Montana Logging Utilization, 2011-2016

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Introduction

The Bureau of Business and Economic Research at the University of Montana conducted a statewide study of logging utilization in Montana from 2011 to 2016. This study provides information to help resource managers and the general public estimate and better understand the impacts of logging on timber inventory in Montana.

What is logging utilization?

Logging utilization studies determine the volumes and proportions of growing stock (live trees ≥ 5 inches diameter breast height [dbh]; measured from a 1-foot stump height to a 4 inch diameter top outside bark [dob]) and non-growing stock portions (e.g., tops and limbs) of trees removed from the forest inventory (figure 2). Removals factors quantify the amount of growing stock volume that is cut and either delivered to the mill or left in the forest as logging residue – as a fraction or proportion of mill-delivered volume.

Methods

Sample design:
Sample sites were selected proportional to a five-year average of commercial timber harvest volume by region (figure 1). Felled trees that qualified as a growing stock (live prior to harvest, with a dbh ≥ 5.0 inches, and meeting minimum merchantability standards), that had their entire stem, including the stump and top, had available for measurement were selected throughout the logging site

Tree measurements:
Diameter and section lengths were taken along the bole as follows (figure 2):

- At the cut stump
- At the1-foot above ground At dbh (diameter at breast height)
- At appropriate log lengths (not to exceed 16 feet) to the 7-inch dob top. (end of sawlog portion of tree)
- At the 4-inch dob top. (end of growing-stock portion of tree)
- At the end of utilization of each tree
- To the tip of the tree

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Cooperating Montana Landowners

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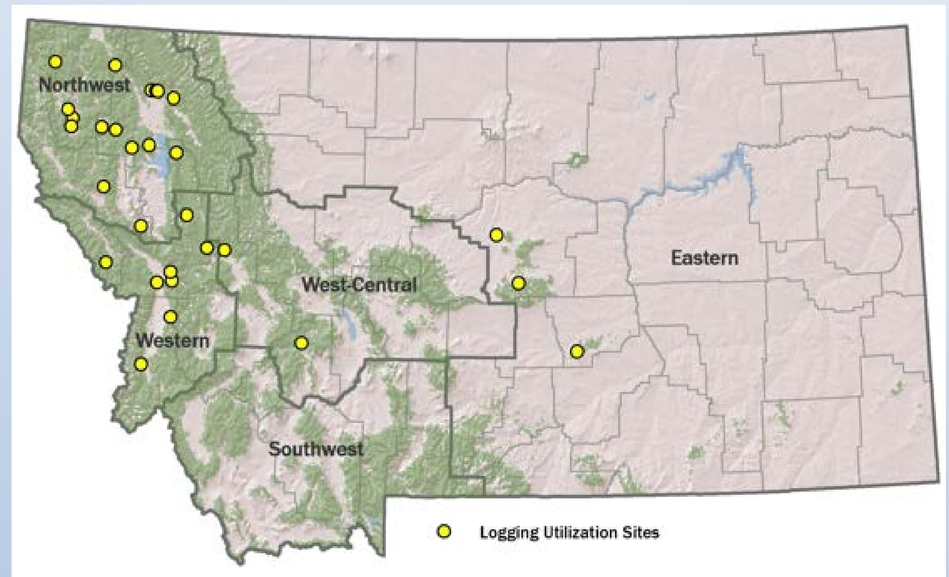


Figure 1: Sampled logging sites, 2011-2016.

Figure 2: Tree measurements.

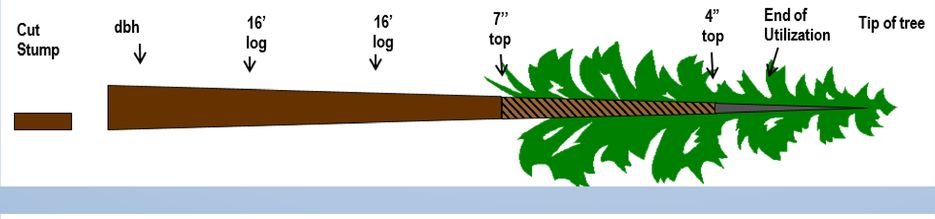


Figure 3: Percent of harvested trees, mill delivered volume, and residue as a percent of delivered volume by tree dbh class.

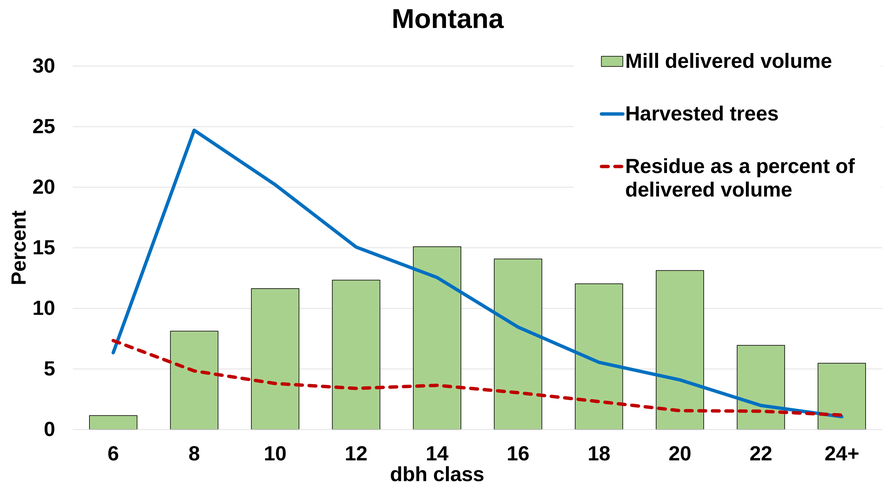
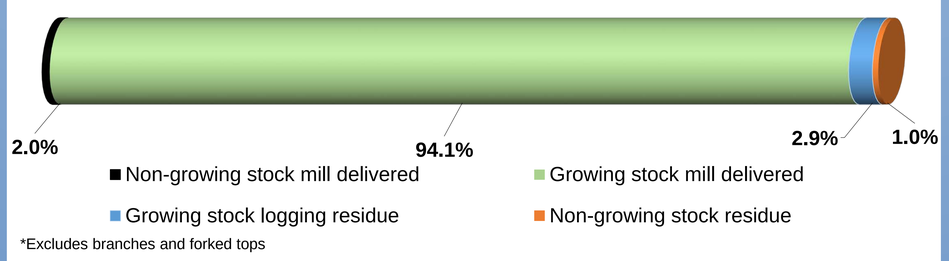


Figure 4: Harvested tree bole * percentages for Montana (portions of tree from cut stump to tip of main stem)



*Excludes branches and forked tops

Results

Logging methods & equipment

Logging operations included hand and mechanical felling methods, ground skidding and cable yarding systems, and hand and mechanical processors.

- Mechanical felling occurred on 63 percent of the sites while ground based skidding occurred on 83 percent of the sites.
- More than 80 percent of the sites processed the whole tree (tree length) with mechanical processors at the landing.

Characteristics of trees

For this study, 757 felled trees on 30 sites were measured, ranging from 5.4 inches to 29.0 inches dbh.

- About half of the harvested trees were ≤ 11.0 inches dbh, accounted for only 21 percent of the mill delivered volume, 31 percent of the total growing-stock logging residue, and produced 44 cubic feet (cf) of logging residue (4.4 percent residue factor) for every 1,000 cubic feet (MCF) delivered to the mill (figure 3).
- Trees >15 inches dbh accounted for 21 percent of the harvested trees, 36 percent of the total logging residue, nearly 52 percent of the mill delivered volume, and produced 21 cf of growing-stock logging residue (2.1 percent residue factor) for every MCF delivered to the mill. In general, smaller trees produced proportionally less volume and more residue for every cf delivered to the mill.
- Douglas-fir, ponderosa pine, and lodgepole pine accounted for 74 percent of the mill-delivered volume from Montana sites in this study.
- Ponderosa pine exhibited the highest residue factor of any species (3.9 percent). The residue factor for the pooled group of "other" softwoods, western redcedar, western white pine, Engelmann spruce, and western hemlock, was only 1.5 percent, the least of any species.

Removals

Factors quantifying harvesting impacts on forest inventory, revealed that:

- For every 1,000 cf of volume delivered to the mill 1,009 cf of growing-stock volume was removed from inventory (table 1).
- For every 1,000 cf of volume delivered to the mill 30 cf of growing-stock logging residue was left on site.
- In addition, 21 cf of non-growing stock from stumps and tops went to the mill.
- For all tree components, growing stock and non-growing stock, only 3.9 percent of the harvested tree bole volume was left on site as logging residue (figure 4).

Table 1 - Montana logging utilization factors for each 1,000 cubic feet of green material delivered to mills, selected years.

Factor	1965	1988	2002	2011-2016
	---------- *cubic feet* ----------			
Non-growing stock product delivered to mills	<5	<5	11	21
Growing-stock product delivered to mills	997	999	989	979
Growing-stock logging residue	163	122	92	30
Removals from growing stock	1,160	1,121	1,081	1,009

Sources: Wilson et al. 1970; McLain 1992; Morgan et al. 2005.

Comparisons

Since 1965, utilization of trees has steadily improved with more non-growing stock being delivered to mills and less growing stock being left on site as logging residue. Utilization of non-growing stock portions of trees has increased fourfold while growing-stock logging residue has decreased by more than 80 percent (table 1). In the last decade, the utilization of non-growing stock has nearly doubled while growing-stock logging residue has decreased by77 percent. With improvements in harvesting technology and greater use of mechanized systems, logging operations today are vastly more efficient in using the resource than those of the past. It is not your Grandpa's logging show!