



Chipping of Thinning Slash on Fuel-Breaks

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ABSTRACT: A heavy stand of conifer saplings and poles on the Stanislaus National Forest was thinned, piled, and chipped. The study sought to determine the amount of material removed and the cost of chipping. Slash disposal costs were \$9.66 per ton for dry material, and \$11.81 per ton for green slash.

What is the cheapest and safest way of getting rid of slash on fuel-breaks? Burning can damage healthy "leave" trees. Winter burning sometimes results in incomplete disposal because of wet

conditions. Researchers with the Conflagration Control Project on the Stanislaus National Forest, near Sonora, California, decided to experiment with a wood chipper for slash disposal on fuel-breaks. Past studies had shown that wood chips closely resemble natural duff and do not contribute materially to fire spread.¹ Costs for logging slash as reported by California operators have varied, ranging up to \$1.40 per thousand board feet of timber cut. Though a great deal of work has been done with wood chippers in California and elsewhere, on logging areas² for tree trimmings, and on slash created as a result of land clearing, little information is available on chipping in thinning operations.

The objectives of the study were to determine (a) the feasibility and costs of using a wood chipper for the disposal of slash which was produced when a dense stand of saplings and poles was thinned and (b) whether it is cheaper to chip dry or green slash.

METHODS

The study was done on the Stanislaus National Forest as part of the Duckwall Conflagration Control Program--a joint study carried on by the Pacific Southwest Forest and Range Experiment Station, the California Region, and the Stanislaus National Forest. Thinning and chipping were done in a heavy mixed-conifer stand composed of 95 percent ponderosa pine, 4 percent sugar pine, and 1 percent incense-cedar, as determined by stem count. The plots were representative of the area distribution.

¹Casamajor, P., and Wilson, C.C. Portable chippers, answer to reducing slash fire hazard. *The Timberman*, pp. 50-52, June 28, 1957.

²Arend, J. L., Smith, R. N., and Ralston, R. H. Tests of a portable wood chipper in utilizing logging residue and in disposing of brush. U.S. Forest Serv. Lake States Forest Expt. Sta. Paper 30, 35 pp., illus. 1954.

A primary objective when constructing fuel-breaks in timber stands is to reduce the volume of flammable fuels on and near the ground, but still retain an overstory for shade. In young stands this usually means heavy thinning of the stand and pruning of the lower limbs on remaining trees.

On test plots, the original stand of 3,500 trees per acre was thinned to the best 320 trees. The trees cut averaged 2 1/2 inches in diameter. Tree length averaged 15 feet. Tables 1 to 3 present additional information on the nature of cut material which affected the thinning, piling, and chipping jobs. Table 1 presents the averaged weight of cut trees by diameter and crown class obtained by weighing a number of trees in each diameter group. Table 2 presents the number of cut stems on each plot by diameter groups. Table 3 lists the green weight of the chipped material on each plot, obtained by multiplying the average stem weight (table 1) by the number of stems (table 2).

The trees on two of the four 1-square-chain plots were thinned in July, and the material left to dry during the summer. In September the slash was carried and piled at the roadside for chipping. The trees on the other two plots were thinned in September; slash was carried to roadside, and chipped green. Only those trees too heavy to handle as a whole were sectioned. All material was stacked with the larger ends facing the road.

The chipper³ used in this study could chip the material as fast as the men could feed it. Only the larger trees (4-5 inches in diameter, 20-35 feet long) had to be fed into it more slowly. To guard against flying chips, operating personnel wore protective shields.

RESULTS AND CONCLUSIONS

To meet fuel-break standards, we removed 91 percent of the original stems per acre, or about 3.26 tons. Slash disposal by chipping compared favorably with slash disposal by burning both in feasibility and in costs. Total costs amounted to \$9.66 per ton for dry material and \$11.81 for green (table 4). It cost \$9.20 per ton to hand thin, prune, pile, and swamper-burn slash from the same stand.

Where ready access made chippers practical, it was cheaper to chip dry rather than green slash because the material was lighter and easier to handle.

Advantages of chipping thinning slash include these:

Most stems did not have to be cut into short lengths. Immediate disposal was

³Hall Model KS292, equipped with 16-inch blades, and powered by a Ford V-8 engine mounted on a truck. (Mention of commercial products does not constitute an endorsement by the U.S. Forest Service.)

Table 1. *Average green weight of cut trees, by diameter and crown class*

Stump diameter (inches)	Crown length, percent of height	Weight pounds
1	5	2
2	20	10
3	30	40
4	45	64
5	75	102

Table 2. *Number of cut stems on each 1-square-chain plot, by diameter groups*

Plot	1 inch	2 inches	3 inches	4 inches	5 inches
1	271	215	60	1	0
2	388	284	124	3	6
3	1,114	381	66	5	0
4	134	71	46	7	1
Total	1,907	951	296	16	7

Table 3. *Green weight of material cut, removed, and chipped from 1-square-chain plots*

Plot	Pounds	Ton	Percent of total
1	5,156	2.58	19.2
2	9,380	4.69	34.9
3	8,998	4.50	33.4
4	3,368	1.68	12.5
Total	26,902	13.45	100.0

Table 4. *Costs and production in chipping study*

Item	Cost	Production (ton/hour)		Cost/ton	
		Dry	Green	Dry	Green
Thinning ¹	\$4.38	--	1.1	\$3.98	\$3.98
Piling ^{1,2}	2.38	0.65	0.47	3.66	5.06
Chipping ³	9.70	4.8	3.5	2.02	2.77
Total	--	--	--	\$9.66	\$11.81

¹Costs are based on California Region rates (1964) of \$2.38 per hour for a permanent Forest Service laborer (laborer II), and \$2.00 per hour for chain saw rental, which includes maintenance and operation by experienced personnel.

²Slash was carried an average distance of one-half chain.

³Costs are based on California Region rates (1964) of \$2.38 per hour for laborer II, \$2.50 per hour for a permanent GS-5 foreman, and \$2.50 per hour for chipper rental, which includes maintenance, operation, and depreciation.

possible, and this eliminated the fire hazard and the possibility of Ips beetle infestations. Finally, no damage to the "leave" stand resulted because of burning.

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