary harvest

- After the harvest of residues, secondary harvesters (communicate with licensees!) need to make sure that there are adequate spots for reforestation and that the fire hazard has been mitigated.
- Residue concentrations should be broken up and scattered or piled for burning if excessive
- Windrow formations may also be acceptable in some areas (communicate with licensees!)
Take home messages

- We need to work together (primary and secondary, licensee and government) if we want to start utilizing residues. Understanding the viewpoints of the process participants is critical. Let’s talk to each other!
- We need to stop viewing logging residues as if they are ‘waste’ and start thinking about them as another product with value.
- We need to be willing to try new methods; the old paradigms around ‘waste’ disposal are becoming less and less acceptable to society.
- Changing methods doesn’t always mean an increase in cost.
Thank you!

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