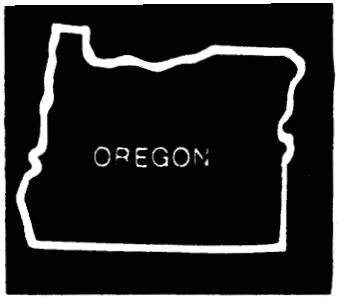

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VOLUME OF LOGGING RESIDUES IN OREGON, WASHINGTON, AND CALIFORNIA-- INITIAL RESULTS FROM A 1969-70 STUDY

by

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ABSTRACT

A study conducted during 1969-70 in Oregon, Washington, and California indicates that the average net volume of logging residues ranged from 325 to 3,156 cubic feet per acre. The highest volume was on National Forests in the Douglas-fir region, which averaged 2.5 times greater than private lands. The lowest volumes of residue were found in the ponderosa pine region where both private and public lands averaged between 325 and 375 cubic feet per acre. Private lands in California averaged 1,558 cubic feet per acre, while National Forests averaged 1,206 cubic feet per acre. The total net volume of logging residues for all regions was 908 million cubic feet, about 26 percent of the reported 1969 log harvest. In the Douglas-fir region total net volume was 465 million cubic feet, which amounted to 50 percent of the wood consumption by the pulp and board industries in western Oregon and western Washington for 1968.

Keywords: Logging slash, wood waste, waste utilization.

INTRODUCTION

Interest in logging residues has grown rapidly over the last decade. Concern for environmental and esthetic quality has brought about the call for abatement of residues by means other than burning. Yet without burning, logging residues present a continuous and costly problem in protection to the forest manager. Logging residues may also hamper access and limit mobility necessary for management of young-growth stands. In addition, the increasing demand for wood and mounting pressure to remove some forest lands from timber production emphasize logging residues as a potential source of utilizable wood fiber.

What is lacking today are the answers to the vital questions concerning logging residues such as: How much residue material is acceptable on a cutover area from an environmental and esthetic standpoint? At what point does the quantity of logging residues require additional outlays for fire protection purposes? What level of residues is necessary to make it economically feasible to relog an area? What policies or practices help or hinder the abatement of residues during the harvesting operation? A major obstacle to the solution of these problems is the lack of adequate knowledge about the magnitude and characteristics of residues created during harvesting operations.

The Pacific Northwest Forest and Range Experiment Station conducted a study to provide such knowledge. This report summarizes statistics on the volume of residues created during the process of log harvesting operations in 1969. A subsequent report will describe logging residue characteristics. Included in this later report will be classifications of residue by type of material, diameter class, length class, species, concentration, and utilization criteria.

SCOPE AND METHODOLOGY

Information for this study was collected from a sample of 76 cutover units in Oregon, Washington, and California. Some of the data from 14 Naticnal Forest tracts sampled in western Washington were shown in a paper by Dell and Ward,[1/] which describes logging residues in relation to fire control problems on National Forests of western Oregon and western Washington.

[1/] John D. Dell and Franklin R. Ward. Logging residues on Douglas-fir region clearcuts--weights and volumes. Portland, Oreg., Pac. Northwest Forest & Range Exp. Sta. USDA Forest Serv. Res. Pap. PNW-115, 10 p., illus., 1971.

The population sampled consisted of the total acreage of clearcuts in western Oregon and western Washington and the total acreage of clearcut and selectively logged areas in eastern Oregon, eastern Washington, and California. Within each geographic area, the sample was allocated among owner classes on the basis of the proportion of the total volume cut in each class. Individual sample units were selected by accumulating the total acreage cut within each owner stratum and randomly drawing the sample units from this array of acres, such that all sampling units were drawn with equal probability.

The method used for measuring residue volume was the line intersect method developed in New Zealand in 1964,[2] with modifications developed in Canada.[3] [4] A 30-chain continuous line transect, with a random change in direction every 5 chains, was located within each cutover area sampled.

Logging residues measured in the study included all material left after logging with a minimum diameter of 4 inches outside bark, 4 feet long, and containing at least 10-percent-sound wood fiber. This includes material from trees that were dead at the time of logging. Both gross and net volume estimates were made on each piece of material. The net volume defines the maximum amount of usable wood fiber and does not reflect any product characteristic, such as minimum log length, log grade, sawability, or peelability.

RESIDUE VOLUME PER ACRE

The average cubic-foot volume of residues per acre by geographic area-owner class is displayed in table 1.

The volume of residues by owner group varies considerably within the Douglas-fir region. The average gross volume per acre for the National Forest sample is almost three times greater than the average for private lands and the average net volume about 2.4 times greater. The greater proportion of old-growth timber occurring on the National Forests may account for a large share of the difference, although

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[2] W. G. Warren and P. F. Olsen. A line intersect technique for assessing logging waste. Forest Sci. 10: 267-276, 1964.

[3] C. E. Van Wagner. The line intersect method in forest fuel sampling. Forest Sci. 14: 20-26, 1968.

[4] G. R. Bailey. A simplified method of sampling logging residue. Forest Chron. 46(4): 1-7, 1970.

Table 1.--*Average volume per acre of logging residues by geographic area and owner, 1969*

Geographic area	National Forest			Other public[2/]			Private		
	Sample size	Average residue volume		Sample size	Average residue volume		Sample size	Average residue volume	
		Gross	Net[1/]		Gross	Net[1/]		Gross	Net[1/]
		Cubic feet per acre			*Cubic feet per acre*			*Cubic feet per acre*	
Douglas-fir region (western Oregon and western Washington)	22	4,511	3,156 (±543)	8	2,677	2,060 (±432)	24	1,507	1,344 (±231)
Ponderosa pine region (eastern Oregon and eastern Washington)	6	[3/]404	[3/]325 (±164)	--	--	--	4	423	376 (±91)
California	6	1,499	1,206 (±540)	--	--	--	6	2,093	1,558 (±806)

[1/] Figures in parentheses represent the 68-percent confidence interval about the average.

[2/] Due to the relatively small volume of timber cut in the "other public" owner group in the ponderosa pine region and California, the statistics were combined with the National Forest stratum.

[3/] Includes one sample observation on Indian land in eastern Washington.

economic and policy factors (such as stumpage price and contract specifications) also play an important role.

The low volume of residues in the ponderosa pine region is primarily the result of the lower stand volumes and harvesting methods used. The results shown for California represent both coastal and interior conditions for each owner group, encompassing a range of volumes from 5,400 cubic feet per acre in the coastal redwood zone to 84 cubic feet per acre on a sample in the interior area. A stratification of sample observations into coast range and interior range logging conditions indicated average net volumes of 2,755 and 401 cubic feet per acre, respectively.

A high proportion of logging residue volume has potential as usable wood fiber. In the Douglas-fir region, net volume of logging residue ranged from half to nearly all of the gross volume. As table 1 shows, the average proportion of net volume to gross volume is 70 percent for the National Forest sample, while for private lands the average is almost 90 percent. The same relationship holds in the ponderosa pine region, with the National Forest sample having a lower proportion of usable volume than the private sample. In California, the percentage of usable volume for the private sample is less than for the National Forests. This may be explained by the greater number of National Forest sample observations in the interior region, where the incidence of rot is lower.

TOTAL RESIDUE VOLUME

Table 2 shows the total volume of potentially usable wood fiber--in pieces at least 4 feet long, at least 4 inches in diameter, and with 10 percent or more of the gross volume suitable for pulp chips--left as residue from logging operations in 1969.

Totals for the Douglas-fir region were developed from clearcut acreage estimates furnished by the Washington State Department of Natural Resources, the Oregon State Department of Forestry, and the U.S. Department of Agriculture, Forest Service, Region 6. For the ponderosa pine region of eastern Oregon, eastern Washington, and California, the totals were derived by applying the ratio of the average volume of logging residues per thousand board feet of timber cut from the sampled tracts to the total volume of timber harvested for each owner class. The total volume harvested was supplied by the California Division of Forestry, the Washington State Department of Natural Resources, and the Oregon State Department of Forestry.

The total net residue volume for the three-State area is 908 million cubic feet, equivalent to about 26 percent of the reported 1969 log

harvest. Due to such factors as slash burning, relogging, and decay, the figures shown in table 2 represent a larger volume of residues from 1969 logging operations than is actually available today.

Table 2.--*Total net residue volume by geographic area and owner class, 1969*

Geographic area	National Forest	Other public[1/]	Private	All owners
		Thousand cubic feet		
Douglas-fir region[2/]	142,000	103,000	220,000	465,000
Ponderosa pine region	64,000	--	29,000	93,000
California	134,000	--	216,000	350,000

[1/] Due to the relatively small volume of timber cut in the "other public" owner group in the ponderosa pine region and California, the statistics were combined with the National Forest stratum.

[2/] Volume from clearcut operations only. Estimated clearcut acreages for the Douglas-fir region: National Forest, 45,000 acres; other public, 50,000 acres; private, 163,600 acres.

Preliminary analysis indicates that in the Douglas-fir region approximately 59 percent of the total net residue volume is in pieces 12 feet or longer, with 50 percent or more of the gross volume suitable for pulp chips. This physical standard nearly meets the definition of a utility log, the minimum log grade currently used.

The total net volume of logging residue generated annually in the Douglas-fir region, most of which is not now economically available, represents a sizable potential source of wood fiber. In 1969, the total net volume of logging residues in the Douglas-fir region was 465 million cubic feet (table 2), equivalent to just over 50 percent of the total raw material consumption by the pulp, paper, and board industries of the region. As economic and technological changes occur, logging residues may present a substantial base for increases in paper and board production, with no additional drain on the timber resource of the region.

The mission of the PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION is to provide the knowledge, technology, and alternatives for present and future protection, management, and use of forest, range, and related environments.

Within this overall mission, the Station conducts and stimulates research to facilitate and to accelerate progress toward the following goals:

1. Providing safe and efficient technology for inventory, protection, and use of resources.
2. Development and evaluation of alternative methods and levels of resource management.
3. Achievement of optimum sustained resource productivity consistent with maintaining a high quality forest environment.

The area of research encompasses Oregon, Washington, Alaska, and, in some cases, California, Hawaii, the Western States, and the Nation. Results of the research will be made available promptly. Project headquarters are at:

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Corvallis, Oregon	Seattle, Washington
La Grande, Oregon	Wenatchee, Washington

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