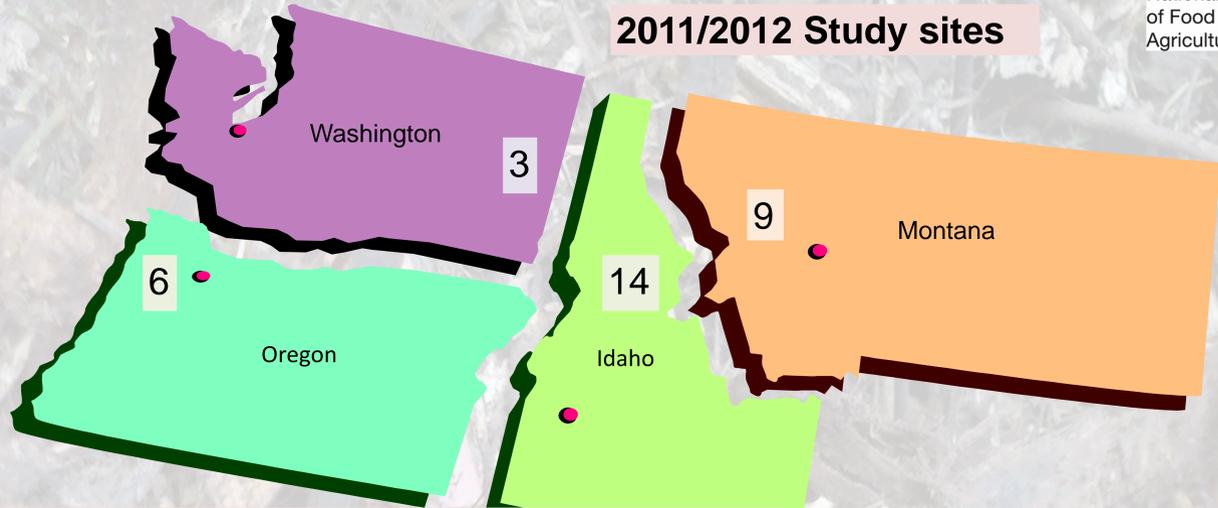


Forestry IS rocket science: quantifying logging residues as feedstock for bio-jet and other uses

Todd A. Morgan, Eric A. Simmons, Erik C. Berg, Charles B. Gale, and Steven W. Hayes

The role of Logging utilization studies in NARA

Logging utilization studies yield bole volumes of commercially harvested trees delivered to the mill versus bole volumes left in the forest as logging residue. When combined with data from other sources, these volumes can be used to estimate total tree (bole residues, tops and limbs) residue biomass. The authors used the results of a recent Idaho logging utilization study to perform this analysis. Because this research draws data from more than 30 randomly selected logging sites and over 700 felled sample trees per state, researchers can quantify residues at a variety of spatial scales. Land managers can use this information to make informed decisions on how to manage woody biomass residues for bioenergy applications at the stand, landscape, or state level.



Step 1: Converting cubic volumes

| Total volume of sampled harvest trees | Cubic ft | Green tons |
|---------------------------------------|----------|------------|
| Mill delivered volume | 32,476 | 812 |
| Bole residue | 795 | 20 |

Step 2: Adding in tops and limbs

Whole Tree Volume Estimates For The Rocky Mountain States
 United States Department of Agriculture
 Forest Service
 Intermountain Forest and Range Experiment Station
 Ogden, UT 84401
 Research Station
 INT-29
 March 1983

Weights of tops and limbs calculated from whole tree volume estimates are added to bole residues to quantify total biomass from logging residue.

Dwane D. Van Hooser
 David C. Chojnacky

Estimates of total logging residue for private lands in Idaho by county based on commercial timber harvest volume

| County | 2010 Timber harvest volume MBF | Total logging residue in green tons | County | 2010 Timber harvest volume MBF | Total logging residue in green tons |
|------------|--------------------------------|-------------------------------------|------------|--------------------------------|-------------------------------------|
| Adams | 9,118 | 14,826 | Fremont | 76 | 124 |
| Bannock | 88 | 143 | Idaho | 13,799 | 22,437 |
| Bear Lake | 0 | 0 | Kootenai | 38,767 | 63,035 |
| Benewah | 111,670 | 181,575 | Latah | 54,853 | 89,191 |
| Bingham | 0 | 0 | Lemhi | 0 | 0 |
| Boise | 18,927 | 30,775 | Lewis | 1,742 | 2,832 |
| Bonner | 44,118 | 71,735 | Madison | 0 | 0 |
| Bonneville | 60 | 98 | Nez Perce | 888 | 1,444 |
| Boundary | 16,522 | 26,865 | Owyhee | 0 | 0 |
| Camas | 0 | 0 | Shoshone | 91,880 | 149,398 |
| Caribou | 300 | 488 | Teton | 0 | 0 |
| Clark | 0 | 0 | Valley | 20,723 | 33,695 |
| Clearwater | 138,950 | 225,933 | Washington | 56 | 92 |
| Elmore | | | | | |
| Sub total | 339,753 | 552,438 | | 222,784 | 362,247 |
| | MBF | Residue | | | |
| Total | 562,537 | 914,685 | | | |

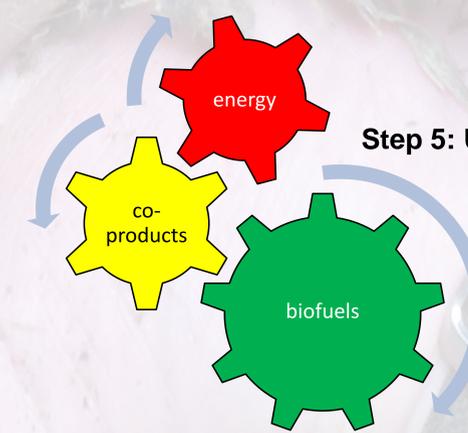
Idaho logging residue by ownership

| Ownership | 2010 Timber harvest volume MBF | Total logging residue in green tons |
|--------------|--------------------------------|-------------------------------------|
| Private | 562,536 | 914,684 |
| State | 260,660 | 423,833 |
| Federal | 96,350 | 156,665 |
| Total | 919,546 | 1,495,182 |

Step 4: Using the factors

Biomass factors can be applied to other data such as timber harvest by county or ownership to estimate total logging residue biomass.

Step 5: Using the biomass



Literature cited

Van Hooser, D.D.; Chojnacky, D.C., 1983. Whole Tree Volume Estimates For The Rocky Mountain States, Resour. Bull. Int-29. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.

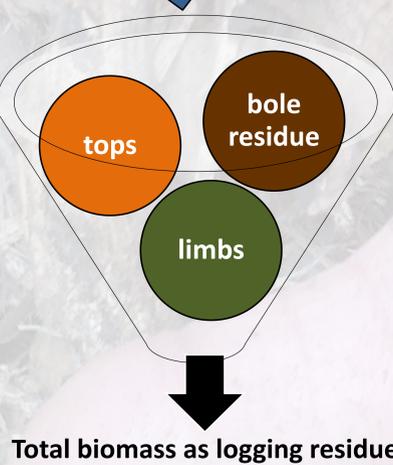
Morgan, T.A.; Spoelma, T.P., 2008. California logging utilization: 2004. West. J. Appl. For. 23(1): 12-18

Brandt, J.P.; Morgan, T.A.; Keegan, C.E. III; Songster, J.M.; Spoelma, T.P.; DeBlander, L.T. 2012. Idaho's forest products industry and timber harvest, 2006. Resour. Bull. RMRS RB-12. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 45 p.

Keegan, C. E. III; Bureau of Business and Economic Research, University of Montana, personal communication.

Contact us

For more info about this study, please contact:
 Eric Simmons: eric.simmons@business.umd.edu
 Erik Berg: erik.berg@business.umd.edu
 Todd Morgan: todd.morgan@business.umd.edu
 Or find us on the web at www.bber.umd.edu



Step 3: Calculating biomass factors

The ratio of the volume of total biomass as logging residue to mill delivered volume provides biomass factors for the following units of measure that can be used to estimate logging residue at varying spatial scales.

- 0.26 green tons residue per green ton mill delivered volume
- 6.5 green tons residue per MCF (1,000 cubic ft.) mill delivered volume
- 1.6 green tons residue per MBF Scribner mill delivered volume

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Cooperating private landowners