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Slash and Litter Weight after Clearcut Logging in Two Young-Growth Timber Stands

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Timber Stands

ABSTRACT: Ninety-year-old stands of the Pacific ponderosa pine and Pacific ponderosa pine-Douglas-fir types yielded 53 to 110 tons of slash to the acre after logging on the Challenge Experimental Forest, Yuba County, Calif. Fine slash (under 4 inches d.i.b.) contributed 61 to 64 percent of this weight.

Heavy concentrations of logging slash usually must be removed to reduce fire danger and to assure adequate stand regeneration. Information on slash weight for various forest cover types could be helpful in fire suppression work, fire control planning, and evaluation of slash disposal methods.

Such weight measurements have been made of slash and litter of two 90-year-old forest cover types at the Challenge Experimental Forest,¹ Yuba County, California, following clearcuttings (fig. 1). For Pacific ponderosa pine (Soc. Amer. Foresters 1954), slash weight averaged 74 tons per acre, ranging from 53 to 89 tons; for Pacific ponderosa pine-Douglas-fir, it averaged 97 tons per acre, ranging from 88 to 110 tons (see appendix).

Conifer slash from the clearcuttings amounted to about 45 percent of the total slash weight (table 1). Materials less than 4 inches in diameter from conifers, hardwoods, and litter made up 61 to 64 percent of the slash weight (table 2). The data from this study proved useful as guides to heat intensities during broadcast burning and to planning precautionary measures during ignition.

Selection of timber stands to be clearcut was based on conifer sawtimber stocking of less than 50 percent of normal (Meyers 1938), age of the stand, aspect, and similarity of soils.

Two stand tables developed from 100-percent cruises of sawtimber (trees more than 12 inches d.b.h.) and samples of the submerchantable trees (trees less than 12 inches d.b.h.) depict the stands of this study (table 3, appendix).

Slash Weight Measurements

Six paired compartments--2, 5, and 10 acres in size--were clearcut in each timber type. Submerchantable conifers and hardwoods were sampled by concentric plots of two sizes: 0.05-acre and 0.01-

Table 1.--Contributions to slash weight by major slash components

PACIFIC PONDEROSA PINE FOREST TYPE		
Components	Average weight	Percent
	Tons per acre	
Conifers	33	45
Hardwoods	23	31
Litter	18	24
Total	74	100

PACIFIC PONDEROSA PINE-DOUGLAS-FIR FOREST TYPE		
Conifers	44	45
Hardwoods	28	29
Litter	25	26
Total	97	100

¹U.S. Forest Service research at the Challenge Experimental Forest is conducted in cooperation with the Soper-Wheeler Company, Strawberry Valley, Calif.



Figure 1.--The total slash, which included unmerchantable trees, in this young-growth Pacific ponderosa pine stand averaged 74 tons per acre. After the harvest cut, the unmerchantable conifers and hardwoods were pushed to the ground.

Table 2.--Slash components, by size of material

Material type	Pacific ponderosa pine forest type		Pacific ponderosa pine-Douglas-fir forest type	
	Less than 4 in. diam.	4 in. diam. and greater	Less than 4 in. diam.	4 in. diam. and greater
	Tons per acre			
Conifers	22	12	27	16
Hardwoods	6	17	10	18
Litter	18	--	25	--
Total	46	29	62	34

acre. Pole-size trees, both conifers and hardwoods, were tallied on the large plots, and saplings on the small plots. The number of plots increased as compartment size increased: e.g., two,

three, and six plots on 2-, 5- and 10-acre compartments, respectively. Hardwood sawtimber was sampled at four points in each compartment, using a Basal Area Factor 20 prism. Cull logs

and unused tops were tallied after logging. Litter was sampled on 1/2-milacre plots.

Conifer slash weight.--Estimates of sawtimber slash weights were based on Chandler's (1960) slash weight tables. Crown length as a percent of total height (in 20-percent classes) was estimated during the timber cruise.

Tallies of submerchantable trees were averaged and stand tables developed for each compartment. Chandler's (1960) slash weight values were multiplied by the number of stems in each diameter class to give slash weights. The weights for submerchantable white fir were used for the missing Douglas-fir values because I believe they would be reasonably similar.

Ovendry slash weights from sawtimber and submerchantable timber are given in two size classes: coarse (4 inches d.i.b. and larger), and fine (less than 4 inches d.i.b.) (table 4, appendix).

Hardwood slash weight estimates.--Tabular bole volumes, in cubic feet, for hardwoods greater than 6 inches d.b.h. (Hornibrook et al. 1950) were summed for each sample plot and averaged for each compartment. Air-dry weight, 12 percent moisture content (Craig and Maguire 1949), for 1 cubic foot of each species was adjusted to oven-dry weight. The oven-dry weight multiplied by the cubic volume gave the bole dry weight.

Crown weights (limbs and tops less than 4 inches d.i.b.) and weights for trees less than 6 inches d.b.h. were obtained from previously published curves (Sundahl 1966). Weights of crowns for hardwoods greater than 22 inches in diameter were obtained by extrapolation of these curves.

Litter.--Litter, including humus layers, was weighed on 88 half-milacre plots in each forest cover type. The fresh weight was recorded for each plot. Fractional samples from every other plot were placed in airtight containers, weighed, and later oven-dried to determine the percent moisture content. The fresh weight for each half-milacre was then adjusted by the average moisture content to obtain dry weight.

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The Author

WILLIAM E. SUNDAHL is on the research staff of the Challenge Experimental Forest. Born in Greenville, Calif., he attended Chico State College, where he received a bachelor's degree in biological sciences (1956). He joined the Forest Service in 1957.

Appendix

Table 3. Stand tables of two young-growth forest types on the Challenge Experimental Forest, California

PACIFIC PONDEROSA PINE FOREST TYPE

D. b. h. (inches)	Conifers					Hardwoods		
	Ponderosa pine	Sugar pine	Douglas- fir	White fir	Incense- cedar	Black oak	Tanoak	Madrone
Average number of trees per acre								
2 - 9	14.1	4.2	37.8	11.2	115.1	19.3	24.7	129.7
10 - 19	14.8	.1	4.9	.5	13.9	7.9	4.1	35.1
20 - 29	15.1	.1	2.2	.3	3.1	1.6	3.0	.0
30 or more	6.8	.3	.6	.2	.4	1.1	.0	.0
Totals	50.8	4.7	45.5	12.2	132.5	29.9	31.8	164.8

PACIFIC PONDEROSA PINE-DOUGLAS-FIR FOREST TYPE

2 - 9	30.4	23.4	211.0	193.4	130.4	56.1	111.9	20.8
10 - 19	5.3	.9	14.6	4.4	6.8	30.9	36.0	4.8
20 - 29	5.6	.9	6.4	1.4	1.7	10.8	6.8	.0
30 or more	2.4	1.2	2.6	.7	.5	6.1	.7	.0
Totals	43.7	26.4	234.6	199.9	139.4	103.9	155.4	25.6

Table 4.--Conifer and hardwood slash weight, by compartment and size class

PACIFIC PONDEROSA PINE FOREST TYPE

Compartment	Conifer slash						Hardwood slash					Litter and humus	Totals
	Sawtimber ¹				Submerchantable timber ¹		Sawtimber		Submerchantable timber				
									Poles		Saplings		
	Less than 4 in. d.i.b.	4 in. d.i.b. and greater	Needles	Cull logs	Less than 4 in. d.i.b.	4 in. d.i.b. and greater	Less than 4 in. d.i.b.	4 in. d.i.b. and greater	Less than 4 in. d.i.b.	4 in. d.i.b. and greater	0.5 to 4 in. d.i.b.		
	Tons per acre												
1	8.4	2.6	2.6	2.1	8.1	7.2	0.2	4.4	1.8	3.5	1.4	24.4	66.7
2	9.3	3.3	3.2	2.7	6.1	8.6	.7	4.8	.4	.5	.2	18.5	58.3
3	6.1	2.0	1.9	1.2	1.5	1.1	.9	8.5	6.7	27.2	6.8	12.8	76.7
4	5.9	2.3	1.9	1.3	.8	.9	.6	5.9	2.2	11.7	2.0	17.9	53.4
5	18.4	3.6	5.0	2.7	7.4	8.1	.8	7.7	.3	.5	.3	19.1	73.9
6	15.3	4.4	4.3	2.0	7.7	9.6	1.7	6.7	3.9	13.8	1.8	17.4	88.6
Average ²	12.7	3.3	3.6	2.0	5.6	6.4	1.0	6.9	2.7	10.2	2.0	17.8	74.0

PACIFIC PONDEROSA PINE-DOUGLAS-FIR FOREST TYPE

7	14.4	2.3	4.3	3.2	8.6	9.5	2.0	16.6	2.9	2.4	5.1	19.7	91.0
8	12.8	2.5	4.4	4.4	15.2	14.8	2.6	18.8	.0	.0	.2	27.7	103.4
9	12.3	1.4	3.9	5.4	5.6	7.8	4.1	12.0	4.8	6.0	2.7	26.3	92.3
10	13.6	3.2	4.5	5.3	9.2	15.7	3.1	13.1	7.9	13.2	1.5	19.6	109.9
11	14.3	2.7	4.5	8.4	7.8	3.6	2.2	8.8	3.4	4.6	2.9	24.9	88.1
12	16.3	3.0	5.2	4.7	7.2	6.7	3.0	11.6	4.9	7.3	2.3	28.5	100.7
Average ²	14.4	2.6	4.6	5.9	8.0	7.9	2.9	11.8	4.5	6.5	2.5	25.2	97.0

¹Sawtimber greater than 12 inches d.b.h.; submerchantable less than 12 inches d.b.h.²Weighted by compartment area.

