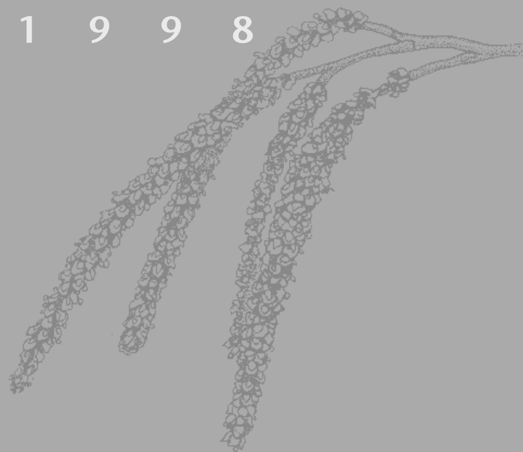
June 1998

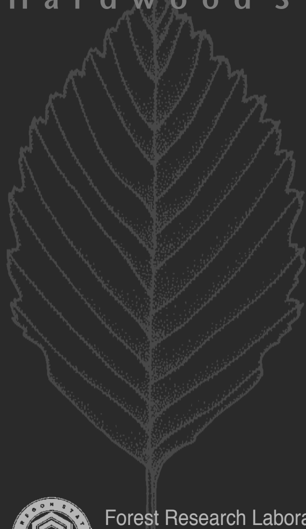


HSC

1997 - 1998

Annual Report

Hardwood Silviculture Cooperative



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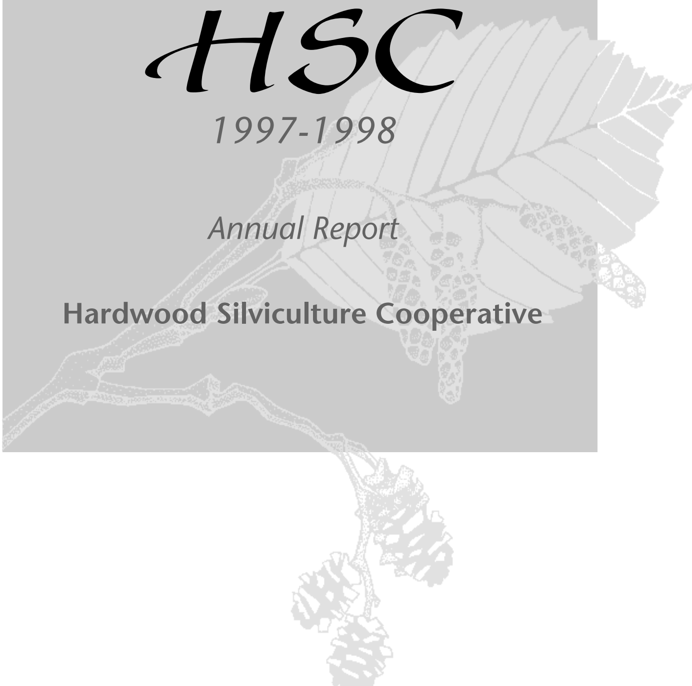


HSC

1997-1998

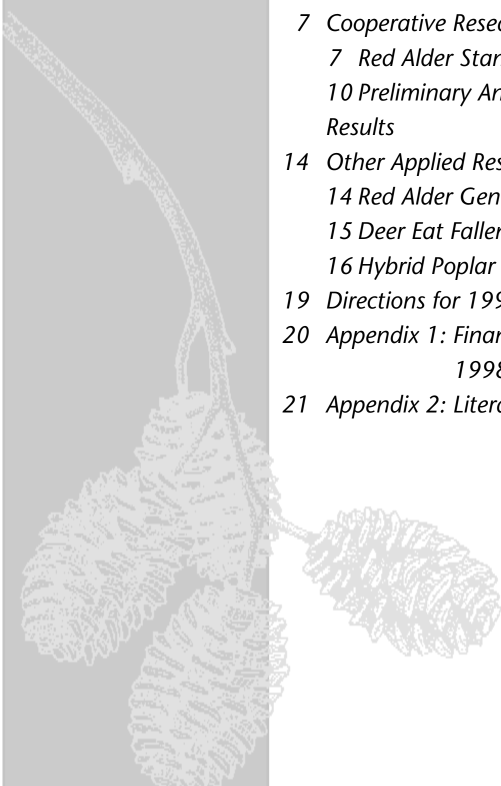
Annual Report

Hardwood Silviculture Cooperative

Highlights of 1997-1998

- We welcome the Washington Hardwood Commission as a new member. A special thanks is due them for going above and beyond the reasonable to reach an agreement with Weyerhaeuser Company for care of their HSC sites.
- Six years of data has been collected on 11 Type 2 (variable density) installations. With this data we have begun a comparison of growth between density treatments.
- Eight installations with non-member ownership were measured with the help of Siuslaw National Forest, Washington Hardwood Commission, Bureau Land Management-North Bend District, and Oregon State University. Thanks for all the great help!
- Protocol for collecting measurements in year three, six and nine was streamlined and as a result the number of worker days required to complete the work was cut in half.
- A grant was received from Cooperative Forest Ecosystem Research (CFER) program for preliminary analysis of the Red Alder Stand Management Study.
- Third-year measurements and permanent plot installation was completed on three Type 2 sites. The first thinning treatment (3-5 year thin) was completed on four Type 2 Installations. Sixth-year measurement was completed on five Type 2 sites; and the first nineth-year measurement was completed on one Type 2 site. Standard measurements were also made on one Type 1 (natural alder stand) installation and three Type 3 (Douglas-fir and red alder species mix) installations.

CONTENTS



INTRODUCTION

This report summarizes the activities of the Hardwood Silviculture Cooperative during its 11th year. Emphasis of the Cooperative continues to be on the management of red alder for timber production, biodiversity, nitrogen fixation, and as an alternative species to conifers in areas infected with laminated root rot.

The Red Alder Stand Management Study continues to be our highest priority project. There are three types of installations in this study. Each type represents a different stand management objective. Type 1 installations examine spacing effects in existing red alder stands stratified by physiographic region and site index classes (Worthington 1960, Harrington and Curtis 1986).

Type 2 variable density installations examine spacing effects in red alder plantations established at a range of spacings, with re-spacing at various ages. These installations are established on recently clear-cut sites stratified by region and site index class (Worthington 1960, Harrington and Curtis 1986).

Type 3 mixed Douglas-fir/red alder installations examine growth and yield of mixed stands of alder and conifer. The design of these sites is a replacement series, with a constant total stand density and changing proportions of each species. Type 3 installations are located on sites of low quality, nitrogen deficient, Douglas-fir site class III or below within each region.

In 1989, we planted our first two installations. We now have a total of thirty-seven installations. There are four Type 1's, twenty-six Type 2's, and seven Type 3's. Type 2 (variable density) installations continue be our primary focus. We now have enough 6 year data to begin analysis on eleven Type 2 installations (see later in this report).

This year we streamlined data collection protocol to keep within budget constraints and still maintain all 37 sites. The following report reviews in more detail the activities of the Coop and the progress on these major projects, as well as related research by HSC staff on alder and other hardwoods.

HSC members should be congratulating themselves. In 10 years, we have done incredibly well. We have come a long, long distance. Our 37 installations represent a well designed study at a scale rarely attempted in forestry. Over the next 20 years, we will harvest much from what we have invested. Our data will make red alder one of the better understood forest trees.

ORGANIZATIONAL ACTIVITIES

Summer Management Committee Meeting, July 1997

The Management committee met on July 22 and 23, 1997 in Corvallis, Oregon. For both days, the mornings were spent indoors and the afternoons in the field.

The meeting on July 22, 1997 began with introductions. Alison Luckett Bower gave an update on the Red Alder Stand Management Study. All planned Type 2 plantations are in the ground for a total of 26 installations. There are four Type 1's and seven Type 3's. Three of the four Northwest Hardwood Type 2's that need measurement were completed with the help of the Siuslaw National Forest Hebo Ranger District crew. There were no Weyerhaeuser Company(Weyco) sites requiring work in the 1996-1997 field season. Note of interest, we have finished the bulk of work (establishment through year 6 measurement) on a lot of Weyco sites.

Red Alder Stand Management Study expenses exceeded revenue by $13,485 in 1997 fiscal year. This is primarily due to the loss of three dues paying members: Weyerhaeuser, Northwest Hardwoods, and Coast Mountain Hardwoods. We actually spent less than projected for 1997 but the decrease did not out weigh the loss of revenue. Members committed to a dues increase of $2,000 for large land owners/managers and $1,000 of in-kind or cash contribution to measure the Weyco/NWH sites. The rest of the difference can be made up by new members, grant money and reduction in work load.

Several changes to the Red Alder Stand Management Study were proposed. It was decided that little changes to protocol that streamline data collection should be made without further discussion but major changes such as dropping of treatments or sites would require group approval.

Next, Alison presented final results for the Bigleaf Regeneration Study. Two years after planting, bigleaf maple survival ranged between 70 and 93 percent. Of the seedling characteristics measured, survival was best predicted by seedling pre-planting root volume and stem diameter. Planting site quality was also very important to seedling survival.

Stem basal diameter growth was used as a performance measure instead of height because of heavy browse damage at all five sites. Stem diameter growth was best predicted by planting site quality. The only morphological characteristic significantly correlated with seedling diameter growth was the amount of the tap root covered with fine roots. In summary, nursery stock with large fibrous root systems and large stem diameter survives and grows better two years after planting. There are several nurseries practices which can improve the quality of bigleaf maple seedlings.

1. Undercut nursery beds to promote the development of second-order lateral roots.
2. Low bed density - about 8-10 seedlings per ft^2.
3. Grading seedlings based on stem diameter and in accordance to the quality of the planting site:
   3a. 5 mm diameter minimum on low-stress, high-quality sites.
   3b. 8 mm diameter minimum on other sites.

There are several environmental conditions to look for when selecting a planting site for bigleaf maple:

1. Avoid planting bigleaf maple in elk and deer habitat. Seedling in these areas were browsed and the tubes pulled off repeatedly.
2. A minimum of two bamboo stakes with tube attached with wireis required to keep tubes on the trees.
3. Avoid planting in frost pockets. Seedlings planted in depressions showed signs of frost damage in year one and two; vigor was low.
4. Avoid planting in rotting wood. Seedlings planted in decomposing conifer stumps showed signs of stress.
5. Keep competing vegetation to less than 30% percent cover.
6. Match seed zone of seedlings to planting site.

In a related study, Bill Volker of ODF reported that their attempt to grow bigleaf maple from seed in the forest failed. Seventy-five seeds were planted in tall plastic tubes, with three seeds per tube. No seeds germinated. Several explanations were proposed: The planting depth of 1/2 to 3/4 inch may have been to deep, bigleaf maple seed is seen germinating on the tree and on top of the ground. There may not have been enough light, or soil temperature in the tube may have been too low. The seed may not have been viable.

Next, Randy Johnson of PNW Research Station gave an overview of his study on "Geographic patterns of genetic variation in red alder and their implications for seed transfer and gene conservation." This study will determine the size of a seed zone for red alder on upland sites in Oregon, Washington, and southern BC west of the Cascade crest. It will compare between upland and riparian sites, and slope aspects. It will quantify the extent of with-in vs. between population genetic variation, and provide the basis for seed transfer guidelines.

After lunch, the group traveled to a Northwest Hardwood (NWH) Type 2 installation that had its first thinning treatment in a 1200 tpa plot and 6 ft lift in the 230 tpa pruned plot in 1997. First we looked at the pruned plot and everyone was impressed by the vigor and growth on the trees. This is the same site we visited in 1995 and the trees have grown a lot since then. Discussion predominately centered around the question of pruning more than six ft in a single lift and only having three lifts instead of the current four (6′,12′,18′, and 24′). No changes to pruning protocol were adopted.

In the tinned 1200 tpa plot, we were all surprised by the lower branch growth on the trees. We speculated on delaying the 3-5 year thin until year 6 on the medium site quality sites. But no change to protocol was made. Overall, a big change in diameter growth was observed in the thinned plot.

On Wednesday morning Dina Brown-OSU Dept. Forest Science gave a talk about hybrid poplar production in the Willamette Valley. Hybrid poplar was introduced into the Willamette Valley as an economic alternative to grass seed production. Production of grass seed has declined due to restrictions on field burning. This reduction of burning is expected to continue as population and concerns over air quality increase in the Willamette Valley. As a result, effort has gone into the development of alternative crops for poorly drained bottom land rye grass farms; hybrid poplar is an alternative.

Wednesday's field trip visited a poplar plantation on converted rye grass fields south east of Corvallis. This site has one to six year old poplar trials. We looked at the one year old trial which has four different soil preparations methods: till only, rip only, till and rip, and nothing. Weed control was consistant over all four methods. So far it appears the trees with no soil preparation are growing the fastest, but it is too early to declare a winner.

We looked at the rooting pattern in a soil pit in a 4 year old plantation. Rooting in the clay soils was quite deep. We also looked at a 6 year old trial in which four different clone types are planted. The branching characteristics were quite different between clones, but they all seemed to be growing well. The mean height was around 60 feet for all the clones.

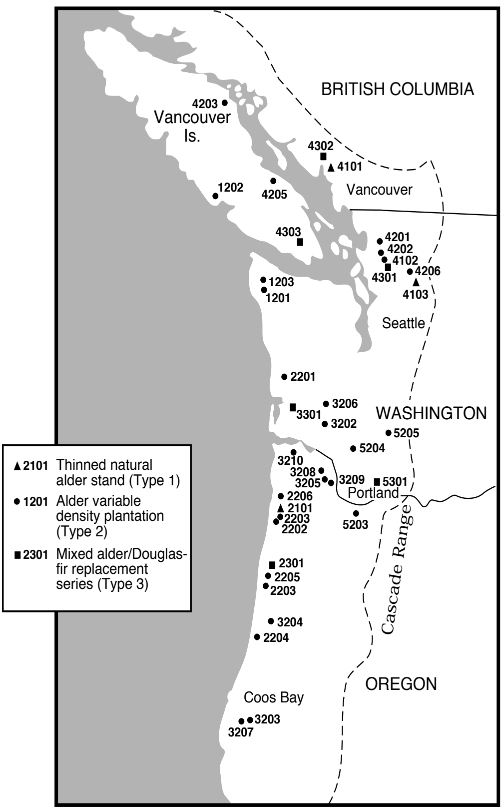
Our second stop on the field trip was the OSU Marchel Tract Hybrid Poplar and Exotic Hardwood Trial. It is located on prime agriculture land just north of Corvallis. Here we saw another poplar clone trial much like the one described above, as well as, several exotic hardwood species not traditionally found in the Willamette Valley.

Winter Management Committee Meeting, January 1998.

The January meeting was canceled at the last minute due to a bad ice storm. The meeting was not re-scheduled. In it's place an extensive report was mailed to HSC members covering all important information from the meeting. Most of this material is covered in the next section of this annual report. We thank Norm Andersen (Washington DNR) for the great effort he put into organizing this meeting and look forward to capitalizing on it at our July '98 meeting.

COOPERATIVE RESEARCH

Red Alder Stand Management Study



All planned installations of the Red Alder Stand Management Study have been planted. There are three types of installations: Type 1 is a thinned natural alder stand. There are four Type 1 installations. Type 2 is variable density alder plantations (100, 230, 525, 1200 trees per acre). There are twenty-six Type 2 installations. Type 3 installations are a mixed alder/Douglas-fir replacement series. There are seven Type 3 installations. Figure 1 shows the location of all installations of this study.

Figure 1. Location of existing installations for the Red Alder Stand Management Study.

Type 2 variable density plantations are the primary focus of this study. Type 2 installations are distributed across a matrix of five regions and three site qualities (Table 1). In Table 1, each site is identified by installation number, ownership, and year it was planted.

Table 1. Matrix of Type 2 installations. Each successful installation identified by number, ownership, and year planted.

Region	Site Quality		
	Low SI_{50} :23-27 M SI_{20} :14-17 M	Medium SI_{50} :28-32 M SI_{20} :18-20 M	High SI_{50} :33+ M SI_{20} :21+ M
1) Sitka Spruce North	X	1201 DNR '91	1202 BCMin '94 1203 DNR '96
2) Sitka Spruce South	2202 SNF '91 2206 SNF '95	2203 NWH '92 2204 SNF '94	2201 WeyCo '90 2205 NWH '94
3) Coast Range	3204 SNF '92 3209 BLM '95	3202 WeyCo '90 3205 ODF '92 3207 BLM '94 3208 ODF '97	3203 NWH '92 3206 WeyCo '93 3210 OSU '97
4) North Cascades	4205 BCMin '94	4202 GYN '90 4203 BCMin '93 4206 DNR '95	4201 GYN '89
5) South Cascades	5205 GPNF '97	5203 BLM '92 5204 WeyCo '93	X

Definition of Acronyms

1. BCMin-British Columbia Ministry of Forests.
2. BLM-Bureau of Land Management.
3. DNR-Washington Department of Natural Resources.
4. GYN-Goodyear-Nelson.
5. GPNF-Gifford Pinchot National Forest.
6. MBSNF-Mt. Baker Snoqualmie National Forest.
7. NWH-Northwest Hardwoods.
8. ODF-Oregon Department of Forestry.
9. OSU-Oregon State University Forest Research Laboratory.
10. SNF-Siuslaw National Forest.
11. WeyCo-Weyerhaeuser Company.

During the 1997-1998 field season, third-year measurements and permanent plot installation was completed on three Type 2 sites. The first thinning treatment (3-5 year thin) was completed on four Type 2 Installations. Sixth-year measurement was completed on five Type 2 sites; and the nine-year measurement was completed on one Type 2 site. Standard measurements were also made on one Type 1 (natural alder stand) installation and three Type 3 (Douglas-fir and red alder species mix) installations.

Weyerhaeuser (Weyco) and Northwest Hardwoods (NWH) are no longer HSC members; however, we need to continue to measure their sites because most are older sites that have already had several thinning treatments. In 1997, Siuslaw National Forest (SNF) Hebo District covered the measurements and thinning on three NWH sites in Oregon. In 1998, Oregon State University (OSU) facilitated the hiring of a student crew and measured two NWH sites. BLM North-Bend District thinned one NWH site, and the Washington Hardwood Commission (WHC) thinned and measured two Weyco sites. We greatly appreciate the extra efforts of these members. WHC has negotiated an agreement with Weyco to manage their Washington installations. We need to find a similar long-term solution for the management of NWH sites in Oregon.

FIELD PROTOCOL CHANGES.

We have several changes to our data collection protocol as part of our continuing effort to cut costs and improve efficiency:

1. In Type 2 and 3 installations during regeneration surveys in years 1 and 2, stop measuring cover by species. Instead, estimate total cover and list dominant species.
2. In Type 2 installation, drop identification of crop trees in control plots.
3. In Type 2 installations, drop treatment 11 (plant 1200 tpa & thin at 30 ft HLC).
4. In Type 2 installations, streamline height tree selection.
5. In Type 2 installations at year 3 and after, tag and measure only control (the four basic densities) and treated plots (number increases with time).

Changes 1-3 were agreed upon at the July 1997 meeting in Corvallis. Changes 4-5 are new ideas derived in the field this winter. They are efficiency measures to reduce the number of times the crew passes through a plot, as well as the amount of work required at each measurement cycle. The response from the field crews has been very positive. It is always difficult for district offices to provide the 25 worker days to complete the 3 year and 6 year measurements. The new changes only require 15 worker days to complete the measurement cycles and this seems within budget capabilities. With the help of Dave Marshall (OSU forest growth modeler), we reviewed the potential impact of these changes on our modeling goals and found them to be minimal.

Implementation of the Stem and form protocol presented in the 1996-1997 annual report is still on hold. It will be instated at a future point in time when budget permits.

Preliminary Analysis of 6th Year Type 2 Results

The HSC now has 11 Type 2 installations that have had their 6th year measurement (out of the total of 26); this is a bench mark for us and provides the first real opportunity to look at the effects of our initial spacing treatments on tree growth. The summary presented here is elaborated in more detail in a Coop report dated July, 1998.

This analysis uses only the four control plots - one at each of the four initial densities (100,230, 525, 1200 TPA) and only 9 of the installations. One installation was dropped because it suffered significant ice and wind damage so its size does not reflect our treatments. The second omission was accidental; its inclusion would not materially change these conclusions.

This first set of analyses examined the relationships between a tree characteristic (quadratic mean diameter (mm), height (m)) and two independent variables: stand density (trees per acre) and site index (m). We calculated plot means for tree characteristics for 1) all the trees on a plot and 2) the 100 trees per acre with the largest diameter.

Four regression equations were developed:

All trees:

$$DBH = 236.9 + 2.9SI_{50} - 40.7\log(TPA) \qquad r^2 = 0.81$$

$$HGT = -170.9 + 19.4SI_{50} + 67.2\log(TPA) \qquad r^2 = 0.45$$

100 largest trees per acre:

$$DBH = 49.3 + 4.6SI_{50} \qquad r^2 = 0.19$$

$$HGT = -285.5 + 17.8SI_{50} + 111.4\log(TPA) \qquad r^2 = 0.56$$

We normally think of stand density having a large influence on diameter. The first equation does show this; the log of trees per acre has a strong influence on stem diameter, larger than the influence of site index. When only the 100 largest trees per acre are examined, however, the effect of stand density is not significant. The mean diameter of these larger trees does not appear to be affected by the density of its neighbors. This suggests that alder does a better job of canopy stratification than expected. Site index does account for some of the variation among the 100 largest trees.

Height is usually thought of as being relatively independent of stand density. The first height equation seems to contradict this rule of thumb: stand density does explain a lot of the variation in height. The coefficient for log (TPA), however, is positive, indicating that height increased with stand density. For the largest 100 trees per acre, stand density is still an important explanatory factor, even more important than for the whole population of plots. Site index also continues to be an important explanatory variable.

Figure 2 shows an interesting interaction between density and site index. The effect of density is quite strong at low site index. At the highest site index, the effect has weakened considerable; the points plotted above site index of 34 seem to show only a slight density effect on mean height for all trees.

Studies of density effects in young stands of red alder and Douglas-fir elsewhere have shown a maximum height growth at intermediate densities (Knowe and Hibbs 1996, Scott et. al. 1992). We see the maximum height at the greatest densities. These two statements may not be at odds; for the size of our

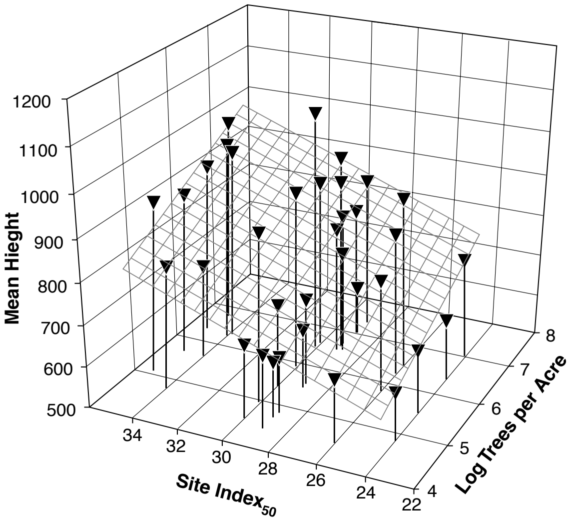


Figure 2. Plot mean points and regression surface for tree height by site index$_{50}$ (Harrington and Curtis 1989) and density.

trees, 1200 TPA may be an intermediate density. Alternatively, our study design may just not be appropriate to pick up the phenomena. For example, our density intervals are large so our study design may not be sensitive to this phenomena.

This second set of analyses examined the relationships between tree quality characteristics (deviation, forks, lean, and damage) and stand density. We used individual tree characteristics (not plot means) for 1) all the trees on a plot and 2) the 100 trees per acre with the largest diameter.

Deviation is a measure of the sweep in the lower stem. It is measured in inches as the distance between the trunk and a 9 foot pole placed against a trunk with its lower end 1 foot above the ground. Forks are forks in the trunk. Lean is the angle in degrees of a line connecting the stump to the tip of the tree. Damage is evidence of any of several kinds: weather, animal, human, insect, disease, and other.

Table 2 shows that only the incidence of forking is affected by density, with lower incidence of forking occurring at high densities. A surprise is that there is no difference in incidence of any characteristic between the total population of stems and the 100 largest per acre. Our initial expectation had been that the larger trees would have scored better than the average tree on most of these characteristics. This result suggest that thinning regimes

Table 2. Percent of all trees and of largest 100 trees per acre for each of four wood quality measures.

Treatment	Deviation	Forks	Lean	Damage
All Trees				
1 (100 tpa)	22	22	14	15
2 (230 tpa)	23	20	13	16
3 (525 tpa)	24	14	11	14
4 (1200tpa)	31	13	13	22
Largest 100 TPA				
1 (100 tpa)	23	22	15	15
2 (230 tpa)	27	20	11	15
3 (525 tpa)	22	12	11	15
4 (1200tpa)	25	12	11	19

that simply favor the larger trees will not improve stem quality in terms of these 4 characteristics.

This work was funded in part by a grant from the Cooperative Forest Ecosystem Research (CFER) program of the Biological Resources Division of USGS.

OTHER APPLIED RESEARCH

Other applied research includes projects conducted by or in association with the HSC staff and of likely interest to HSC Cooperators, but not funded by HSC.

GENETICS OF RED ALDER

We have had reports to the HSC by Randy Johnson of the PNW Research Station of the genetics study of red alder that he is leading. This effort is designed to better quantify the pattern of genetic variation across the re-

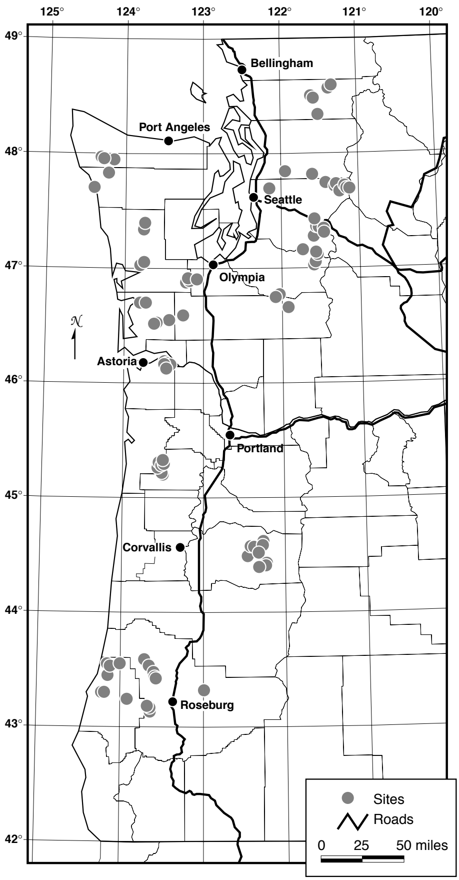


Figure 3. Sites of alder seed collection for alder genetics study.

gion. Current information on genetic variation and seed transfer comes primarily from two common garden studies: one involving an extensive collection of seed sources from both riparian and upland sites in Southern British Columbia (Xie et al. 1996), and a second in which riparian seed was collected from four watersheds in Oregon and Washington (Ager 1987, Ager et al. 1993, Hibbs et al. 1994, Hook et al. 1987).

The Ager study (1987) collected seed from two trees in each stand. He found the genetic variation patterns in riparian alder similar to associated conifers and that temperature amplitude best explained variation in height growth. Where temperature amplitude was small, i.e. little difference between summer and winter temperature, the growth was better. There was little with-in stand variation.

The BC study found that stock from the southern B.C. and low elevation provinces grew the fastest, but were also less tolerant of fall frost. Latitude, longitude and elevation explained a lot of variation in height growth. There was a large amount of with-in stand variation.

Both found among-stand variation to be significant and decreased genetic potential for growth with increasing elevation of parent trees.

The objectives of this new study is 1) to determine how large a seed zone is for red alder on upland sites in Oregon, Washington, and southern BC west of the Cascade crest, 2) to compare upland and riparian sites and between slope aspects, 3) to quantify the extent of with-in vs. between population genetic variation, and 4) to develop seed transfer guidelines.

The research plan involves two seasons of seed collection, followed by seedling production and the outplanting at several test sites around the PNW. Randy made his first seed collections in the fall of 1996 with the second planned for the fall of 1997. That fall, Randy learned the hard lesson that we have also learned in the HSC - alder does not produce good seed crops every year. Thus, the second collection is rescheduled for the fall of 1998. The map shows the sites where collections have been made; 1998 collections will fill in between.

Deer Eat Alder Leaves in the Fall

An HSC site was used last summer and fall in a study of the leaf chemistry of red alder. It has been observed for a long time that deer and elk eat a lot of alder leaves as they fall from the trees in late summer and fall. During the spring and early summer, alder leaves are rarely eaten. The question arose of whether the leaves area eaten from the ground because they are a convenient source of low quality food - as they pile up under the trees - or if there is actually significant food value in those leaves.

The study by Gonzalez-Hernandez, Starkey, and Karchesy (to be submitted to the Canadian Journal of Forest Research) sampled seasonal trends in fiber content, crude protein, condensed tannin, and astringency. Among the interesting findings was that summer protein levels averaged 15.6 % and only dropped to 14% in fallen leaves. Tannin levels and astringency did decrease through the growing season. The authors conclude that protein digestibility of alder leaves is greatest in the fall but cannot clearly say whether the greater food value in the fall, the greater abundance of leaves, or both influence the increased consumption.

HYBRID POPLAR PRODUCTION IN THE WILLAMETTE VALLEY

June 1998, marks the end of the hybrid poplar project at OSU, a three year program funded by the Oregon Department of Agriculture (ODA) that has developed the fundamental cultural, yield, and economic information establishing the basis for poplar as an alternative crop for smoke-restricted ryegrass seed farms. One of the primary objectives of this project has been to collect growth information from existing cottonwood plantations and develop a model to predict yields on various soil types. The growth and yield work was actually begun in 1994, under a separate grant from ODA and resulted in the publication of <u>Hybrid Poplar Production for Willamette Valley Ryegrass Sites</u> by Withrow-Robinson, Hibbs, and Beuter. We are now in the process of revising this document using new growth and yield information. Height, diameter, age, and density measurements were collected from 160 plots, and a Chapman-Richards nonlinear regression model was fitted to predict yield (Figure 4.) The different yield classes (high, medium-high, etc.) are correlated to the different soil types within the Valley.

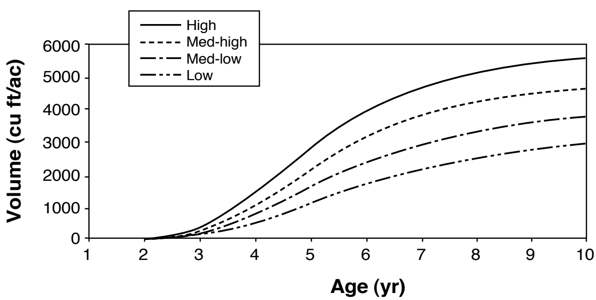


Figure 4. Estimated hybrid poplar yields for the Willamette Valley for four soil productivity classes. For a rough estimate of harvest yields, multiply volume (cu ft/acre) by 0.85 to account for wood loss, and divide by 100 to convert to bone dry tons of chips per acre (BDT/acre).

The second major goal of the hybrid poplar project has been to determine if some type of pre-plant site preparation could improve growth on the more heavy clay soil types in the Willamette Valley. Toward that goal, we installed five site preparation treatments (The five treatments are: (1) simple ripping - use of a heavy, rigid tine to break up compacted layers to a depth of 18"-22"; (2) cultivation - plowing and rolling, combined with ridging - creation of a 10" high planting “hill”; (3) cultivation combined with ripping and ridging; (4) winged sub-soiling - commonly used in breaking up deep (down to 30"), compacted layers at landings following forest harvesting operations; and, (5) no-till - a control with no mechanical site preparation.) at two locations. There were no significant differences (p = 0.76) in height between the five site preparation treatments however there was a significant difference (p = 0.058) in survival between the cultivation combined with ripping and ridging and the simple ripping treatments, with an average survival of 100% and 90%, respectively.

The end of the poplar research work at OSU signals a good time to compare growth from the two oldest OSU Willamette Valley plantings. The oldest, on OSU Research Forest's Marchel Tract, has had seven growing seasons. The Marchel Tract is located on the Willamette River and has Camas gravelly sandy loam and Newberg fine sandy loam soils. Native black cottonwood are growing along the river at this site. The second planting is on a ryegrass seed farm owned by Don Wirth, located near Shedd, Oregon, and has had six growing seasons. The soils on the Wirth farm are Concord silt loams. Initial poplar growth was good on both sites but the Marchel Tract experienced superior growth, as was expected (see Figure 5.) Then surprisingly, after three growing seasons, growth at the Wirth farm surpassed that of the Marchel Tract. We did not expect a mid-valley site to outperform a riparian planting. A likely explanation is that the inherent fertility of the Concord silt loam on the Wirth farm is

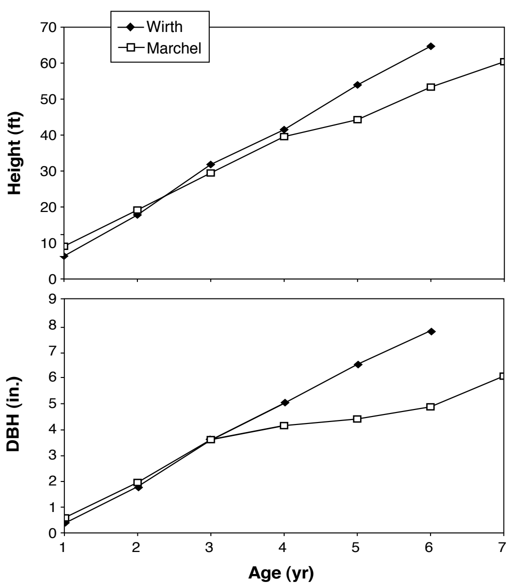


Figure 5. Height and diameter comparison of hybrid poplar between Wirth and Marchel sites. The comparisons shown are for clone 15-029 planted on a 7' x 10' spacing.

higher than the sandy loams at the Marchel tract.

While research on poplar culture is drawing to a close at OSU, growing poplar for pulp production proceeds at quite large scales in Oregon, both along the lower Columbia River for Fort James Corporation and on the east side for Boise-Cascade and Potlatch. In addition, poplar culture can be seen catching hold in every corner of Oregon: La Grande, Vale, Madras, and Klamath Falls. Interest is also extremely high for creating alternative poplar products such as veneer, oriented strand board, and particle board. An exciting new front that will see rapid adaption is the use of poplar for environmental applications such as riparian buffer plantings and wastewater reuse plants. Poplar culture is surely here to stay in Oregon.

DIRECTIONS FOR 1998-1999

Now that all our installations are in the ground (Hooray!), our attention can be turned toward data management and analysis. One of our goals is to finish cleaning and archive the Red Alder Stand Management Study data set. There have been many changes in data collection protocol over the past ten years and one of our biggest challenges will be to achieve variable compatability. This is the first and crutial step in developing our growth model. We have made some progress on this with our CFER funding.

In the 1998-1999 field season, we will continue to look for ways to streamline data collection and crew efficiency.

We will continue to look for ways to expedite the next step in the Stand Management Study: building a red alder growth model. We came close last year in a proposal to the University of Washington Stand Management Cooperative. We should have the opportunity to submit a proposal to them this year.

And we wish Randy Johnson a good alder seed year so he can get the genetics study off the ground.

APPENDIX 1. FINANCIAL SUPPORT RECIEVED IN 1997-1998

Cooperator	Support
B.C. Minestry of Forests	$8,500
Bureau of Land Management	9,500
Gifford Pinchot National Forest	9,500
Goodyear-Nelson Hardwood Lumber Co.	4,500
Oregon Department of Forestry	9,500
Siuslaw National Forest	8,500
USDA Forest Service PNW Station[1]	-
Washington Department of Natural Resources	8,500
Washington Hardwood Commission	9,500
Subtotal	$68,000
Forestry Research Laboratory	51,643
Total	$119,643

APPENDIX 2

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