Steep-Slope Timber-Harvesting Research in Western Canada

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Outline

- Facts about steep slopes in British Columbia (BC)
- Steep slope harvesting methods in BC
- FPInnovations Steep Slope Initiative
  - Introduction
  - Projects – tech assessment, machine stability, tech development, planning tools, environmental impacts.
  - Collaboration
- Summary
Steep Slopes: the Need

- Changing harvest profile (MPB)
- High accident rate with manual falling
- Expensive
- Needed fibre supply
- Skilled labour shortage
- Concern about environmental impacts
## BC Timber Volume by Slope Class

<table>
<thead>
<tr>
<th></th>
<th>Total AAC (million m³)</th>
<th>AAC &gt; 35% (million m³)</th>
<th>AAC &gt; 35% (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>77.0</td>
<td>18.3</td>
<td>24%</td>
</tr>
<tr>
<td>Coast</td>
<td>18.1</td>
<td>10.1</td>
<td>56%</td>
</tr>
<tr>
<td>Interior</td>
<td>58.9</td>
<td>8.2</td>
<td>14%</td>
</tr>
</tbody>
</table>

Source: British Columbia Government data
AAC – Allowable Annual Cut
## 2013 Safety Statistics
### Manual vs Mechanized Tree Falling

<table>
<thead>
<tr>
<th></th>
<th>Manual Tree Falling &amp; Bucking</th>
<th>Mechanized Tree Falling</th>
<th>Forestry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Years</td>
<td>490</td>
<td>483</td>
<td>16,215</td>
</tr>
<tr>
<td>Injury Rate %</td>
<td>26.8</td>
<td>1.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Serious Injury Rate* %</td>
<td>8.4</td>
<td>0.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Claims paid $million</td>
<td>9.3</td>
<td>0.4</td>
<td>44.3</td>
</tr>
</tbody>
</table>

* >30 days off

Source: WorkSafeBC
Steep Slopes Initiative Roadmap

GOALS

1) Increased safety - reduce accidents by 50%
2) Increase margin - by $5/m³
3) Access more fibre - 2 M m³

- 2015-2016
  - Introduction & field testing of new technology
  - Initiate regulatory changes

- 2016-2017
  - Commercial availability of steep slope equipment
  - Regulatory flexibility to support innovation

- 2017-2018
  - Decision support matrix of steep slope harvesting systems
  - Machine stability rating prototype

- 2018-2019
  - Best practices applied widely
  - Prototype in-cab real-time stability warning system

- 2019-2020
  - Operational machine stability rating system
  - In-cab machine stability dash board
Steep Slope Initiative Projects

- Technology Assessments
- Machine stability-related work
- Technology development
- Planning tool
- Roads and transportation
- Environmental impacts
Technology Assessments

- Including:
  - Grapple cams
  - Yoaders
  - Pierce grapple processor
  - Electronic release chokers

- Benchmark against existing technologies & systems

- Help implement
  - Regulatory compliance
  - Best practices
Technology Assessments: Winch-Assisted Systems

- ClimbMax (NZ) operating in the BC Interior for 18 months
- Remotely-operated bulldozer
- Ponsse-Alpine system
- JD-Haas system
- More systems appearing regularly
Combination winch-assist feller director and yarder.

Recently developed in Washington
Winch-Assisted Harvesting

- **Survey**
  - 9 major BC companies (44.5 mln m³)
  - Industry demand for winch-assist falling machines in next 5 years, 15.5 million m³/year, **155 machines**

- **Standard Development**
  - Line tension monitoring
  - Assessment of cable wear and integrity
  - Machine stability and traction
  - Anchoring
  - Soil/track interface
  - Machine inclination
Machine Stability

[Diagram of machine stability with labels: Tilt Table Platform, Buncher House, Tracks, Boom, Track angle relative to slope, Boom orientation relative to tracks]
## Machine Stability Testing

### Example Test Positions
Compare LTRs at 35, 40, and 50% for the two machines

<table>
<thead>
<tr>
<th>Position</th>
<th>Non-tilting machine</th>
<th>Tilting machine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LTR @ 35% slope</td>
<td>LTR @ 40% slope</td>
</tr>
<tr>
<td>5</td>
<td>0.05</td>
<td>0.13</td>
</tr>
<tr>
<td>3</td>
<td>0.14</td>
<td>0.22</td>
</tr>
<tr>
<td>6</td>
<td>0.62</td>
<td>0.70</td>
</tr>
</tbody>
</table>

- **LTR 0.00 - 0.29**   good stability
- **LTR 0.30 - 0.59**   moderate stability
- **LTR 0.60 - 0.89**   marginal stability
- **LTR 0.90 - 1.00**   unstable

(LTR = load transfer ratio. Higher LTR = less stability)
(LTR of 1 = upset condition)
Machine Stability

50% load capacity, minimum reach, track angle relative to the slope = 0 degrees, head height = 0.5 m
Technology Development

- Technology watch & market assessment
- Foster local technology development
- Adapted solutions to the BC needs & context
- Local winch-assist system (T-Mar)
Planning tools

- Heli-logging making a come-back in B.C.
- Currently updating operating cost assumptions
- Developing a user-friendly planning & deployment model
Environmental Impacts

- Collaborative project between FPInnovations, governments, universities, stakeholders
- Main issues around ground disturbance, rutting and terrain stability
- Develop/adapt/implement best practices with industry
Collaboration

- Industry
- Manufacturer Advisory Group
- International collaboration
- Universities
- WorkSafe BC and BC Safety Council
Web site – STEEP Initiative

- Dedicated steep slope initiative web page on the FPI web site
- Communications products, the team, project description, useful links
Summary

- 5-year STEEP initiative
- Collaboration with numerous stakeholders
- New technologies
- Ensure safety, cost-effectiveness and environmental sustainability
Thank you!

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