SERVING SOUTHWEST OREGON THROUGH ADAPTIVE RESEARCH AND EDUCATION

fir report

forestry intensified research

DECEMBER 1979 VOL.1 NO.4

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

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

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

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

For the FIR Staff

Stephen D. Hobbs
Reforestation Specialist

inside...

Agriculture, Home Economics, 4-H Youth, Forestry, Community Development, and Marine Advisory Programs.
Oregon State University, United States Department of Agriculture, and Oregon Counties Cooperating.

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current research

CUTBANK EROSION PLANTING

Mike Amaranthus, soil scientist for the Galice and Illinois Valley Districts of the Siskiyou National Forest, is trial-planting 11 native shrub species on road cutbanks to reduce erosion and visual impacts this fall. The districts are looking for new methods of revegetating cutbanks since grass seed mixtures have often failed. Planting ponderosa pine and Douglas-fir on cutbanks of deep, soft, sedimentary material last spring resulted in an average survival rate of 95 percent along six miles of road. This success encouraged the districts to look for species capable of surviving in more severe environments. Thus, the decision to test native shrubs was made. Shrubs are also less likely to impair vision on curves than are conifers.

The 11 species to be tested include (200 of each):

Arctostaphylos uva-ursi - Kinnikinnick*
Arctostaphylos canescens - hoary manzanita
Artemisia tridentata - big sagebrush
Ceanothus cuneatus - common buckbrush*
Clematis ligusticifolia - western clematis
Eriogonum umbellatum - sulfur flower
Holodiscus discolor - oceanspray
Quercus sadleriana - sadler oak
Quercus vaccinifolia - huckleberry oak
Symphoricarpos albus var. laevigatus - common snowberry
Whipplea modesta - whipplevine

*only 100 plugs of these species were available

The seed was grown as plugs in a local nursery. Two thousand were produced at an average cost of 56¢ each.

The plugs are being planted on 20 different sites ranging from 2,500 to 5,500 feet elevation. The sites represent a range of soil parent materials, aspects, and climatic conditions. The areas selected in the two districts have failed to revegetate either naturally or by normal forest practices.

Five pairs of ten species are being planted at each site. The plugs are planted whenever a dibble or hoedad can prepare a spot. No locations are planted that would obstruct vision, i.e. inside curves. Survival will be followed during the summer.

D.M.

FUEL-AIR EXPLOSIVE DEVICE (FAE) TESTED

Three test explosions of the Fuel-Air Explosive device (FAE) were detonated on sites in the Siskiyou National Forest in late November to evaluate its potential as a site preparation technique.

The FAE consists of a metal cannister containing 80 pounds of propylene oxide, a liquid fuel similar to gasoline and a 1 pound columnar explosive charge located inside the cannister. The device is suspended from a bipod above the ground and a smaller explosive charge placed nearby. When the 1 pound columnar explosive is detonated inside the cannister, a disc shaped, aerosol fuel-air charge is dispersed over a 60 foot diameter area. In less than one second after the cannister is detonated, the nearby smaller explosive charge is triggered which detonates the aerosol fuel-air explosive cloud. The resulting shock waves from the explosion shred all foliage and small stems within and under the cloud.

The three test areas on the Siskiyou National Forest were dominated by deerbrush ceanothus (60-70 percent coverage) with the remainder of the vegetation made up of associated species such as tanoak, Pacific madrone, canyon live oak, poison oak, hazel, grasses, and forbs. Over the three sites, canopy height ranged from 7-14 feet. Slopes were between 60 and 70 percent and all sites had southwest exposures.

The resulting shock waves from the three separate FAE tests completely shredded most of the foliage, buds, and small branch material on the test sites. The debris was deposited over the cleared area as a fine ground mulch. The soil was left in place, but was fluffed or loosened to a depth of 4-5 inches. The larger brush stems were left standing although they had been stripped of most buds and small branches. The size of individual cleared areas ranged from 0.057 to 0.072 acres.

Prior to the tests these areas would have been extremely difficult to plant trees in because of the dense brush. However, after clearing with the FAE, tree planting should be relatively easy. Douglas-fir seedlings will be planted in each of the three test areas as well as on control plots that have not been cleared. Seedling survival and growth will be monitored for several years as will the rate of recovery of competing vegetation.

Cooperators in this exploratory study are the USFS Region-6, Siskiyou National Forest, USFS Missoula Equipment Development Center, USFS Pacific Northwest Forest and Range Experiment Station, and the U.S. Navy.

S.H.

continuing education

SOIL INFORMATION FOR LAND USE PLANNING

January 31 - February 1: Eugene, Oregon
February 14-15: Bend, Oregon
February 28-29: Tualatin, Oregon
March 13-14: Pendleton, Oregon
March 27-28: Newport, Oregon
April 10-11: Medford, Oregon

A two-day workshop on the use of soil maps and soil survey interpretations for agricultural lands, sponsored by the OSU Extension Service. Enrollment is limited to 100 at each location and a workshop registration fee of $25 is required. CONTACT: Herb Huddleston, Department of Soil Science, Oregon State University, Corvallis, OR 97331.

DOUGLAS-FIR TUSSOCK MOTH SYMPOSIUM

January 15-17. Portland, Oregon. CONTACT: Conference Office, Cooperative Extension, 323 Ag. Phase II, Washington State University, Pullman, WA 99164.

ESTATE PLANNING FOR THE FOREST PROPERTY OWNER

February 28-29. Oregon State University, Corvallis. Enrollment is limited to 150. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331. Phone: (503)754-3709.

PLYWOOD MANUFACTURING

March 10-14. Oregon State University, Corvallis. Enrollment is limited to 40. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331. Phone: (503) 754-3709.

INTERIOR WEST WATERSHED MANAGEMENT SYMPOSIUM

April 8-10. Ridpath Hotel, Spokane, Washington. Registration fee: $45. CONTACT: Watershed Management Symposium, Phase II, Room 323, Cooperative Extension, Washington State University, Pullman, WA 99164.

MANAGING FUTURES TRADING

April (exact dates to be announced). Oregon State University, Corvallis. Enrollment limited to 100. CONTACT: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331. Phone: (503)754-3709.

WATERSHED MANAGEMENT SYMPOSIUM

July 23-25. Boise, Idaho. Sponsored by the American Society of Civil Engineers, the Symposium theme is "Making Watershed Management Work." CONTACT. Clifton W. Johnson, USDA-SEA, 1175 So. Orchard, Boise, ID 83705.

SIXTH NORTH AMERICAN FOREST BIOLOGY WORKSHOP

August 11-13. University of Alberta, Edmonton, Alberta, Canada. Sponsored by the Society of American Foresters' Physiology and Tree Genetics and Improvement working groups. The workshop theme is: "Directions of Forest Biology in the 1980's." CONTACT: Professors Kenneth O. Higginbotham or B. P. Dancik, Department of Forest Science, University of Alberta, Edmonton, Alberta, Canada T6G 2G6.

INTERNATIONAL SYMPOSIUM ON FOREST SEED STORAGE

September 18-October 2. Petawawa National Forestry Institute, Chalk River, Ontario, Canada. Sponsored by IUFRO Working Party on Seed Problems. CONTACT: B. S. P. Wang, National Tree Seed Centre, Petawawa National Forestry Institute, Canadian Forestry Service, Chalk River, Ontario, Canada KOJ 1JO.

The FIR soil compaction program originally scheduled for March is being postponed, but not abandoned. The delay will allow time for research in progress to be completed and synthesized. Thus, a later program will be more up to date and complete.

# of interest

FIR'S FUNDAMENTAL RESEARCH PHASE UNDERWAY

The USFS Pacific Northwest Forest and Range Experiment Station in Corvallis recently received Congressionally appropriated funds for the Fundamental Research Phase of FIR. Corvallis-based scientists will initiate studies designed to find solutions to the complex forest management problems associated with southwest Oregon. Researchers will investigate a wide variety of problem areas ranging from site preparation to genetics growth and yield of forest stands, and seedling-environment relations. OSU's FIR Extension and adaptive research specialists in Medford will provide the communication link between fundamental researchers and southwest Oregon natural resource managers to ensure the prompt transfer of technology as it is developed.

S.H.

USING CORDONS TO PROTECT STEEP SLOPES

Bruce Sims, hydrologist for the Chetco and Gold Beach Districts of the Siskiyou National Forest is using cordons to establish vegetation on steep slopes adjacent to streams on the Lobster Burn. The fire severely burned a clearcut unit during logging last August. Surface erosion is a serious problem in the area and the establishment of riparian vegetation is important for protecting the fishery resources.

In the present context, a cordon is two layers of cuttings projecting horizontally from trenches on the slope contour and partially covered with soil so that they will root. As the cuttings root and grow, they form a dense line of trees to cover the slope and protect the stream. Sims found cordons more effective than wattling (the placement of bundles of cuttings in contour trenches) in the tropics of the Phillipines while working with the Peace Corps. Bundles of branches in contour trenches tended to divert water across the slope, concentrating the flow in low areas, and producing gullies. With cordons, water continues to move uniformly down slope through the exposed ends of the cuttings without producing new erosion channels.

Cuttings, approximately 35 cm long, can be made from the juvenile growth of any species which will root easily when placed in the soil. *Populus* species are among the most easily reproduced. Terminal branches make good stock, but branches larger than 2.5 cm may be too old, and contribute to increased handling costs. Cuttings should be grown so that they contain at least two nodes, and should be collected during the dormant season, fall and winter. Cuttings may be planted immediately or stored between freezing and 40 degrees Farenheit. In any case, cuttings should be kept moist and not allowed to dry out. Cuttings are planted butt first.

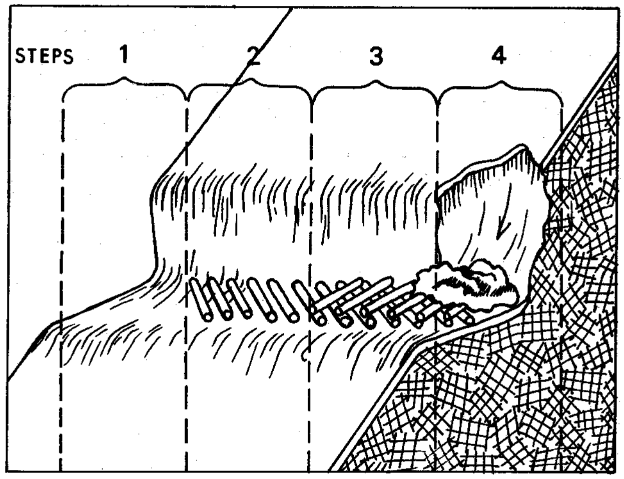
The four basic steps in the construction of cordons are (see illustration):

1) Construct a slightly down-sloping step in the hillside on the contour approximately half the length of the cuttings.

2) Place one layer of cuttings in the step at 45 degrees to the bank.

3) Place a second layer of cuttings in the step perpendicular to the first layer.

4) Fill the step with soil from the bank above or from the construction of another cordon. A lower cordon can provide a standing platform for the construction of another further upslope.



Another technique that may achieve similar results (although it has not been tested) is to use a dibble to punch holes close together in the slope and fill them with cuttings. If the soil is soft and rocks are not a problem, cuttings may be pushed directly into the soil.

D.M.

CRITIQUE OF THE EPA ALSEA II STUDY

The Environmental Health Sciences Center at Oregon State University has just published a report that should be of considerable interest to natural resource managers and the public. The title of the report is: A SCIENTIFIC CRITIQUE OF THE EPA ALSEA II STUDY AND REPOPT, by S. L. Wagner, J. M. Witt, L. A. Norris, J. E. Higgins, A. Agresti, and M. Ortiz, Jr. 1979. Environmental Health Sciences Center, Oregon State University, Corvallis. 92 p.

Written by an interdisciplinary task force of six specialists, the report presents a critical review of the Environmental Protection Agency's "Alsea II Study" which provided much of the basis for the suspension of the herbicide, 2,4,5-T.

The report examines in detail and refutes each of the three conclusions drawn by EPA in the Alsea II Study. Quoting from the summary in the OSU critique, the authors conclude "that EPA reached erroneous conclusions from the Alsea II Study because of: 1) failure to account for differences in the characteristics between the Study area and the Rural and Urban control areas, 2) inaccuracies in the collection of data on spontaneous abortions, 3) failure to account for marked differences in the medical practice among areas, 4) incomplete and inaccurate data on 2,4,5-T use, and 5) failure to recognize that the magnitude of the monthly variations in rates of hospitalized spontaneous abortions (HSAb) in all three areas is no greater than would be expected due to random variations. ...The original contention of the women from Alsea, Oregon, namely that there is a relationship between herbicide use and miscarriages, is not supported by the data in EPA's Alsea II Report."

Copies of this report may be obtained by writing to:

Environmental Health Sciences Center
Oregon State University
Corvallis, OR 97331

S.H.

CHECKDAM CONSTRUCTION

Several BLM and Forest Service units have constructed checkdams to reduce erosion impacts. During recent meetings with Bruce Sims and Bill Hansen, hydrologists with the Siskiyou National Forest, we discussed methods of modifying current checkdam designs. If anyone is planning to build checkdams and would like to experiment with different designs, please contact one of the FIR Staff in Medford.

D.M.

RESULTS OF THE STAND MANAGEMENT PROBLEM ANALYSIS WORKSHOPS

Stand management problem analysis workshops were held this fall in Medford, Grants Pass, and Roseburg. The objective of the workshops was to identify and rank specific research and technical training needs of foresters in southwest Oregon. Forty-six foresters from various public and private organizations attended the three workshops. The information from these meetings will be used to develop FIR programs in the area of stand management.

At each meeting a list of specific stand management problems was compiled. Each person was asked to rank what they believed to be the top five problems in his/her area. These rankings were then quantified by giving first choices a score of five, second choices a score of four, and so on down to the fifth choice which received a score of one. A priority score was developed for each specific stand management problem by workshop and a total for all three workshops. The results are summarized in the table below. For a specific problem to be listed, it must have received a minimum score of one. These data reflect the problems of general concern in southwest Oregon and problems that may be of greater concern within a specific area. FIR programs relating to stand management topics will be aimed at both the highest ranking general concerns and high ranking concerns for a specific area.

K. W.

OVERALL RANK	Specific Stand Management Need	PRIORITY SCORE: Medford	Grants Pass	Roseburg	TOTAL
1.	Biological and economic analyses of all regeneration systems (selection vs. shelterwood vs. clearcut) - why and where to use them.	57	35	49	141
2.	Growth and yield models for conifer species and site conditions specific to southwest Oregon (in priority order: mixed conifers, true firs, Douglas-fir, ponderosa pine, and other commercial species).	55	9	28	92
3.	An adequate system of site classification for southwest Oregon - measure of site capability (traditional measures of site index are inadequate).	--	29	42	71
4.	Stocking guidelines for managed stands of different species and sites in southwest Oregon.	30	20	--	50
5.	The amount of residual overstory required to achieve regeneration success under shelterwood regeneration systems (reduce moisture and temperature stress or minimize frost problems).	22	1	19	42
6.	Techniques for removing shelterwood overstories.	20	9	9	38

OVERALL RANK	Specific Stand Management Need	SCORE PRIORITY Medford	Grants Pass	Roseburg	TOTAL
7.	Biological and economic analyses of the potential for synthetic chemical fertilization in southwest Oregon.	11	--	23	34
8.	Economic analysis of the response of overstocked stands to release by thinning (considering age and site).	4	--	23	27
9.	Standards for measuring growth and yield information for managed stands and second-growth unmanaged stands.	--	--	21	21
10.	Management guidelines for mixed conifer-hardwood forests.	--	13	--	13
10.	Techniques for monitoring growth in precommercial stands.	--	--	13	13
12.	An evaluation of a "no-thinning" regime as an alternative management strategy on some sites.	6	--	6	12
12.	Development of stand density indices for all commercial species.	--	--	12	12
12.	What should be considered in clearcut layout design to maximize regeneration success?	--	--	12	12
15.	Growth and yield models for hardwood species (chinquapin, madrone, tan oak, black oak).	--	10	--	10
16.	Evaluate slash disposal techniques for different regeneration systems.	--	--	9	9
17.	Management alternatives for harsh sites (steep, brushy, shallow soils, rocky).	6	2	--	8
17.	Evaluate the potential for vegetation management vs. synthetic chemical fertilization.	--	4	4	8
17.	Potential for using a shelterwood for vegetation management (control of competing vegetation).	8	--	--	8
17.	When and how to precommercially thin.	8	--	--	8
17.	What is the maximum you can thin with ground cable systems?	--	--	8	8
22.	What is an acceptable level of damage with commercial thinning?	--	--	6	6
23.	Training on writing silvicultural prescriptions.	5	--	--	5
23.	The effects of excluding fire from southwest Oregon ecosystems on productivity.	--	5	--	5
25.	Training in the use of computer technology in evaluating stand exam data.	4	--	--	4
26.	An evaluation of underburning with shelterwoods.	3	--	--	3
26.	Size of clearcut units given site and habitat type.	3	--	--	3
26.	The potential for increasing site capability through vegetation management (choice of a species; controlling competing, non-merchantable vegetation).	--	3	--	3

OVERALL RANK	Specific Stand Management Need	PRIORITY SCORE Medford	Grants Pass	Roseburg	TOTAL
29.	Evaluate the potential for using artificial regeneration with a selection regeneration system.	2	--	--	2
29.	How can one best take advantage of natural regeneration?	--	--	2	2
29.	Evaluate crown thinning as an alternative to basal area guidelines for thinning clumpy stands.	--	--	2	2
32.	What can be done with slash in noncommercial thinnings?	1	--	--	1
32.	Economic evaluation of and the techniques for stand conversion.	1	--	--	1
32.	Evaluation of commercial thinning techniques.	1	--	--	1

RESULTS OF THE TREE IMPROVEMENT PROBLEM ANALYSIS

A problem analysis of tree improvement was undertaken by FIR following a number of general inquires about the subject. The problem analysis consisted of two parts: 1) a questionnaire, and 2) a problem analysis workshop. The objective of the problem analysis was to identify training and research needs, and the role the FIR program could play in supporting tree improvement efforts in southwest Oregon.

In early November, questionnaires were distributed to 110 people affiliated with a tree improvement program. One hundred eighteen questionnaires were returned. Respondents were asked to indicate their occupation in one of six groups: administrator-manager, tree improvement specialist, silviculturist, regeneration forester, forestry technician, or other. A fairly well balanced sample was obtained across the occupational groups with 25, 11, 26, 23, 21, 12 people responding respectively by group. People were asked to evaluate their level of understanding with reference to 21 questions concerning basic genetic concepts and tree improvement principles. A "general comment" question was included in the questionnaire. For each question, each respondent rated his or her level of understanding on a scale from one to five with one = none, three = fair, and five = exceptional. Average scores for each question were calculated for all the questionnaires and by each occupational group.

We learned several things from the survey. As expected, tree improvement specialists (average score 4.13) were the most confident in understanding the questions followed by silviculturists (3.30), regeneration forester (3.18), occupations other than the five designated (3.01), forestry technicians (2.99), and administrators-managers (2.93). There is a fair understanding of genetic concepts and tree improvement principles in southwest Oregon, if the questionnaires produced reliable results.

One interesting fact about the results is that whether one looks at the overall results or those from any one of the six occupational groups, the outcome was essentially the same. Questions dealing with evaluation plantations and production of genetically improved material for operations scored below average in understanding. These are also the topics of most immediate concern. Questions relating to basic genetic concepts and principles scored rather high. Has a better job been done training people about basic genetic concepts and principles? Has a poorer job been done training people about evaluation plantations and operational production of genetically improved material? Do the responses reflect familiarity with the questions rather than a true evaluation of understanding? It would be very difficult and dangerous to draw concrete conclusions. For example, some people may believe they have an adequate understanding of a problem even though they may not.

The greatest value of the survey was getting people to think about tree improvement and the corresponding written remarks under the general comment question. These comments provided a good basis for the beginning discussion at the Tree Improvement Problem Analysis Workshop. Many of the training and research problems compiled during the workshop were identified in the questionnaires.

The problem analysis workshop was held in Roseburg on November 28. Twenty-eight people attended. As was the case at other FIR problem analysis workshops, a list of specific training and research problems was compiled. Each person ranked what they believed to be the top five problems. These rankings were then quantified by giving first choices a score of five, second choices a score of four, and so on down to the fifth choice which received a score of one. A priority score was developed for each specific tree improvement problem. The results are summarized in the table below.

One fact came through loud and clear in the written comments on the questionnaire and the problem analysis workshop. There is strong demand for greater awareness of tree improvement in southwest Oregon. More than just general programs are needed. Programs need to be tailored to the different occupational groups (i.e. administrators-managers, specialists, technicians) and specific topics.

K.W.

OVERALL RANK	Specific Tree Improvement Need	PRIORITY SCORE
1.	More training opportunities and mechanisms (workshops, seminars, field trips, publications) for specific audiences (i.e. administrators-managers, specialists, technicians).	42
2.	How might establishment techniques for evaluation plantations be modified to get high survival on harsh sites (cultural treatments such as shade)?	35
3.	Will superior families chosen under the conditions of the evaluation plantation perform the same when grown under operational conditions or in mixed stands?	34
4.	How much site variability due to past treatments and site preparation (i.e. soil compaction) is acceptable for an evaluation plantation?	27
5.	Where do existing tree improvement programs go after progeny testing in terms of operational production of genetically improved material and future generations of breeding?	26
6.	Research on cultural practices to stimulate flower production.	22
7.	The addition or expansion of existing tree improvement programs to meet specific needs in southwest Oregon (i.e. drought resistance selection and programs for species other than Douglas-fir).	21
8.	What genetic factors should be considered in selecting a regeneration system and timber stand improvement procedures?	18
9.	A comparative evaluation of different tree improvement strategies.	17
10.	At what age can we reliably select individuals or familes for future breeding?	15
10.	How should genetic gains be used in allowable-cut calculations and what are justifiable estimates of gain?	15
12.	Contract guidelines and specifications for tree improvement jobs (i.e. pollen collection, control pollination, cone collection, grafting).	12
13.	Basic population genetic studies in southwest Oregon.	11
14.	Genetic factors to be considered when choosing between alternative management regimes for established plantations (i.e. off-site seed sources).	10
15.	Species evaluation trials.	
16.	Guidelines for handling genetic test seedlings prior to outplanting and holding seedlings over another year because plantation evaluation sites have not been prepared.	7
17.	General program for forest managers to put tree improvement into a proper perspective with a total forest management program.	5

OVERALL RANK	Specific Tree Improvement Need	PRIORITY SCORE
18.	How much control is needed in handling and culturing genetic test material to minimize the effects that could confound evaluation (in terms of cone collection, seed processing and storage, seed stratification, selection of stock type, culturing-nursery vs. greenhouse)?	4
19.	A system for identifying genetic test material by organization.	1

HANDLING SEEDLINGS ON THE PLANTING SITE

The process of reforesting any given area by tree planting takes several years and a significant amount of money if we consider the time it takes for cone collection, seed extraction, raising the seedlings in the nursery, site preparation, storage, transportation, and finally the planting operation itself. When we think of the emphasis placed on reforestation, it seems ridiculous to lose the operation because of poor tree handling during outplanting. Unfortunately it sometimes happens, primarily because of inadequate attention to detail, education, or supervision.

Whether the seedling is in a storage container or the tree planter's bag, it is out of its natural environment and is extremely vulnerable to damage. This is particularly true of the seedling's root system. Seedling damage incurred during the planting phase can usually be attributed to three causes: 1) changes in moisture content, 2) changes in heat content, or 3) mechanical damage. Tree planters should be aware of these factors, how they impact on seedling survival, and the measures they can take to minimize these impacts.

After the seedlings have been transported to the planting site they should not be removed from the storage bags or the bags opened until the trees are ready to be planted. Preferably the trees should be transported in a refrigerated truck or an insulated container. If this is the case, then the storage bags should be left inside the insulated container until they are needed. However, the prefered type of storage is not always available for use on the planting site. If an insulated storage area is not available, then storage bags should be placed in the shade. They should be bunched together, thus allowing air to circulate freely around the bags. A "space blanket" is often helpful in keeping the seedlings cool. To prevent temperature increases, keep the reflecting side faced upward. If there is a possibility of the seedlings freezing, then the reflector side should be turned inward. No more seedlings than are likely to be planted on any given day should be transported to the field. If seedlings are returned to a permanent storage facility overnight, then they should be the first trees planted the next day.

Storage bags or boxes should never be handled roughly. Patch torn bags immediately. In the field, keep seedlings as cool as is operationally feasible without freezing them.

Carefully remove seedling bundles from storage bags as needed and cut, not yank, the strings or rubberbands holding them together. As soon as the trees have been removed from the storage bags their roots should be dipped in water or a slurry such as that made with vermiculite. In the case of containerized seedlings, the containers can be submerged in water for just a few minutes. This not only helps to protect the roots, but it also makes the plugs more easily removed from the containers. A word of caution: leaving seedling roots submerged in standing water for prolonged periods can result in considerable damage to the tree. Remember, a seedling's roots are easily damaged and should be protected and carefully handled at all times. This is true on even the most overcast days because even the slightest breeze has a drying effect. Seedling roots must be kept moist. This may even mean placing wet sphagnum moss or some other similar material in the planting bag. Individual trees should be removed from the planting bag only after the planting hole has been made. Only as many trees as can be carried by an individual while planting should be brought onto the actual planting site at any one time. Extra planting bags filled with seedlings should not be carried onto the site for storage until needed. Crew or individual breaks should not be taken while seedlings remain in the planting bags. After seedlings have been removed from the storage bags, they should be planted as quickly as possible. Water should also be available to remoisten seedling roots if the need arises.

Seedlings are particularly subject to injury during the planting operation. Personnel involved in tree planting can do much to improve seedling survival through actions that minimize seedling exposure and handling.

S.H.

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 Publications
Pacific Northwest Forest and Range Experiment Station
P.O. Box 3141
Portland, OR 97208

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

3 Forest Research Laboratory
Oregon State University
Corvallis, OR 97331

4 Publications
Intermountain Forest and Range Experiment Station
507 25th Street
Ogden, UT 84401

5 T. J. Drew
Weyerhaeuser Canada, Ltd.
Forest Regeneration and Research Centre
Rural Route 3, St. Anne's Rd.
Armstrong, B.C. Canada
VOE 1BO

6 Publications
Research Branch Ministry of Forests
Parliament Buildings
Victoria, B.C. Canada
V8W 3E7

7 Publications
Rocky Mountain Forest and Range Experiment Station
240 West Prospect Street
Fort Collins, CO 80526

8 I. F. Alvarez
Forestry Sciences Laboratory
3200 Jefferson Way
Corvallis, OR 97330

9 University of Washington
Forest Resources AR-10
Seattle, WA 98195

10 Department of Forestry
North Carolina State University
Raleigh, NC 27650

11 Department of Plant Pathology
University of Kentucky
Lexington, KY 40546

SETTING PRECISION FOR RESOURCE INVENTORIES: THE MANAGER AND THE MENSURATIONIST, by D. A. Hamilton, Jr. 1979. Journal of Forestry 77(10):667-670. Traditionally, managers have relied heavily on judgement when setting precision of forest inventories. The author describes a method whereby precision and the resulting sample size are based on the consequences of errors in inventory estimates and the inventory costs. The responsibility of the manager is to define and quantify the consequences of errors in the estimates; the mensurationist calculates costs of the inventory and determines the estimate of optimal precision.

4

AN EVALUATION OF TWO MEASURES OF COMPETITION FOR NATIONAL FOREST TIMBER SALES, by R. W. Haynes. 1979. USDA Forest Service Research Note PNW-337. Pacific Northwest Forest and Range Experiment Station, Portland. 9 p. This paper evaluates two methods--overbid and bid-appraisal ratio--used by the Forest Service in Region-6 to determine if timber sale bidding is competitive or non-competitive. No real increases occurred with the overbid method, but the bid appraisal ratio did decline with time. If the purpose of bid monitoring is to detect collusion in an individual sale, either method is adequate. If the purpose of the monitoring is to evaluate competition over time, overbid is the preferred method.

1

STREAM CHEMISTRY AND WATERSHED NUTRIENT ECONOMY FOLLOWING WILDLIFE AND FERTILIZATION IN EASTERN WASHINGTON, by A. R. Tiedemann, J. D. Helvey, and T. D. Anderson. 1978. J. Environ. Qual. 7:580-588. Stream chemistry was monitored for three years following a severe wildfire. Nitrate-nitrogen (N) in stream water increased from pre-fire levels on the burned, unfertilized watershed and on two watersheds that were burned and fertilized (~ 55 kg-N/ha). Nitrate-N levels in the burned-only watershed were similar to those watersheds receiving fertilizer. Yearly N input from precipitation was sufficient to balance solution losses in three of the five postfire years; average N input was 1.23 kg/ha per year. While the wildfire had protracted impacts on stream chemistry, the fire and fertilization exerted negligible effects on chemical water quality for municipal use.

1

SITE INDEX AND HEIGHT GROWTH CURVES FOR MANAGED, EVEN-AGED STANDS OF DOUGLAS-FIR EAST OF THE CASCADES IN OREGON AND WASHINGTON, by P. H. Cochran. 1979. USDA Forest Service Research Paper PNW-251. Pacific Northwest Forest and Range Experiment Station, Portland. 16 p. Potential height growth and site index curves and equations are reported for managed, even-aged stands of Douglas-fir east of the Cascade Range in Oregon and Washington. Mature, managed stands on which competing vegetation was controlled during establishment and stocking do not exist. To develop data for this report, natural stands had to be selected where growth of the dominant trees was apparently never reduced by stand density, competing vegetation, or top damage (i.e. weather, insects, diseases). Douglas-fir trees were sampled from pure and mixed conifer stands. Consequently, the results are applicable to Douglas-fir in both pure and mixed stands. Height-age data were derived from dominant trees on sample plots using destructive sampling techniques (falling the trees and sectioning them - stem analysis). Procedures for estimating site index and growth curves were derived and reported.

1

SITE INDEX AND HEIGHT GROWTH CURVES FOR MANAGED, EVEN-AGED STANDS OF WHITE OR GRAND FIR EAST OF THE CASCADES IN OREGON AND WASHINGTON, by P. H. Cochran. 1979. USDA Forest Service Research Paper PNW-252. Pacific Northwest Forest and Range Experiment Station, Portland. 13 p. Potential height growth and site index curves and equations are reported for white or grand fir growing in managed, even-aged pure stands or mixed with other conifers east of the Cascade Range in Oregon and Washington. Mature, managed stands on which competing vegetation was controlled during establishment and stocking do not exist. To develop data for this report, natural stands had to be selected where height growth of the dominant trees was apparently never reduced by stand density, competing vegetation, or top damage (i.e. weather, insects, diseases). Height-age data were derived from dominant trees on sample plots using destructive sampling techniques (falling the trees and sectioning them - stem analysis). Procedures for estimating site index and growth curves were derived and reported.

1

GROSS YIELDS FOR EVEN-AGED STANDS OF DOUGLAS-FIR AND WHITE OR GRAND FIR EAST OF THE CASCADES IN OREGON AND WASHINGTON, by P. H. Cochran. 1979. USDA Forest Service Research Paper PNW-263. Pacific Northwest Forest and Range Experiment Station, Portland. 17 p. Yield information is reported for Douglas-fir and white or grand fir east of the Cascade Range in Oregon and Washington. Equations and tables for predicting net basal area, net volume, gross periodic annual volume increment, gross volume yields, and gross periodic annual basal area increment are reported.

1

GROWTH MODELS FOR PONDEROSA PINE: I. YIELD OF UNTHINNED PLANTATIONS IN NORTHERN CALIFORNIA, by W. W. Oliver and R. F. Powers. 1978. USDA Forest Service Research Paper PSW-133. Pacific Southwest Forest and Range Experiment Station, Berkeley. A growth model was developed for estimating yields of unthinned ponderosa pine plantations with high initial survival, negligible brush competition, and low mortality from external causes. Yield tables for unthinned ponderosa pine plantations in northern California are reported for five site indices (40, 60, 80, 100, and 120). Yield table parameters are: age from planting (5-year intervals between 10 and 50 years), planted spacings (6x6, 8x8, 10x10, 12x12 feet), trees per acre, mean height, mean dbh, basal area per acre, and total net volume per acre. In addition, tables of mean diameters and number of trees by crown classes (dominant, codominant, intermediate, and suppressed) for each of the five site indices are presented.

2

HOW TO GROW TREE SEEDLINGS IN CONTAINERS IN GREENHOUSES, by R. W. Tinus and S. E. McDonald. 1979. USDA Forest Service General Technical Report. RM-60. Rocky Mountain Forest and Range Experiment Station, Fort Collins. 256 p. This reference offers a comprehensive guide to growing containerized seedlings in greenhouses. It has been written in considerable detail and covers all aspects of greenhouse management for conifer production. The manual is well referenced and contains several appendices with much useful information. Organized into 21 chapters, this publication covers everything from greenhouse development, facilities, hardware and control, to growing medium, temperature and humidity control, mineral nutrition, records, pest management, and water crises. It is a valuable source of information and provides useful insight into the production of containerized seedlings. A must reference for foresters working with containerized stock.

7

RESPONSE TO UREA AND AMMONIUM NITRATE FERTILIZATION IN AN 80-YEAR-OLD DOUGLAS-FIR STAND, by R. E. Miller and C. A. Harrington. 1979. USDA Forest Service Research Note 330. Pacific Northwest Forest and Range Experiment Station, Portland. 5 p. An 80-year-old, site I, Douglas-fir stand in western Washington responded with a 20 percent increase in gross total cubic growth following fertilization with 200 lb. of nitrogen per acre. Response to urea and to ammonium nitrate was similar; however, the weather was cloudy, cold, and wet during and for three days following treatment, minimizing the opportunity for nitrogen volatilization.

1

MASS MOVEMENT RESPONSE TO FOREST MANAGEMENT IN THE CENTRAL OREGON COAST RANGES, by S. Gresswell, D. Heller, and D. N. Swanston. 1979. USDA Forest Service Resource Bulletin PNW-84. Pacific Northwest Forest and Range Experiment Station, Portland. 26 p. Landslides after a major storm on the Mapleton District, Siuslaw National Forest, were accelerated as a result of timber management activities. Clearcut harvesting, exclusive of roads, was the most damaging activity, causing more than three-fourths of the failures and accounting for about two-thirds of the debris volume. Less than one-fifth of the failures occurred within the road rights-of-way and then produced only one-third of the total debris volume. More than 95 percent of all failures inventoried occurred on three resource inventory units and on slopes greater than 70 percent. The reduced impact of roads relative to harvesting may reflect the overall effort by the district to improve road location, design, and construction practices and maintenance of drainages and culverts during the storm.

1

RELATIONSHIP OF STEM ELECTRICAL IMPEDANCE AND WATER POTENTIAL OF DOUGLAS-FIR SEEDLINGS TO SURVIVAL AFTER COLD STORAGE, by R. van den Driessche and K-W. Cheung. 1979. Forest Science 25(3):507-517. Four experiments were conducted with 2-0 and 1-1 Douglas-fir seedlings from interior and coastal Douglas-fir seedlings in British Columbia. The experiments were designed to evaluate the use of water potential and stem electrical impedance as measures of cold hardiness as reflected by percent survival after cold storage. Other variables included lifting date, storage temperature, relative growth rate, and provenance. Water potential was unrelated to seedling survival, but both prestorage and poststorage stem electrical impedance were highly correlated with seedling survival. Stem electrical impedance may prove useful in determining seedling lifting dates and stock quality after cold storage.

6

BROADCAST BURNING: 25-YEAR EFFECTS ON FOREST SOILS IN THE WESTERN FLANKS OF THE CASCADE MOUNTAINS, by J. F. Kraemer and R. K. Hermann. 1979. Forest Science 25:427-439. Broadcast burning does not appear to have any long term effects on soil chemical or physical properties. Soil property values were weighted by the percentage of area found in each of four burn classes before comparing stand conditions. Reestablishment of vegetation, and the litter fall and nutrient cycling it stimulates, is important to minimizing the effects of severe burns on soil properties. The presence of Ceanothus on burned plots significantly increased soil organic matter.

3

REDUCTION OF GENETIC BASE BY SIZING OF BULKED DOUGLAS-FIR SEED LOTS, by R. Silen and C. Osterhous. 1979. Tree Planters' Notes 30(1):24-30. The elimination of empty and partially filled seed using blowing or screening is considered a good nursery practice. However, the sizing of filled seed from bulked seed lots can have significant genetic consequences. Arbitrarily culling bulked seed lots on the basis of seed size or weight is demonstrated to result in a significant reduction of seed from some families and complete elimination of others. Year-to-year variation in family seed weight is appreciable. Consequently, sizing would discriminate against different families in different years. The correlation between seed size and weight, and growth parameters of 10-year-old trees was poor. Hence, there is no indication that sizing for larger or heavier seed will result in better growth of trees at age 10.

1

UNEVEN-AGED FOREST MANAGEMENT: STATE OF THE ART (OR SCIENCE)?, by D. W. Hann and B. B. Bare. 1979. USDA Forest Service General Technical Report INT-50. Intermountain Forest and Range Experiment Station, Ogden. 18 p. The development and use of uneven-aged management is considered in an historical perspective. Major decisions facing forest managers interested in applying uneven-aged management are: 1) The optimal, sustainable diameter class. 2) The optimal species mix for a stand. 3) The optimal cutting length for each stand. 4) The optimal conversion strategy and conversion period length for each stand. 5) The optimal scheduling of compartment treatments and the date of entry for each compartment. A review is made of the techniques traditionally used, or recently proposed, for use in making these decisions. Problem areas needing further research and development are: 1) Improvement of computer and algorithm capabilities. 2) Development of techniques for interfacing stand simulators to nonlinear programing models. 3) Development of uneven-aged growth and yield simulators. 4) Development of techniques for determining optimal species mixes. 5) Development of optimization tools for scheduling compartment treatments on a forest-wide basis.

4

TIMBER RESOURCES OF SOUTHWEST OREGON, by P. M. Bassett. 1977. USDA Forest Service Resource Bulletin PNW-72. Pacific Northwest Forest and Range Experiment Station, Portland. 29 p. (Revised March 1979.) This revised report presents statistics from a 1973 inventory of timber resources of Douglas County and from a 1974 inventory of timber resources of Coos, Curry, Jackson, and Josephine Counties, Oregon. Tables presented are of forest area, timber volume, growth, and mortality by ownership class.

1

OREGON'S FUTURE TIMBER HARVEST: THE SIZE OF THINGS TO COME, by P. L. Tedder. Journal of Forestry 77(11):714-716. If current management trends continue, Oregon's annual timber harvest is expected to decline over the next fifty years and then stabilize somewhat below current levels. Of equal importance to the decline in timber harvest are the changes in the raw material being harvested. Currently, the average tree diameter harvested in western Oregon is 23 inches. That is expected to drop to 14 inches by the year 2075. Average diameter of the trees being harvested in eastern Oregon is expected to drop from the current 25 to 14 inches by 2075. Variability in the size of trees harvested will also change dramatically. By the year 2000 and after, most trees being harvested will fall into the 9- to 21-inch group. Timber smaller and less variable in size has some significant economic implications. Although future harvests may have approximately the same volume as current levels, more acres will need to be harvested at much higher costs. Even greater economic implications arise about the utilization and quality of the end product.

3

MYCORRHIZAE AND GROWTH OF WHITE FIR SEEDLINGS IN MINERAL SOIL WITH AND WITHOUT ORGANIC LAYERS IN A CALIFORNIA FOREST, by I. F. Alvarez, D. L. Rowney, and F. W. Cobb, Jr. 1979. Can. J. For. Res. 9 (3):331-315. White fir seedlings were examined for mycorrhizae on five different sites in the north central Sierra Nevada Mountains of California. On each site seedlings growing on bare mineral soil and mineral soil with organic layers were collected. On the sample areas observations showed that white fir seedlings grew better on bare mineral soil. Seedling dry weights were significantly related to total root length, number of main lateral roots, and the presence of mycorrhizae. These variables were greater on seedlings taken from sites with bare mineral soil as compared with those having organic layers. The absence of organic layers favors the development of mycorrhizae and consequently better white fir seedling growth.

8

HOW TO DEMONSTRATE THE IMPORTANCE OF FISHERY RESOURCES TO INTERDISCIPLINARY PLANNING TEAMS, by F. H. Everest. 1979. Fisheries 4:15-19. A quantitative estimate of both commercial and sport fishery values can be developed by fishery biologists so that they can be compared to the value of other resources. Thus, resource managers are able to make resource allocations to protect or manage important fisheries. The Mt. Butler/Dry Creek Planning Unit of the Siskiyou National Forest was used as an example where critical portions of watersheds were allocated for protection of fish habitat and water quality.

1

OPERATIONAL TEST OF THE PROTOTYPE PEEWEE YARDER, by C. N. Mann and R. W. Mifflin. 1979. USDA Forest Service General Technical Report PNW-92. Pacific Northwest Forest and Range Experiment Station, Portland. 7 p. Presents the results of an operational test of a small, prototype running skyline yarder for use in thinning and clearcut harvesting of small logs. Controls were simplified reducing training time for proficient operation and crew size was reduced because the operator can act as a chaser. Production as high as 343 pieces per day was achieved with average loads estimated to be less than half the capability of the yarder.

1

SKYLINE YARDING COST ESTIMATING GUIDE, by R. W. Mifflin and H. H. Lysons. 1978. USDA Forest Service Research Note PNW-325. Pacific Northwest Forest and Range Experiment Station, Portland. 19 p. A breakdown of yarding cost and production elements are given in flow diagrams along with a procedure for determining and comparing the cost of alternative systems. One example of estimating costs and blank worksheets is provided for the reader's use.

1

RESPONSE OF A 110-YEAR-OLD DOUGLAS-FIR STAND TO UREA AND AMMONIUM NITRATE FERTILIZATION, by C. A. Harrington and R. E. Miller. 1979. USDA Forest Service Research Note PNW-336. Pacific Northwest Forest and Range Experiment Station, Portland. 8 p. A recently thinned, 110-year-old, site II, Douglas-fir stand in the lower, Central Oregon Cascades responded significantly to both ammonium nitrate and urea after four years. Basal area increment was increased 59 percent by ammonium nitrate and 37 percent by urea over the controls. The difference in response to source of nitrogen (N) was also significant although weather conditions suggest that volatilization of urea was probably not a major factor in reducing the response to urea. Speculation as to the differential response to N source is the lower N dosage in this study (150 versus the normal 200 pounds per acre) and the immobilization of urea in a thick forest floor.

1

EFFECTS OF SOIL AND FOLIAR APPLICATIONS OF NITROGEN FERTILIZERS ON A 20-YEAR-OLD DOUGLAS-FIR STAND, by R. E. Miller and S. Wert. 1979. USDA Forest Service Research Note PNW-329. Pacific Northwest Forest and Range Experiment Station, Portland. 12 p. A 20-year-old Douglas-fir stand southeast of Canyonville, Oregon was fertilized with either urea or 32 percent nitrogen (N) solution by direct application to the foliage. Application rates were 150 lb. per acre for urea and 96 lb. per acre for N solution (solution application range was 64 to 123 lb. per acre). Only four percent of the trees has as much as 30 percent of their foliage surface injured at maximum application rates. Four-year volume growth increased 37 percent for urea and 32 percent for N solution. Foliar fertilization decreased cone production while urea fertilizer increased cone production.

1

RESPONSE OF SMALL MAMMALS TO HERBICIDE-INDUCED HABITAT CHANGES, by J. E. Borrecco, H. C. Black, and E. F. Hooven. 1979. Northwest Science 53 (2):97-106. Halves of three clearcuts in western Oregon were treated with herbicides to control herbaceous vegetation and modify small mammal habitat. Various combinations of 2,4-D, silvex, dalapon, and atrazine were applied to test areas in the spring of 1970 and 1971. Vegetation and small mammal populations were sampled before and after treatments. The five species comprising 95 percent of the animals captured were the Oregon vole, deer mouse, vagrant shrew, Trowbridge shrew, and Pacific jumping mouse. Herbaceous vegetation control with herbicides caused small mammal community changes. Species preferring grassy habitats were less abundant on treated than untreated areas.

3

STAND DENSITY MANAGEMENT: AN ALTERNATIVE APPROACH AND ITS APPLICATION TO DOUGLAS-FIR PLANTATIONS, by T. J. Drew and J. W. Flewelling. 1979. Forest Science 25(3):518-532. A method of viewing stand density as it relates to volume production and tree size is developed in the form of a simple density management diagram applicable to plantations of coastal Douglas-fir on all sites. Three prominent points in stand development (crown closure, imminent competition-mortality and the maximum size-density relationship) are defined in terms of tree size and stand density, and their implications for stand dynamics are discussed. A relative density index is presented as a basis for quantifying tree growth and stand yield as a function of density. The trade-off between maximizing individual tree size or stand yield is considered; this recurring dilemma for forest managers can be rationalized on the basis of the density management diagram.

5

INITIAL EFFECTS OF CLEARCUT LOGGING ON SIZE AND TIMING OF PEAK FLOWS IN A SMALL WATERSHED IN WESTERN OREGON, by R. D. Harr and F. M. McCorison. 1979. Water REsources Res. 15:90-94. The size of the annual peak flow in a small watershed in western Oregon (H. J. Andrews Experimental Forest, Watershed 10) was reduced 32 percent with an average delay of nearly nine hours shortly after clearcut logging. No significant changes were detected in size or timing of peak flows that resulted from rainfall alone, but rain with snowmelt were significant with the size of peak flows reduced 36 percent and the peak delayed by 12 hours. While only two percent of the annual precipitation occurs as snow and accumulation is low, a majority of the larger storm events are of this type (9 of 13), thereby dominating the hydrologic response of the watershed following logging. With small snow events, a sizeable proportion of it is intercepted by the canopy. Snow in tree crowns is more susceptible to condensation-convection melt than snow on the ground in a clearcut. Thus, snow in the forest canopy is more quickly converted to water which can then enter the ground than is snow on the ground.

1

DETERMINING AVERAGE YARDING DISTANCE, by R. H. Twito and C. N. Mann. 1979. USDA Forest Service General Technical Report PNW-79. Pacific Northwest Forest and Range Experiment Station, Portland. 29 p. This report presents two desk-top calculator programs for obtaining unit area and average yarding distance. The programs are written in the American Standard Code for Information Interchange BASIC Language. Program 1 applies to regular-shaped units where the logs are yarded from their location straight to a landing. Program 2 applies to units where skyline systems with slackpulling capability operate in either parallel or fan-shaped settings.

1

EVALUATION OF PONDEROSA PINE REFORESTATION TECHNIQUES IN CENTRAL ARIZONA, by L. J. Heidmann, F. R. Larson and W. J. Rietveld. 1977. USDA Forest Service Research Paper RM-190. Rocky Mountain Forest and Range Experiment Station, Fort Collins. 10 p. Over a 15-year period many published and unpublished reforestation studies of ponderosa pine were undertaken on the Beaver Creek Watershed in north-central Arizona. This publication summarizes the studies in sufficient detail so that the reader is provided with a variety of site specific treatment effects over a wide range of site conditions. Spot seeding and broadcast seeding were almost total failures on Watershed 14 irregardless of the site preparation employed. On the other hand, after two years the survival of planted 2-0 ponderosa pine was 91.50 percent in areas where the slash had been piled and burned.

7

FUTURE POTENTIAL FOR USE OF SYMBIOTIC NITROGEN FIXATION IN FOREST MANAGEMENT, by D. DeBell. 1979. In: J. C. Gordon, C. T. Wheeler, and D. A. Perry (eds.), Symbiotic Nitrogen Fixation in the Management of Temperate Forests. p. 451-466. Forest Research Laboratory, Oregon State University, Corvallis. 501 p. Foresters have three major opportunities to affect the nitrogen system --conservation, application of synthetic fertilizers, and use of nitrogen fixing plants. These opportunities are not mutually exclusive, but are interactive. The role nitrogen fixing plants serve in the system is dependent on economic, sociopolitical, and biological factors. Several types of nitrogen-fixing systems are possible, including: plants in the understory; mixture of two commercial species - one capable of nitrogen fixation; and crop rotations with other species. Before fully realizing the potential of nitrogen fixing plants, several limitations and obstacles will have to be overcome, including lack of management information and experience, lack of appropriate demonstrations, and negative attitudes.

1

INFLUENCE OF SOME ENVIRONMENTAL FACTORS ON INITIAL ESTABLISHMENT AND GROWTH OF PONDEROSA PINE, by M. G. Harrington and R. G. Kelsey. 1979. USDA Forest Service Research Paper INT-230. Intermountain Forest and Range Experiment Station, Ogden. 26 p. The study was established in 1974 to explore the impacts of various environmental factors on ponderosa pine seed germination and subsequent growth under overstory protection and in the open. Various soil surface treatments were applied on the two areas. Precipitation, heat, and light were less under the pine overstory thus decreasing seed germination and growth. Germination rates and seedling growth were greater on the open-grown plots. Plots that had been prescribed burned produced the largest seedlings. Environmental factors found to be of major importance to germination were light, heat, and moisture.

4

SULFUR REQUIREMENTS OF NITROGEN FERTILIZED DOUGLAS-FIR, by J. Turner, M. J. Lambert, and S. P. Gessel. 1979. Forest Science 25:461-467. Foliage sulfate-sulfur (SO_4-S) was found to be a better predictive index of nitrogen fertilizer response (17 of 19 stands) than was foliage nitrogen concentrations (12 of 19 stands). A comparable precision of predicting fertilizer response was achieved by using a combination of soil parent material and separately measured soil nitrogen content. Trees located on soils derived from sedimentary and glacial parent material responded to N fertilization when the soil contained less than 8,000 kg/ha N in the rooting zone whereas no trees were found to respond on soils derived from pumice and basalt parent materials containing less than 2,400 kg/ha N.

9

BIOMASS RESPONSE OF LOBLOLLY PINE TO SELECTED CULTURAL TREATMENTS, by S. G. Haines and C. B. Davey. 1979. Soil Sci. Soc. Amer. Journal 43: 1034-1038. The effects of site preparation and cultural treatments, including various combinations of disking, applying herbicides, fertilizing, subsoiling, fumigating the soil, irrigating and mowing, on the biomass of 1 and 2-year-old loblolly pine seedlings were reported. Herbicide treatments had the most pronounced effect on seedling growth, resulting in a significant increase in both root collar diameter and stem volume the first year, although biomass parameters were not increased significantly. After the second year, herbicides significantly increased all biomass parameters measured as well as height, root collar diameter, number of branches, and longest root length. Root collar diameter was as effective an indicator of treatment response as other variables singly or in combination; however, seedlings used in the study were graded prior to planting to obtain uniform-sized trees and grading was recommended as a means of reducing within-plot variation.

10

COMPARATIVE ROOT SYSTEM MORPHOLOGIES OF SEEDED-IN-PLACE, BAREROOT, AND CONTAINERIZED DOUGLAS-FIR SEEDLING AFTER OUTPLANTING, by C. L. Preisig, W. C. Carlson and L. C. Promnitz. 1979. Can. J. For. Res. 9(3):399-405. Five- to eight-year-old Douglas-fir seedling root system morphologies were examined for differences due to seedling source. The sources studied were naturals (seeded-in-place), bareroot, and containerized stock. Within source variation was less for containerized and natural seedlings than for bareroot stock. Root spiraling was very low in all seedling sources. Root system morphologies for the three seedling sources had no overall effect on height growth at age 6. The study confirmed earlier reports that the soil type did not affect the amount of root egress on containerized seedlings when characterized by texture and the amount of gross physical obstruction.

11

SYMBIOTIC NITROGEN FIXATION IN THE MANAGEMENT OF TEMPERATE FORESTS, by J. C. Gordon, C. T. Wheeler, and D. A. Perry (eds.). 1979. Forest Research Laboratory, Oregon State University, Corvallis, Oregon. 501 p. Cost: $5.00. This is the proceedings of a workshop held April 2-5, 1979, at which both applied forestry researchers and basic researchers gathered from across the nation and several countries to assemble a state-of-the-art document on the role of symbiotic nitrogen fixation in temperate forest ecology and management. A total of 35 papers and 24 poster papers with printed abstracts were presented during the meeting. The papers included several subject areas: the economic and biological problem, actinomycetous root nodules, physiology and biochemistry, symbiosis in forest ecosystems, and silvicultural and utilization potential.

Several papers are of particular interest to forest managers in the Pacific Northwest: Forest fertilization and the economics of perpetual motion machines, J. Beuter; Industrial forestry requirements for alternative nitrogen sources, B. D. Rottink, R. F. Strand, and W. R. Bentley; Prospects and problems of nitrogen management using symbiotic nitrogen fixers, K. Cromack, D. Delwiche, and D. H. McNabb; Ceanothus in Douglas-fir clearcuts: nitrogen accretion and impact on regeneration, C. T. Youngberg, A. G. Wollum, and W. Scott; Fertilization versus red alder for adding nitrogen to Douglas-fir forests of the Pacific Northwest, R. E. Miller and M. D. Murray; and Future potential for use of symbiotic nitrogen fixation in forest management, D. DeBell.

3

ANIMAL DAMAGE TO CONIFEROUS PLANTATIONS IN OREGON AND WASHINGTON. PART II. AN ECONOMIC EVALUATION, by D. Brodie, H. C. Black, E. J. Dimock II, J. Evans, C. Kao and J. A. Rochelle. 1979. Forest Research Laboratory Research Bulletin 26. Oregon State University, Corvallis. 24 p. Height growth and survival data for Douglas-fir and ponderosa pine were collected during the period 1963-1975 and models fitted for trees protected against animal damage and those that were unprotected. Growth and yield were 13 percent less for unprotected trees which represents a decrease in present net worth returns of 18 percent. It is estimated that animal damage in Oregon and Washington can reduce the total value of the forest resource by $1.83 billion and $230 billion at the 3- and 6-percent rates.

CORRELATION OF SOIL PLASTICITY WITH AMORPHOUS CLAY CONSTITUENTS, by D. H. McNabb. 1979. Soil Sci. Soc. Amer. Journal 43:613-616. Amorphous clay constituents or poorly crystallized clay minerals are common in many of the Western Cascade soils. They are often found in slump-earth, flow-type landslides. As the amount of these constituents increase or they become less crystalline, the whole soil becomes less plastic. Because of their unique physical properties, these soils occur well below the 'A' line on the Casagrande plasticity chart. The percentage of amorphous constituents is positively correlated with soil plasticity. Soil plasticity is identified by the plasticity angle, which is defined by the angle relative to the 'A' line intercept, at which the Atterberg limits of air-dried soil occur on the Casagrande plasticity chart.

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