CRAFTS

Annual Report 1984-85

Staff

Steven R. Radosevich
Associate Professor
Program Leader

Michael Newton
Professor

Robert G. Wagner
Research Assistant

Timothy B. Harrington
Research Assistant

CRAFTS

Coordinated Research On Alternative Forestry Treatments & Systems

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Forest Research Laboratory
Oregon State University

CRAFTS Highlights

This report covers the fifth year of activity by the CRAFTS program on forest vegetation management. Highlights of this past year include:

- A study to compare the effects of site preparation on tree growth and site quality was completed. The experiment involved re-evaluation of six treatments after eight growing seasons. Differences among the treatments in soil chemical and physical properties, non-coniferous vegetation, and tree survival and growth were found.

- Timothy Harrington was hired as a research assistant within the program. Tim's responsibilities include data collection and analysis of the Coast Range competition release study. He also shares responsibility for the special project on interference of Douglas-fir and red alder.

- Several sites were selected and treatments were applied for testing suppression of bigleaf maple by herbicides.

- Special research projects were begun on the development of an interspecific competition index and the influence of Douglas-fir/red alder mixtures on forest productivity.

- Data was collected and analyzed from the second and third years of our study comparing competition release treatments in young conifer stands.

- Review and revision of the CRAFTS prospectus was begun.

- Several graduate students have begun various thesis projects, many of which are of interest to the Cooperative.

Introduction

The purpose of the CRAFTS program is to improve our understanding about the management of competing vegetation on commercial forest lands of the Pacific Northwest. CRAFTS initiates research on the biological impact of competing vegetation in young conifer plantations and conducts educational activities at Oregon State University (OSU). CRAFTS also provides a forum for research coordination and information exchange among the various organizations participating in the Cooperative. For example, subcommittee meetings were held last year to determine the procedures for treatment screening and the feasibility of extending cooperative research into the Cascade Range.

The 1984-85 period was dynamic for CRAFTS as a cooperative. A new organization, the British Columbia Ministry of Forests, joined the CRAFTS program, and our research efforts were assisted by the addition of several graduate students. We welcome them to the Cooperative. Unfortunately, CRAFTS lost two supporting cooperators during 1984-85; we appreciate the past interest and support of those organizations.

At the 1984 Policy Committee meeting, it was decided that the current CRAFTS prospectus should be revised to more accurately reflect the present concerns, priorities, and efforts of the Cooperative. A subcommittee met in March that consisted of members from both committees, Technical (T) and Policy (P): Tom Aufenthie (T) of the Bureau of Land Management, Jerry Chetock (T) of the Oregon Department of Forestry, David Handley (P) of MacMillan Bloedel Ltd., Wayne Hite (P) of Champion International, Alan Long (T) of Weyerhaeuser, and Tim White (P) of International Paper. Subsequently, a draft document was prepared and distributed to all members of the Policy Committee. Discussion and possible acceptance of the revised prospectus is a topic at the 1985 Policy Committee meeting.

Research Activity by Staff

This year the CRAFTS program was involved in several continuing and new research projects, many complemented by the work of graduate students. Refer to Appendix 2 for detailed reports of ongoing research results.

Release Study in the Coast Range

The CRAFTS competition release study was designed to test the efficacy of several treatments for controlling competing vegetation and enhancing Douglas-fir growth. At six sites in the Coast Range of Oregon and Washington, the following treatments were applied to Douglas-fir plantations of 2- to 3-years-old:

1) Roundup® applied late foliar (August-September) by helicopter at 1.5 qts/A in 10 gals/A aqueous spray.
2) Garlon 4® applied late dormant (February-March) by helicopter at 1.5 qts/A in 10 gals/A diesel oil spray.
3) Garlon 4® applied early foliar (April-May) by helicopter at 1.25 qts/A in 10 gals/A aqueous spray.
4) Manual cutting of vegetation applied late dormant-early foliar (March-April) with chainsaws in a 4-ft radius around each Douglas-fir. All vegetation was cut no higher than 6 inches above the ground.
5) All woody and herbaceous vegetation removed for the duration of the study.
6) No treatment.

Three replications of the study have completed their second growing season after treatment and three have completed their third season of growth. Using treatment averages of Douglas-fir size and

growth, an analysis of variance incorporating pre-treatment size as a covariate was used to test for differences among the treatments.

In both the completed second year data (6 replications) and the third year data (3 replications), the complete removal treatment was significantly different ($\alpha = 0.05$) from all other treatments for the following variables: diameter increment (Fig. 1), total stem diameter, and stem volume. In the second year, diameter increment was 50-90% larger in the complete control as compared to any

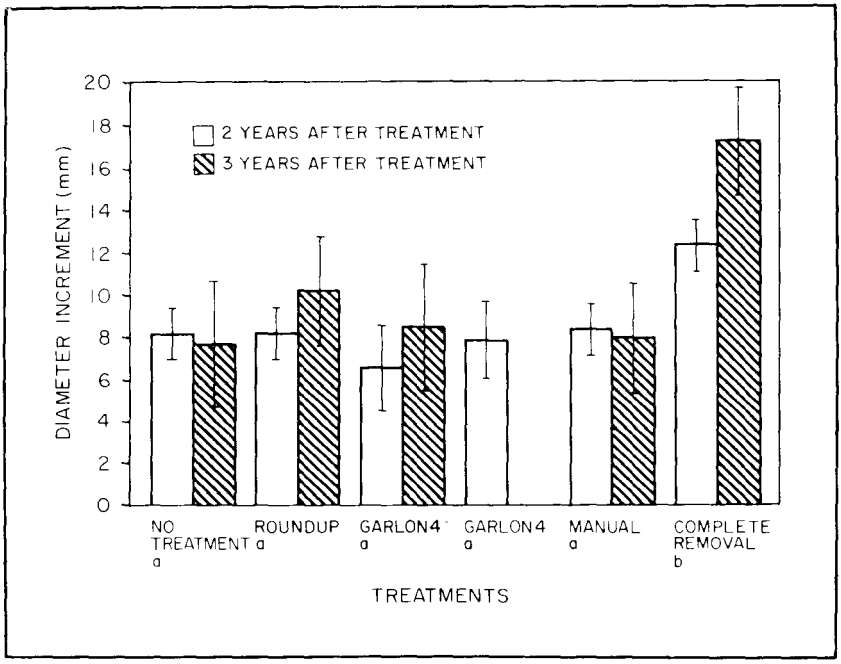

Figure 1. Mean diameter increments of Douglas-fir adjusted for pre-treatment size, 2 and 3 years after six release treatments in the Oregon and Washington Coast Range. Two-year data are averaged from six sites and 3-year data are averaged from three sites. Lines on bars represent ± two standard errors. Treatments for a given year followed by the same letter are not significantly different ($\alpha = 0.05$).

other treatment. In the third year, diameter increment was 70-125% larger. Total diameter was 20-30% larger the second year and 40-50% larger in the third year.

Canopy coverage of shrubs and hardwoods (Fig. 2) was significantly less ($\alpha = 0.05$) on the Roundup® and complete removal treatments than on the other treatments in the second year. In general, increases in brush cover during the second and third years after treatment are accompanied by decreases in herb cover. However, total cover from brush and herbs combined has not changed greatly in any treatment since application except in the complete removal treatment.

Douglas-fir has not responded to treatment of Roundup®, even though significant brush cover reductions occurred. This observation may be a

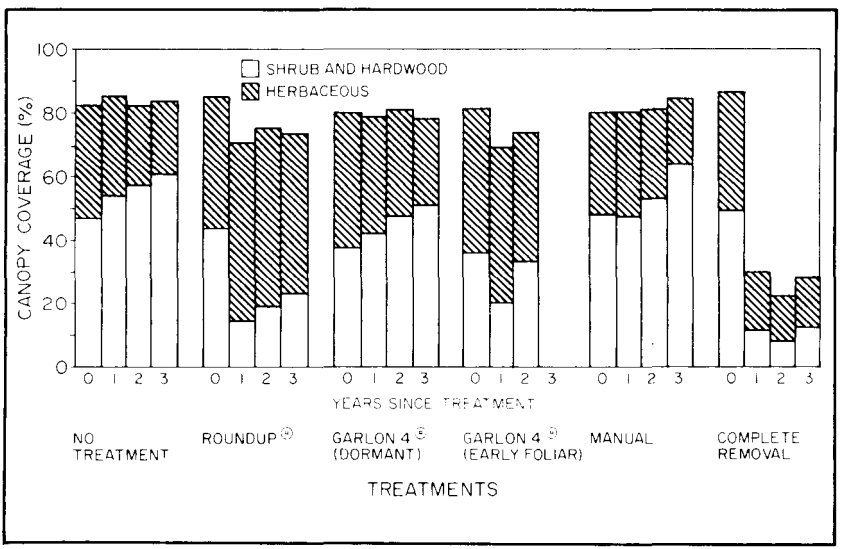

Figure 2. Canopy coverage (%) of shrub/hardwood vegetation and herbaceous vegetation through 3 years after the application of six release treatments in the Oregon and Washington Coast Range.

result of either herbicide injury or herb competition. To determine if herbicide injury was involved in the Roundup® treatment, an additional set of specimen trees, not protectively bagged during Roundup® application, was measured in the complete removal treatment. A t-test comparison of sizes for bagged versus unbagged trees in the complete removal treatment showed no significant differences, thus suggesting that herbicide injury was not suppressing a growth response in the Roundup® treatment.

A regression analysis is underway to examine growth of individual trees in relation to the surrounding cover of brush and herbs. It is believed that this analysis may explain better the growth responses observed. This summer during field measurement of three sites, Douglas-fir xylem potential will be measured with a pressure chamber on the Roundup®, complete removal, and no treatment plots to determine possible differences in moisture stress among the treatments.

Screening Trials

The first CRAFTS screening trials were initiated this past year. The objective of these trials is to provide information on the efficacy and selectivity of various vegetation management treatments on individual species and species complexes associated with Pacific Northwest forests. The trials are designed to compare the effects of timing, application method, treatment combinations, and frequency of application of chemical and non-chemical treatments, as well as types, rates, and formulations of chemical methods only.

Prospectuses describing screening trials on bigleaf maple and scotch broom were distributed to cooperators this year. Each prospectus outlined a set of methods and proposed treatments for each trial. Interested cooperators with potential study sites were gathered to participate in each trial.

Five sites in the Cascades and Coast Ranges of Oregon and Washington were selected for the trial on bigleaf maple sprout clumps. The participating cooperators and study site locations are near Alsea, OR (Willamette Industries, Inc.), Centralia, WA (Boise Cascade Corp.), Roseburg, OR (Lone Rock Timber), Springfield, OR (Weyerhaeuser Co.), and Vaughn, OR (International Paper Co.).

The bigleaf maple screening trial will test four herbicides, three timings, and two methods of application as well as a manual cutting treatment. The first series of treatments are scheduled for application this spring.

A search for study sites and participating cooperators to conduct the scotch broom trial is still underway and will continue into the coming year. In addition, new screening trial prospectuses addressing other species and species complexes will be distributed to cooperators in the next year.

Site Preparation Alternatives in Southcentral Oregon

A study examining the effects of six alternative site preparation treatments in southcentral Oregon has been completed by Darrel Ross and Jack Walstad. Treatments included a logged-only control, ripping, brushblading, disking, chemical, and chemical followed by disking. The study involved the remeasurement of the plots eight growing seasons after establishment. Each treatment was evaluated based on changes in selected soil chemical and physical properties, the response of non-coniferous vegetation, and the survival and growth of planted pines.

Soil samples were analyzed for total N, total S, total C, and extractable P. Bulk density also was determined for each sample. In general, the brushblade and chemical/disk treatments caused the greatest reduction in nutrient levels and the greatest increase in bulk density when compared to the control (untreated) and other treatments.

The greatest differences in the amount of non-conifer vegetation among site preparation treatments were observed at the low-elevation site (East Aspen), which supported an established shrub community prior to treatment. Total above-ground biomass of shrubs was highest on the control plot. Ripping had the second highest shrub biomass, followed by the disk, brushblade, chemical, and chemical/disk treatments, respectively. Plant communities at the higher elevation sites (Swede Cabin and Camp Nine) were primarily composed of grass, sedge, and forb species with scattered shrubs. In general, the control and rip plots had the highest canopy coverage of herbaceous vegetation at these sites, followed by the brushblade, disk, chemical/disk, and chemical treatments.

Pine survival was satisfactory for all treatments, except the rip and untreated plots at East Aspen and Swede Cabin. However, survival was low for all treatments at Camp Nine.

Table 1. Ponderosa pine survival and growth at the East Aspen site after eight growing seasons following each of six site preparation treatments.[1]

Site preparation treatment	Survival (%)	Diameter[2] (mm)	Total height (cm)	Current annual height increment (cm/yr)	Crown volume (m^3)	Total above-ground biomass[3] Bareroot (kg)	Plug (kg)
Chem/disk	87 a	54.6 a	178.8 a	32.6 a	0.908 a	1.819 a	1.841 a
Chemical	78 a	50.5 a	173.4 a	33.4 a	0.762 a	1.691 a	1.468 ab
Disk	79 a	42.5 b	144.4 b	28.8 a	0.499 b	1.052 a	0.996 bc
Brushblade	79 a	35.1 c	113.8 c	22.9 b	0.302 c	0.492 b	0.658 c
Rip	62 ab	24.9 d	87.8 d	20.1 bc	0.125 d	0.371 b	0.162 d
Control	30 b	16.2 e	65.0 d	15.3 c	0.049 d	0.118 c	0.060 e

[1] Within a column, values that are followed by the same letter are not statistically different at the 0.05 level of significance by the protected LSD procedure.
[2] Diameters were measured at 10 percent of the total height of each tree.
[3] The stock types were analyzed separately, because the stock type by site preparation interaction was significant ($P < 0.05$) for total above-ground biomass.

The greatest differences in conifer growth among site preparation treatments occurred at East Aspen (Table 1). At this site, the chemical/disk and chemical treatments resulted in a substantial in-

crease in height growth compared to the control. Disking, brushblading, and ripping also increased height growth, but to a lesser extent. All of the treatments, except ripping, were equally effective at Swede Cabin in increasing height growth compared to the control. At Camp Nine, the effect of treatments with respect to height growth was the same as that at East Aspen, although the magnitude of the differences was less.

The results of this study indicate the importance of controlling competing vegetation in order to achieve maximum survival and early growth of planted pines in southcentral Oregon. A comprehensive report of this study is currently in preparation.

Development of an Interspecific Competition Index

The first year of a five-year study was completed for the Siuslaw National Forest by Bob Wagner and Steve Radosevich. The purpose of the study is to develop an interspecific competition index that will assist foresters in assessing the effects of vegetative competition on the growth and survival of young Douglas-fir. The index is calculated from simple vegetation measurements around individual trees that can be obtained from routine plantation exams.

The study is being accomplished in two concurrent phases. Phase I utilizes existing site preparation experiments on the Siuslaw National Forest. These studies were established over the past decade by Dr. William Stein of the Pacific Northwest Forest and Range Experiment Station. Nine study sites were selected from these experiments that range in age from 4 to 9 years and compare as many as six site preparation treatments. Data collected from these

sites in the past year are being used to construct a regression model that utilizes the best interspecific competition index to predict the size of young Douglas-fir. Growth models for the major shrub and hardwood species encountered on these sites also will be developed during this phase of the study. A final project report for Phase I is scheduled for completion in August 1986.

Phase II, also established this year, is designed to test and refine the model developed during Phase I. Phase II will focus on 1- to 5-year-old Douglas-fir plantations in salmonberry (Rubus spectabilis) dominated communities on the Siuslaw National Forest. Light and soil moisture availability in the seedling environment under various levels of the competition index also will be examined.

Four new study sites with uniform salmonberry cover were selected. Two of the sites are located in the Picea sitchensis zone and two are located in the Tsuga heterophylla zone. In each zone, one site lies on a south aspect and the other on a north aspect. The salmonberry on each of the sites was cut at the ground level and planted with 2+0 Douglas-fir. Seven treatments will be maintained on seven 400 m^2 plots on each site (Figure 3). These treatments will allow examination of individual Douglas-fir growth responses and environmental resource availability under a wide range of competition levels.

Completion of this study will allow the integration of growth models for the major shrub and hardwood species with a regression model that predicts growth and survival losses of Douglas-fir under various levels of vegetative competition. Thus, foresters may quantify potential gains or losses in plantation development by managing associated vegetation.

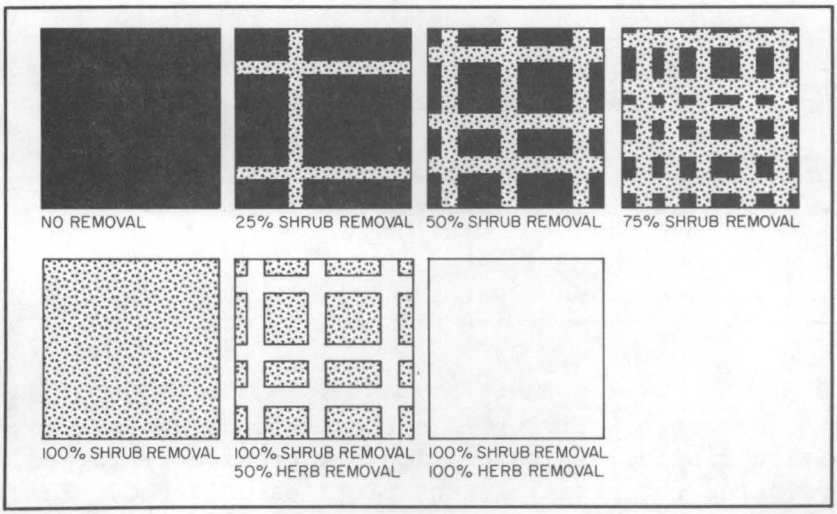

Figure 3. Seven levels of vegetation manipulation applied to 400 m^2-plots on which Douglas-fir seedlings have been planted. The study sites are located in salmonberry (Rubus spectabilis) dominated communities on the Siuslaw National Forest for the development of an interspecific competition index.

Interference Between Douglas-fir and Red Alder in the Coast Range

The initial phases of a long-term study to explore the possible interactions between Douglas-fir and red alder are underway. The project, directed by Steve Radosevich and Dave Hibbs, utilizes both replacement series and Nelder experiments to examine the intraspecific and interspecific relationships between the two tree species. Three study sites have been selected which represent a range of forest productivity and fertility levels common to the Pacific coast mountain ranges (Table 2).

Table 2. Description of three study sites for Douglas-fir and red alder interference experiments.

Site location	Agency	Estimated site index	Probable fertility level
Belfair, WA (proximity)	Washington Dept. of Natural Resources	90	low
H.J. Andrews Experimental Forest	USFS	100	medium
Cascade Head Experimental Forest	USFS	120	high

Research activity is currently underway at the Belfair site. This location was previously logged, prepared for planting, and plots established. The planting of both tree species, installing of neutron probe access tubes for soil moisture determination, and sampling for initial soil nutrient content was accomplished during the winter and spring of 1985. The other sites will be logged and prepared for study this summer and autumn.

The replacement series approach is being used in these experiments. The total density of trees in each experiment remains constant (435 trees/acre), but the proportions of each species varies in mixed stands (Table 3). Because it is possible that the greatest yield advantage or least competitive effect may occur when Douglas-fir planting precedes red alder planting, each experiment includes some treatments in which red alder planting is delayed for five years. In addition, other treatments are included in which red alder will be removed from a 0.5/0.5 mixture after 5 and 10 years.

Fluctuations in soil moisture and radiant energy (light) will be measured twice during each growing season. Patterns of biomass accumulation, allocation, and canopy development of each species will be measured annually. Soil and foliar nitrogen also are being measured once a year.

Table 3. Description of treatments for examining interactions between Douglas-fir (DF) and red alder (RA).

Treatment	Planting time		RA removed	Proportion		Density (trees/plot)		Spacing
	DF	RA	Year	DF	RA	DF	RA	(ft)
1	Immediate	--	--	1.0	0	80	0	10 x 10
2	Immediate	Immediate	--	0.90	0.10	72	8	10 x 10
3	Immediate	Delayed	--	0.90	0.10	72	8	10 x 10
4	Immediate	Immediate	--	0.75	0.25	60	20	10 x 10
5	Immediate	Delayed	--	0.75	0.25	60	20	10 x 10
6	Immediate	Immediate	--	0.50	0.50	40	40	10 x 10
7	Immediate	Delayed	--	0.50	0.50	40	40	10 x 10
8	Immediate	Immediate	5	0.50	0.50	40	40	10 x 10
9	Immediate	Immediate	10	0.50	0.50	40	40	10 x 10
10	Immediate	Immediate	--	0.25	0.75	20	60	10 x 10
11	Immediate	Delayed	--	0.25	0.75	20	60	10 x 10
12	--	Immediate	--	0	1.0	0	80	10 x 10
13	--	Delayed	--	0	1.0	0	80	10 x 10
14	Immediate	--	--	1.0	0	40	0	14 x 14
15	--	Immediate	--	0	1.0	0	40	14 x 14

Projects by Graduate Students

Several new graduate student projects were initiated or planned over the last year. These projects are often sponsored jointly by CRAFTS, FIR, FRL, and other organizations such as the U.S. Forest Service and USDA. Since these projects are of direct interest to the Cooperative and are co-sponsored by it, they are described briefly here.

Competitive Interactions Between Douglas-fir and Red Alder Seedlings: Resource Use, Physiology, and Growth Analysis

Graduate Student: Laura J. Shainsky, M.S. Univ. of Calif., Davis
Major Advisor: S.R. Radosevich
Degree Sought: Ph.D.

Quantitative approaches are needed to assess the underlying mechanisms and relative importance of intraspecific and interspecific competitive interactions. Models will be developed to predict conifer growth under different environmental conditions and competitive regimes. Douglas-fir and red alder seedlings have been interplanted in a systematic design with varying species proportions and densities. Relative growth rates and biomass allocation patterns of both species will be measured to assess their responses to the competitive regimes. Soil moisture depletion, water potential patterns, and light interception by the canopies will be measured in order to quantify possible resource limitations mediating the competitive interactions. Analysis of patterns of photosynthetic rates and leaf water potential of each species may provide useful and correlative information on physiological performance under competitive regimes.

Comparative Strategies of Physiology and Biomass Partitioning Between Douglas-fir and Red Alder

Graduate Student: Samuel Chan, M.S. Oreg. St. Univ.
Major Advisors: J.D. Walstad and S.R. Radosevich
Degree Sought: Ph.D.

The comparative physiological strategies and subsequent biomass partitioning responses of individual Douglas-fir and red alder seedlings will be determined. The trees will be subjected to various levels and combinations of radiant energy (light) and soil moisture. The subsequent physiological and biomass responses of the trees then will be assessed. The specific hypothesis being explored is that site resource availability (i.e., radiant energy and soil moisture) and the relative ability of red alder and

Douglas-fir to use these resources, ultimately affects tree physiology, growth, and yield. Information from this study is necessary to understand the mechanisms and tactics employed by these species in response to resource availability and competition. This experiment is tied closely to that being conducted by L.J. Shainsky (above).

Characterization of Growth by Douglas-fir and Red Alder Seedlings

Graduate Student: Pamela Bold, B.S. Oreg. St. Univ.
Major Advisors: S.R. Radosevich and D.E. Hibbs
Degree Sought: M.S..

A study to develop allometric equations describing the growth of Douglas-fir and red alder seedlings is being conducted near Belfair, Washington. From these equations we plan to examine the growth of four tree components: total biomass, root biomass, shoot biomass, and leaf area. In addition to conventional independent variables used for predicting biomass (diameter and height), the potential validity of two other independent variables (density and species proportion) are being examined. The seedlings are being grown in three plant densities and in two species proportions. By destructively sampling a fraction of the seedlings after each growing season for two years, regression equations will be generated to test the importance of density and proportion on the growth of the seedlings. This information is needed to apply the growth relationships to the trees in the interference study being conducted by Drs. Radosevich and Hibbs on that site.

Population Growth and Demographics of Salmonberry and Thimbleberry

Graduate Student: Bruce Maxwell, M.S. Mont. St. Univ.
Major Advisor: S.R. Radosevich
Degree Sought: Ph.D.

Salmonberry and thimbleberry are major associates of Douglas-fir seedlings on most clearcuts in the Coast Range. Little is known about the autecology or the demography of either species. A major problem of managing young plantations is predicting the rate at which each species will enter a competitive stature and density. Management of salmonberry and thimbleberry could be improved if their future density, growth, and reproductive ability could be predicted.

The relationships between plant density and growth will be investigated in planted monoculture populations of salmonberry and thimbleberry. The growth characteristics along with demographic data from planted populations and wild populations will be used to develop population projection matrix models which predict the numbers of individuals in different age or size classes over time. The models will be used to examine population dynamics and identify stages in the life cycle that are critical to population growth, species abundance and, thus, management. The proposed matrix models will be based on reproductive rates, survivorship, and growth characteristics of salmonberry and thimbleberry ramets.

Pinegrass and Douglas-fir Competition

Graduate Student: Allison Nicholson, B.S. Univ. of Victoria, B.C.
Major Advisor: S.R. Radosevich
Degree Sought: M.S.

Current information suggests that mechanisms of interference (competition) between pinegrass (Calamagrostis rubescens) and Douglas-fir seedlings are not understood clearly enough to ensure successful reforestation of many dry, southern interior sites of British Columbia. The two factors which appear to be lacking are soil moisture data and information regarding the relative abilities of pinegrass and conifer seedlings to obtain water. Information of this type is basic to successfully enhancing soil moisture availability, integrating use of a common resource, and predicting regeneration on pinegrass sites. Thus, research is being directed toward meeting two objectives: (1) assess the relationships between temperature and moisture conditions, grass abundance, and Douglas-fir seedling survival and growth; and (2) determine the water status of pinegrass and Douglas-fir seedlings within various competitive regimes.

In order to study the occurrence of competition and to approximate the critical level of pinegrass for optimal survival and growth of Douglas-fir seedlings, a replacement series experiment has been established in the Caribou Region (Williams Lake) of

British Columbia. The total relative density or yield of the species mixtures will remain constant and the treatments will refer to varying relative proportions or ratios of the two species. To determine the effects of intraspecific and interspecific competition, the total yield of each species in the treatment mixtures will be compared to the yield of each species in monoculture. Survival of Douglas-fir and absolute and relative growth rates of Douglas-fir and pinegrass will be determined. In addition, water-use patterns of the two species at various competitive regimes will be compared.

Competitive Effects of Whiteleaf Manzanita Growing with Douglas-fir and Ponderosa Pine in Southwest Oregon

Graduate Student: Diane White, M.S. Univ. of Calif., Davis
Major Professor: Michael Newton
Degree Sought: Ph.D.

The difficulty of establishing conifer plantations in southwest Oregon has been apparent for several years. The difficulty stems from hot, dry summers and an abundance of highly competitive shrub species. This study (in association with FIR) was installed in 1982 in a 2-year-old conifer plantation that contained high numbers of whiteleaf manzanita germinants. Rectangular plots were established with spacings of manzanita ranging from 0 (conifers only) to one every 0.38 m. At the spacing of one manzanita every 0.76 m there was an additional plot in which the native herb community was left intact. Seasonal soil moisture depletion began earliest in the plot that contained herbs. By midsummer the plots in which the conifers had no competitors had

significantly higher levels of soil moisture than the other plots. Over the season the xylem sap tension (water stress) of all three species increased. Pine consistently had lower values of xylem sap tension than Douglas-fir or manzanita. This suggests that the pines responded more quickly to reduced moisture than the fir or manzanita. Measurements of stomatal resistance show pines to have higher resistances. Treatment effects indicate that the conifers growing in competition with manzanita have higher xylem sap tension than conifers growing alone. Addition of herbs to the manzanita resulted in the highest levels of xylem sap tension and stomatal resistance. Impacts on conifer growth are significant. Conifers growing with no competition have doubled in size every year.

Site Preparation for Pines in Hot, Dry Climates of Oregon and Mexico

Graduate Student: Miguel Capo-Arteaga, M.S. Facultad de Ciencias-UNAM
Major Professor: Michael Newton
Degree Sought: Ph.D.

The site preparation requirements of pines under hot, dry regimes are being studied. Five pine species are being tested under four levels of competition by shrubs and herbs. The following treatments were applied before planting: (1) hand slashing, (2) hand slashing plus simazine, (3) total vegetation control with herbicides, and (4) no treatment. One-year-old container seedlings of P. aracahuite var. brachyptera, P. pseudostrobus, P. lambertiana, P. ponderosa, and P. hartwegii were planted in January 1985. Two aspects were chosen (south/north) for study in each of two locations (SW Oregon and NE Mexico).

Observations on tree growth rate and survival are being conducted and will be related to soil moisture and temperature levels created by site preparation treatments. This experiment will contribute to our understanding of the rehabilitation needs of many pine species and assist Mexican foresters in interpreting published data from the USA.

Root Death and Turnover on Tanoak After Shoot Removal

Graduate Student: Glenn Ahrens, B.S. Humbolt St. Univ.
Major Professor: Michael Newton
Degree Sought: M.S.

A study to examine root maintenance and seasonal death after shoot removal of tanoak is being planned. The objective of the study is to evaluate the quantity and spatial pattern of root death and turnover on mature and sprouting tanoak in response to shoot removal. Relations between leaf area, root parameters, and soil moisture will also be examined.

Tanoak and Douglas-fir Competition

Graduate Student: Tim Harrington, M.S. Oreg. St. Univ.
Major Professor: John Tappeiner
Degree Sought: Ph.D.

A study concerning tanoak competition with Douglas-fir was established in southwestern Oregon in association with the FIR project. A two-year-old

tanoak sprout stand containing a Douglas-fir plantation was thinned to produce four levels of competition: 0, 25, 50, and 100% of the untreated tanoak crown cover. Second-year results of this experiment reveal a strong relationship between Douglas-fir diameter and tanoak percent cover or estimated leaf area index ($r = -0.80$). Removal of herb and shrub competition caused a significant increase ($\alpha = 0.05$) in fir stem volume only in the complete tanoak removal treatment.

Educational Activity

Another important mission of the CRAFTS program is to facilitate the transfer of new knowledge and technology.

Textbook on Forest Vegetation Management

For the past several years, a national effort has been underway to prepare a textbook on forest vegetation management. The project has been coordinated by Jack Walstad of Oregon State University and Peter Kuch of the Environmental Protection Agency (EPA). Financial support for the work has been provided by CRAFTS, EPA, the National Agricultural Pesticide Impact Assessment Program (NAPIAP) of the USDA, and several universities. Seventeen authors from across the U.S. are contributing chapters to the text (see Appendix 1). Most of the chapters have been drafted and will be subjected to technical peer review this summer. The target date for publication of the textbook is 1986. It should be useful to forestry students, professional foresters, administrators, regulatory officials, and others interested in forest resource management.

Extension Annual Meeting

In December 1984, the CRAFTS program was asked to describe its current research activity at the annual Extension meeting at Oregon State University. This meeting consisted of various extension administrators, specialists and county agents. Steve Radosevich discussed the general goals and objectives of the Cooperative. Bob Wagner, Tim Harrington, Mike Newton, and Dave Hibbs also made presentations concerning specific research projects being conducted and associated with the CRAFTS program.

Workshop on Forest Vegetation Management

"We just have to have this kind of information input from the University," said a U.S. Forest Service employee after attending a workshop on vegetation management at Oregon State University. He was one of 120 professional foresters who gathered at OSU February 19-21 for the workshop.

The workshop covered all aspects of vegetation control. One session was devoted to non-chemical methods, including grazing, fire, and mulching. Another focused on individual weed species and the most effective methods for control. Forest scientists from OSU, as well as experts from public and private forest management, delivered a series of talks ranging from the theory and biology of competition to pragmatic concerns, such as maximizing the safety of various control techniques. Workshop participants also shared their own research results and insights in an open session. Participants and leaders alike left the workshop with new strategies and ideas.

New Report Format

During the past year, the CRAFTS staff developed a new report format for distributing interim and final project results to cooperators. The first two reports were distributed last November and described the two-year effects of six release treatments on major brush species and the growth and survival of Douglas-fir in the Oregon and Washington Coast Range (Figure 4). We believe this new report format, combined with a newly created mailing list of all technical forestry personnel in each cooperating organization, will facilitate communication of research results and enhance technology transfer through the Cooperative.

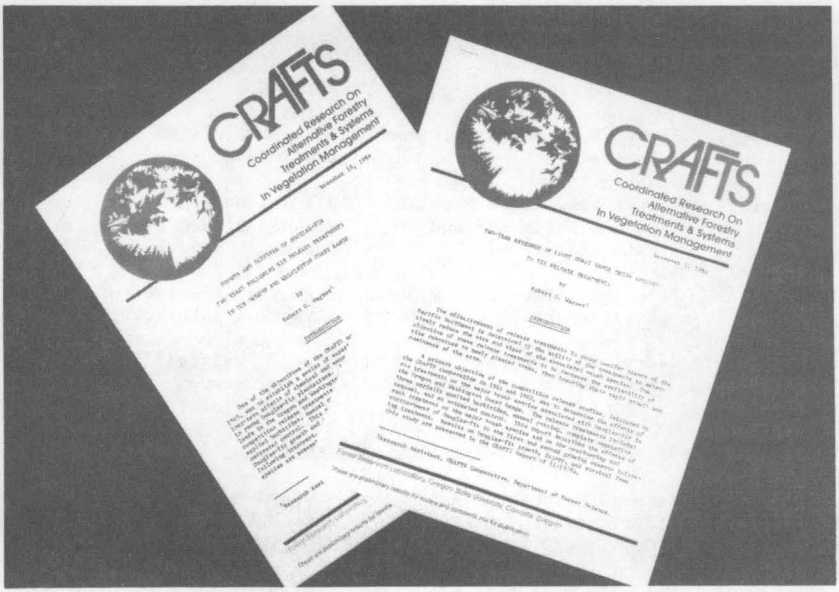

Figure 4. Two CRAFTS reports displaying the new cover format.

Appendix 1

Tentative Table of Contents for Textbook

Forest vegetation management for conifer production
by John D. Walstad and Peter J. Kuch (editors).

TOPIC	AUTHORS
Preface and Acknowledgments	John D. Walstad Peter J. Kuch
Section I. FOREST VEGETATION MANAGEMENT PERSPECTIVES	
Chapter 1. Introduction	John D. Walstad Peter J. Kuch
Chapter 2. Forest Vegetation Problems in the Northwest	John D. Walstad Michael Newton Raymond J. Boyd, Jr.
Chapter 3. Forest Vegetation Problems in the South	Dean H. Gjerstad Bradford L. Barber
Chapter 4. Forest Vegetation Problems in the Northeast and Lake States	Michael Newton Maxwell L. McCormack, Jr. Robert L. Sajdak
Chapter 5. Principles Governing Plant-Environment Interactions	Steven R. Radosevich Katherine Osteryoung
Chapter 6. Overview of Vegetation Management Alternatives	John D. Walstad Michael Newton Dean H. Gjerstad
Section II. CONIFER RESPONSE TO VEGETATION MANAGEMENT	
Chapter 7. General Principles and Patterns of Conifer Growth and Yield	Shepard M. Zedaker Harold E. Burkhart Albert R. Stage
Chapter 8. Loblolly Pine Response to Vegetation Management	Harold E. Burkhart Peter T. Sprinz Glenn R. Glover
Chapter 9. Douglas-fir Response to Vegetation Management	J. Douglas Brodie John D. Walstad
Chapter 10. Mixed Conifer Response to Vegetation Management	Albert R. Stage Raymond J. Boyd, Jr.

Appendix 2

Publications and Papers by CRAFTS Personnel (1984-85)

Books, Journal Articles, and Other Publications

Howard, K.M., and M. Newton. 1984. Overtopping by successional Coast Range vegetation slows Douglas-fir. Journal of Forestry 82(3):178-180.

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Appendix 3

Publications and Papers Prepared by CRAFTS Personnel (1981-84)

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Smith, N.J. 1983. Effects of density stress and soil production on size, mortality, and nitrogen fixation in artificial populations of seedling red alder. Ph.D. dissertation, Oregon State University, Corvallis, Oregon.

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Appendix 4

Financial Support Received in 1984-85

Cooperators	Financial support	
Boise Cascade Corporation	$ 4,500	
Bureau of Land Management	4,500	
Champion International Corporation	4,500	
Crown Zellerbach Corporation	4,500	
International Paper Company	4,500	
Lone Rock Timber Co.	2,225	
ITT-Rayonier, Inc.	4,500	
Longview Fibre Company	4,500	
MacMillan Bloedel Limited	4,500	
Oregon State Department of Forestry	4,500	
Publishers Paper Company	4,500	
Rex Timber	4,500	
Starker Forests, Inc.	2,225	
USDA Forest Service, Pacific Northwest Forest and Range Experiment Station	--[1]	
Washington Department of Natural Resources	4,500	
Weyerhaeuser Company	4,500	
Willamette Industries, Inc.	4,500	
Subtotal		$ 67,500
Forest Research Laboratory, Oregon State University		88,458
Subtotal		$155,958
Other sources[2]		
EPA/USDA Forest Service,[3] NAPIAP Program (Walstad)	$116,400	
USDA, Siuslaw National Forest[3] (Radosevich)	30,790	
USDA, Forest Service NAPIAP Program (Radosevich)	15,388	
USDA, Forest Service NAPIAP Program (Radosevich)	13,200	
Subtotal		$175,778
Total		$331,736

[1] Support given by in-kind contributions.

[2] Leader for project funded shown in parentheses.

[3] Includes university overhead.

Forest Research Laboratory
Oregon State University
Corvallis, OR 97331-5704

Address Correction Requested