Intermountain Weight Scaling Methods

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Weight Scaling:

- Using weight as a unit of measure to determine the value of logs for buying and selling
- Sampling loads for weight and scaled volume to develop weight to volume conversions for future weigh-only loads
- Weight scaling is a relatively unexplored scaling method for the Inland Northwest

Compelling Questions:

- What factors are most important in determining weight to volume conversions for scaling?
- How viable is weight scaling over time (e.g. are trees and environments changing enough to alter relationships)?
- What are the effects of moisture loss from felled sawlogs on weight scaling?
Strengths and Weaknesses of Weight Scaling

**Strengths**
- Tangible to everyone
- Cheaper than traditional scaling
- Faster truck turn-times at mill
- Good correlation with volume

**Weaknesses**
- Difficult to determine conversions
  - Mixed loads: species/sorts
  - Variability within species/sort
  - Moisture content
  - Heartwood to sapwood ratio
- Some scaling is still required
- Does not measure all value drivers
  - Diameter, length, defects, grade

**Unknowns**
Overview

Current Practices
- Intermountain West weight scaling

Current Research
- Two UI weight scaling studies

Future
- Where weight scaling is headed

J. Saralecos, University of Idaho, 2013
Weight Scaling Review

Current Practices

Total scaled volume ÷ Total weighed volume = Weight-to-Volume Conversion

J. Saralecos, University of Idaho, 2012
Current Practices

- One conversion for each supervisory district
- Updated Yearly
- Does not vary by season, species, product type, or defect
- No conversions for cedar products, poles
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Study One: U of I Moisture Loss

Investigate moisture loss rates in harvested sawlogs and their affect on weight scaling.

Water commonly makes up over half of the wet (green) weight. Sawlogs decked prior to transport are subjected to varying amounts of drying and moisture loss.

Brad French, Iron Pine Logging, 2013
J. Saralecos, University of Idaho, 2013
Methods

Felled 30 Douglas-fir (*Pseudotsuga menziesii*) in 3 size classes 5-10, 10-15, 15-20 inches DBH

2 treatments  1) Cut-to-length  
               2) Whole tree

Sample cores were collected on alternate days through a 28 day period

Cores were dried and weighed to obtain moisture content
Study Results

Moisture loss was significantly affected by:

**Stem size class** – Larger stems lost moisture slower compared to smaller stems

**Treatment type** – Stems containing limbs had greater loss than stems with removed limbs

**Environmental factors** – Relative humidity (RH) and vapor pressure deficit (VPD)
Results

The moisture content (MC) of stem wood in the days following harvesting. Mean MC values for trees by DBH on a given sampling date are shown as solid shapes and error bars show standard errors (SE).
The changes in stem wood moisture content and site relative humidity are shown over the duration of the study. Mean moisture contents and relative humidity are shown in solid shapes with error bars showing SEs.
Figure shows the mean moisture content of stem wood separated by treatment type and stem location in the time following harvesting. Treatment 1 represented a cut-to-length harvesting system and Treatment 2 a whole-tree system. The results focused on the MC in the upper portions of the stems underneath the crowns.
Economic Impacts

2 Days
1.2 tons = $87.56

3 Days
2.5 tons = $182.60

4 Days
3.1 tons = $226.27

Idaho DFL $400/mbf
State W-V Avg. 5.48 tons/mbf
Avg. truck weight 27.3 tons

Extreme Case Scenario
Environmental and physical characteristics affecting weight to volume relationship for commercial sawlogs

J. Saralecos, University of Idaho, 2013
Methods

Project Completion: Late April 2014

• 7900 scaled loads from across Idaho
• Investigating climate data (ppt & temp)
• Also looking at species and season
• Working to make conversions more accurate and understandable
Results

W:V Conversions

Limited variation between supervisory districts

Large variation across season and species

Defect is highly predictable among delivered loads

Cubic is more closely correlated to weight than Scribner

\[
\begin{align*}
16'' \text{ SED} & = 16 \\
17'' \text{ SED} & = 18 \\
16'' \text{ SED} & = 22.34 \\
17'' \text{ SED} & = 23.78
\end{align*}
\]
Results

Seasonal Quarters

% Change from Average

-0.5 -0.4 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5

1 2 3 4

WRC  DFL  GFHAF  LPPP

Graph showing % change from average for different seasons and quarters.
Weight Scaling Conclusions

Weight works best when:

- Timber is consistent
- Loads are delivered in like-valued sorts
- Scaling is used to establish volume and value
- The purchaser and seller understand it well and use cubic rather than board feet for conversions
- Conversion factors adjust seasonally and with regard to species

Understanding weight scaling factors, specifically moisture loss
Citations and Acknowledgements


Questions?