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FIR Report

FALL 1982

VOL. 4 NO. 3

"FIR REPORT" is a quarterly publication containing information of interest to individuals concerned with forest management in southwest Oregon. It is mailed free on request. Requests should be sent to: FIR REPORT, 1301 Maple Grove Drive, Medford, Oregon 97501.

FIR REPORT communicates recent technological advances and adaptive research pertinent to southwest Oregon, and alerts area natural resource specialists to upcoming educational events. Comments and suggestions concerning the content of "FIR REPORT" are welcome and should be sent to the Maple Grove address.

The Southwest Oregon Forestry Intensified Research Program (FIR) is an Oregon State University, School of Forestry program designed to assist region foresters and other specialists in solving complex biological and management problems unique to southwest Oregon. FIR specialists organize, coordinate, and conduct educational programs and adaptive research projects specifically tailored to meet regional needs.

Established in October, 1978, the FIR project is a cooperative effort between Oregon State University, the Bureau of Land Management, U.S. Forest Service, O & C Counties, and southwest Oregon timber industries. It represents a determined effort by the southwest Oregon forestry community and county governments to find practical solutions to important forest management problems.

For the FIR Staff,

Steven D. Tesch
Silviculture Specialist

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OREGON STATE UNIVERSITY
EXTENSION SERVICE

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FIR

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Current Research

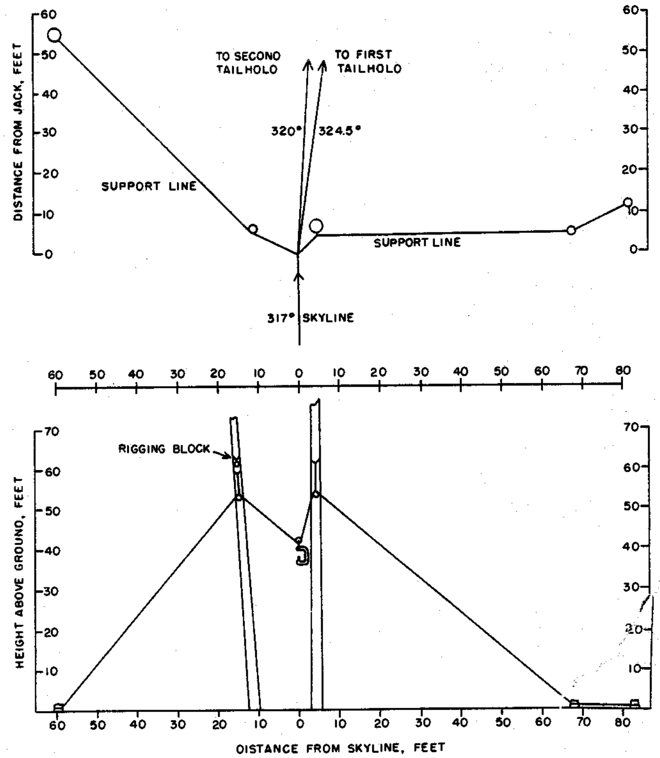
Adaptive FIR

A CASE STUDY OF MULTISPAN LOGGING OLD GROWTH TIMBER

A new cooperative case study between Adaptive FIR and the Medford District, BLM, has been initiated on multispan logging of old growth timber in southwest Oregon. The logging phase of the study has been completed and the data are being analyzed by Dave Lysne, FIR, and Steve Armitage, BLM, for publication. Some preliminary results are now available.

The six-acre study area, located on the Glendale Resource Area of the Medford District, BLM, was clearcut in June, 1982, by Bud Van Norman of Glendale, Oregon. Based on a 100 percent cruise, the average tree was 28 inches DBHOB and contained 1.1 Mbf gross volume, with the largest trees being 64 inches DBHOB. The sale averaged 31.8 Mbf net volume per acre. Bud's yarder, carriage, and jack were all custom-made, but are typical of equipment commercially available. The yarder has a 1 1/4-inch skyline, and a 7/8-inch mainline, a 5/8-inch haulback, and a 7/16-inch strawline. The carriage is similar to a large open-sided Christy.

Two intermediate support settings were used to log the unit, a double tree support system (Figure 1) and a single tree support system (Figure 2). Bud would rig the skyline through a support and tie the skyline off to a convenient temporary tailhold so yarding could proceed while the ultimate tailhold was rigged. All tailholds are shown in the figures.



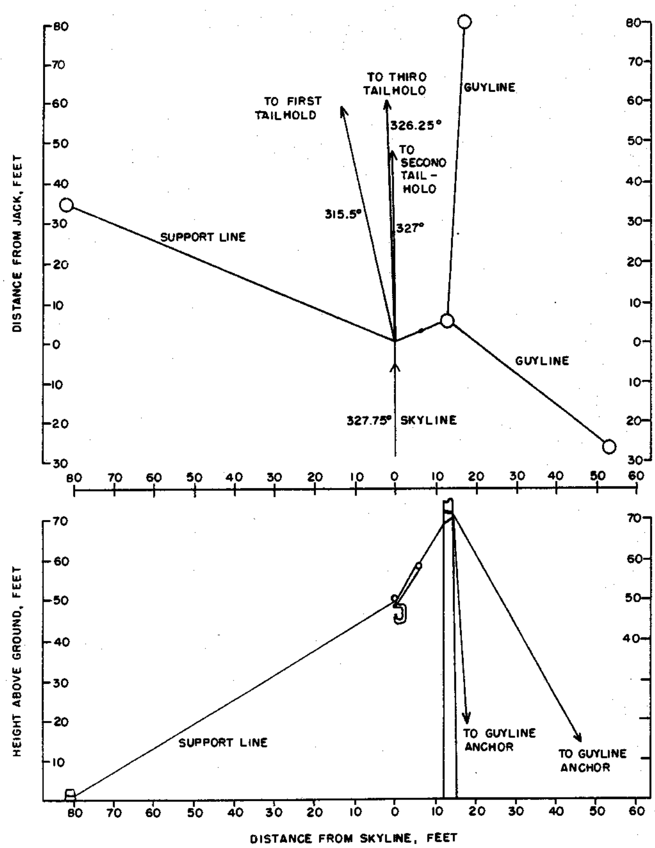


Figure 2. Single tree support system. The jack has been enlarged to show detail.

Each support system required four hours to fully rig. However, future supports could probably be rigged in three hours with a hooktender, a choker setter, a yarder engineer, and a live strawline from the yarder.

As shown in the figures, the skyline spans were not colinear. In Figure 1, the 7.5 degree deviation from span colinearity has caused the jack to drift towards the right support tree under the influence of the skyline horizontal component. The 7.5 degree deviation from colinearity did not cause a problem with either the mainline rubbing against the right support tree or the carriage or jack impacting the support tree on loaded inhaul (FIR REPORT 3(3):9). The mainline either dug into stumps uphill of the terrain break at the supports, into the soil between the supports or into the base of the right support tree. When the mainline did rub against the support tree, the tree remained stable because the rubbing was at the tree's root collar. As the loaded carriage would approach the support, the weight of the carriage, jack and logs would overcome the horizontal skyline component and the jack would center between the support trees, allowing free passage of the logs. The carriage, however, could not pass the 12.25 degree deviation from span colinearity shown in Figure 2. As the carriage would approach the jack, the weight of the carriage and turn of logs would cause the jack to hang vertically, forcing the skyline to slip out of the groove in the jack. This problem was not observed with the 7.5 degree dogleg, although some wear on the side of the skyline groove in the jack was observed after logging the double tree support setting.

The entire unit was logged in 15 days, including move-in, rigging and move-out, for an average net production of 12.7 Mbf per day, based on the cruised volume. While logging over rigged support trees, net production averaged 25 Mbf per day. In a sample of 35 turns from both the single tree and double tree support settings, net production averaged 5.5 Mbf per hour, excluding scheduled delay time. The use of intermediate supports did not appear to lower production once the supports were rigged.

Bud used a live skyline while logging the unit. As needed, the carriage would be stopped and the skyline retensioned during any phase of the yarding cycle. The skyline fed easily over the jack and through a clip used to secure the skyline on the jack. Neither skyline nor jack wear was apparent as a result of this practice.

Support line tensions for the single tree support system are given in Table 1. All of the data was collected from a setting with a deviation from span colinearity of 0.75 degrees and chord slopes of -39 percent and -59 percent. The highest support line tensions occurred when the carriage was located immediately uphill from the jack and the lowest tensions occurred when the carriage was crossing the jack. A static analysis of support line tensions will predict that the highest support line tension will occur as the carriage crosses the jack. A static analysis may be simulated by stopping the carriage at various places during inhaul, including on top of the jack, and measuring support line tensions. We found, however, that with the carriage traveling at typical logging speeds, dynamic loads greatly exceeded the static loads. As the carriage approached the jack from below, the skyline would form a steep angle up to the jack, causing a high support line tension. Suddenly, the carriage would ascend the skyline and quickly pass the jack. Very little of the carriage and log weights were transferred to the support line as the carriage passed the jack. Once the carriage was uphill from the jack, the skyline slack from the lower span would rapidly flow over the jack into the upper span and the carriage would accelerate into a valley in the skyline's upper span created by the additional skyline length. When all of the skyline slack was transferred to the upper span, the skyline would catch the falling carriage and the support line tension would surge to its highest level.

Table 1. Single Tree Support Tensions.

Total[1] turn weight	Carriage location: Immediately below jack	Crossing	Immediately above jack
10.1	14.3[2]	8.7	16.1
6.1	13.1	[3]	13.8
5.3	13.5		13.7
5.0	13.3	9.7	13.7
6.9	13.3	8.5	13.5
6.8	15.5	___	17.3
6.7[4]	13.8	9.0	14.7

[1]Includes carriage, jack and logs (kips).
[2]Kips.
[3]Blanks indicate missing data.
[4]Averages.

A two-dimensional static analysis of support line tensions (using carriage, jack and log weights plus the skyline force on the jack when the skyline is tensioned to the pretension length necessary to obtain the required ground clearance) yields an estimate of 10.8 kips support line tension. A three-dimensional analysis using the same inputs yields an estimated support line tension of 12.9 kips. A desk-top computer program that statistically predicts jack loading for various carriage positions estimates the support line tensions to be 11.0 kips in a two-dimensional analysis and 13.2 kips in a three-dimensional analysis. All estimating procedures overestimated the support line tensions when the carriage crossed the jack and underestimated the maximum tensions resulting from dynamic forces.

Additional information and discussion of the case study results will be published through the Forest Research Laboratory.

D. L.

PONDEROSA PINE PLANTED IN RIPS

In the spring of 1981, a study was initiated in southwestern Jackson County near Ruch to evaluate the impact of soil ripping as a site preparation method on ponderosa pine seedling survival and growth. Prior to site preparation the site was dominated by manzanita with scattered buckbrush, madrone, white oak, and poison oak. The aspect is south with a 30 percent slope at an average elevation of 610 m. The soil series is Vannoy, a fine-loamy, mixed, mesic Typic Haploxeralf. A D-6 tractor was used to uproot and pile brush into windrows which were burned in the fall 1980. The site was then ripped on contour by a D-4 tractor to an approximate soil depth of 30 cm. Changes in soil bulk density due to ripping have been previously described by Dave McNabb

(FIR REPORT 3(3)4-5). One hundred sixty 2-0 bareroot and 160 1-0 bareroot ponderosa pine seedlings were planted on the test site in the spring 1981. One-half of the seedlings in each stocktype were planted in the rips while the other half were planted mid-way between rips. Planting was done by shovel.

By the end of 1981 survival of both stocktypes was excellent despite a record-breaking heat wave during the summer. No differences in survival could be found for either stocktype due to ripping (Table 1). Likewise, no difference in height growth were detectable after one year although 2-0 seedlings generally produced more height growth than 1-0 seedlings.

Table 1. Percent survival and mean height growth (± s.d.) of 1-0 and 2-0 bareroot ponderosa pine seedlings in ripped and unripped planting spots.

Stocktype/ treatment		1981 survival (%)	Initial height (cm)[1]	1981 growth (cm)
1-0:	ripped	99	7.6 ± 2.3	3.9 ± 2.0
	unripped	100	8.1 ± 2.5	4.1 ± 1.8
2-0:	ripped	98	10.7 ± 3.2	5.8 ± 9.6
	unripped	99	11.1 ± 3.5	5.8 ± 6.9

[1]Differences in initial height between ripped and unripped seedlings reflects soil sloughing into the rip furrow shortly after planting.

These results clearly show that under the described test conditions, soil ripping had absolutely no effect on seedling performance as defined by the variables measured. It should be emphasized, however, that this information represents only one year of observation and that conclusions regarding treatment effectiveness should be based on a longer period of study. Consequently, these seedlings will continue to be measured for three or four more years. A report on second-year performance will appear in the winter issue of the FIR REPORT.

S. H.

Fundamental FIR

A NEW LOGGING STUDY

A new Fundamental FIR study initiated by George Brown and Dave Perry, Oregon State University, will study a "Comparison of Alternative Harvest Systems in Shelterwood Overstory Removal and Impact on Understory Seedlings." The study objectives are to compare (1) falling and yarding costs and (2) mortality and damage to understory seedlings for dispersed tractor skidding and the use of directional falling and designated skid trails.

One tractor logging timber sale has been selected for study on the Butte Falls Resource Area, Medford District, BLM. If a suitable area can be found, a comparison study will examine the cost and effectiveness of using carefully located skyline corridors and directional falling to reduce understory damage during skyline overstory removal logging. Prelogging data are currently being collected for the tractor study and sites are being examined for inclusion in the companion study.

D. L.

HERBICIDE DEGRADATION IN SCLEROPHYLL BRUSHFIELD FOLIAGE

Mike Newton and colleagues at Oregon State University have been studying herbicide residues as part of an evaluation of various vegetation management methods in southwest Oregon. Herbicide treatments tested included aerial application of 2,4-D ester, two rates of triclopyr amine, two rates of triclopyr ester, and a mixture of 2,4-D ester with potassium salt of picloram.

Applications were made in 6-8 year old brushfields which had been clearcut. The former Douglas-fir or mixed conifer stands contained brush 1-3 meters tall, dominated by tanoak sprouts. Other species included manzanitas, madrone, golden chinkapin, and varnish leaf ceanothus.

Residue samples were taken from foliage in the upper crowns of primarily tanoak, and from the browse layer in the lower crowns of the same shrubs. Twenty specimens were tagged in each of three replicated plots before treatment. Dates of collection were 0, 18, 37, 79, 153, and 325 days after herbicide application. Metal cups attached to each shrub were used to estimate absolute deposit rate. Samples were analyzed by gas-liquid chromatography with a detection limit of about 0.1 part per million (ppm) wet weight basis. Crown samples of all herbicides contained higher levels of residue than understory foliage which caught from one-half to one-sixth of the canopy deposits. Degradation results indicate all herbicides deteriorated substantially over time (Tables 1, 2). A half-life of less than one month was observed for picloram; 2,4-D was most persistant with a half-life of close to six months. The triclopyr treatments showed initial half-lives of about one month, but degradation slowed after the third month.

Table 1. Concentrations of several herbicides in tanoak canopy foliage from zero to 325 days after application in the Siskiyou Mountains of Oregon.

		Concentration mg/kg					
Herbicides	kg/ha	Day-1	18	37	79	153	325
2,4-D ester	2.2	66	40	39	32	28	14
	3.3	157	107	88	60	53	52
Picloram, k salt	0.55	22	12	7.5	1.1	1.3	2.8
Triclopyr amine	2.2	141	122	32	21	16	17
	4.4	221	150	51	23	26	21
Triclopyr ester	1.65	69	54	35	24	24	23
	3.3	127	57	59	60	45	37

Table 2. Concentrations of herbicides in tanoak understory foliage from zero to 325 days after application in the Siskiyou Mountains of Oregon.

Herbicides	kg/ha	Concentration mg/kg					
		Day-1	18	37	79	153	325
2,4-D	2.2	26	--	10	6.3	9.0	5.8
	3.3	58	--	22	21	22	19
Picloram, K salt	0.55	11	--	9.3	1.1	0	1.1
Triclopyr	2.2	76	--	12	9.8	7.5	6.9
	4.4	49	--	18	14	14	11
Triclopyr ester	1.65	24	--	20	8.6	11	13
	3.3	33	--	29	17	18	11

Newton notes that the initial rapid degradation in residues occurred prior to significant fall rains, in a climate where summers can be characterized by intense sunshine. The scientists postulate that the dry environment of the aerial parts of shrubs was not conducive to microbial degradation, and that ultraviolet light-based (photolytic) destructive processes were active. They also noted the ester formulations, which are noted for better entry into the waxy sclerophyll foliage than water soluble salts, degraded more slowly. Once absorbed into the leaf tissue, residues are less exposed to the ultraviolet radiation and would be expected to be more persistant if photolysis were the major degrading process.

S. T.

REGENERATION OUTLOOK ON BLM LANDS IN THE SISKIYOU MOUNTAINS

A comprehensive evaluation of regeneration on BLM lands in the Siskiyous has been completed. This work was similar to that reported on for the southern Cascades in PNW Research Paper PNW-284. Some highlights are presented here; the full report will be published following technical review and editing.

"Both partial cut and clearcut units cutover during 1956-1971 in the Siskiyous were well-stocked with a combination of regeneration that became established before and after harvest cutting (Figure 1). Total stocking varied somewhat among the Applegate, Evans, and Galice-Glendale areas, but averaged 81 percent in partial cuts and 77 percent in clearcuts. In partial cuts, advance regeneration was a sizable component of total stocking. Clearcuts had more regeneration that became established after harvesting than partial cuts, averaging 71 percent subsequent stocking vs. 56 percent.

Douglas-fir was the predominant species of advance and subsequent regeneration in both partial cuts and clearcuts. Incense-cedar, sugar pine, and true firs were commonly present in partial cuts, whereas ponderosa pine was the second most common species in clearcuts. Two or more species were present on one-third of all stocked four-milacre subplots.

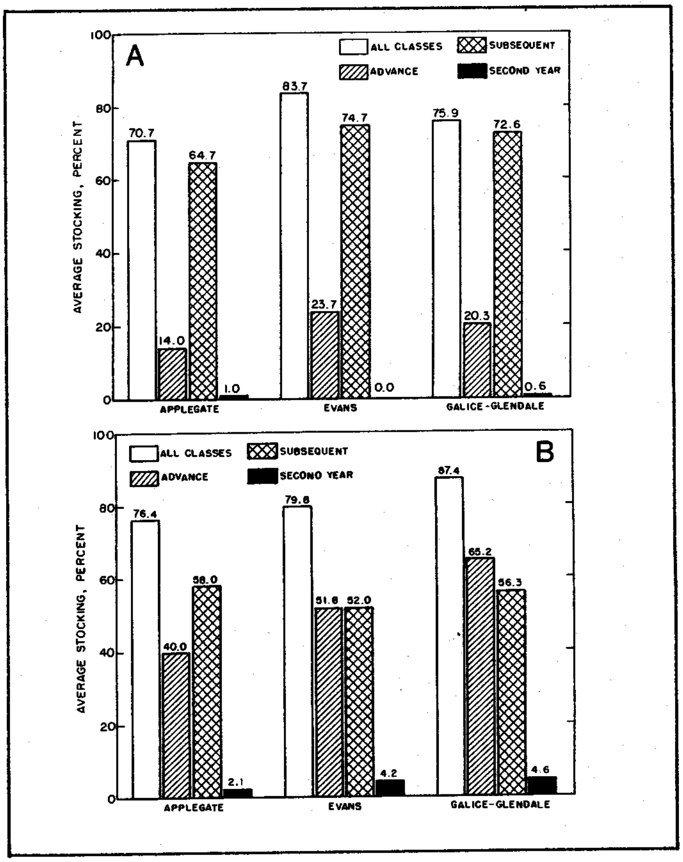


Figure 1. Regeneration in clearcuts (1A) and in partial cuts (1B), by class.

Average stocking differed significantly by forest type, soil series, soil origin, soil depth, and stream drainage. In partial cuts, stocking averaged lower in the Douglas-fir forest type than in the sugar pine type. But in clearcuts, stocking was greater in the Douglas-fir type. Stocking tended to be higher than average on soils of granitic origin and lower than average on soils of volcanic origin. Stocking in clearcuts tended to be greater on the deepest soils but did not differ significantly between shallow- and medium-depth soils. Partial cuts in small drainages that flow directly into the middle part of the Rogue River tended to have the highest total, advance, and subsequent stocking. Stocking in clearcuts tended to be higher in the west fork of Cow Creek than elsewhere.

Stocking was correlated with an array of environmental variables. However, the correlations tended to differ between partial cuts and clearcuts and between the Applegate, Evans, and Galice-Glendale areas. In both partial cuts and clearcuts, stocking usually decreased 1) as slope increased; 2) as amount of logs, wood, bark, increased; and 3) as the cover of woody perennials increased. Higher stocking was generally but not always associated with greater precipitation. Stocking tended to be higher on slopes most exposed to the sun in partial cuts and on those least exposed to the sun in clearcuts.

From the array of stocking, environmental, and statistical data, I concluded that regeneration responses differ in the Applegate, Evans, and Galice-Glendale areas. Reforestation can be improved by paying greater attention to forest types, soil series, and differences in local tree and plant communities when selecting cutting method and reforestation techniques. For maximum results, cutovers must be reforested promptly, competition from vegetation must be controlled, and damage from animals must be kept at a reasonable level."

William I. Stein
PNW Experiment Station, Corvallis

COARSE FRAGMENT VARIABILITY ON STEEP SLOPES

Soil variability within specific landscape units of the Umpqua National Forest is being studied by Ron Myhrum and Herb Huddleston, OSU Department of Soil Science. Their objective is to quantify and determine the causes of variability in particle size distribution. This variability, particularly in coarse fragment content, contributes to the reforestation problems on many sites in southwest Oregon. Coarse fragment content of a soil is important because it reduces the water holding capacity of the soil and decreases plantability. Both factors are considered when determining whether commercial forest land can be successfully reforested.

Four sites have been selected on the Umpqua National Forest. These sites have steep slopes and soils mapped as Soil Resource Inventory units 27 and 51. These soils are shallow to moderately deep, gravelly to very gravelly loams, silt loams and clay loams.

One hundred sample points were established on each site. Sample points were located on a 10 by 10 point grid with a grid spacing of 15 m. A surface mineral soil sample and a subsoil sample were collected at each point. Slope gradient and slope convexity or concavity were recorded for each point. The particle size distribution, based on the whole sample was separated into the following size fractions > 3", 1 1/2-3", 3/4-1 1/2", 3/8-34", 5 mm-3/8", 2-5 mm, sand, silt, and clay.

Considering the data from all sites, the most variable property, as indicated by the coefficient of variation, was the coarse fragment fraction > 3 inches. This was consistent across all sites and for both A and B horizons; however, examination of the data revealed that for each site and particle size class, several of the sampling points contained none of a given particle size class. Zero content of sand, silt, and clay occurred when sampling points fell on bedrock outcrops or on tallus rubble. Averaging zero values with nonzero values gave a distorted impression of the true mean and variability of each size fraction for areas where soil occurred and planting may be considered.

Omitting zero entries from the calculations only increased mean values of the fine soil fractions (sand, silt, and clay) from 2 to 5 percent but decreased the coefficient of variation from about one-third to one-half. Omitting zero entries from the four smallest coarse fragment contents (2 mm-3/4 inch) had a minor effect on the means and coefficients of variation, probably because they are random occurrences, although some zero entries were associated with tallus rubble dominated by larger coarse fragments.

Zero values had a significant impact on the mean and coefficient of variation of the two largest coarse fragment sizes. About 30 percent of all samples lacked the 1 1/2-3" size class and 83 percent of the samples lacked the > 3" size class. Excluding these values increases the mean to nearer the median of the values which do occur and reduces the coefficient of variation by up to 79 percent.

Myhrum and Huddleston have formulated a two-stage sampling scheme for helping to account for zero size classes. The first stage of the procedure involves a quick survey to determine the amount and location of bedrock outcrops. This step is also useful for determining what proportion of a unit can be considered forested land. The second stage involves retraversing the site and sampling the soil between rock outcrops.

Two conclusions from their study were disappointing. They were unable to find a significant relationship between either slope gradient and each particle size fraction or slope convexity or concavity and the amount of soil or coarse fragment content in any particle size fraction. Second, the amount of soil or coarse fragment content in any particle size class could not be predicted by the amount in the A horizon within any degree of confidence. Thus, in terms of site evaluation for reforestation purposes, each site will need to be field checked in detail for making an accurate assessment of its reforestation potential with respect to the water-holding capacity of the soil and the plantability.

D. M.

Continuing Education

BAREROOT NURSERY TECHNOLOGY

October 26-28, 1982. Oregon State University, Corvallis. Program will address forest tree nursery development, seedling growth as related to soil-water-plant management, harvesting and planting and bareroot seedling, operational planning, computerized record-keeping systems, quality control and research needs. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331, (503)754-2004.

SOUTHWEST OREGON FOREST WEED ECOLOGY

November 9, 1982. Adaptive FIR, Best Western Riverside Conference Center, Grants Pass, Oregon. This one-day workshop will cover the operational environment, the competitive ecology of grass and woody shrubs, the prediction and assessment of weed competition, and control measures. This workshop is designed to provide a fundamental understanding of southwest Oregon forest weeds. Fee is $10. Limited enrollment. CONTACT: Elaine Morse, Adaptive FIR.

PULP CHIP QUALITY

November 11-12, 1982. Oregon State University, Corvallis. The course is designed to assist those people who share the responsibility of furnishing chips for pulp mills understand some of the basic principles of pulping and papermaking, and how these principles relate to chip quality. It would be of interest to foresters, loggers, and in general to anyone associated with chip procurement who is not directly connected with a pulp mill. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331, (503)754-2004.

ARE LOG EXPORTS THE PROBLEM?

November 12, 1982. Marriott Hotel, Portland, OR; sponsored by the League of Women Voters of Oregon Education Fund. Major topics include the economic impacts of log and wood products exports on employment, domestic wood prices, international trade balance, etc.; state and federal legal restrictions and requirements of log and wood products exports; environmental impacts of log and wood products exports on sustained yield of natural resources, etc.; and the prospects for increasing the export of log and wood products. CONTACT: League of Women Voters of Oregon, 317 Court Street N.E., Suite 202, Salem, OR 97301, (503)581-5722.

73RD WESTERN FORESTRY CONFERENCE

November 30-December 2, 1982. Portland Hilton Hotel. Annual Western Forestry and Conservation Association Meeting. The theme of this year's meeting is "Forestry Dollars and Sense - Gearing Up for the Future." Includes technical sessions on reforestation, stand management, pest management, and fire. CONTACT: Steele Barnett, Western Forestry and Conservation Association, American Bank Building, Portland, OR 97205, (503)226-4562.

STAND MANAGEMENT: FERTILITY

December 14-16, 1982. Oregon State University, Corvallis. This 2 1/2 day workshop is aimed at forest managers who are interested in maintaining forest productivity in the Pacific Northwest. Program will address several aspects of nutrient-conservation and management including: nutrient cycling, nutrient conservation in harvesting, and enhancement of productivity by artificial fertilizers and biological nitrogen-fixation. Program includes exercises in which participants will learn how to plan for long-term nutrient management. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331, (503)754-2004.

DESIGNATED SKIDTRAILS TO REDUCE SOIL COMPACTION

January or February 1983. Medford, OR. Sponsored by OSU Forest Engineering Extension and Jackson County Extension. A one-day classroom and field workshop is being planned to discuss skidtrail layout with sale layout foresters, timber sale administrators, and loggers. Workshop includes presentations on soil compaction and principles of skidtrail layout. Field portion includes marking of skid trails with a critique to follow. Fee is $55. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis,

FOOTHILLS FOR FOOD AND FOREST

April 25-28, 1983. Oregon State University, Corvallis. International symposium sponsored by the OSU Schools of Agriculture and Forestry. Hill lands perhaps offer the greatest potential for increased food and fiber supply and the livestock industry is a major factor in their development. This symposium will attempt to explore current development and possibilities for the future of these lands in grazing, and in the grazing/forestry interface for producing food and fiber. Program includes variety of topics related to nutrient management, prospects for growing trees and livestock together, wildlife interaction with domestic animals and forestry, and integrated forage/livestock production. CONTACT: Dr. Jim Oldfield, Department of Animal Science, Oregon State University, Corvallis, OR 97331, (503)754-3431.

YOUNG STAND MANAGEMENT IN SOUTHWEST OREGON

June 14-16, 1983. Adaptive FIR, Holiday Inn, Medford, OR. Program is in the preliminary planning stages. Topics will address management practices which affect young stand growth, as well as how young stand management decisions may affect future management alternatives. CONTACT: Steve Tesch, Adaptive FIR.

Of Interest

REFORESTATION OF SKELETAL SOILS PROCEEDINGS AVAILABLE

Proceedings of the Reforestation of Skeletal Soils Workshop held in Medford, November 17-19, 1981, are now available for purchase at $7.50 a copy. The proceedings contain 19 papers that address various aspects of the reforestation of skeletal soils with particular emphasis on southwest Oregon. Topics range from "The nature of skeletal soils in steep terrain" to "Site preparation strategies for skeletal soils" and "Mycorrhizal inoculation." Checks or purchase orders should be made payable to: OSU SCHOOL OF FORESTRY, for $7.50 per copy (US dollars) and sent to:

Workshop Proceedings
FIR
1301 Maple Grove Drive
Medford, OR 97501

RESIDUAL STAND DAMAGE AFTER CABLE THINNING

Mike Caccavano, Forest Engineering Department, OSU, recently completed a Master of Forestry paper entitled Factors Influencing Residual Stand Damage Levels Due to Cable Thinning of Coniferous Stands in Western Oregon. The purpose of the study was to determine the significant variables influencing total scar area per acre (ft^2/acre) following skyline thinning of coniferous stands. He measured damage levels in ten study areas that had received their first commercial thinning as part of the smallwood harvesting research program. Some units had been logged conventionally; some used prebunching and swinging to the landing. A variety of small to medium-sized yarders were used.

Ten independent variables were measured in three categories: harvesting systems, stand conditions, and topography. A regression equation was produced with three significant variables. These variables include the percent of western hemlock in the stand, the volume removed per acre (ft^3/acre) and whether the unit had been logged conventionally or by prebunching and swinging. Damage levels ranged from 0.4 to 64.4 square feet of scar area per acre, with individual scars observed as large as 12 square feet.

The percent of western hemlock in a stand may not be a real useful variable for much of southwest Oregon, but Caccavano also noted that the percent of true firs in a stand also increased damage considerably. Not only do true firs damage more easily than Douglas-fir, but the acceptability of any damage to true fir must be considered in light of its susceptibility to rot.

The mean total scar area per acre was 17.94 square feet with a 95 percent confidence interval from 15.00 to 20.87 square feet. A 10 percent increase above the mean level in percent western hemlock resulted in a 36.7 percent increase in scar area per acre; a 100 ft^3/acre increase in volume removed resulted in a 12.3 percent increase in scar area; and prebunching resulted in a 43.7 percent reduction in scar area. Mike indicated that even though prebunching has considerable statistical significance, he doesn't have a good explanation for the strength of the relationship.

It is probably reasonable to conclude, however, that in stands where species sensitive to damage will constitute a large proportion of the residual stand, consideration of specialized harvesting systems, such as prebunching and swinging, may be warranted to minimize damage and decay. Other observations which did not enter into the regression equation, but bear consideration, include: 1) as residual stand density increases, stand damage increases; 2) larger yarders with greater horsepower cause more damage; 3) crew skill is very important (damage can be reduced by careful choker setting).

On the other hand, if the equation doesn't provide some measure of how the scar area is distributed throughout the stand, one doesn't know if only a few trees are badly scarred or if many trees have small scars. A few badly scarred trees may be sacrificed, but having many scarred residual trees in a rot sensitive situation may be unacceptable.

S. T.

WATERSHED INFORMATION AVAILABLE

The National Forest System, as part of its Washington office watershed staff, maintains a Watershed Systems Development Group (WSDG) at its Fort Collins Computer Center (FCCC). The long-range mission of the WSDG is to provide procedural guides and analytical tools that will help integrate Forest Service watershed management programs into the Resource Protection Act process.

The WSDG has three specific objectives: 1) develop, modify, and support procedural guides and analytical tools that enhance the capacity of watershed specialists to respond to management needs; 2) provide soil, hydrology and water quality technical support of Forest, Regional and Washington office watershed personnel; and 3) provide training to watershed specialists as appropriate.

The main method used by WSDG to communicate its findings to watershed and other interested specialists is a series of WSDG reports. These reports may concern specific subject areas or explain specific procedures or concepts that can be solved with handheld calculators or by computer programs maintained at the FCCC. Examples of their reports include: Statistical Methods Commonly Used on Water Quality Data Analysis; Water Quality Monitoring Programs; Soil Depth Corrections Based on Slope Gradient; Topographic Factor for Universal and Modified Soil Loss Equations; and Statistical Analysis Using SPSS at the USDA Fort Collins Computer Center. These and other reports are available to all interested users from the WSDG upon request.

The WSDG can be reached as follows:

Watershed Systems Development Group
USDA Forest Service
3825 East Mulberry Street
Fort Collins, CO 80524

Telephone: (303)482-0356 - Commercial
323-1417 - FTS

FREQUENT MONITORING REQUIRED TO INSURE PLANTATION SURVIVAL

In the fall of 1979, studies were established to determine the causes of repeated plantation failure in the red fir zone at Butte Mountain on the Klamath National Forest's Goosenest District. This research was conducted as a result of a cooperative agreement between the University of California, Davis, and Region 5 of the USFS. Work was conducted on two sites: a *Ribes cereum* brushfield, having a southern aspect and a 0-15 percent slope, and an induced meadow dominated by *Bromus marginatus*, with a southeast aspect and 0-15 percent slope. Each had been clearcut 15 years previously.

Three site preparation methods (hand scalping, disk/brushrake and glyphosate [Roundup] treatments) were compared to unmanipulated controls on each site. Comparisons were made in terms of type and presence of competing vegetation, soil moisture at four depths and presence and activity of herbivorous insects and vertebrates.

Red fir, white fir and lodgepole pine seedlings (2-0 stock) planted in May 1980 experienced high rates of mortality, regardless of site or treatment. Over two growing seasons, mortality on some treatments approached 100 percent. Survival was better on treatments where accessible soil moisture was maintained through effective control of competitive vegetation. In addition, vegetation control had to eliminate habitat favorable to herbivorous species present on a site. Treatment which did not sufficiently increase available soil moisture and reduce herbivores were insufficient to significantly alter levels of seedling mortality over the two seasons of this study.

Glyphosate and hand-scalping treatments were moderately successful on the brushfield site in 1980 (Table 1). Defoliation or removal of shrubs freed soil moisture reserves for use by planted conifers. This advantage was lost during the 1981 season, however, as annual and biennial successional species became established and pre-empted available soil moisture. Standing brush which remained on both treatments provided cover for rabbits, whose feeding activity causes substantial amounts of conifer damage and subsequent death. Survival was best on disking/brushrake treatments over the two-season period. Complete removal of shrub cover prevented soil moisture losses through transpiration and eliminated rabbit habitat. Conifers were able to become established during the first season under optimal conditions of soil moisture and without stress created by rabbit clipping damage. Although annuals had reinvaded the site by the second year, surviving trees were established and appear to have captured the site.

Table 1. Percent conifer mortality following four different site preparation treatments.

Treatment	Brushfield 1980	Brushfield 1981	Meadow 1980	Meadow 1981
Control (no manipulation)	58	100	87	95
Disk/brushrake	24	50	46	100
Glyphosate	38	83	34	89
Hand-scalped	39	90	61	100

Low soil moisture due to grass competition and the feeding activity of a heavy grasshopper infestation (6-8/m^2) were primary mortality sources on the meadow site. Again, treatments which reduced vegetation competition and altered habitat (by reduction of grass cover) provided the best survival during the first year. Glyphosate and disked treatments were most successful here (Table 1). Re-establishment of grasses on disked treatments during 1981, however, reduced soil moisture and increased grasshopper presence and feeding, thus reducing conifer survival to less than one percent. Glyphosate treatments maintained high soil moisture levels through both seasons. In spite of this, mortality increased substantially during the second year. Reasons for this are unclear. The level of grasshopper damage received in 1980, while not sufficient to kill trees that year, may have stressed trees sufficiently to cause mortality in 1981. In the case of fir species, inadequate shading in the open meadow could induce seedling mortality.

Sites such as these, plagued with numerous limitations to regeneration require supervision beyond the first year. Site quality can change dramatically with the appearance of seemingly insignificant amounts of vegetative regrowth. Seedling survival depends on continued monitoring of the site and the ability to react with further control measures when the need arises.

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THE LOG DRIVE

Cable Yarding Production Equations

Richard Aubuchon, recently a Master of Forestry student in the Forest Engineering Department of Oregon State University, has completed his Master of Forestry Paper, A Compendium of Cable Yarding Production Equations. A set of tables containing production data, production equations, equipment information, crew information and physical characteristics of the study areas is presented for small (mainline pulls less than 25,000 pounds), medium (mainline pulls between 25,000 and 71,000 pounds) and large (mainline pulls greater than 71,000 pounds) yarders. An excellent discussion on the use of production equations as predictive tools is included. Richard's paper is available either in the library of the Forest Research Laboratory at OSU or from WESTFORNET.

Log Weights

Accurately estimating log weights is essential for determining the feasibility of cable and aerial logging systems and establishing log bucking guidelines. Often, however, the weight of logs is not accurately known. Ten pounds per board foot is frequently used for determining log weights, but that weight applies only for small timber in thinnings. Seven to eight pounds per board foot is more typical for larger timber. Because the number of board feet within a log will vary with different scale rules, the cubic foot measure provides the most reliable estimate for log volume. The Smalian Formula, which averages the square feet of area inside bark for both ends of a log and multiplies the average end area by the log length, in feet, is a convenient method of obtaining the cubic foot volume of a log. One helicopter logging company uses an average wood density of 48 pounds per cubic foot in southwest Oregon. A sample of 18 logs used to determine log weights for the multispan study described in the Current Research section of this FIR REPORT found an average wood density of 46 pounds per cubic foot. Unless site-specific information is available, an average wood density of 48 pounds per cubic foot applied to the Smalian cubic foot log volume would probably provide a good estimate of log weights in southwest Oregon.

Safety Publications

The Worker's Compensation Board of British Columbia, Canada, has published a number of excellent handbooks on logging safety. One handbook, the Yarding and Loading Handbook, July 1981, may give an example of the type of information contained in other publications. The Yarding and Loading Handbook contains sections on developing a highlead yarding and loading side, major hazards encountered during highlead yarding and loading, precautions to avoid accidents, clothing and personal protective equipment, use of tools and equipment, and appendices covering first aid, a glossary, and highlead yarding and loading signals. The handbook is well-written and contains excellent sketches depicting the concept being discussed. A complete list of publications and cost of each is available from:

Worker's Compensation Board of British Columbia
5255 Heather Street
Vancouver, B.C. V5Z 3L8
(604)266-0211

D. L.

DON'T FORGET THE FORESTRY MEDIA CENTER!

The Forestry Media Center at the OSU School of Forestry has a variety of slide-tapes and films available for rent or purchase. Programs are available addressing both broad and very specific topics within the scope of forest management, forest engineering, and forest products. Some recent titles include: Reducing Injuries to Residual Trees During Stand Management Entries, Skylines of the Northwest, Estimating Buffer Strip Survival, Forest Practices and Mass Soil Movement, and Color Infrared Aerial Photography. For a complete list of available media materials contact the Forestry Media Center, School of Forestry, Oregon State University, Corvallis, Oregon 97331 (503)754-4702.

S. T.

ROSEBURG BLM GRASS CONTROL STUDY

Second-year seedling survival rates for a BLM grass control study designed by Adaptive FIR and conducted by the Roseburg District, are now available. The original study design, 1980 survival percentages and treatment costs have been previously reported (FIR REPORT 3(2):6-7). The study objective was to evaluate the impact of four grass control treatments and an untreated control on Dougas-fir, ponderosa pine, and grand fir seedlings. During the spring of 1981, however, Roundup was applied to one-half of the 1980 Atrazine plots and one-half of the 1980 Atrazine plus Dowpon plots. One-half of the paper mulch plots were also remulched.

Survival patterns established in 1980 continued through 1981. Very poor seedling survival was associated with hand scalping or no grass control treatments regardless of species (Table 1).

Table 1. Percent second-year seedling survival (October 1981) by treatment, stocktype, and species.

	Stocktype/species				
Treatment	2-0 DF (Nursery A)	2-0 DF (Nursery B)	1-0 DF	2-0 PP	1-0 GF
Atrazine 1980	71	58	42	93	62
Atrazine 1980 Roundup 1981	80	80	75	91	45
Atrazine + Dowpon 1980	71	59	21	93	68
Atrazine + Dowpon 1980 - Roundup 1981	84	73	36	86	70
Paper mulch 1980	78	76	18	98	38
Paper mulch 1980 + 1981	84	93	45	98	51
Hand scalp 1980	1	0	0	12	0
Untreated control	2	0	0	22	0

2-0 DF = 2-0 Bareroot Douglas-fir; 1-0 DF = 1-0 Douglas-fir plug; 2-0 PP = 2-0 Bareroot ponderosa pine; 1-0 GF = grand fir plug

The obvious conclusion that can be drawn from these results is that chemical or paper mulch grass control methods are far superior to the alternatives tested in this study. Although the paper mulch treatment may have been very effective, use of the technique is very expensive (FIR REPORT 3(2):6-7) and is subject to terrain limitations such as steep slopes where anchoring of the paper may be difficult and more frequent maintenance necessary. Clearly, chemical control of competing grasses is the most desirable treatment.

S. H.

ALTERNATIVE SOIL SAMPLES?

At a recent meeting on predicting Douglas-fir response to fertilizer, participants reported some unusual types of tools used to sample surface soils (0-30 cm). They include a garden bulb planter (0-15 cm) and thin-walled electrical conduit (0-30 cm, depending on soil moisture texture). Both of these tools are volumetric samplers which are necessary when the individual samples are to be bulked, mixed, and a single composite sample saved. Thus, they represent an improvement over using shovels for sampling and may consistently produce more representative samples than soil tubes or augers.

These soil samplers also have some unusual features which make them useful in sampling forest soils. The serated edge of the bulb planter helps to cut fine roots and allow easier penetration of the soil. A 2-foot piece of 2-inch conduit (approximately $2), a half-round file and a hammer makes a more sturdy sampling set. The outside of the tube is beveled and the inside edge smoothed. The file is also used to smooth dents in the edge after rocks are encountered. Although the conduit folds under the blows of the hammer, it will withstand heavy use. The replacement cost make it an inexpensive sampler.

D. M.

Recent Publications

(1) Publications
Pacific Northwest Forest and Range Experiment Station
809 NE 6th Avenue
Portland, OR 97232

(2) Publications
Pacific Southwest Forest and Range Experiment Station
P.O. Box 245
Berkeley, CA 94701

(3) Dr. S. G. Conard
Forestry Sciences Laboratory
3200 Jefferson Way
Corvallis, OR 97331

(4) USDA Forest Service
Equipment Development Center
Fort Missoula
Missoula, MT 59801

(5) FERIC
201-2112 West Broadway
Vancouver, B.C.
Canada V6K 2C8

PHOTO SERIES FOR QUANTIFYING NATURAL FOREST RESIDUES: SOUTHERN CASCADES, NORTHERN SIERRA NEVADA, by K. S. Blonski and J. L. Schramel. 1981. USDA Forest Service Gen. Tech. Rep. PSW-56. Pacific Southwest Forest and

Range Experiment Station, Berkeley, CA. 145 p. A total of 56 photographs show different levels of natural fuel loadings for selected size classes in seven forest types. Data provided with each photo include fuel and stand descriptions.

(2)

LOGGING ROAD CONSTRUCTION IN ROCK: SUMMARY OF THREE CASE STUDIES, by R. K. Krag. 1981. Forest Engineering Research Institute of Canada (FERIC) Technical Note TN-50. Production data is given for three case studies of road construction in rock. Techniques for logging the right-of-way timber volume, removing the overburden, blasting and removing the blasted rock are discussed in detail. Drilling techniques are discussed and production data presented for tank drills and an airtrack drill. Blasting techniques are elaborated upon and examples of charges, patterns, and timing are given for various rock and slope conditions. Information is given on the use of a hammer seismograph and on difficulties encountered with the device. The publication can serve as a source of information for anyone wanting to learn about road construction techniques in rock.

(5)

POISON OAK AND POISON IVY DERMATITIS. PREVENTION AND TREATMENT IN FOREST SERVICE WORK, by W. L. Epstein and V. S. Byers. 1981. USDA Forest Service, Equipment Development Center, Missoula, MT. This report describes a method for identifying the most sensitive workers to keep them away from poison oak/ivy areas and details information about the disease: how it is spread, best treatment methods, how it afflicts people, and how it can be prevented. Extensive information is presented for treating the dermatitis in the field or clinic with topical or systemic (both oral and injected) corticosteriods.

(4)

GROWTH RESPONSES OF WHITE FIR TO DECREASED SHADING AND ROOT COMPETITION BY MONTANE CHAPARRAL SHRUBS, by S. G. Conard and S. R. RADOSEVICH. 1982. Forest Science 28:309-320. Moisture availability was the primary factor that limited growth of white fir within sclerophyll brush on two sites in the northern Sierra Nevada Mountains. The white fir saplings ranged up to 1.5 meters in height and from 300 to 800 trees per ha across the two sites. The chaparral species--greenleaf manzanita, snowbrush ceanothus, and bush chinkapin--covered 80 to 90 percent of the sites and ranged in height from 0.8 to 2.0 meters. Four years after treatment, white fir growth on one site increased to 140 to 160 percent over controls when soil moisture was increased by decreasing brush cover more than 80 percent by cutting and removing the brush tops and spraying the cut stumps with 2,4-D amine. With the addition of the cut tops to provide standing dead shade, growth of white fir on both sites increased to 200 percent, with the additional increase probably being caused by a reduction in water demand by shading. Cutting and removing the brush tops, or reducing brush canopy coverage with glyphosate, yielded slightly lower soil water tensions than for the control plots but did not cause significant changes in white fir growth. These two treatments each were associated with both slight increases and decreases of growth across the two study areas.

This study indicated that treatments which can reduce the brush canopy by 80 percent, control resprouting of the brush and not harm the white fir should yield strong increases in the growth of suppressed white fir.

(3)

POST FIRE SUCCESS IN WHITE FIR (ABIES CONCOLOR) VEGETATION OF THE NORTHERN SIERRA NEVADA, by S. G. Conard and S. R. Radosevich. 1982. Madrono 29:42-56. Observations of post-fire seral changes in the structure and composition of communities ranging in age from 5 to 270 years, and composed of *Abies concolor* and associated species revealed a slow change in dominance from montane chapparel to *Abies concolor*. Two species groups were detected by association analysis. One, containing *Abies concolor* and three brush species characterized early stages of succession. The other group, primarily herbaceous and sub-shrub parasites, characterized mature *A. concolor* forests. Regeneration of shrub species was episodic, occurring only after fire or other disturbance. Reproduction of *Abies concolor* was, however, continuous throughout the succession.

Tree density decreased with time as basal area approached a maximum of 100 to 135 m^2/ha following a negative log relationship.

(3)

INFLUENCE OF FOREST AND RANGELAND MANAGEMENT ON ANADROMOUS FISH HABITAT IN WESTERN NORTH AMERICA. 6 SILVICULTURAL TREATMENTS, by F. N. Everest and R. D. Harr. 1982. USDA Forest Service, Gen. Tech. Rep. PNW-134. Pacific Northwest Forest and Range Experiment Station, Portland, OR. 19 p. Distribution of anadromous salmonids and coniferous forest coincides along much of the Pacific slope; consequently, the habitat of anadromous fish is subject to a wide variety of silvicultural treatments required to establish and nuture young forests. Silvicultural treatments discussed in this report include cutting prescriptions, broadcast burning, mechanical site preparation, planting, and competition reduction. Timber harvest and use of pesticides and fertilizers are not discussed. Broadcast burning and machine scarification and piling can increase sedimentation and thermal heating of streams and have the potential to damage habitat of anadromous fish. Habitat damage usually does not occur, however, because of the limited extent of treatments. The highest risk of habitat damage from silvicultural activities occurs in small streams in areas with erosive soils and high rainfall, or with high summer solar radiation and low streamflow. Silvicultural activities discussed in this paper affect fish habitat far less than timber harvest or road construction activities.

(1)

SOIL COMPACTION FROM LOGGING WITH A LOW-GROUND PRESSURE SKIDDER IN THE OREGON COAST RANGE, by R. C. Sidle and D.

M. Drlica. 1981. Soil Sci. Soc. Am. J. 45:1219-1224. Increased bulk density of a clay loam soil on logging skid trails in the Oregon Coast Range was most highly correlated with the logarithm of the number of turns with a low-ground pressure (FMC) skidder. The surface 15 cm of soil was compacted more by uphill than by downhill yarding. After nine turns with an FMC skidder, soil bulk density at the 7.5 cm depth increased approximately 25 and 45 percent for uphill and downhill yarding, respectively. After approximately 18 turns, the predicted bulk density increase of the 22.5 cm soil depth was 25 percent. A modified 10-blow Proctor test slightly overestimated increases in soil bulk density on high-use downhill skid trails. The 15- and 10-blow Proctor tests very closely estimated the density increases for the 7.5 and 15 cm depths for uphill skidding.

(1)

DUFF REDUCTION CAUSED BY PRESCRIBED FIRE ON AREAS LOGGED TO DIFFERENT MANAGEMENT INTENSITIES, by S. N. Little, F. R. Ward, and D. V. Sandberg. 1982. USDA Forest Service Res. Note PNW-397. Pacific Northwest Forest and Range Experiment Station, Portland, OR. 8 p. A pilot study investigated the impact of two harvesting intensities on duff consumption from prescribed fire. Two units of old-growth Douglas-fir and western hemlock, located in the Willamette National Forest were harvested in 1980 and burned in 1981. Duff consumption was 36 percent less on the unit logged to minimum merchantability specification of 6 inches by 6 feet than on the unit logged to the standard minimum specification of 8 inches by 10 feet. Mineral soil exposure attributed to burning was similar and below regional guidelines for both units.

(1)

WATERSHED CLASSIFICATION BASED ON SOIL STABILITY CRITERIA, by D. N. Swanston. 1981. In: D. M. Baumgartner (ed.). Interior West Watershed Management Symposium. Extension Service, Washington State University, Pullman. Judging the natural stability of a watershed and assessing soil mass movement hazards related to harvest activities is possible by combining subjective evaluation of factors controlling stability of an area and a limited strength-stress analysis based on available or easily generated field data. The resulting analysis indexes the watershed in terms of relative hazard, identifies problem areas, defines failure mechanisms, and pin-points factors which may be amenable to specific control or correction procedures.

(1)

INTERACTION AMONG WEEDS, OTHER PESTS, AND CONIFERS IN FOREST REGENERATION, by S. R. Radosevich and S. G. Conard. 1982. In Biometeorology in Integrated Pest Management. p. 463-486. Academic Press Inc. Foresters and other resource specialists interested in brush control will find this publication to be very useful. It is a clearly written synopsis of the competitive autecology of western conifer and brush species regarding water and light. The authors also briefly discuss the roles of vegetation with respect to conifer depredation by insects and small mammals. Unfortunately, there is no discussion of grass-conifer competition, nor of the roles of allelopathy and competition for nutrients. With 41 references.

(3)

STREAMFLOW CHANGES AFTER LOGGING 130-YEAR-OLD DOUGLAS-FIR IN TWO SMALL WATERSHEDS, by R. D. Harr, A. Levno, and R. Mersereau. 1982. Water Resources Res. 18:637-655. Harvesting 130-year-old timber in two small watersheds in the H. J. Andrews Experimental Forest in the central, Western Oregon Cascades increased annual water yield up to 42 cm. For 4 years after logging, yield increases averaged 38 cm at a 13.0 ha clearcut watershed and 20 cm at a 15.4 ha watershed where timber was shelterwood cut. Increased summer flows were indicated by much fewer low-flow days after logging, particularly at the clearcut watershed. Neither the size nor the timing of peak flows changed significantly after logging at either watershed.

(1)

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