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"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 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 a joint effort between the School of Forestry at Oregon State University and the Pacific Northwest Forest and Range Experiment Station of the U.S.D.A. Forest Service. It is 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 research projects specifically tailored to meet regional needs.

Established in October, 1978, the FIR Program is supported by Oregon State University, the Bureau of Land Management, U.S.D.A. 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

Inside

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FORESTRY INTENSIFIED RESEARCH

SERVING SOUTHWEST OREGON THROUGH RESEARCH AND EDUCATION

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JOHN MANN, Harvesting

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Current Research

Adaptive FIR

EFFECT OF RIPPING ON PONDEROSA PINE SEEDLINGS

In the last issue of the FIR REPORT [4(3):3-4], I reported first-year results of a study designed to evaluate the effects of soil ripping on ponderosa pine seedling survival and growth. The study site is located in southwestern Jackson County just outside of Ruch at an elevation of 610 m on a 30 percent south slope. The soil is of the Vannoy series and is classified as a fine-loamy, mixed, mesic Typic Haploxeralf. Originally dominated by several manzanita species, the study area was site prepared as previously described [FIR REPORT 4(3):3-4]. Soil ripping was accomplished with a D-4 tractor to an approximate soil depth of 30 cm. One hundred sixty 2-0 bareroot and 160 1-0 bareroot ponderosa pine seedlings were shovel planted in the spring of 1981. One-half of the seedlings in each stocktype were planted in the rips while the other half were planted mid-way between rips. Second-year results of the study are now available.

Survival of the two stocktypes continues to remain very high two years after planting with no significant differences in survival due to soil ripping (Table 1). Despite the lack of treatment effects, the rate of seedling survival is encouraging given the droughty nature of the site.

Table 1. Percent survival of 1-0 and 2-0 bareroot ponderosa pine seedlings in ripped and unripped planting spots.

Stocktype/ treatment		Seedling Survival (%), by year 1981	1982
1-0:	ripped	99	98
	unripped	100	100
2-0:	ripped	98	96
	unripped	99	99

Height growth dramatically increased for both stocktypes during the 1982 growing season (Table 2). Soil ripping did not, however, affect the magnitude of these increases. It is likely that differences in growth between 1981 and 1982 reflect recovery from planting shock and more moderate weather conditions during the summer of 1982.

Table 2. Mean height growth ($\pm$ s.d.) of 1-0 and 2-0 bareroot ponderosa pine seedlings in ripped and unripped planting spots.

Stocktype/ treatment		Initial height (cm)[1]	1981 growth (cm)	1982 growth (cm)
1-0:	ripped	7.6 $\pm$ 2.3	3.9 $\pm$ 2.0	12.9 $\pm$ 5.1
	unripped	8.1 $\pm$ 2.5	4.1 $\pm$ 1.8	13.7 $\pm$ 4.6
2-0:	ripped	10.7 $\pm$ 3.2	5.8 $\pm$ 9.6	13.5 $\pm$ 5.2
	unripped	11.1 $\pm$ 3.5	5.8 $\pm$ 6.9	14.4 $\pm$ 5.7

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

The lack of any difference in seedling survival or growth between treatments after two years is sufficient reason to question the need for ripping under the conditions described. The soil could, however, have been ripped to a deeper depth such as 46 cm which might have produced different results. Nonetheless, observations to date have not shown any benefit derived from ripping. Final judgment on this particular ripping technique should be reserved, however, until additional data have been collected.

S.H.

FIRST SUMMER SURVIVAL FOLLOWING SITE PREPARATION

In August 1981, a study was initiated to evaluate the effectiveness of various machine site preparation techniques in aiding the reforestation of Low Intensity Management lands in the northwest portion of the Grants Pass Resource Area, Medford District, BLM. The site is at 4,000 feet elevation, with southerly slopes and soils weathered from granodiorite. The site was clearcut and site preparation treatments were installed by November 1981.

Snow covered the site from mid-December until May 1981, delaying planting until May 18. The site was planted with 2-0 Douglas-fir. Seedlings were slow to break bud, with some still shedding budcaps in September.

After the first growing season, survival is good for all treatments except the control (Table 1). Although the survival to date is good, the performance of the stock has been generally poor. This conclusion is based on the retarded budbreak, loss of older needles, and short leader growth of the seedlings.

Table 1. Seedling survival after one growing season, by treatment.

Treatment	Treatment description	Survival
Control	No site preparation	54%
Scarification	Slash and shrubs removed with slashrake	92%
Scarification + rip	Scarification and soil ripped with rock rippers	95%
Soil removal	Slash, shrubs, and two or more inches of soil removed with a dirt blade	95%
Soil removal + rip	Soil removal and soil ripped	87%

Table 1 indicates the relative importance of good site preparation in obtaining seedling survival. However, the high rates of survival may also be a function of late June precipitation in 1982. Precipitation on the site was negligible for the first six weeks after planting and budburst was slow. On June 26 and 28, a total of 1.3 inches of rain fell; thereafter increasing numbers of seedlings began to break bud and initiate leader growth.

During the first winter after logging and site preparation, standing water was observed in depressions on all treatments except the control plots, and small rivulets flowed across some of the plots on several occasions. However, erosion has been negligible. Storm events of 2 to 3 inches of precipitation in 24 hours were responsible for the standing water, but these storms did not approach the intensity expected to occur every couple of years in this area. Therefore, precipitation will continue to be monitored on the site in coming years and erosion pins have been installed to document any future erosion attributable to machine site preparation treatments.

D.M.

RAVEL DEFLECTION DEVICES

A study to evaluate the effectiveness of ravel deflection devices to prevent seedling burial was installed in an old clearcut in the Glendale Resource Area, Medford District, BLM. Previous reforestation efforts on the site have failed. The brush had recently been treated with herbicide.

Ravel deflection devices evaluated included shingle wedges and 1 x 2 x 18 inch and 1 x 4 x 18 inch stakes placed directly upslope of the seedling. The control was unprotected seedlings. In addition, a flat bench about 8 inches wide was excavated behind half of the seedlings prior to planting. The bench was to protect seedlings by catching ravel before it reached the seedlings.

The site was planted in mid-March and subsequently covered by the April snows. To date, no seedling mortality could be attributed to burial by ravel; however, ravel movement during the summer was minor. One to two percent of the unprotected seedlings were partially buried but not killed by ravel.

Interestingly, the material covering seedlings was not ravel but old logging slash. Ravel deflectors stopped the movement of slash in numerous instances; however, in certain situations slash may be a more serious cause of seedling burial than ravel per se. This is most apt to be the case if the ravel is less than an inch in diameter and the seedlings are of good caliper.

The movement of logging slash and the trailing mass of ravel detained behind it will be greatest during snow-creep on steep slopes. Thus, on higher elevation sites, we are more prone to find seedlings buried than on lower elevation sites where snow packs are intermittent.

D.M.

PLANTED DOUGLAS-FIR SURVIVES UNDER HARDWOODS

First year survival data indicate that low value hardwood stands in southwest Oregon have a good potential to be converted to more valuable Douglas-fir by herbicide treatment followed by underplanting. Hardwood stands composed of tanoak, madrone, and chinkapin with basal areas of 250 to 350 feet^2 per acre were injected with triclopyr amine (Garlon 3A) in September 1981, and planted with 1-0 plugs (10 c.i.) and 2-0 bareroot Douglas-fir seedlings in May 1982. Adjoining untreated areas were similarly planted to serve as controls. The treatments were replicated three times. First year survival and height growth indicate differences between the treated stands and between stocktypes (Table 1).

Table 1. First year (1982) survival and growth - Underplanting study.

Treatment/stocktype	Survival	Height growth (in.) (unbrowsed seedlings)
Injected hardwoods		
1-0 plugs	95	3.8
2-0 bareroot	90	2.1
Control		
1-0 plugs	94	3.0
2-0 bareroot	66	1.1

The plugs, which broke bud quickly, survived very well in both treated and control stands. The bareroots, which exhibited delayed bud break, survived well in the treated stands but not in the control areas. Height growth followed similar patterns. Seedling performance therefore appeared to be related to seedling vigor as well as herbicide treatment. Moisture stress measurements during the growing season showed that seedling stress was much greater in the control stand than in the injected hardwoods. Because this year's growth was largely dependent on the seedlings' previous benign nursery environment, growth and survival of seedlings in the treated stands should increase compared to those in the uninjected control stands as the latter cope with diminished photosynthesis caused by lower light levels and greater moisture competition.

O.H.

BAREROOTS AND PLUGS DO WELL ON TIN PAN PEAK BURN

Bareroot 2-0 and 1-0 plug seedlings of ponderosa pine and Douglas-fir were planted in February 1982 on a low elevation west-facing slope (40%) within the area burned by the Tin Pan Peak fire in 1981. The study included 4 replications of 4 stocktype-species combinations, each planted with 50 seedlings per treatment plot. Personnel from FIR and the Medford BLM removed snags to eliminate shade and then planted the seedlings. Competition from grass and resprouting hardwoods was controlled with herbicides, and baiting proved necessary to control gopher depredation. First year survival indicated the Douglas-fir and pine survived equally well but that survival differed between stocktypes (Table 1).

Table 1. First year survival (%) at Tin Pan Peak.

Species	Survival (%) 1-0 plugs	2-0 bareroots
Douglas-fir	90	99
Ponderosa pine	92	98

Budbreak on all species and stocktypes occurred quickly in the spring which indicated good seedling quality. These first-year results are encouraging and, if trends continue, suggest that withdrawn lands similar to the Tin Pan Peak site have a high probability of successful reforestation given good quality seedlings, proper planting, and control of weeds and gophers.

O.H.

SHADE ALTERNATIVES

Although cheaper than shelterwood systems, providing artificial shade with shadecards to Douglas-fir seedlings planted on open south-facing slopes still costs a lot of money--about $0.40 per seedling--and may not be the most cost-effective way to guarantee acceptable levels of stocking under some conditions. First-year survival results of a shading study carried out on the Medford District, BLM, shed some insight into the conditions when shading may be most effective.

The object of the study was to compare south shadecards (standard placement), east shadecards, and styrofoam coffee cups inverted around the seedling's base with unshaded controls. These four treatments were installed as randomized block experiments at two locations. First-year survival results are presented in Table 1.

The Lick Gulch site is located on a south-facing 30-40% slope at 2900' elevation on withdrawn land. The site was a manzanita brushfield before being cleared and operationally planted in 1981. The area receives about 30 inches of annual precipitation and has a high bulk density clay loam soil. Potential insolation during the growing season (May 1 to September 30) is about 144,000 gram-calories. Application of atrazine eliminated grass competition. Seedlings for the shade study were planted properly in February 1982, and broke bud quickly in the spring.

Table 1. First year (1982) survival for shade treatments.

Study area	Survival, by treatment (%) No shade	South shade	East shade	Styrofoam cup
Lick Gulch (withdrawn land) T.39S, R.2W, S.34	95	100	99	99
Julie Creek T.34S, R.9W, S.35	59	84	72	75

The Julie Creek site is a south-facing clearcut at about 3100'. Old-growth Douglas-fir was harvested and the site burned in 1981. Slopes range from 40 to 60% and the soil is a lower bulk density gravelly loam. The area receives about 80 inches of precipitation annually and potential summer insolation averages about 142,000 gram-calories. In contrast to Lick Gulch, the shade treatments were installed on operationally planted seedlings and planted in May (because of snowed-in roads) during warm weather by an inexperienced crew. These seedlings exhibited delayed bud break.

The most interesting comparison has nothing to do with shading. The high survival of the unshaded controls (95%) on Lick Gulch compared to the lower survival (59%) of controls on the better Julie Creek site strongly suggests that initial survival depends more on proper seedling quality and planting than on land classification of these two sites.

Among the shading treatments, the standard south shadecards consistently gave the greatest increase in survival. The increases vary, however, in importance between the two sites. The 5% increase at Lick Gulch is significant statistically but very likely will not prove to be cost-effective, given the 95% survival of the controls. In comparison, at Julie Creek, the increase in survival from 59% to 84% would easily prove to be cost-effective if the alternative to meet stocking goals such as fill-in planting was more expensive.

The other shade treatments, the east cards and styro-cups, had equal effects on survival. The lower cost of the cups ($0.08 to $0.14 installed) makes them clearly more cost-effective than east shadecards. Their lower cost, despite their lower survival, could also make them more cost-effective than the south shadecards if the survival rate achieved by using the cups met stocking goals.

O.H.

Fundamental FIR

PREDICTING TANOAK SPROUT DEVELOPMENT, FROM PARENT STEM DIAMETER, PRIOR TO CUTTING

A master's thesis in silviculture has developed a technique for predicting the potential cover from tanoak stump sprouts. Work was done on 11 sites in the Siskiyou Mountains which had been clearcut and burned one to six years previously. Width, crown area, leaf area and biomass of tanoak sprout clumps one to six years old were all strongly related to parent stump d.b.h. prior to cutting. Correction techniques are provided for multi-stem clumps. Thus, using a stand table with numbers of tanoak stems by diameter class, foresters can predict the potential cover up to six years after cutting. Copies of the thesis, written by Tim Harrington, are available at the FIR office and BLM headquarters in Medford and at the Siskiyou Forest Supervisor's office in Grants Pass. Data has been collected to develop similar prediction techniques for sprouting madrone. This information should be available at the same locations by March 1983.

Please contact me if you have comments or questions about this technique.

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SHADING AND MULCHING EFFECTS ON SOIL TEMPERATURE

Early results from the summer 1982 experiments of the Reforestation Microclimate project indicate that there are substantial differences between several shading and mulching treatments in their effect on shallow soil peak temperatures near the stems of Douglas-fir seedlings. The most effective treatments keep the soil close to air temperature while the least effective allow it to warm to higher temperatures than those reached near seedlings with no treatment.

Figure 1 shows maximum temperature at a depth of 2 cm (about 3/4 inch) for each of 16 treatments and 3 controls on one day in late August. The temperatures were measured by thermocouples which were buried at the time of planting within 1.2 inch of the stem of the seedlings on the south side. Care was taken not to distort the soil temperature profile by the presence of the thermocouple. Data for the figure were obtained from observations repeated at approximately 45 minute intervals throughout the day. For most treatments, the number plotted is the average of 5 replications. The exceptions have the actual number of replications indicated in parentheses. The bars show the range of one standard deviation above and below the average.

The treatments fall into three groups as shown in the figure. Standard lath-stake shadecards were oriented in five different directions for the first group. In all cases but one, the back of the card faced the seedlings. In the case of the treatment labeled SW/E-W, the stake was driven to the southwest of the seedling but the card itself faced south. This was tried because previous results had indicated that reflection of sunlight from the back of southwest oriented shadecards in the morning could increase soil tempertures.

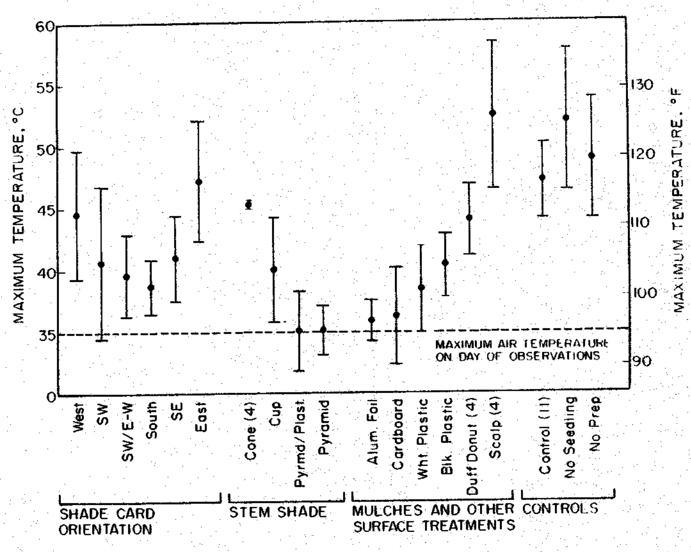

Figure 1. Maximum soil temperatures at 2 cm depth, by treatment, August 24, 1982.

All of the treatments in the stem shade group are experimental (i.e., not currently used operationally). The styrofoam cup is being used in an Adaptive FIR experiment conducted by Helgerson and reported in this issue. An ordinary styrofoam coffee cup with the bottom removed is slit along the side and inverted around the base of the seedling. The other three treatments were developed for this microclimate experiment. The cone is a shaped piece of white file card stapled around the base of the seedling stem to form a cone about 3 inches high with a 2-inch-diameter base. The pyramids are formed from medium weight white cardboard folded to form three sides of a four-sided pyramid about 6 inches high with a 10-inch base. The peak of the pyramid is cut off to provide a hole for the stem and lower branches of the seedlings, and its base is sloped to match the angle of the site (60% south aspect). One of the two groups of pyramids has white plastic stapled to the bottom edge to serve as a mulch. The open side of both pyramids faces north.

The mulches consist of heavy-duty aluminum foil (18-inch squares), heavy waxed cardboards, and white and black polyethylene film (all 30-inch squares). The duff donut is basically a scalp but with some of the removed surface material piled in a one- or two-inch-thick "donut" around the seedling stem. At this particular site there was little real duff, so the donut was mainly of surface soil material.

The control group includes, besides seedlings planted in the normal way with a hoe (but with no treatment applied), two groups where no tree was planted. The first had all the usual preparation operations such as scraping the surface performed, but no tree was actually planted. In the No Prep group, the site was disturbed only to the extent necessary to insert the thermocouple.

Statistical analysis of the data, assuming equal population variances, yields for each treatment a value for the minimum reduction in peak temperature compared to the control seedlings at the 95% confidence level. The following examples illustrate the magnitudes of the statistically significant reductions of peak temperatures. The corresponding numbers for the remaining treatments exhibit a pattern similar to that shown by the average values in the figure.

Treatment	Minimum reduction (95% confidence) of peak temperature, °F
West shadecard	0.0
South shadecard	10.1
All pyramids	17.6
Black plastic	7.0
Scalp	-2.2

Since there is evidence that direct heat damage has an exponential dependence on temperature, a few degrees of reduction in maximum soil temperatures could be a distinct survival advantage under conditions where soil tempertures approach the lethal limit. However, treatments also differ considerably in installed cost. This kind of quantitative information on treatment effectiveness (extended to other survival-related variables as well as temperature) can be coupled with site-specific information and regional climatic probabilities to eventually allow more objective and successful balancing of cost and effectiveness when selecting treatments.

A few cautions about interpretation of these results are in order. This is the first look at just a portion of the total summer-long data set; there are many analyses yet to be done and the final results may differ. The data presented represent effects on maximum shallow soil temperature only, and the analysis so far has not considered other possible benefits of the treatments such as reducing length of exposure to high temperatures or increasing moisture availability. The 1982 study included measurements of soil moisture as well as growth and survival data on a much larger sample of each treatment, and these results will be forthcoming.

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VEGETATION CLASSIFICATION IN SOUTHWESTERN OREGON - A PRELIMINARY REPORT

How many times have you pondered over questions as you walked through forest stands? For example...Why does this stand seem different from the one upslope? Why is beargrass here and what does it mean? Why isn't western redcedar found on my district or area? What species mix would best regenerate the site? What species is most productive through the rotation?

The list of questions is endless, but an approach to answering them is in preparation. The Pacific Northwest Forest and Range Experiment Station (PNW) and the U.S.D.A. Forest Service's Southwestern Oregon Ecology Program are cooperatively developing a plant association classification for public and private lands in southwestern Oregon. Vegetation classification has been effectively applied in Washington, Oregon and Idaho to answer management's questions and predict vegetation's response to management activities.

Vegetation occurs along complex environmental gradients related to climate, geology and topography. Additional complexity may be added when localized disturbances such as storms, fires, grazing and past-use blur natural patterns. In fact, disturbance has been so much a part of southwestern Oregon's history that it is often difficult to determine the productive capacity or limitations of a site. Vegetation classification can simplify the complexity by using vegetation to indicate the operative environment, site capacity and response to management. Vegetation classes, called Series and Associations, are formed by dividing the vegetation gradient at natural breaks into discrete classes. Each class has its characteristic productivity, response and limitations and can be efficiently managed as a discrete entity.

The Series is the higher level in the classification hierarchy and is named after the climax dominant tree species. Series are used at the planning level; they reflect a broad range of environmental conditions. The association uses subordinate vegetation and site factors for more specific project application.

Several authors have classified parts of southwestern Oregon. Bailey (1966) worked out secondary successional patterns on the southern Oregon Coast, Emmingham (1973) classified the lower Illinois River drainage. But the greatest body of knowledge has come from the many people who have written descriptions of Research Natural Areas. Franklin and Dyrness (1973) summarized their findings and provided a sound basis for further work in the area.

We now have a new and comprehensive data base consisting of over 4,000 ecological plots in southwestern Oregon. This data base and others such as timber inventories, stand exams, soil inventories and special studies are providing a finer resolution of the environment and its associated vegetation.

The following series have been tentatively identified in southwestern Oregon from the samples:

Common name	Scientific name acronym
Mountain hemlock	TSME
Pacific silver fir	ABAM
Shasta red fir	ABMAS
Western white pine	PIMO
White fir	ABCO
Western hemlock	TSHE
Western redcedar	THPL
Port-Orford-cedar	CHLA
Grand fir	ABGR
Tanoak	LIDE3
Douglas-fir	PSME
Ponderosa pine	PIPO
Oregon white oak	QUGA
Lodgepole pine	PICO
Jeffrey pine	PIJE

A brief summary of each series follows:

The mountain hemlock series is the coldest and highest in elevation. It is discontinuously located in cirque topography in the Siskiyous but comprises a zone, or band, in the southern Oregon Cascades. It grades into whitebark pine at higher elevations to the east of the Cascade crest and mixes with the Shasta red fir series at lower elevations and high elevation south slopes to the west.

The Shasta red fir series occupies the next lower elevational band. It is limited in range to southwestern Oregon and northern California and mixes with the Pacific silver fir series at high elevations in the northern half of its range.

The Pacific silver fir series seems to require more summer moisture than the Shasta red fir series, and Englemann spruce is more often associated with Pacific silver fir than Shasta red fir. It is a restricted series within southwestern Oregon, occurring only as far south as the Rogue-Umpqua Divide, with discontinuous patches south into the Rogue National Forest.

The western white pine series is another high elevation series but is a very special case. Western white pine is climax on a few cold, ultrabasic sites in the Siskiyous. Jeffrey pine is a distinctly subordinate associate to western white pine at these high elevation sites.

The white fir series occurs at lower elevations than the Shasta red fir and Pacific silver fir series. It is the most widespread series in southwestern Oregon. There is a substantial amount of vegetational variety in the white fir series and many of our silvicultural problems occur here.

The western hemlock and tanoak series occur below the white fir series. Western hemlock seems to require more moisture than tanoak. It occurs near the coast in association with tanoak and along the western flank of the Cascades, chiefly north of Butte Falls. Tanoak dominates south of Port Orford and slightly farther inland than western hemlock but does not occur in the Cascades. This distribution pattern suggests that western hemlock cannot dominate under conditions of high evapotranspirational demand. (There are significantly more clear, summer days south of Butte Falls and south of Port Orford.) The tanoak series, on the other hand, requires ample soil moisture and can tolerate atmospheric demand but favors sites where temperature extremes are modified by the oceanic influence. Tempertures, both soil and air, are generally warmer in the tanoak series than in the western hemlock series.

The western redcedar, Port-Orford-cedar, and grand fir series occur along drainage bottoms and are usually confined to lower elevations. Although these series are not widespread, they are the most productive in terms of timber and wildlife. Many of our resource conflicts are associated with these series.

The Douglas-fir series does not occur as an elevational band. It occupies sites that are hot and dry over a wide range of elevations. Together with the tanoak and ponderosa pine series, it characterizes the Mixed-Evergreen Zone of the Franklin and Dyrness (1973) classification. The evergreens such as tanoak, canyon live oak, chinkapin and madrone do play an important role in this series. They often dominate the site immediately following fire or disturbance, competing with economically important conifers for light, water and nutrients. Fires are frequent in this series because of its hot and dry environment. The series occurs sporadically in the central Oregon Cascades (Means 1981) and becomes increasingly more common in the southern Cascades. In the Siskiyous, where evapotranspirational demand is high, the Douglas-fir series almost becomes zonal.

The ponderosa pine series is the lowest elevational series that still produces commercial timber. Most sites skirt the valley floor and have been repeatedly disturbed or converted to nonforest uses. A ponderosa site is often dominated by a few old pines with scattered black oak, manzanitas, madrone and a few white oaks.

The Jeffrey pine series and the lodgepole pine series, like the western white pine series, are special cases. Jeffrey pine is almost totally confined to serpentine or peridotite parent materials or soils derived from them. On most, but not all, sites it does not produce commercial timber.

The lodgepole series is confined to high elevation cold pockets with coarse textured soils such as pumice. It is borderline commercial and reforestation is extremely difficult.

The relative elevational position of each series is depicted across a west-east gradient in the southern Coast Range (Figure 1), the Siskiyou Mountains (Figure 2) and the southern Cascade Range (Figure 3).

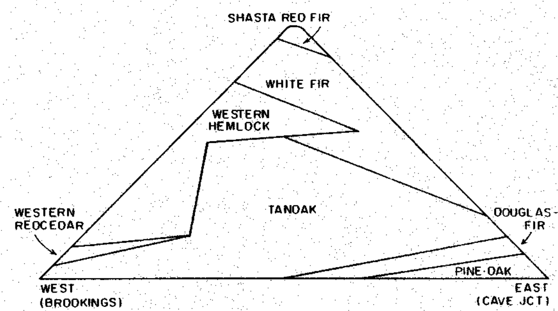

Figure 1. Schematic representation of the relative positions of the series in the SOUTHERN COAST RANGE.

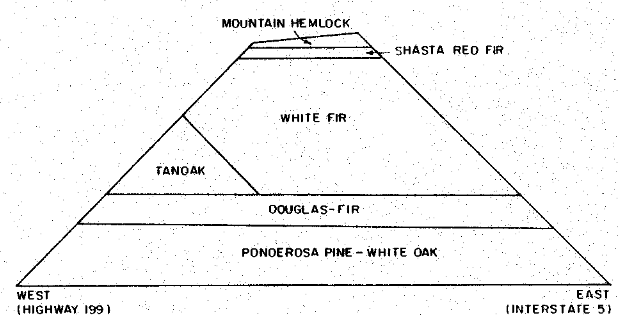

Figure 2. Schematic representation of the relative positions of the series in the SISKIYOU MOUNTAINS.

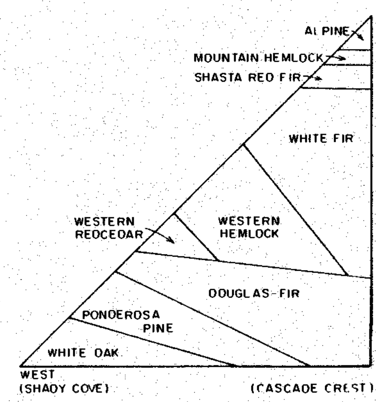

Figure 3. Schematic representation of the relative positions of the series in the SOUTHERN CASCADE MOUNTAINS.

Generally, the series tie together zones of environmental similarity. Understanding the environmental requirements of a series goes a long way toward applying the proper silvicultural prescription. But our project level working units are the plant associations. At this preliminary stage of development we feel that it will require well over 50 plant associations to characterize southwestern Oregon. Within the next few years we will be developing and publishing management guides and other publications that will deal specifically with the plant associations. If you have any questions, please contact one of us through the Siskiyou National Forest.

Tom Atzet, Forest Service
David Wheeler, Forest Service
Jerry Franklin, Forest Service
Brad Smith, Forest Service

VARIATION IN DATES OF MAXIMUM SOLAR HEATING POTENTIAL WITHIN A MANAGEMENT UNIT

Slope and aspect are recognized as important factors in prescribing silvicultural practices for harvested units. These two site properties are considered along with soil, elevation, and habitat characteristics when planning reforestation activities. It is obvious that substantial variability exists among the slopes and aspects of individual seedling microsites, but units are typically described on the basis of only average slope and aspect. Values are often obtained from a topographic map of the unit, with no information about microsite variability.

Differences in planting spot slope and aspect strongly influence the timing of the solar heat load on seedlings. The microtopography of the planting spot may result in maximum solar heat loads which occur much earlier than June 21, the date most commonly associated with high solar heat loads [FIR REPORT 4(2):5-6]. This variation in heat load probably influences seedling bud burst, growth initiation, dormancy, and ultimately mortality. If microsite slope and aspect are taken into account, silviculturists may be able to better interpret the variation in seedling performance observed on many sites.

This note summarizes the effect of variability in seedling microsite on the timing of maximum solar heating potential, as observed at the Wolf Creek reforestation microclimate site. This clearcut unit is visually quite uniform with an average slope of 60 percent, and an average aspect of 182 degrees. Five hundred 2-0 Douglas-fir seedlings were planted in the spring of 1982. The slope and aspect of each seedling microsite (an 8-inch diameter area around the seedling) was then measured with a specially designed device. The planting operation was found to have reduced the average slope at the seedlings from 60 to 46 percent.

When analyzed using DASUNMX, a program for predicting the dates of maximum heating potential, the dates of maximum solar heating potential differ greatly between 46 percent and 60 percent slopes. Maximum heating potential for a 46 percent slope occurs on May 11 and again on August 1, with maximum heating potential for a 60 percent slope occurring on April 21 and again on August 21. There is a 20 day difference in timing of potential maximum heat load when microsite slope is used in the calculation rather than average unit slope.

When microsite aspect is also considered, the variability among the 500 microsites resulted in an average departure of 35 days from the June 21 maximum, with a standard deviation of 24 days. It is likely that the "average seedling" would receive maximum solar heating on May 18 and again on July 27, but some microsites would experience maximums as early as April 24 and again as late as August 20.

The results emphasize several points. Variability in microsite slope and aspect significantly affect the timing of the potential maximum heat load for seedlings. Broad brush unit averages for slope and aspect may not adequately represent the seedling microsite. As per my earlier FIR REPORT article, be aware that steep slopes with southerly aspects receive maximum potential solar heat loads long before June 21 and again later in the summer.

The 500 microsite sample illustrates that knowledge of microsite slope and aspect improves our estimate of the seedling environment. However, the data also show that lots of variability in microtopography is encountered across the unit which means lots of variability in the timing of potential solar maximums for individual seedlings. The large microsite variability is probably typical of most reforestation units. I propose that stratification of reforestation data by seedling microsite conditions may help explain variability in plant response. The Reforestation Microclimate project would welcome opportunities for collaboration with other projects to jointly exploit this or other developments.

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GENETICS OF THE DOUGLAS-FIR SHELTERWOOD REGENERATION SYSTEM

Shelterwoods have been an important management tool for regeneration of Douglas-fir throughout southwest Oregon. Shelterwoods are commonly used on sites that are difficult to regenerate following clearcutting (i.e., south- and west-facing slopes) and are most often underplanted. On some sites, however, natural regeneration can be significant. Natural regeneration is desirable because a local seed source is guaranteed. In addition, there is potential for a small amount of genetic gain if the leave trees are superior. However, the question of the genetic makeup of stands regenerated by a small number of leave trees (typically 10-15/acre in southwest Oregon) has not been addressed. In 1980 a study was begun to examine the genetics of two shelterwood stands on the Diamond Lake District, Umpqua National Forest.

Both shelterwoods were fully stocked with 3-5 year old natural regeneration and were adjacent to uncut stands of Douglas-fir. Allozyme markers (variants of single genes) were used to determine the genetic composition of trees in the uncut stands, leave trees in the shelterwoods, and natural regeneration in the shelterwoods. Preliminary results indicate that the genetic makeup of the shelterwood leave trees and their progeny (natural regeneration) is not appreciably different from that of the adjacent uncut stands. For example, genetic variability as measured by the mean number of variants per gene (based on 10 genes) did not differ significantly among the sampled populations. The mean for the uncut stands was 2.85, for the leave trees 2.95, and 2.90 for the natural regeneration.

In addition, it has been suggested that wide spacing in shelterwoods may lead to reduced cross-pollination among leave trees and increased proportions of self-fertilized (i.e., heavily inbred) progeny. The mean estimate of selfed seeds from trees in the uncut stands was 2.5% and was 6% in the shelterwoods. Thus, the percentage of selfed seeds was more than doubled in the shelterwood stands, but we have yet to determine what proportion of the selfs actually survive to the seedling stage. On the whole, the shelterwood regeneration system appears to have had only a very limited impact on the genetic composition of the regeneration in these stands.

David Neale, OSU, Forest Science
Tom Adams, OSU, Forest Science

FIR GROWTH AND YIELD PROJECT - INTERIM STATUS REPORT

The FIR Growth and Yield Project has now completed two summers of data collection. Sampling in 1981 and 1982 covered the mixed-conifer forests along the western slope of the Cascades from the Dead Indian Highway north to the Prospect Ranger District. This portion of the study area took in part of the Klamath and all of the Butte Falls BLM Resources areas (Medford District), the Butte Falls and the Prospect Ranger District (Rogue River National Forest), and substantial Boise-Cascade Corporation and Medford Corporation industrial forest land (Table 1).

Table 1. Distribution of 1981-1982 sample plots, by ownership.

Ownership	Plots	Trees felled	Trees sectioned
	number		
BLM	44	235	141
USFS	48	241	194
Boise-Cascade	56	318	311
Medford Corp.	60	307	226
Total	208	1,101	872

We have collected growth information from 208 plots with measurements from about 12,500 standing trees. Of these, 1,101 trees were felled for height growth measurement with 872 sectioned for detailed volume, taper, and stem growth measurements.

Seventy-three sample trees met the qualifications for free-to-grow site-index trees (Table 2). These trees were aged at intervals along the stem to develop and evaluate site-index curves.

Table 2. Summary of 1981-1982 felled tree data, by species.

Species	Felled trees	Site trees
	number	
Douglas-fir	594	54
White fir	113	3
Grand fir	90	4
Ponderosa pine	113	5
Sugar pine	67	7
Incense cedar	124	0
Total	1,101	73

For the final field season in 1983, we plan to measure 135 plots and fall 816 trees to complete the data set. These plots will be located east of Interstate-5 in the Evans, Graves, and Cow Creek drainages. We anticipate an additional two years for model building, with release of the models scheduled for 1985.

We are interested in all available stem analysis data from southwest Oregon site trees. Anyone having data to share, please contact us. We're also happy to answer any questions regarding this project.

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Continuing Education

INTERNATIONAL FORESTRY: EXPORTING OREGON'S PRODUCTS, TECHNOLOGY, AND EXPERTISE

February 10-11, 1983. Oregon State University, Corvallis, OR. This meeting of foresters, scientists, industry representatives, and the public will provide a forum for sharing information on current activities, identifying opportunities for export, and discussing constraints on exporting and how to remove them. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331, (503)754-2004.

MICROCOMPUTER APPLICATIONS FOR RESOURCE MANAGERS

March 1983. Oregon State University, Corvallis, OR. This workshop will demonstrate the Apple II and other microcomputers with a variety of commercially available and special programs. A good opportunity to get hands-on experience and make side-by-side comparisons of various hardware and software. Enrollment is limited to 30 people. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331, (503)754-2004.

REFORESTATION: SEEDLING HANDLING AND PROTECTION

March 22-23, 1983. Oregon Institute of Technology, Klamath Falls, OR. Sponsored by OSU Forest Science Extension. Review of correct seedling handling procedures at all stages from lifting to outplanting. Especially valuable for field foresters and nursery technicians. A demonstration section will look at devices available to help detect seedling damage. Small group problem solving exercises are also part of the program. Enrollment is limited to 70. Fee is $120. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331 (503)754-2004.

DESIGNATED SKIDTRAILS TO REDUCE SOIL COMPACTION

April 1983. Coos Bay, OR. Sponsored by OSU Forest Engineering 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 making of skid trails with a critique to follow. Fee is $55. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331, (503)754-2004.

FOOTHILLS FOR FOOD AND FOREST

April 25-28, 1983. Oregon State University, Corvallis, OR. 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. Announcements for registration will be sent out in early spring. CONTACT: Steve Tesch, Adaptive FIR.

Of Interest

FIR PERSONNEL CHANGES - NEW HARVESTING SPECIALIST HIRED

Dave Lysne is no longer with Adaptive FIR. He has returned to the Forest Service and is presently assigned to the Rogue River National Forest in Medford where he will be working in the areas of pre-sale and logging and transportation planning. Best of luck to Dave. We will miss his contribution to the FIR Program!

We have been fortunate to hire John Mann to fill the harvesting specialist slot. John has been the director of the Mississippi State University Forestry and Harvesting Training Center in Longbeach, Mississippi for the past several years. He is anxious to return to the West where he received a master's degree in forest engineering from Oregon State University and worked as a harvesting specialist for the Six Rivers National Forest in California. He should be on board by mid-January, 1983.

ADAPTIVE FIR ANNUAL REPORT AVAILABLE

For those of you interested in a summary of the extension and research activities of the Adaptive FIR team for the period October 1981 through September 30, 1982, our annual report is available upon request. The report presents up-to-date results of on-going research projects and outlines new projects.

PRECOMMERCIAL THINNING ON LOW SITE LAND IN SW OREGON

Candidate stands for precommercial thinning have not been abundant on Site V land in southwest Oregon. Naturally regenerating conifers must compete with very well-adapted shrub species in a generally moisture-limited environment. Without intensive management, regeneration periods may last from 25 to 75 years, with full stocking never achieved among the competing vegetation. As a result few stands have needed percommercial thinning of competing conifers, but many require release treatments from competing shrubs.

Increasing skills in the establishment and tending of plantations will probably lead to more precommercial thinning opportunities in the future. Planting densities of 650 or more trees per acre have been common, with anticipated rates of mortality by stand establishment of up to 70 percent. With good site preparation and vegetation management, survival rates should increase significantly, leading to a need for precommercial thinning. What precommercial thinning density is appropriate?

A survey of precommercial thinning practices on sites in northern California and southwest Oregon indicated that where thinning had been done, and most experience was on better sites, that after-thinning densities of about 300 trees per acre were most common. Somewhat lower densities were targeted for poor sites as a precaution against stagnation or on sites where commercial thinning feasibility was limited. Locally derived growth and yield data is limited for this region; however, those surveyed have attempted to use a variety of guides and simulators generated with data from other parts of the West Coast.

Biological justification exists for precommercial thinning on poorer sites. According to Reukema and Bruce (1977) relative gains in growth from precommercial thinning are greatest on poorer sites. They indicate that a 20 to 30 percent relative improvement in site index and current gross cubic volume growth may be obtained with precommercial thinning on Site V land. On poor sites there is also concern that stand differentiation is inhibited, resulting in a tendency for stagnation.

Precommercial thinning density is most often related to a merchantability standard for the first commercial entry; generally the target is about 10 inches d.b.h. This provides for a compromise between maximum stand and individual tree growth rate up to the first commercial thinning, at which point further stocking control is used to maintain the growth rates. However, many poor sites in this region occur on steep terrain which requires cable harvesting. Increased logging costs on these sites and questionable markets for thinning products may result in many commercial thinnings never being harvested. In fact, the probability for large-scale commercial thinning ventures on the vast acreages of second-growth stands available in the future is rated as poor by many managers. What will the impact of missed commercial thinning be on the stand growth rate for the rest of the rotation? Reukema and Bruce indicate that uniform precommercially thinned stands differentiate poorly, especially on poor sites, and tend to stagnate if no further thinning is carried out. This speculation may in itself warrant wider spacing at precommercial thinning.

The density management diagram developed by Weyerhaeuser Company can be used to track stand growth at various percommercial thinning densities, enabling us to view the impact of missed commercial thinnings within a rotation of 80 years. Recall that the diagram is based on a maximum size-density relationship using relative density (RD) as a measure of the maximum growth obtainable. An RD value of .15 is obtained at about the time of crown closure; .40 is considered by many the proper time to initiate stocking control to maintain growth rates; and above a value of .55, mortality is imminent.

Table 1 shows the approximate height and age at which a stand growing on a site index 70 (King) (Site V) will reach an RD of .40. Three hundred trees per acre (tpa) results in exactly a 10-inch d.b.h. tree when RD.40 is reached at age 57 years. However, if no intermediate entry is made, the stand will be under increasingly severe intraspecific competition until final harvest. Two hundred trees per acre do not reach RD.40 until age 72, at which time the trees will be 14.4 inches d.b.h. The site has not been fully occupied early in the rotation, but crop tree growth remains maximum for a longer period of time. With 400 trees per acre RD.40 is reached at 46 years, prior to the stand reaching 10 inches d.b.h.

Table 1. Stand characteristics when RD.40 is reached, by precommercial thinning density for SI_{70K}.

PCT Density	Height	d.b.h.	Age (b.h.)
200 TPA	85'	14.4"	72 years
300	75	10.0	57
400	66	8.8	46

Stands precommercially thinned to 200, 300, and 400 trees per acre are described at age 40, 60, and 80 with no intermediate entry in Table 2. Growth rates on SI_{70K} are generally slow enough that reasonable flexibility is maintained for all three densities through 80 years, but the compromise between stand growth rate and individual tree size is apparent by age 40.

Table 2. Stand characteristics by age and precommercial thinning density for SI_{70K}.

	Density after PCT		
Age/parameter	200 TPA	300 TPA	400 TPA
40 YEARS (ht = 61 ft)			
Relative density	.22	.28	.35
d.b.h. (inches)	9.5	8.5	8.0
Vol./acre (ft^3)	2200	2700	3240
60 YEARS (ht = 70 ft)			
Relative density	.35	.44	.53
d.b.h.	11.8	10.2	9.4
Vol./acre	3300	4800	5800
80 YEARS (ht = 89 ft)			
Relative density	.45	.56	.67
d.b.h.	13.2	11.4	10.5
Vol./acre	6800	/800	8000

None of the stands have reached RD.40 yet, but considerable differences exists in d.b.h. and stand volume. By age 60 both 300 and 400 trees per acre densities have exceeded RD.40, with the 400 trees per acre density rapidly approaching the zone of imminent mortality. By age 80 all three densities have exceeded RD.40, but the 200 trees per acre density has produced significantly larger diameter trees. Stand volume growth has declined in the 400 trees per acre density to the point where the 300 trees per acre density is nearly equal in biomass, but contains one-inch diameter larger trees.

One must certainly keep in mind the respective management situations when evaluating Table 2. Can the organization place a value on the extra diameter growth, or are alternative regimes based solely on cubic foot growth? From the standpoint of either situation, if a commercial thinning is missed and a final harvest planned for 80 years, a 300 trees per acre precommercial thinning density appears to present a reasonable compromise between stand and individual tree growth on Site V land in southwest Oregon.

S.T.

DROUGHT RESISTANCE OF DOUGLAS-FIR IN SW OREGON

Initial results of a study to compare the relative drought resistance of 200 Douglas-fir families collected between Roseburg and the California border are available. The study is a cooperative venture between the OSU School of Forestry, the Forest Service, and the BLM. Seed was collected from two parent trees, each representing a different family, at each of about 100 locations along the latitudinal transect. Most seed was collected by the BLM, and the seedlings were grown in the BLM nursery at Merlin. The seedlings were transplanted to controlled soil environment bins at the Forest Research Lab in Corvallis where they received no moisture input from the end of April until mid-October.

Increased drought resistance, as measured by seedling survival under controlled soil moisture conditions, was strongly correlated with decreasing latitude of seed source; that is, the seedlings from southerly collections were more drought resistant. Movement of seed from the California border to Roseburg is not recommended, but collection of seed from the southern end of a seed zone would be appropriate.

About 25 collection sites were characterized as either mesic or xeric. Within this rather limited sample, survival of seedlings whose parents were located on xeric sites was about twice that of those seedlings from mesic sites. This result suggests that ecotypic adaptation to the harsh environment exists and that it may be a good idea to plant droughty sites with seedlings whose parents were located on droughty sites.

A rule of thumb for harsh site reforestation may be to use seed obtained from xeric sites located in the southern extreme of the respective seed zone.

D. P. Lavender, OSU, Forest Science

Recent Publications

For copies of the publications cited, mail your requests to the appropriate address as indicated by the number following each summary. Requests should be sent to:

(1) Conference Office
323 Agricultural Sciences
Washington State University
Pullman, WA 99164

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

SITE PREPARATION AND FUELS MANAGEMENT ON STEEP TERRAIN, by D. M. Baumgartner (ed.). 1982. Cooperative Extension, Washington State University, Pullman, WA. 197 p. Twenty-four papers discuss site preparation equipment and techniques, related influences and concerns, and vegetation responses in the northern Rocky Mountains. Techniques for site preparation covered include machines, fire, handscalps, and chemicals. Fifteen papers cover the use of prescribed burning, particularly the response of western Montana vegetation types to burning. Site preparation influences on site productivity, duff reduction, importance of residual organic debris, insolation and heat effects, animal use and damage, and landscape design are covered individually. Cost $11.50.

(1)

BRUSH CONTROL WITH HERBICIDES ON HILL PASTURE SITES IN SOUTHERN OREGON, by L. A. Norris, M. L. Montgomery, L. E. Warren, and W. D. Mosher. Silvex alone or with 2,4-D in a 1:1 ratio at about 3 or 4 kg/ha gave 60 to 100 percent control of many brush species including poison oak, Oregon oak, and maples. Picloram at 1 kg/ha plus 2,4-D at 4 kg/ha was most effective with respect to the amount of picloram; however, the mixture of 1 kg/ha plus 2 kg/ha, respectively, was nearly as good. Complete pasture renovation in this area requires brush control, burning, fertilization, and seeding of desirable species. Picloram and 2,4-D disappear from soils in 29 months with no significant leaching into the soil profile at these study sites. Herbicide discharge in streamflow was small, representing 0.35 percent and 0.014 percent of applied picloram and 2,4-D. We believe that nearly all of the herbicide discharged from these watersheds represents residue from adjacent streambanks. Significant overland movement of herbicides from upslope did not occur on these study areas. The probability of crop damage from irrigation with water from these watersheds is low.

(2)

ENVIRONMENT, VEGETATION, AND REGENERATION AFTER TIMBER HARVEST IN THE APPLEGATE AREA OF SOUTHWESTERN OREGON, by D. Minore, A. Abee, S. D. Smith, and E. C. White. 1982. USDA Forest Service Research Note PNW-339. Pacific Northwest Forest and Range Experiment Station, Portland, OR. 15 p. Multiple regression analyses were used to relate environmental factors and vegetation to post-harvest forest regeneration in the Applegate area of southwestern Oregon. Optimal environments for regeneration were identified by aspect, slope, elevation, rock cover, and vegetation. The authors concluded that gently sloping northern aspects on deep soils at elevations below 4,000 feet are optimal for clearcut regeneration. They found hotter sites could be regenerated naturally if sufficient overstory is maintained, but underplanting was recommended where prompt regeneration is required.

(2)

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