Hardwood Silviculture Cooperative

Annual Report 1990-1991

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# Highlights of 1990-1991

## Contents

## Introduction

## Organizational Activities

### Policy Committee meeting - June 1990

At our June 1991 meeting (Oregon State University, Lasell-Stewart Center, Corvallis), the Policy Committee reviewed the final report on the alder existing data base and a progress report on the stand management project.

An overview was given, outlining research goals and an approach to meeting them in the Red Alder Stand Management Study. It was determined that many topics identified in the overview can be investigated without new resources at this time; HSC Staff can identify important questions and provide preliminary answers via synthesis of past work and ongoing studies. These topics include growth and yield model form, linkages between stages of stand development, diameter and height growth prediction, and site quality evaluation.

Pruning and wood quality, along with density related changes in stem form and allometrics, were identified as worthwhile topics for allocation of new HSC resources. The estimated carryover in the 1990-1991 budget ($8,928) was made available for cooperative work on pruning/wood quality and stem form/allometrics, involving the HSC, the PNW research station, and Weyerhaeuser Co.. HSC Staff were directed to prepare study plans for review by the Technical Committee. The meeting concluded with review and approval of the annual budget.

**Technical Committee meeting - March 1991**

The Technical Committee met on March 5 in Mt. Vernon, Washington. The agenda for this meeting included an update and overview of the Red Alder Stand Management Study, presentation and discussion of the Alder Wood Quality and Stem Form study plan, and an education session on evaluating site quality for alder. On the morning of March 6, we had a tour of two alder plantation installations (Goodyear Nelson Hardwood Lumber Co.) and one alder thinning installation (Washington DNR).

## Cooperative Research

Cooperative research emphasizes Cooperative-funded studies of hardwood management.

**Alder Stand Management Study**

The alder stand-management study was initiated in July 1988 with the general goal of improving the information base for management of alder stand density and composition. Our long-term goal is to produce a high-quality data base for predicting growth and yield in managed alder stands. Our major task at this stage is the establishment of new research installations (described below) to provide the managed stand data base.

It will take many years for new research installations to produce a complete data set. In the interim, we are proceeding with model development and testing using existing data sets from alder spacing studies and natural stands. As

part of this effort, we are working with the CRAFTS Cooperative at OSU on the development of stand-establishment-phase growth models for alder. This interim effort will provide guidelines for density management and for the collection and analysis of the long-term data base.

Two important purposes are served by Cooperative efforts to establish Alder Stand Mangement Study installations: 1) A consistent set of plots will be established to provide high-quality data and 2) Each Cooperator will develop a successful program for alder regeneration and silviculture within their particular operational environment. The early stages of this study have already produced important syntheses of operational and theoretical information about alder regeneration and stand management.

**Installations** - Two types of pure alder installations are incorporated in the plan: 1) manipulations in existing stands (Type 1 installations) and 2) manipulations of new plantations (Type 2 installations). Installations of both types are stratified by region (Table 2) and alder site index class. Thinning will be done at each of three different ages of entry: 1) age 3 to 5 years, 2) when trees have 4.6 to 6.1 m (15 to 20 ft.) height-to-live-crown, and 3) when trees have 9.1 to 9.8 m (30 to 32 ft.) height-to-live-crown. A list of installations is given in Table 2.

Table 2a. Red alder stand management Type1 study installation goals and progress by year, Region, and Cooperator.

**Type 1 installations**

| Installation[1] # | Year | Region[2] | Location | Cooperator |
|---|---|---|---|---|
| **Established installations** | | | | |
| 4101 | 1989 | 4 | Seshelt, B.C. | B.C. Ministry of Forests |
| 2101 | 1990 | 2 | Beaver, OR | Siuslaw National Forest |
| 4102 | 1991 | 4 | Sedro Woolley, WA | Washington DNR |
| **Potential installations** | | | | |
| 4103 | 1991 | 4 | B.C., Vancouver Island | Norvik Timber Inc. |
| 4104 | 1991 | 4 | B.C. Mainland | Norvik Timber Inc. |
| 2102 | 1993 | 2 | Coos Bay, OR | BLM or Diamond Wood Products |

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[1] Installation # 1st digit=Region, 2nd digit=installation Type
3rd and 4th digit = number of installation, chronological order of establishment within Region and Type

[2] Physiographic regions of the Pacific Northwest:
1 - Sitka spruce zone north of the Olympic Penninsula
2 - Sitka spruce zone south of the Olympic Penninsula
3 - Coast Ranges, Oregon and Washington
4 - North Cascade foothills and B.C. Coast Ranges
5 - South Cascade foothills
6 - Puget Sound glacial trough

Table 2b. Red alder stand management Type 2 study installation goals and progress by year, Region, and Cooperator.

**Type 2 installations**

| Installation # | Year | Region | Location | Cooperator |
|---|---|---|---|---|
| **Established or planted installations** | | | | |
| 4201 | 1989 | 4 | Sedro Woolley, WA | Goodyear Nelson Hardwood Lumber Co. |
| 4202 | 1990 | 4 | Sedro Woolley, WA | Goodyear Nelson Hardwood Lumber Co. |
| 3201 | 1990 | 3 | Philomath, OR | Siuslaw National Forest |
| 3202 | 1990 | 3 | Longview, WA | Weyerhaeuser Company |
| 2201 | 1990 | 2 | Aberdeen, WA | Weyerhaeuser Company |
| 5201 | 1990 | 5 | Packwood, WA | Gifford Pinchot Natl. Forest |
| 1201 | 1991 | 1 | Forks, WA | Washington DNR |
| 2202 | 1991 | 2 | Hebo, OR | Siuslaw National Forest |
| **Potential installations** | | | | |
| 4203 | 1992 | 4 | B.C. Vancouver Is. | B.C. Ministry of Forests |
| 4204 | 1992 | 4 | B.C. Vancouver Is. | B.C. Ministry of Forests |
| 3203 | 1992 | 3 | Apiary, OR | Oregon Dept. of Forestry |
| 3204 | 1992 | 3 | Toledo, OR | Diamond Wood Products |
| 5202 | 1992 | 5 | Randle, WA | Gifford Pinchot Natl. Forest |
| 3205 | 1993 | 3 | Yamhill, OR | Bureau of Land Management |

The Cooperative is also interested in establishing controlled mixtures of red alder and Douglas-fir on sites where productivity is low due to low available nitrogen supplies (Douglas-fir site class III and IV). Currently, we are planning to establish at least six Type 1 installations, 25 Type 2 installations, and eight mixed alder/Douglas-fir installations before 1996.

Specific goals and expectations have been formulated for each Cooperator to help ensure that the Region-by-Site Index sampling matrix is filled from the diverse Cooperative ownerships.

**Field Manual** - Substantial editing and revision of the Field Manual has occurred since the first draft in January 1989. After our experiences with the first installations, we made a summary of major issues pertaining to experimental design and installation establishment protocol (sent to the Technical Committee for review in February 1990). Appropriate revisions have been made and the Final Draft (June 1990) is available on request.

**Data management** - The field manual contains standard forms and specific instructions for field records of pre-establishment, establishment, and remeasurement surveys. Computer input and data storage formats for each form type have been established and documented using Foxbase software (Foxbase Software Inc., Perrysburg, Ohio.) in cooperation with the Forest Science Department Quantitative Sciences group at OSU. Computer programs for producing remeasurement data forms containing previous data and identifiers are currently written for SAS (SAS Institute Inc., Cary, North Carolina) statistical software for use with ASCII (American National Standard Code for Information

Interchange) or SAS data files.

In summary, major activities in 1990-1991 included:

1) Establishment of two Type 1 and two Type 2 installations (see Table 2).

2) Completion of a report "Red alder - guidelines for successful regeneration".

3) Working with nursery managers to ensure communication of most current information and recommendations for alder seedling production.

4) Continued reconnaissance for future installation sites. In addition to established installations, four potential Type 1 sites and seven potential Type 2 sites have been located.

5) Cooperation with CRAFTS Cooperative in development of establishment-phase growth models for young alder and Douglas-fir.

**Alder wood quality and stem form**

In the last year, HSC Staff have put substantial effort into developing a new project to investigate the effects of stand management on alder stem form and wood quality (an outcome of the June 1990 Policy Committee meeting). There are two general goals for this work: 1) to provide immediate information about the effects of stand management on wood quality, and 2) to guide the design of future work on this topic on long-term research installations in the Stand Management Study.

This topic is being pursued in two separate studies described below.

**Lumber recovery study** - In the first study, HSC Staff took the opportunity to cooperate with the U.S.D.A PNW Lumber Quality Project on an

alder lumber recovery study that was in progress in northwest Washington. The PNW lumber recovery study was set up to characterize lumber volume and grade recovery as a function of tree and log diameter. Their plan was to sample natural stands in northwest Washington. The objectives for HSC efforts in this study were: 1) to evaluate effects of tree and stand characteristics on volume and grade recovery; 2) to examine effects of individual tree growth rate on lumber quality recovery; 3) link juvenile growth attributes with characteristics of merchantable size trees.

The major question we are asking is: For a given size of tree or log, how much does growth rate affect lumber recovery? In order to ask this question, we assisted in sampling to: 1) provide a range of diameter growth rates within each size class, 2) select and reference sample trees within logical stand units that cover a range of ages, and 3) characterize stand units and the relative position of sample trees within stands. Data collection has been completed for this study. Some analysis and preliminary reporting should be done by September 1991.

**Tree growth and branch pruning as a function of spacing -** In the second study, we plan to examine relationships between spacing and tree growth, growth allocation, crown dynamics, and stem form in existing long-term spacing studies. In alder, the most important component of wood quality is the recovery of furniture grade lumber. Several attributes of crown development interact to produce the major grade characteristics of alder lumber: the size and frequency of knots. The important attributes of the crown that resopond to spacing are the rate of crown lift, the frequency and size of branches, and the rate of self pruning. Our

plan is to quantify these crown attributes, along with stem taper and growth allocation. We will then analyze the way they respond to stand density. The methods employ some destructive sampling along with analysis of remeasurement data.

Characterizing the development of tree crowns is also important for predicting height and diameter growth in a basic tree growth model. From this study of crown dynamics, we also wish to determine what crown characteristics we should measure for inclusion in our managed stand growth and yield data-base.

The current plant calls for remeasurement of permanent plots during the winters of 1990-1991 and 1991-1992. Any destructive sampling and growth allocation measurements will be accomplished in summer 1992. The work will be done with a combination of graduate student, HSC Staff and PNW station efforts.

# Other Applied Research

This research is of interest to, but usually not funded directly by, the HSC. Cooperative members and their associates participate at their discretion through donations of land, labor or facilities.

**Riparian Zone Management Study (COPE)**

**Streamside Hardwood Filter Belts**

**Response of Red Alder to Intraspecific Competition**

**Cottonwood Clonal Screening in the Willamette Valley**

**Black walnut and black cherry plantation trials**

## Basic Research

## Educational Activities

### HSC Reports

The Cooperative produces reports and other documents for its members. The following have been completed to date:

Comparison of stand characteristics from long-term remeasured plots of red alder with yield table and growth model predictions

The Size-Density Relationship in Pure and Mixed Red Alder/Douglas-fir

stands and its Use in the Development of a Growth Model. Ph.D. thesis:

Red alder: guidelines for successful regeneration

Red alder stand management study field manual: final draft

**Workshops**

Evaluating Site Productivity for Red Alder was the topic of a presentation and discussion session at the March 5 Technical Committee meeting. Connie Harrington (U.S. Forest Service, Forestry Sciences Laboratory, Olympia, WA) and Paul Courtin (B.C. Ministry of Forests, Vancouver, B.C.) presented results of their work on evaluating site productivity for alder based on topographic, geologic, edaphic, and climatic factors. Dale Cole (University of Washington, Seattle) presented results of recent work on changes in soil properties under alder and the effects on subsequent growth of planted alder (alder after alder).

**Presentations**

Establishment and management of red alder in the Pacific Northwest. Glenn R. Ahrens Oregon Department of Forestry, Annual Reforestation Conference. Tillamook, OR. July 17-19, 1990.

Control of Herbs and Other Weeds in Young Hardwood Plantations in the Pacific Northwest. Glenn R. Ahrens. Forest Vegetation Management Workshop: New Forests for Fiber and Wildlife. Corvallis, OR. January 23, 1991.

## Direction for 1990-1991

**Appendix 1: Publications**

Emmingham, W., Bondi, M. and D. E. Hibbs. 1989. Underplanting western hemlock in a red alder thinning: early survival, growth, and damage. New Forests 3:31-43.

Giordano, P. A. 1989. Growth and carbon allocation of red alder seedlings grown over a density gradient. M.S. Thesis, Oregon State University, Corvallis, OR. 129 p.

Hibbs, D. E., and A. A. Ager. 1989. Red alder: Guidelines for seed collection, handling, and storage. Special Publication 18. Forest Research Lab, Oregon State University, Corvallis, Oregon. 6 p.

Hibbs, D. E. and G. C. Carlton. 1989. A comparison of diameter- and volume-based stocking guides for red alder. West. J. Appl. For.
4(4): 113-115.

Hibbs, D. E., and K. Cromack, Jr. 1990. Actinorhizal plants in Pacific Northwest forests. In C. Schwintzer and J. Tjepkema (eds.), The Biology of Frankia and actinorhizal plants, pp. 343-363. Academic Press, New York.

Hibbs, D.E., Emmingham, W., and M. Bondi. 1989. Thinning red alder: Effects of method and spacing. For. Sci. 35(1): 16-29.

Lu, S. 1989. Seasonal and diurnal trends of leaf water conductance of red alder (Alnus rubra Bong) growing along a density gradient in western Oregon. M.S. Thesis. Oregon State University, Corvallis, Oregon. 95 p.

Peterson, W. C. and D. E. Hibbs. 1989. Adjusting stand density management guides for sites with low stocking potential. West. J. Appl. For. 4(2):62-65.

Puettmann, Klaus. 1990. The size-density relationship in pure and mixed red alder/Douglas-fir stands and its use in the development of a growth model. Ph.D. Thesis. Oregon State University, Corvallis, Oregon. 178 p.

**Appendix 2: Financial Support Received in 1990-1991**

| Cooperator | Support |
|---|---|
| Bureau of Land Management | $5,000 |
| British Columbia forest Service | 5,000 |
| Diamond Wood Products, Inc. | 3,000 |
| Forestry Canada | 3,000 |
| Gifford Pinchot National Forest | 5,000 |
| Norvik Timber Inc. | 5,000 |
| Oregon Department of Forestry | 5,000 |
| Siuslaw National Forest | 4,700 |
| Goodyear-Nelson Hardwood Lumber Co. | 3,000 |
| University of Washington[1] | - |
| USDA Forest Service Pacific Northwest Research Station[1] | - |
| Washington Department of Natural Resources | 5,000 |
| Weyerhaeuser Company | 5,000 |
| Subtotal | |
| Forest Products Laboratory, OSU | |
| Total | $ |

[1] In-kind contributions.