FIR Report

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"FIR REPORT" is a quarterly newsletter 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

Ole T. Helgerson
Silviculture Specialist

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FIR

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NOTES FROM THE EDITOR

With this issue, editorial responsibility shifts from Steve Tesch to Ole Helgerson. Many thanks to Steve for his good work over the last year!

Please note that we need the assistance of you--our readership--in maintaining and upgrading the usefulness of the FIR REPORT. Our central goal is to share the best and most up-to-date information on the management of forests in southwest Oregon, with special focus on reforestation problems. Please keep us informed of research or study results or your ideas or concerns.

Because of space limitations, results described within Current Research appear as extended abstracts. Readers who are interested in learning more about individual studies are encouraged to contact the study's investigator or otherwise wait for publication of a more complete description in typically a refereed journal.

Ole T. Helgerson

ERRATA-

In the last issue of the FIR REPORT 4(4) there was a typographical error in the article on precommercial thinning by Steve Tesch. In the first paragraph on page 11, the article suggested a relative density value of .04 is considered by many the proper time to initiate stocking control to maintain growth rates. The correct relative density value should be .40, as was used throughout the rest of the article.

Current Research

USING A PRESSURE CHAMBER TO DETECT FREEZING DAMAGE TO SEEDLINGS

Cold storage of seedlings is often a necessary step in the reforestation of conifers in the Pacific Northwest. Despite improvements in the overall quality of refrigeration facilities, occasional equipment malfunctions still occur which can result in seedlings being exposed to sub-freezing temperatures. Such exposure can be especially injurious to root systems which are believed to be more sensitive to freezing than shoots. Unfortunately, we know little about the tolerance limits of roots to this type of injury. Also, there is no simple and effective method of identifying the extent of injury. Consequently, when a storage problem like this is discovered, foresters are often left scratching their heads and wondering if they should throw out or plant the exposed seedlings.

In December 1982, a study was initiated to determine if a pressure chamber device could be effectively used to identify seedlings that were severely damaged by freezing. Groups of 10 bareroot 2-0 Douglas-fir seedlings supplied by the Medford Nursery were placed in a programmable freezing chamber and exposed to ten temperatures ranging from -3°C to -12°C. Afterwards, they were put in a cold room for 24 hours and then planted in pots. A small lateral branch from each seedling was removed for measuring plant moisture stress (PMS) with a pressure chamber on the first, fourth, and sixth days after planting.

Most of the 20 seedlings which died were those exposed to the lowest freezing temperatures, -11°C and -12°C. There was a close correlation between seedling mortality and the percent change in PMS from the first to the third measurement date (one and six days after planting). The PMS of seedlings which subsequently died tended to go up greatly during this five day interval, while the increase in PMS of surviving seedlings was much smaller. Of the 20 seedlings with the largest percent increases in PMS, 17 subsequently died. A similar relation between increased PMS and seedling mortality also appeared between the first and second measurement date, but was less dramatic.

These data suggest that a pressure chamber can be a very useful tool in identifying seedling injury caused by unintentional freezing during cold storage. This assessment procedure is simple, requiring only a pressure chamber and a small amount of greenhouse or growth room space, and can be completed within a week after the suspected injury occurs. For additional information contact Doug McCreary, Forest Research Lab, Oregon State University, Corvallis, OR 97331, telephone (503) 753-9166.

Doug McCreary
OSU, Forest Science

NURSERY COOPERATIVE FORMED TO IMPROVE SEEDLING QUALITY

The objective of the Nursery Technology Cooperative, officially formed on July 1, 1983, is to improve nursery productivity in the Northwest. Members include nurseries and seedling users. Present activities include (1) applied studies, (2) continuing education, and (3) technical assistance. The Nursery Technology Cooperative will be a clearinghouse of information for nursery and regeneration technology.

In our first study, we will be assessing the effects of top pruning on seedling growth and survival. Top pruning is a common nursery practice, about which little information is available. A few of the questions we will be addressing include:

1. Does pruning result in a more uniformly sized crop?
2. Are unclipped seedlings within a pruned bed "released?"
3. What is the effect of pruning on survival and growth in the field?

The Nursery Technology Center is now also coordinating the seedling vigor evaluation program conducted at Oregon State University. In addition to providing this service, we are initiating studies to improve current testing procedures. This year we will carry out a research project designed to evaluate the ability of the vigor evaluation method to predict seedling survival and growth under closely controlled field conditions. This study will also compare the vigor evaluation method with the approach of measuring root regeneration capacity. We are also conducting studies aimed at developing new techniques of assessing seedling quality (see "Using a Pressure Chamber to Detect Freezing Damage to Seedlings" in the Current Research section).

Anyone interested in our activities at the Nursery Technology Cooperative should contact Mary Duryea, Forest Research Lab, Oregon State University, Corvallis, OR 97331, telephone (503) 753-9166.

Mary Duryea
OSU, Forest Science

GLYPHOSATE IN PACIFIC NORTHWEST FOREST ECOSYSTEMS - FATE AFTER AERIAL APPLICATION

Glyphosate residues were evaluated in forest ecosystems which received maximum rates of application, 3.3 kg/ha, by aircraft. Deposits were recorded on foliage and on mylar targets at various depths within the forest canopy to determine where interception was occurring. Residues in foliage, ground litter, and soil were documented. Animals feeding on vegetation, animal matter and mixed diets were trapped and their body contents were analyzed for glyphosate and metabolites. A stream which received direct spray within the sprayed area was followed to determine rates of glyphosate degradation in water and sediments. Coho salmon fingerlings were held in the stream to determine their ability to collect glyphosate from contaminated water. Half-lives of glyphosate in foliage and litter ranged from less than 10 to 14 days at the various levels in the canopy. Persistence was twice as great in soil. Total stream contamination peaked at 0.27 mg/liter and decreased rapidly after application. Sediments reached higher concentrations than water and retained them longer. Mammalian exposure and retention varied with food preference. Carnivores and herbivores alike maintained visceral contents at or below observed levels in ground forage and litter. Body concentrations remained substantially below visceral concentrations, indicating a more rapid elimination than absorption of glyphosate from food supplies. Concentrations in bodies remained below those of food supplies, indicating that higher trophic feeders in food chains have progressively less glyphosate in food supplies with each trophic level. Aminomethyl phosphonic acid was found at low concentrations on foliage and other samples, and degraded rapidly. N-nitrosoglyphosate residues were at or below the detection limits.

Michael Newton, Oregon State University
Bruce R. Kelpsas, Forest Research Lab
Kerry M. Howard, Sealaska Corporation
Roy Danhaus, Monsanto Corporation
Sam Duberman, Monsanto Corporation
Marlene Lottman, Monsanto Corporation

GRASS CONTROL INCREASES SEEDLING SURVIVAL - SPECIAL ROOT COATING DOESN'T HELP

A comparative study with the Coos Bay BLM District, designed to test the effects of grass control and a special root coating on the survival of planted Douglas-fir seedlings revealed that vegetation management is more important. In the winter of 1982, bareroot 2-0 Douglas-fir seedlings were planted across three vegetation control treatments with and without receiving the special root coating. The test site, located in the Panther Creek drainage near Coos Bay, Oregon is a south-facing hillside (30-50 percent slope) at an elevation under 1,000 feet. Grass covered the entire area, poison oak was present in scattered clumps and the site held scattered incense cedar and Douglas-fir. The soil is a gravelly loam less than 20 inches deep.

The grass control treatments included a 36 by 36 inch area treated with glyphosate or paper mulch and untreated control areas. Combined with these treatments, seedling roots were treated or not treated with a Terra Sorb® slurry. Terra Sorb® is a hydrolysed starch material that is capable of absorbing many times its own weight in water. It was applied to seedling roots by dipping bundles of 50 to 100 seedlings in the recommended slurry before the seedlings were placed in planting bags.

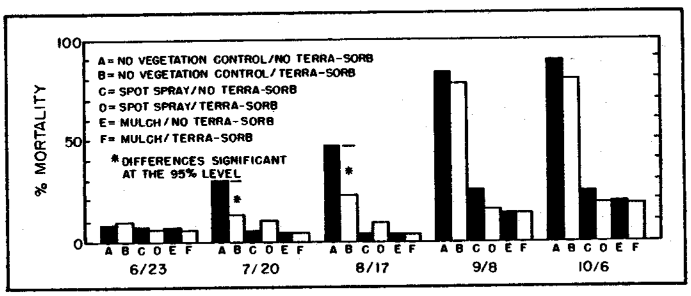

Figure 1. Seedling survival at five sampling dates.

Seedling survival was measured on five dates during the growing season (Figure 1). Terra Sorb® alone did not reduce mortality at the end of the growing season but did appear to have a beneficial effect earlier on July 20 and August 17. Mulching and spot spraying, however, kept seedling mortality at similarly low levels through the growing season regardless of whether the seedlings were treated with Terra Sorb®. Compared to a single treatment with glyphosate, the paper mulch required maintenance at three week intervals to replace paper displaced by elk. About 70 percent of all seedlings with paper mulch required extra tending.

The results mirror those from a study of grass control in the Roseburg area that has been reported in previous issues of the FIR REPORT (3(2), 4(3)). Control of grass competition pays large dividends in seedling survival, and among control methods, herbicides are hugely more cost effective than mulching.

The Terra sorb® material was tested on another site (Monument Peak) on Boise-Cascade land near Detroit Lake. Douglas-fir and noble fir seedlings that had been stored for three months were planted during warm dry weather in late June 1982 on a 35 to 45 percent slope which faces south to southwest at an elevation of 4,300 feet. Huckleberries, grass and, to a lesser degree, beargrass were the main competitors on the recently clearcut site. No vegetation control was applied. The seedlings were again treated with Terra Sorb® before being placed in the planting bags. At this location, the seedlings treated with Terra Sorb® did not perform as well as the untreated controls (Table 1).

Table 1. First year survival at Monument Peak site (percent).

Species	Untreated controls	Treated with Terra Sorb®	Significance level between seedling treatments
Douglas-fir	70	60	p .1
Noble fir	67	52	p .01

The results from these two study sites indicate that while Terra Sorb® may provide a temporary advantage earlier in the growing season, it is not a substitute for grass control. Furthermore, it does not appear to increase seedling survival at the end of the first growing season, appearing instead to increase seedling mortality.

Dave DeYoe
OSU, Forestry Extension

METHOD OF FIRST YEAR SHADING AFFECTS SECOND YEAR SURVIVAL

Although shadecards are commonly used on Douglas-fir seedlings planted on south facing sites, a new product, Reemay Sleeves®, cylinders of spun polyester which provide effective protection against deer browsing, also seemed to have potential for providing protection to seedlings from lethal heat loads. To test this idea, 2-0 bareroot Douglas-fir seedlings were given shadecards, Reemay Sleeves®, or left as unshaded controls in a randomized complete block study located near Butte Falls, on the Rogue River National Forest. The study site, a brushfield which had been mowed by a Trac-Mac, faces southwest with a slope averaging between 15 and 20 percent and is at an elevation of 4,200 feet. The shadecards were the variety that has the wooden stake woven through slits in the card and the Reemay Sleeves® were long enough to entirely cover the seedlings.

Seedling survival was measured in early August and September 1981 (before and after a prolonged three week long heat wave) and in August 1982. Seedling survival before the heat wave differed little between treatments, averaging 98, 100 and 92 percent for controls, shadecards and Reemay Sleeves®, respectively (Figure 1). After the hotspell, however, survival of seedlings enclosed by Reemay Sleeves® had dropped subtantially--to 62 percent--whereas survival of the controls and seedlings with shadecards was still high (92 and 97 percent, respectively).

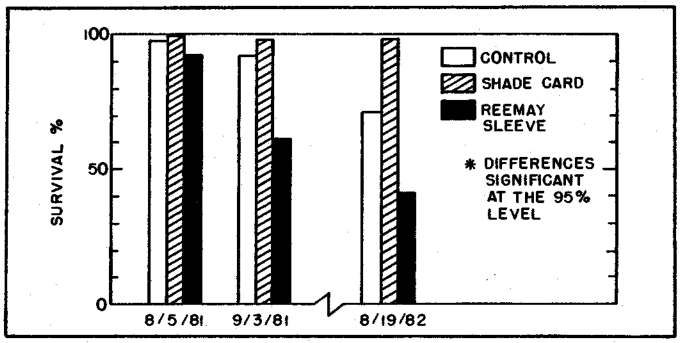

Figure 1. Survival differences by shade treatment.

Seedling survival at the end of the second year tells a more complete story. During the previous winter, snow loading had collapsed the shadecards around the wooden stakes. Nonetheless, survival of the seedlings with the shadecards remained high through the second growing season, but survival of the controls and seedlings in the Reemay Sleeves® continued to drop. Because the shadecards provided less shade in the second growing season, it is plausible that the continued high survival of seedlings with shadecards was in part related to an effect carried over from the first year.

Although survival of the controls and seedlings receiving shadecards was very similar at the end of the first growing season, the shadecards may have reduced the physiological stress on the seedlings during the first year allowing them to maintain their higher survival during the second year compared to the decrease in survival for the controls or the seedlings in the sleeves.

The drop in survival during the heat wave that was observed for the seedlings in the sleeves indicated that this effective method of browse protection should be avoided on sites receiving radiation loads similar to the ones in this study. The continued high survival of seedlings protected by shadecards indicated that survival of Douglas-fir should be enhanced into the second year on sites receiving similar radiation loads.

Dave DeYoe
OSU, Forestry Extension

Adaptive FIR

SEEDLING SURVIVAL AND BRUSH COMPETITION

The brushfield ecology project located on Negro Ben near Ruch is undergoing a shift in emphasis this spring. The new phase of the study will address the effects of four levels of competition from resprouting brush on the survival and growth of planted Douglas-fir seedlings (1-0 plugs).

In May 1982, the two units which had total brush removal in 1980 (FIR REPORT 3(3):2-3) were split with half of each unit sprayed with Garlon 4E in oil to kill all the resprouting greenleaf manzanita and canyon live oak. At the time of spraying, many resprout clumps were 2-3 feet tall and will provide some dead shade for planted seedlings this summer. The brush in the other subunits continues to grow and will represent fourth year resprouts this coming summer.

In February 1983, four additional subunits were handslashed with complete brush removal. Brush-stumps on subunits will be allowed to resprout to provide first year resprout competition for the planted seedlings. In the other two subunits, the seedlings will be covered and the resprouting brush sprayed in late spring before soil moisture is drawn down. Seedlings will be planted in late February or early March 1983.

A summary of the treatments follows:

1. Brush removed, first year resprouts killed in late spring (maximum soil moisture, no shade).
2. Two-year-old resprouts killed (maximum soil moisture, some dead shade).
3. First-year resprouts (reduced soil moisture, some live shade by late summer).
4. Fourth-year resprouts (minimum soil moisture available to seedlings, live shade immediately).

As stated in the previous FIR REPORT article, the test site is a 66 percent west-facing slope at 3,600 feet elevation. The soil is a skeletal Xerochrept with a surface mantle of ravel. The results of this study should help determine the need for vigorous vegetation management on tough-to-regenerate sites such as this.

S. T.

SKIDDING ATTACHED TOPS TO REDUCE FUEL LOADING

Designated skid trails are being used more frequently to minimize soil compaction during logging; however, foresters often find themselves in a dilemma over how to treat residual fuels when broadcast burning is not feasible. One alternative is to leave tree tops attached to the uppermost merchantable log, which is then skidded to a central landing for bucking and top disposal. This practice results in some long logs being turned into skid trails, which may cause extra damage to residual crop trees in a commercial thinning. Tops are often broken off during this turning process, so a fundamental question is how successful is this practice in reducing fuel loadings.

As previously noted in the FIR REPORT (3(3):2, 4(2):8-9) a study has been undertaken on the Rogue River National Forest near Union Creek to address this issue from the perspective of logging production, residual stand damage, and fuel loading. The study was conducted in a commercial thinning (mean d.b.h. of cut trees = 13 ± s.d. 8 inches) that used designated skid trails spaced at average intervals of 140 feet. Tops were left attached to trees and skidded to the landing from every other area between skid trails.

Results from the logging production phase of the study indicated that skidding attached unmerchantable tree tops to the landing did not reduce logging productivity and that pulling winch line out to logs from a designated skid trail resulted in the same skidding time per turn as driving directly to the logs for chokering.

Residual stand damage was measured after most "rub trees" near the skid trails had been removed. No significant difference ($p = .05$) was found between the percent of leave trees damaged in the area from which tops were skidded (18.6 ± s.d. 17.6%) and the area in which tops were left in the woods (11.9 ± s.d. 8.6%). Nor did the average size of bole scars differ between the two areas. Average scar size when tops were left in the woods was 1.57 ± s.d. 1.9 square feet versus 1.45 ± s.d. 1.6 square feet when tops were skidded to the landing.

A great deal of variation was observed in post-logging fuel loads, but preliminary analyses indicate no significant difference ($p = .05$) between total fuel loadings in the area from which tops were removed (85.2 ± 69.9 tons/acre) and the area in which tops were left in the woods (64.9 ± 30.9 tons/acre). Prelogging fuel loadings had been virtually identical between the two areas at about 43 tons/acre. These results held for the 0-9 inch diameter fuel class; no significant difference was observed between the two treatments.

In assessing the importance of tops in fuel loads, it is important to note that many tree tops were broken when logs were turned into the skid roads and that the logger was not required to choker broken tops separately. In the logging production study, twice as many tops were removed from the top-yarded area, a significant difference. It appears, however, that the larger limbs which were removed from lower logs and left in the woods in both areas constitute a large enough portion of the post-logging fuels to outweigh the difference in numbers of tops removed.

As practiced in this timber sale, where only tops attached to logs are required to be skidded, logging production was not reduced and residual stand damage was not increased, but the practice was ineffective in reducing post-logging fuel loadings below a level obtained by bucking and leaving tops in the woods.

S. T.

SHADECARDS MAY DECREASE DEER BROWSING

As reported in the last issue of the FIR REPORT (4(4):4), a study examining artificial shading of Douglas-fir seedlings is underway. During the first growing season some interesting browsing patterns were observed that may be related to shade protection (Table 1).

Table 1. Percent seedlings with browsing damage at Julie Creek study site (3 replications averaged.

Control	Cups	Shadecard placement East	Shadecard placement South
33	31	9	12
a	a	b	b

Treatment means with different letters differ at p = .05.

The site, Julie Creek, is a south-facing 20 acre clearcut at about 3,100 feet. Douglas-fir seedlings were operationally planted in May, due to a late snowpack. The trees were not protected against deer browsing. After planting, FIR personnel installed the four shade treatments in a randomized block design with three replications. The treatments are south-facing shadecards, east-facing shadecards, styrofoam cups inverted around the base of the seedlings, and unshaded seedlings (control). Treatments were installed without regard to potential browsing activity.

Observed patterns in deer browsing between treatments were measured and tested by ANOVA which indicated that a significant difference (p = .05) existed between treatments. A Multiple Comparison Test indicated that browsing was significantly less (p = .05) on the shadecard treatments compared to the cups and controls. Nearly one-third of the seedlings in the control or styrofoam cup treatments were browsed, whereas only slightly more than 10 percent of the seedlings with shadecards received browsing. The placement of the shadecards may be a key factor; all were placed within six inches of the seedlings with the top of the shadecard angled towards the seedling leader, often touching it.

Thus, a possibility exists that visual or mechanical obstruction by the shadecards reduced deer browsing. Because of the availability of other seedlings without shadecards or other protection from browsing, it is unknown whether placing shadecards by all seedlings would have also reduced deer browsing by the same amount.

The results of this study indicate, however, that in addition to offering seedlings protection from heat, shadecards installed close to Douglas-fir seedlings have a potential to significantly reduce browse damage in the first growing season after planting.

Jim Bunker
FIR Research Assistant

EFFECTIVENESS OF DRY-SEASON PRECIPITATION IN PARTIALLY RECHARGING THE SOIL PROFILE

Data from the new dry-season precipitation map (precipitation occurring between May and September 30) are being used by several FIR research projects to characterize the climate of southwest Oregon. For example, this information is being used with the soil moisture storage to help characterize the amount of water potentially available to newly planted seedlings in the Adaptive FIR study of reforestation potential of withdrawn BLM lands.

An uncertainty which remains, however, is how effective dry season precipitation is at recharging the soil profile. To address this question, I have collected additional data to determine the number of storms that have the potential to do this.

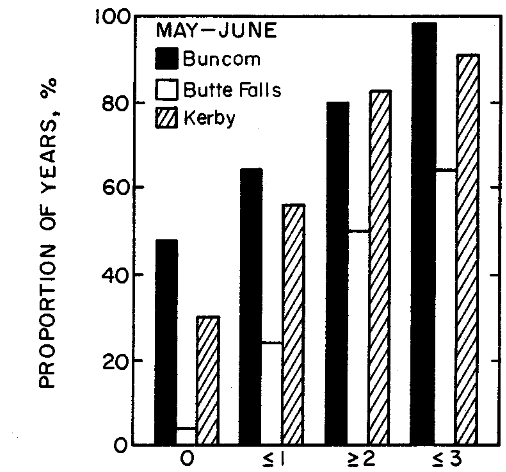

Figure 1. Cumulative number of storm events ≥ 0.5 inch/48 hours.

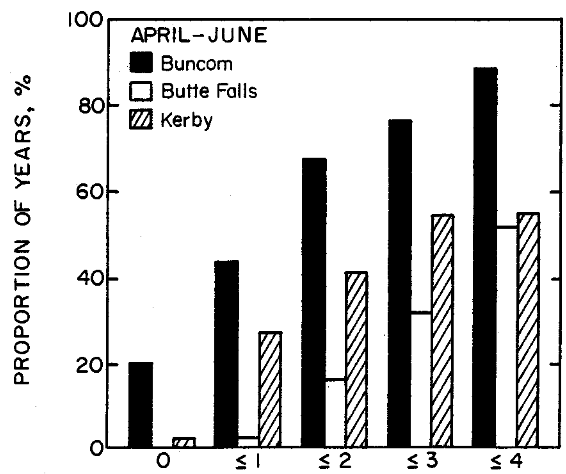

Figure 2. Cumulative number of storm events ≥ 0.5 inch/48 hours.

A storm with this potential was defined as producing at least 0.5 inches of precipitation in 48 hours. During the spring and early summer this amount of precipitation should rewet the seedling root zone in most skeletal soils. Forty-eight hours was used as a base time to include slow moving storm fronts with low daily totals. Daily precipitation data were analyzed over the past 25 years (1957-1981) from ten stations: Brookings, Buncom (Little Applegate Valley), Butte Falls, Crater Lake, Drain, Glendale, Kerby, Medford, Sexton Summit, and Steamboat Ranger Station.

July and August are the driest months and are also least likely to receive a ≥ 0.5 inch storm. At five locations, two or fewer of these storms occurred in July over the past 25 years. The Cascades and Coast are more apt to receive ≥ 0.5 inch storms but still have not received this amount of precipitation in either of these months for half of the years on record. At several locations, the distribution of 0.5 inch storms in September is similar to August.

The chance of ≥ 0.5 inch storms occurring earlier during May and June at lower elevations in the interior Rogue Basin is much lower than at other locations. Buncom, which receives on the average less than four inches of dry season precipitation, has not received a ≥ 0.5 inch storm during May-June in 12 of the past 25 years (Figure 1). The chance for Buncom and Kerby receiving more than three of these storms in May-June is also very low. The probability for a location to receive more than four storms improves, however, for areas where dry-season precipitation exceeds about six inches.

The chance of at least one ≥ 0.5 storm occurring in a given year improves if storms in April are included (Figure 2). The Buncom site is still drier than other locations, however, going without a storm during April-June during one year out of five and receiving only one storm during one year in four.

The probability of less than one or less than two ≥ 0.5 inch storms occurring in either May-June or April-June is significantly related to the average amount of dry-season precipitation (DSP) a site receives. The following equations can be used to predict the percent of time that lower number of storms will occur.

Months	Number of storms	Equation	R^2
May-June	≤ 1	% time = 97.6 - 10.1 DSP	0.75
May-June	≤ 2	% time = 119.6 - 10.6 DSP	0.77
April-June	≤ 1	% time = 70.5 - 8.6 DSP	0.72
April-June	≤ 2	% time = 92.7 - 10.6 DSP	0.75

The equations are valid for dry-season precipitation amounts between three and ten inches.

The relevance of this information to reforestation success in southwest Oregon is not well documented, but first year seedling survival can be quite good when a site receives only one ≥ 0.5 inch storm during May and June. One similar storm in late June occurred during the first year after planting on the machine site preparation study site (FIR REPORT 4(4):2-3). First year survival of ponderosa pine at China Gulch in the Applegate Valley was between 98 and 100 percent (FIR REPORT 4(3):3-4), although the site received only one storm in April-June, with the second major storm event not occurring until October.

Having at least one dry-season storm event may help seedling survival. To minimize the risk of reforestation failure if ≥ 0.5 inch storms do not occur in May and June, seedlings should be planted as early in the year as possible in low dry-season precipitation areas. This increases the likelihood of having a ≥ 0.5 inch storm event occurring after planting. Vegetation management in these areas is also extremely important to insure that water from the few storm events that do occur will be available to seedlings and not be lost to weeds.

D. M.

Fundamental FIR

WATER USE BY WHITELEAF MANZANITA AND GROWTH OF CONIFER SEEDLINGS

Foresters in southwest Oregon involved in stand establishment and young stand management are interested in knowing to what degree brush competition affects the mortality rates and growth of young conifer stands. A Fundamental FIR project, FS 112, is currently underway to better define these relationships.

One study within the project will examine the effects of water use by whiteleaf manzanita on the survival and growth of planted Douglas-fir and ponderosa pine seedlings across five densities of manzanita seedlings ranging from a two by two to an eight by eight foot spacing, with plots free of manzanita to serve as controls.

The study is designed to run for at least two years. During this time information will be collected on soil moisture depletion, transpiration by manzanita, and plant moisture stress of manzanita and conifer seedlings. Seedling heights and basal diameters will also be measured at the end of each growing season.

This information will prove useful in testing the null hypotheses that manzanita has no effect on water availability, survival and growth of conifer seedlings, and will also help to better define functional relationships between density of manzanita and conifer growth.

Diane White
Forest Science, OSU

KIND AND INTENSITY OF EVERGREEN SHRUB COMPETITION IN SOUTHWESTERN OREGON CONIFER FORESTS

It has been demonstrated that growth of crop trees can be increased by controlling vegetation that competes with trees for such site resources as light and moisture. Little is known quantitatively, however, about how specific levels of vegetation control affect young conifer productivity. The objective of this study is to better define how evergreen shrub species common to southwest Oregon influence the survival and growth of Douglas-fir seedlings.

Seven levels of vegetation control have been installed around individual Douglas-fir seedlings planted in 15 replications in one two-year old clearcut and across 10 replicates in another within the Illinois Valley Ranger District, Siskiyou National Forest. The treatments are: (1) no vegetation removal (control); (2) one-half of the vegetation removed within a 4-foot radius around the seedlings; (3) one-half of the vegetation removed within a 9-foot radius; (4) one-half of the vegetation removed within a 12-foot radius; (5) all vegetation removed within a 4-foot radius; (6) all vegetation removed within a 8-foot radius; and (7) all vegetation removed within a 12-foot radius. The Douglas-fir seedlings wer 2-0 bare-roots planted the year before the treatments were installed. Major competitors present are tanoak, madrone, manzanita, poison oak, snowbrush, and deerbrush. Periodic measurements are being made on height and diameter of conifer seedlings, shrub resprouting and growth, soil moisture levels, and soil temperatures.

Averaged over the first two growing seasons since the treatments were applied, seedling growth increased as the amount of surrounding vegetation decreased. For instance, where one-half of the vegetation was removed within a 12-foot radius (1/2 x 12), seedling heights were 1.1 times greater than control seedlings and were 1.5 times taller where all the vegetation was removed within a 12-foot radius (T x 12).

Diameter growth trends were similar: Seedling diameters in the 1/2 by 12 plots were 1.6 times larger than the controls, and in the T x 12 plots seedling diameters were 2.8 times larger than control seedlings.

The largest growth differences occurred, however, during the second growing season. In comparison to the two year average, seedlings in the T x 12 plots grew 2.2 times more in height, and 7.0 times more in diameter, than did the control seedlings.

Conifer growth data will be collected for at least three more growing seasons on all plots, then compared with soil moisture levels and shrub characteristics such as height growth and number of resprouts.

Annabelle Jaramillo, Botanist
PNW Forestry Sciences Lab, Corvallis

SEED PRODUCTION FROM SHELTERWOOD STANDS IN THE CASCADES

A study initiated by Dick Williamson in 1971 measured the production of sound seed in shelterwood and adjoining uncut stands located in the Oregon and Washington Cascades over different four and five year periods. Four study sites were located in the Tiller Ranger District, Umpqua National Forest. The shelterwood stands were logged by tractors and received site preparation after harvest either by broadcast burning or by burning slash piled by tractor.

In the first year after the seed cuts, all five shelterwood stands produced from two-thirds to as much sound seed as did the adjoining uncut stands, even though the shelterwood overstories had no more than half the number of dominant trees. By the second year and beyond, total seed fall under the shelterwoods was nearly equal to or slightly greater than under the uncut stands. Average total seed production for five years tended to be greater for the shelterwood stands (411,000 seeds/ac/5 yrs) than for the controls (330,000 seeds/ac/5 yrs), although huge variation existed within and between locations and between years.

Regeneration surveys and seed fall data on two shelterwoods within the south Umpqua drainage were used to estimate a seedling-to-seed ratio of about 1:1000. For similar units on gentle topography which receive similar site preparation, natural seeding has the potential to adequately restock a stand. For this potential to be realized, however, competing weeds and animal damage must be controlled, and care must be exercised during overstory removal to avoid damage to seedlings which could reduce stocking below acceptable levels. For more information contact: Dick Williamson, PNW, 3625 93rd Avenue S.W., Olympia, WA 98502, telephone (206) 953-9470.

Dick Williamson, USFS

Continuing Education

YOUNG STAND MANAGEMENT IN SOUTHWEST OREGON

June 14-16, 1983. Adaptive FIR, Holiday Inn, Medford. The presentation of information will use a symposium format on the first day; a field trip to view an array of young stand management opportunities, including some research results will be held on the second day; and a guided design exercise using growth simulators and economic analysis will follow on the third day. Participants may register for the first day only, or for all three days. The first day is intended for a general audience; days two and three will be more challenging and are intended for professional foresters involved in writing prescriptions and planning. Announcements for registration will be mailed by May 1, 1983. CONTACT: Elaine Morse, Adaptive FIR.

NORTHWEST FOREST SOILS COUNCIL SUMMER MEETING

July 17-19, 1983. Longview, WA. Summer field trip will be in the Mt. St. Helens area. Hosts are Weyerhaeuser Company and Gifford Pinchot National Forest. Erosion, revegetation and regeneration on several sizes and depths of ash will be observed by traversing the blast zone from west to east. CONTACTS: Steve Webster, Weyerhaeuser (206) 924-6325 or Steve Hawse, Forest Service, R-6 (503) 221-6858.

TRACKING NUTRIENTS AND PRODUCTIVITY WITH FORCYTE

July 11-12, 1983. Oregon State University, Corvallis. Acquaint forest researchers and managers with the FORCYTE simulation model. The model is designed to simulate nutrient changes in forest ecosystems associated with different harvesting strategies and management practices. Half the time will be spent in lecture and half the time spent evaluating computer simulations. Limited to 35. CONTACT: Conference Assistant (503) 754-2004.

SAF CONTINUING FORESTRY EDUCATION

Foresters and allied professionals have a unique opportunity to gain professional recognition for participation in continuing education and professional development. Because of advancing technology, increasing public concern and ever changing regulations, resource professionals must continually acquire knowledge to remain effective. The Society of American Foresters' CFE program provides a framework by which SAF members and non-members alike can be recognized for their initiative in professional development.

A CFE Certificate is awarded for completing 150 contact hours of continuing forestry education and professional development during a three year period across six categories of participation. The categories include taking organized course work in forestry or complementary fields, presenting information, and giving service to resource organizations. The key to being awarded hours is that the CFE activities must lie outside the general realm of the individual's job activities.

The CFE program is important. It is also based on the initiative and integrity of its participants to keep track of their own CFE hours. Individuals who wish to participate should contact their local SAF Chapter Scholarship Chairman; or Denny Lavender, Forest Research Lab, OSU, Corvallis 97331; or John Christie, Clatsop Community College, Astoria, OR 97103. SAF members in the Siskiyou Chapter should contact Ole Helgerson, Adaptive FIR.

Of Interest

PROTECTING SEEDLINGS FROM DEER BROWSE - BIOLOGICAL AND COST EFFECTIVENESS

Foresters have used numerous techniques to prevent deer browse damage to planted seedlings of Douglas-fir. Most common are plastic mesh or paper barriers that protect the entire seedling or just its leader. Information collected by Greg Chandler and Doug Henry of the Medford District, BLM, indicates that although Vexar® tubes, netting, and paper budcaps are equally effective in preventing deer browsing, their cost of installation and maintenance vary widely (Table 1). In this study, installed on seedlings planted in 1981, each seedling protection technique was laid out on a transect that contained 50 seedlings. The site was located on a 50-55 percent slope and received about three feet of snow during the following winter. The Vexar® tubes were 34 inches long, the black netting was rolled-over just above the top of the seedlings, and the budcaps were made of 5 1/2 by 8 1/2 inch pieces of Rite-in-the-rain paper firmly stapled around the seedling.

Additional costs come from maintenance. In this study, 30 to 40 percent of the Vexar® tubes required straightening or replacement of lath stakes after being deformed by moving snowpack, and many steel twist ties had rusted and broken after one year. Vexar® tubes also must often be removed from seedlings to avoid girdling. With the netting, one-sixth of seedlings had grown out of the netting, and the netting had fallen off another one-sixth. In addition to replacing netting on these trees, another 21 percent will require maintenance to free leaders from the netting.

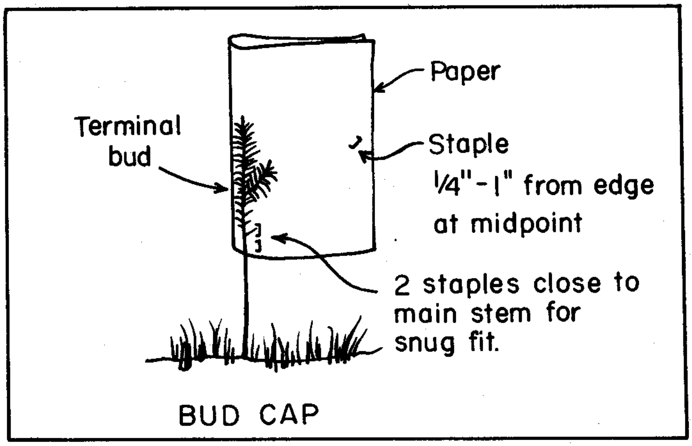

Figure 1. Attachment diagram for paper budcap.

Table 1. Performance of anti-deer browse treatments after one growing season.

Treatment	Seedling mortality (%)	Browsed leaders (%)	Deformed seedlings (%)	Installation cost per tree[1] (1982 $)	Estimated relative maintenance cost[2]
Vexar tubing 34"	0	0	3	0.236	1-3x
Black netting	5	0	95 laterals 21 terminals	0.045	1-2x
Paper budcaps	5	0	0	0.060	1x
Control	0	50	---	---	---

[1]Cost of materials plus labor.

[2]Expressed as multiples of budcap application cost.

As for the budcaps, all remained attached to the seedlings, but the seedlings grew out of them after one season. Thus to be effective, the caps will require annual renewal until the seedlings grow beyond the range of deer browse.

So which treatment appears to be the most cost effective? The Vexar® tubes caused no mortality but had an installation cost four to five times that of the netting or budcaps and will require annual maintenance in areas susceptible to creeping snowpack.

Given a strong likelihood of no differences in first year survival between treatments, an intuitive assessment indicates that budcaps could be annually applied four and perhaps five times and cost less than tubes (installation plus maintenance costs) if rotation ages remain unchanged. Although netting appears to have the lowest initial cost, it also requires extra maintenance to replace netting and to untangle seedlings. Thus, budcaps appear to be the best alternative when they are applied firmly to the seedling to avoid being blown off.

O. H.

EVEN RESEARCHERS HAVE 20/20 HINDSIGHT

Recently I examined survival results from all Adaptive FIR research sites that have been planted with conifer seedlings. It soon became very apparent that on those sites where survival fell below 70 percent, competition from other vegetation was the major cause of mortality (Table 1). The only exception was on site 16 where a fungal infection built-up inside the budcaps during late spring while the seedlings were under a heavy snowpack. However, on those sites where adequate site preparation had been achieved or where re-emerging vegetation had been eliminated by supplementary treatments following planting, survival consistently remained above 80 percent.

Even though these 16 sites are considered "hard-to-regenerate," we probably could have obtained 80 percent survival or better on all of them had we been more aggressive in controlling competing vegetation.

This review reinforces our knowledge that the elimination of competing vegetation is a prerequisite to successful artificial regeneration in southwest Oregon. Unfortunately, we occasionally fail to make use of this information. We should not, however, lose sight of the fact that in those environments where soil moisture is the primary limiting factor, newly planted seedlings do

Table 1. Precent survival on 16 Adaptive FIR research plots located throughout southwest Oregon.

Study site	Years of observation	Highest survival (%)	Cause of mortality
1	3	86	
2	2	99	
3	2	98	
4	2	94	
5	2	87	
6	2	67	Grass competition
7	2	58	Brush competition
8	2	53	Brush and forb competition
9	2	48	Grass competition
10	2	47	Brush competition
11	1	100	
12	1	99	
13	1	95	
14	1	95	
15	1	84	
16	1	50	Fungal infection

not have a competitive advantage and must be relatively free of associated vegetation until their root systems have become adequately developed. How long this will take, of course, depends upon individual site conditions, but in southwest Oregon the first two years are certainly critical.

S. H.

SKYLINE DEFLECTION: HOW MUCH IS ENOUGH?

It is a well established principle that adequate deflection is necessary for skyline cable systems. Depending on ground configurations, less than about 5-6 percent deflection can often cause log loads and carriages to drag on the ground, lower payload capabilities and decrease production efficiency. Virtually everyone that works with this type of harvesting system understands that as deflection increases so does the payload carrying capacity of a given diameter wire rope. "Good deflection" has come to be accepted as synonymous with a successful skyline cutting unit.

It may seem sacrilegious, therefore, to suggest that there could be such a thing as too much deflection, but observations by logging engineers and silviculturists over a period of years have led to this conclusion. This situation can occur in prescriptions for partial cutting when reducing logging damage to the residual stand is of primary importance. Minimizing the width of skyline corridors can help to keep the residual timber stand in good condition. Controlling skyline deflection can help achieve this objective.

Deflection, of course, is the sag in the skyline. It is formally defined as the vertical distance between the chord and the skyline. It is usually measured at midspan and expressed as a percentage of the span length (Figure 1).

If we slice through this diagram vertically at midspan and view it from the perspective of looking straight down the chord from the headspar support point, we see a projection of the vertical deflection distance as shown in Figure 2.

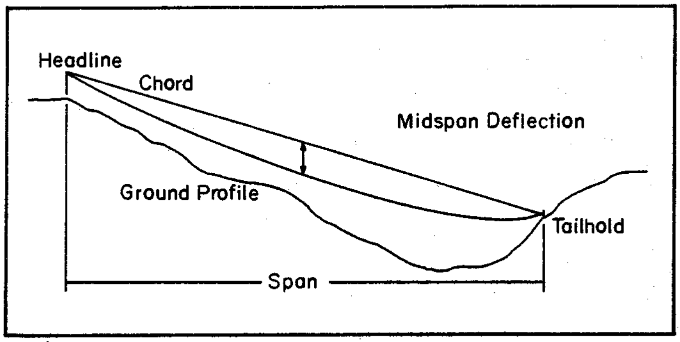

Figure 1. Skyline profile.

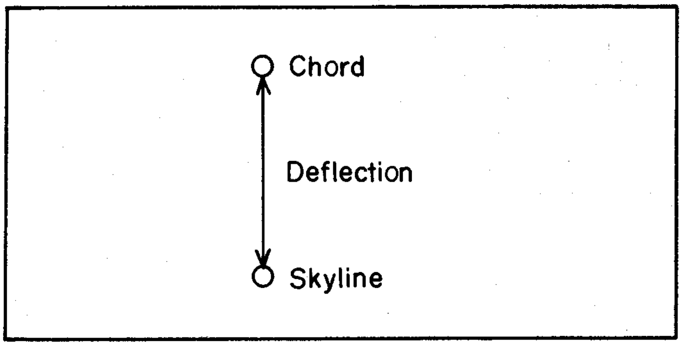

Figure 2. Cross section of skyline profile.

In the lateral yarding phase of log movement, as tension is developed in the drop line and the skyline, the vertical deflection is translated to lateral skyline deflection. An overhead or plan view of this situation is shown in Figure 3.

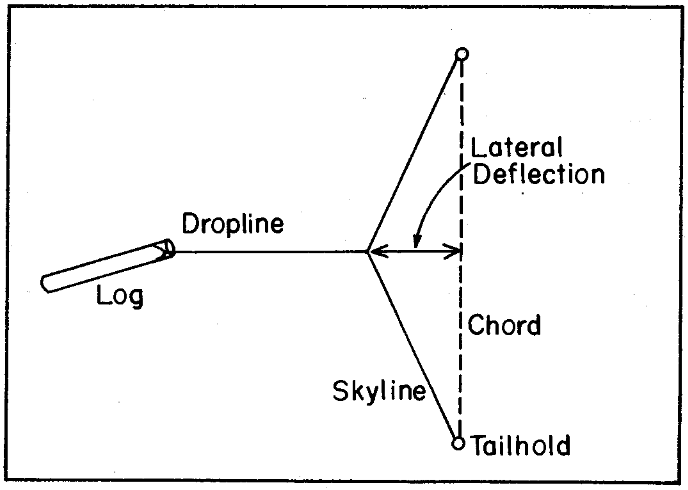

Figure 3. Plan view of the skyline profile during lateral yarding.

While it does not necessarily have to be so, the amount of lateral deflection in many operations is approximately the same or greater than the vertical deflection that existed prior to lateral yarding. Just as with a skyline's ability to support vertical loads, the capacity for lateral loads increases as lateral deflection increases. During lateral inhaul, a yarder engineer will often allow the skyline to deflect toward the load until the log being yarded begins to move toward the corridor. Because log movement is made easier by increasing lateral deflection, the natural tendency is for the yarder engineer to let the skyline deflect to the side; initially by the vertical deflection distance available and, if this does not prove to be adequate to break the log loose from its bed, by then increasing the skyline length and lateral deflection. If we use the cross sectional view of a skyline profile developed in Figure 2 to help understand what is occurring here, we see that the skyline is rotating on an axis represented by the chord (Figure 4).

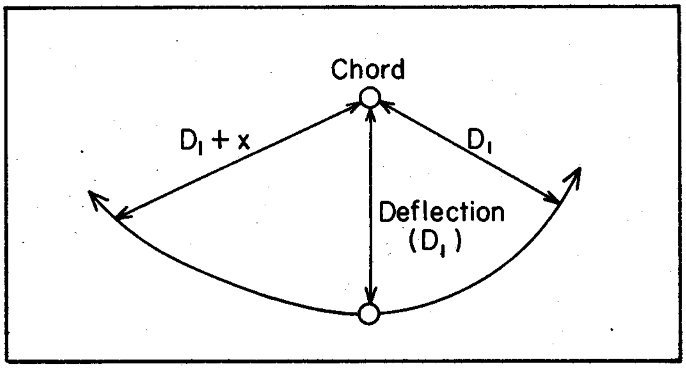

Figure 4. Cross section of skyline profile during lateral yarding.

The greater the vertical deflection available in any given yarding situation, the greater the lateral deflection that can be expected. As lateral deflection increases, the width of the skyline corridor and the likelihood of damage to more residual trees also increases. Depending on tree size in the residual stand, damage can range from bark removal and top damage on large trees to complete destruction of smaller trees. Skyline corridors with fairly narrow end areas but extremely wide central bulges are often the result of a lack of control over lateral excursion.

As was previously indicated, this does not have to occur. Lateral movement of the skyline can be controlled by the rigging slinger and the yarder engineer. Some lateral skyline movement is absolutely necessary if lateral yarding is to be efficient and safe. There is, however, no real need to increase the lateral excursion of the skyline until after the safe working load of that line has been approached. The same principle holds true for vertical deflection and moving logs up (or down) the skyline corridor during inhaul. Enough deflection is needed to carry the maximum expected payload at the safe working load of the line and to keep strain on the lines and equipment at an acceptable level. Additional deflection to decrease skyline tension or increase payload size above what can realistically be hooked on a turn is superfluous and, as has been described in this report, encourages greater lateral deflection, wider skyline corridors, and increased stand damage.

J. M.

WATERBARS: CAN WE MAKE THEM MORE EFFECTIVE?

Blakemore Thomas, Watershed Management Department, Humboldt State University, recently completed a thesis entitled An Evaluation of Waterbar Effectiveness in the Coast Ranges of Northern California, which documented characteristics of failed waterbars. Four types of failure were observed:

Type 1: Waterbar broken by raindrop impact or overland flow; water moves freely down the trial.

Type 2: Water not sufficiently slowed or dispended at the waterbar outlet, resulting in a gully.

Type 3: Waterbar broken by animal traffic.

Type 4: Waterbar broken by vehicular traffic.

The last two failure types were not significantly associated with frequency of failure or amounts of rill or gully erosion. Methods of construction affected the Type 1 and Type 2 failures. Forty-seven percent of the waterbars built with an angle $< 30°$ (measured from the perpendicular of the skid trail centerline) had a Type 1 failure, while only 6 percent of the waterbars built with an angle $\geq 30°$ failed. Waterbars built with no outlet for runoff had a 66 percent Type 1 failure rate, but those possessing a clean outlet had only a 7 percent failure rate. Sixty percent of waterbars built in through cut skid trail sections also had Type 1 failures.

Distance between waterbars, topographic position, and terrain slope strongly influenced Type 2 failures. Skid trails built within 100 feet of a stream channel had higher incidents of Type 2 failure. Mean erosion per waterbar for Type 2 failures was 2.6 cubic yards and for Type 1 failures was 0.9 cubic yards. Both types of failure and related erosion increased significantly on slopes greater than 50 percent.

Thomas recommends that Type 1 failures can be kept to a very low percentage if waterbars are constructed with angles between 30° to 60°, clear outlets, and heights of at least 12 inches. Type 2 failures can be reduced by better spacing and location of waterbars. Because most Type 1 and 2 failures occurred during the first winter and did not significantly increase over the next ten years, he concludes that land managers can get a good estimate of waterbar effectiveness and maintenance needs after the first year. Thomas' thesis is available from the Humboldt State University Library, Arcata, CA 95521.

Carl Yee
Humboldt State University

Recent Publications

For copies of these publications, mail your requests to the indicated address:

(1) FIR
1301 Maple Grove Drive
Medford, OR 97501

(2) Oregon State University Bookstore
Oregon State University
Corvallis, OR 97331

AVERAGE DRY-SEASON PRECIPITATION IN SOUTHWEST OREGON, MAY THROUGH SEPTEMBER, by D. H. McNabb, H. A. Froehlich, and F. Gaweda. 1982. Extension Service EM 8226, Oregon State University, Corvallis, OR 97331. 7 p. + 1 map. Data collected from 79 precipitation stations (National Weather Service, Oregon Water Resources Department, USDA Forest Service, and USDI (Geological Survey)) were used to construct these two new precipitation maps for a five county southwest Oregon area. The data indicate that average annual precipitation is higher than previously reported, particularly in the western Siskiyou Mountains. Precipitation is strongly influenced by elevation over much of the region, with the region subdivided into smaller zones to account for rainshadows and similar local effects of mountainous terrain. Dry season precipitation during the months of May to September averages about one seventh of average annual precipitation across the sampling areas, and is lowest in the interior valleys. Of these, the Rogue Valley receives approximately two thirds the precipitation during the dry season as does the Umpqua Valley. The variation in dry-season precipitation, coupled with the constancy of potential evapotranspiration, makes this map useful for predicting the region's dry season climate. Each map costs $1.25 plus 25¢ for postage and handling.

(1)

OREGON WEED CONTROL HANDBOOK, compiled by R. D. William. 1983. Extension Service, Oregon State University, Corvallis, OR. 148 p. This version is little changed from the 1982 edition. It remains a very useful compendium of the properties and uses of herbicides and other agrichemicals. Changes of interest to foresters include updated information on triclopyr and application times. Also of interest are tables illustrating herbicide effectiveness on numerous non-woody weeds found in eastern and western Oregon. $15.

(2)

HANDBOOK OF WEED AND INSECT CONTROL CHEMICALS FOR FOREST RESOURCE MANAGERS, by M. Newton and F. B. Knight. 1981. Timber Press, Beaverton, OR. 213 p. This pocket sized handbook provides a comprehensive guide to controlling forest weeds and insects with chemicals in forest ecosystems across the United States. The chapter on forest vegetation management includes basics of weed ecology, chemical properties, biological properties, and formulations of herbicides, application methodology and prescriptions. Among the information in the chapter on forest insect management, insects are classified by the type of damage they produce, specific problem situations are identified, and the chemical properties and the application of various insecticides are discussed. Chapters are also devoted to application technology and risks and care in handling pesticides. The appendix contains information by chemical class on the management of chemical poisoning. This publication should be of considerable use to anyone interested in pest management in forest ecosystems.

(2)

AVERAGE ANNUAL PRECIPITATION, 1960-1980, IN SOUTHWEST OREGON, by D. H. McNabb, H. A. Froehlich, and F. Gaweda. 1982. Extension Service EM 8220 Oregon State University, Corvallis, OR 97331. 8 p. + 1 map.

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