Hardwood Silviculture Cooperative

annual report 2003

Highlights of 2002-2003

- Modeling efforts are proceeding. George Harper, with the BC Ministry of Forests, has successfully developed a red alder version of TASS. He is currently working with Andrew in the process of submitting "runs" of a wide range of silvicultural activities. For more information on TASS contact the website: www.for.gov.bc.ca/research/gymodels/TASS/
- Another modeling effort has started and is currently acquiring and formatting red alder data. Once this regional red alder database is assembled, the development of a publicly available red alder growth model will commence.
- Two more of our Type 2 sites have had the 12^{th} year growth measurement, making a total of six (of the twenty six) sites. After the twelfth year, the measurement cycle changes to every five years.
- The second thinning treatment (15-20' height to live crown thin) and the 9^{th} year growth measurement have been completed on well over over half of the Type 2 installations (19 of the 26 sites).
- All Type 2 sites have had the 6^{th} year growth measurement and first pruning lift.
- Nine year growth measurements were completed on four of the seven Type 3 (mixed red alder/Douglas-fir) installations.
- All four of the Type 1 (thinned natural red alder stands) installations have had their 9^{th} year growth measurement. After nine years, the measurement cycle changes to once every five years.
- Twenty-two of the thirty seven sites were GPS'd.

Contents

HSC Executive Summary 2003

The Hardwood Silviculture Cooperative (HSC) is fifteen years old and running strong. First established in 1988 by a small (and visionary) group, the HSC is in the lead providing information for foresters interested in hardwood management. The HSC's study design includes thirty-six study installations from Coos Bay, Oregon to Vancouver Island, British Columbia divided into three types:

- ▲ 4 thinning studies in natural stands
- ▲ 7 replacement series studies of red alder/Douglas-fir mixtures
- ▲ 26 variable density plantations with thinning and pruning treatments

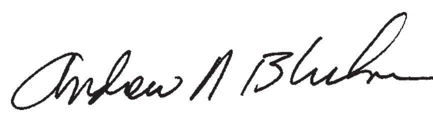
The data collected from these sites is accumulating rapidly. Roughly one third of the sites are twelve years or older (potentially half of the rotation age!) and with each passing year more and more data is added.

In the three short years I've been here, I've seen the value of this data increase as the idea of managed plantations of red alder becomes more and more promising. Because of our extremely large database and the acceptance of managing red alder, the HSC plays a key role in communicating information. Instead of standing in the rain all winter collecting data and analyzing the data in isolation, I am bombarded daily by questions/requests about red alder management. Coupled with Dave Hibbs being in France, I sometimes feel I'm a public relations officer instead of a forest researcher! Not surprisingly, I've gotten on to the "talk circuit" this last year and have given half a dozen presentations at various tours, meetings, workshops, symposiums, etc. These are summarized in this report.

The HSC has always been in the forefront of red alder research. Now we're in the forefront trying to establish the "last piece of the puzzle" in alder management: a growth and yield model. Our work with the B.C. Ministry of Forests to develop a red alder version of TASS has paid off. Release of this publicly available version is imminent. Furthermore, we're involved in assembling a regional red alder database to facilitate the development of another public red alder model. By the end of the summer, HSC data will be combined with red alder data from other research and land management programs. Then, with one very large and extensive database, modeling efforts (like OREGANON and FVS) can proceed.

It has been a very busy and productive year. As a whole, we have accomplished much. Managing red alder is now no longer a dream but a reality.

If only Dave could see us now!



History of the HSC

The Hardwood Silviculture Cooperative (HSC) is a multi-faceted research and education program focused on the silviculture red alder (*Alnus rubra*) and mixes of red alder and Douglas-fir (*Pseutotsuga menzeisii*) in the Pacific Northwest. The goal of the HSC is improving the understanding, management, and production of red alder. The activities of the HSC have already resulted in significant gains in understanding of regeneration and stand management, and have highlighted the potential of red alder to contribute to both economic and ecological forest management objectives.

The HSC, begun in 1988, is a combination of industry and both federal and state agency members, each with their own reasons for pursuing red alder management. For instance, some want to grow red alder for high-quality saw logs, while others want to manage red alder as a component of biodiversity. What members have in common is that they all want to grow red alder to meet their specific objectives.

Members invest in many ways to make the HSC a success. They provide direction and funds to administer the Cooperative. They provide the land for research sites and the field crews for planting, thinning, and taking growth measurements.

The HSC's highest priority is understanding the response of red alder to intensive management. To accomplish this, the HSC has installed 26 variable-density plantations extending from Coos Bay, Oregon to Vancouver Island, British Columbia. The majority of plantations are located in the Coast Range, with a few in the Cascade Range. The plantation distribution covers a wide range of geographic conditions and site qualities. At each site, cooperators planted large blocks of red alder at densities of 100, 230, 525, and 1200 trees per acre. Each block is subdivided into several treatment plots covering a range of thinning and pruning options (twelve total treatments per site).

In addition to the 26 variable-density plantations, the HSC has related studies in naturally regenerated stands. Young stands (less than 15 years old) of naturally regenerated red alder, 5 to 10 acres in size, were pursued as a means of short-cutting some of the lag time before meaningful thinning results could be obtained from the variable-density plantations. It came as a surprise to find only four naturally regenerated stands of the right age and size available in the entire Pacific Northwest.

The HSC has also established seven mixed species plantations of red alder and Douglas-fir. They are located on land designated as Douglas-fir site class III or below. Each plantation is planted with 300 trees per acre with five proportions of the two species. The site layout is designed to look at the interactions between the two species. We are finding that in low proportions and when soil nitrogen is limited, red alder can improve the growth of Douglas-fir. This improvement is due to the nitrogen fixing ability of red alder. The management challenge is to find the right proportion of the two species to maintain a beneficial relationship.

Since the HSC was established, we have learned a great deal about seed zone transfer, seedling propagation, stocking guidelines, identification of sites appropriate for red alder, and the effects of spacing on early tree growth (see the HSC web-page http://www.cof.orst.edu/coops/hsc for more information). Furthermore, the data set is now complete enough to begin analyzing the growth response of red alder after thinning and/or pruning. Our ultimate goal is a better understanding of the effects of stand density on red alder growth and yield, and wood quality and to develop a red alder growth model.

The HSC red alder stand management studies are well designed and replicated on a scale rarely attempted in forestry. Over the next 20 years, we will harvest much from our investment. Our data set on growth of managed stands will make red alder one of the better-understood forest trees of the Pacific Northwest.

Cooperative Research

Red Alder Stand Management Study

The Red Alder Stand Management Study is divided into three specific types of installations. Study installations are predominately located in the coastal mountain ranges of the Pacific Northwest from Coos Bay, Oregon to Vancouver Island, British Columbia (Figure 1). The three types of study installations are as follows:

1. Type 1 is a natural red alder stand thinned to 230 and 525 trees per acre. There are four Type 1 installations.
2. Type 2 is a variable-density red alder plantation. At each site, red alder is planted in large blocks at densities of 100, 230, 525, and 1200 trees per acre. Each block is subdivided into several thinning and pruning treatments. There are twenty-six Type 2 installations.
3. Type 3 is a mixed species plantation of red alder and Douglas-fir. Each site is planted to 300 trees per acre with five proportions of the two species.

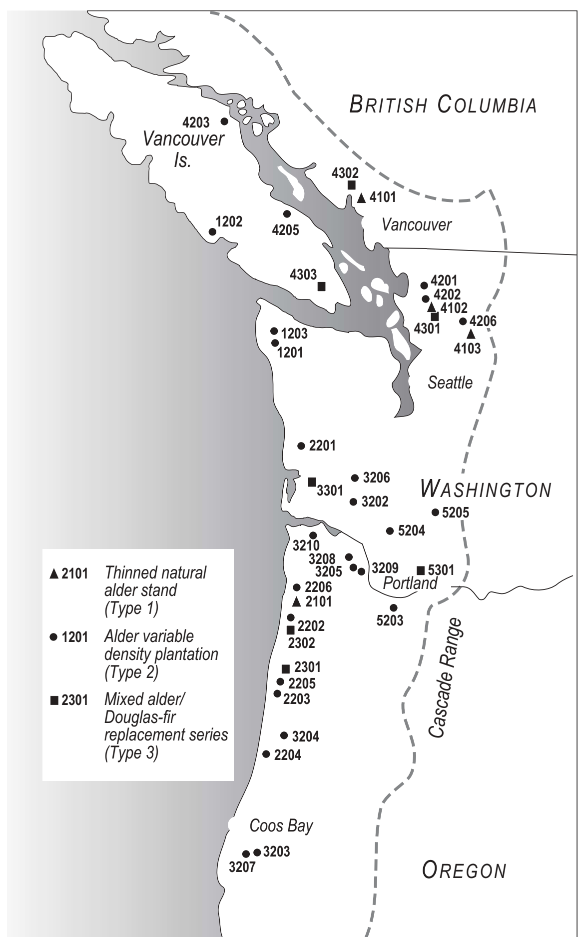


Figure 1. Location of installations for the Red Alder Stand Management Study.

The primary focus of the Red Alder Stand Management study continues to be the Type 2 variable-density plantations. Type 2 installations are distributed across a matrix of five ecological regions and three site qualities (Table 1).

With each passing year, more and more treatments are applied and data collected. Tables 2, 3, and 4 describe the data collection schedules for the three installation types. The shaded areas of the tables indicate what activities have been completed and illustrate the tremendous accomplishments of the HSC to date.

Winter 2003 was the busiest field season in years with field work completed on 17 installations(Table 5):

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

	Site Quality		
	Low	Medium	High
Region	SI50 :23-27 M SI20 :14-17 M	SI50 :28-32 M SI20 :18-20 M	SI50 :33+ M SI20 :21+ M
1) Sitka Spruce North 1203 DNR '96	X	1201 DNR '91	1202 BCMin '94
2) Sitka Spruce South	2202 SNF '91 2206 SNF '95	2203 NWH '92 2204 SNF '94	2201 WHC '90 2205 NWH '94
3) Coast Range	 3204 SNF '92 3209 BLM '95	3202 WHC '90 3205 ODF '92 3207 BLM '94 3208 ODF '97	 3203 NWH '92 3206 WHC '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 WHC '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-Formerly Northwest Hardwoods.
8. ODF-Oregon Department of Forestry.
9. OSU-Oregon State University Forest Research Laboratory.
10. SNF-Siuslaw National Forest.
11. WHC-Washington Hardwood Commission.

Table 2. Data Collection Schedule for Type 2 Installations. Shaded areas indicate completed activities.

TYPE 2	GYN	WHC	WHC	GYN	DNR	SNF	NWH	NWH	SNF	ODF	BLM	WHC	BCmin
Site Number	**4201**	**2201**	**3202**	**4202**	**1201**	**2202**	**2203**	**3203**	**3204**	**3205**	**5203**	**3206**	**4203**
Site Name	Humphrey Hill	John's River	Ryderwood	Clear Lake	LaPush	Pollard Alder	Pioneer Trail	Sitkum	Keller-Grass	Shamu	Thompson Cat	Blue Mtn.	Mohun Ck.
Year Planted	1989	1990	1990	1990	1991	1991	1992	1992	1992	1992	1992	1993	1993
1st yr Regen	1990	1991	1991	1991	1992	1992	1993	1993	1993	1993	1993	1994	1994
2nd yr Regen	1991	1992	1992	1992	1993	1993	1994	1994	1994	1994	1994	1995	1995
Plot Installation	1992	1993	1993	1993	1994	1994	1995	1995	1995	1995	1995	1996	1996
3rd yr Measure	1992	1993	1993	1993	1994	1994	1995	1995	1995	1995	1995	1996	1996
3-5 yr Thin	1993	1996	1996	1994	1996	1996	1997	1998	1997	1997	1996	1998	1998
Prune Lift 1 6ft	1995	1996	1996	1996	1996	1996	1997	1998	1997	1997	1996	1998	1998
6th yr Measure	1995	1996	1996	1996	1997	1997	1998	1998	1998	1998	1998	1999	1999
15-20' HLC Thin	1995	1999/04?	1999	1996	1999	1999/02	2000	2001	2001	2000	2000	2002	2001/03
Prune Lift 2 12ft	1995	2002	1999	1996	2002	2000	2000	2001	1999	2000	2000	2002	2002
9th yr Measure	1998	1999	1999	1999	2000	2000	2001	2001	2001	2001	2001	2002	2002
Prune Lift 3 18ft	1998	2007?	2002	1999	2008	2003	2004	2001	2004?	2004?	2004	2002	2005?
12th yr Measure	2001	2002	2002	2002	2003	2003	2004	2004	2004	2004	2004	2005	2005
30-32' HLC Thin	2001	2007?	NA	2002	2005	?	2007?	?	NA	?	?	2005?	?
Prune Lift 4 22 ft	2001	2007?	2002	2002	?	?	?	2004?	?	?	?	2005	?
17th yr Measure	2006	2007	2007	2007	2008	2008	2009	2009	2009	2009	2009	2010	2010
22nd yr Measure	2011	2012	2012	2012	2013	2013	2014	2014	2014	2014	2014	2015	2015

Table 2 continued

TYPE 2	WHC	BCmin	SNF	NWH	BLM	BCmin	SNF	BLM	DNR	DNR	ODF	OSU	GPNF
Site Number	**5204**	**1202**	**2204**	**2205**	**3207**	**4205**	**2206**	**3209**	**4206**	**1203**	**3208**	**3210**	**5205**
Site Name	Hemlock Ck.	Lucky Ck.	Cape Mtn.	Siletz	Dora	French Ck.	Mt. Gauldy	Scappoose	Darrington	Maxfield	Weebe Packin'	Wrongway	Tongue Mtn.
Year Planted	1993	1994	1994	1994	1994	1994	1995	1995	1995	1996	1997	1997	1997
1st yr Regen	1994	1995	1995	1995	1995	1995	1996	1996	1996	1997	1998	1998	1998
2nd yr Regen	1995	1996	1996	1996	1996	1996	1997	1997	1997	1998	1999	1999	1998
Plot Installation	1996	1997	1997	1997	1996	1996	1997	1998	1997	1998	2000	2000	2000
3rd yr Measure	1996	1997	1997	1997	1997	1997	1998	1998	1998	1999	2000	2000	2000
3-5 yr Thin	1998	1999	1999	1999	1999	1999	2001	2000	2000/01	2002	2003/06	2003/06	2003/06
Prune Lift 1 6ft	NA	1999	1999	1999	1999	1999	2001	2000	2000	2002	2003	2003	NA
6th yr Measure	1999	2000	2000	2000	2000	2000	2001	2001	2001	2002	2003	2003	2003
15-20' HLC Thin	2002	2006?	2006	2003	2003/06	2003/06	2004?	2004	2002/04	2005?	?	?	?
Prune Lift 2 12ft	NA	2006?	2003	2003	2006	2003	2004?	2004	2002	2005?	2006?	2006?	NA
9th yr Measure	2002	2003	2003	2003	2003	2003	2004	2004	2004	2005	2006	2006	2006
Prune Lift 3 18ft	NA	?	2011?	2008?	?	2006?	?	?	2004	?	?	?	NA
12th yr Measure	2005	2006	2006	2006	2006	2006	2007	2007	2007	2008	2009	2009	2009
30-32' HLC Thin	2005?	?	?	2006?	?	2006?	?	?	?	?	?	?	?
Prune Lift 4 24 ft	NA	?	?	?	?	?	?	?	?	?	?	?	NA
17th yr Measure	2010	2011	2011	2011	2011	2011	2012	2012	2012	2013	2014	2014	2014
22nd yr Measure	2015	2016	2016	2016	2016	2016	2017	2017	2017	2018	2019	2019	2019

Table 3. Data Collection Schedule for Type 1 Installations. Shaded areas indicate completed activities.

TYPE 1	BCmin	SNF	DNR	MBSNF
Site Number	**4101**	**2101**	**4102**	**4103**
Site Name	**Sechelt**	**Battle Saddle**	**Janicki**	**Sauk River**
Plot Installation	1989	1990	1991	1994
1st yr Measurement	1989	1990	1991	1994
3rd yr Measurement	1992	1993	1994	1997
6th yr Measurement	1995	1996	1997	2000
9th yr Measurement	1998	1999	2000	2003
14th yr Measurement	2003	2004	2005	2008
19th yr Measurement	2008	2009	2010	2013
24th yr Measurement	2013	2014	2015	2018

Table 4. Data Collection Schedule for Type 3 Installations. Shaded areas indicate completed activities.

TYPE 3	BCmin	NWH	GYN	BCmin	DNR	SNF	GPNF
Site Number	**4302**	**2301**	**4301**	**4303**	**3301**	**2302**	**5301**
Site Name	**East Wilson**	**Monroe-Indian**	**Turner Creek**	**Holt Creek**	**Menlo**	**Cedar Hebo**	**Puget**
Year Planted	1992	1994	1994	1994	1995	1996	1997
1st yr Regen Survey	1993	1995	1995	1995	1996	1997	1998
2nd yr Regen Survey	1994	1996	1996	1996	1997	1998	1999
Plot Installation	1993	1996	1996	1996	1998	1999	2000
3rd yr Measurement	1995	1997	1997	1997	1998	1999	2000
6th yr Measurement	1998	2000	2000	2000	2001	2002	2003
9th yr Measurement	2001	2003	2003	2003	2004	2005	2006
12th yr Measurement	2004	2006	2006	2006	2007	2008	2009
17th yr Measurement	2009	2011	2011	2011	2012	2013	2014
22nd yr Measurement	2014	2016	2016	2016	2017	2018	2019

- ▲ Two of the four Type 1 installations had fieldwork.
- ▲ In the Type 2's, a total of eleven installations had fieldwork. All installations have now had at least the sixth year measurement completed.
- ▲ Four of the seven Type 3 installations had fieldwork.
- ▲ All measured sites were GPS'd.

This coming year's fieldwork will be much less than last year's. There are only 11 foreseeable sites to measure: (Table 6)

- ▲ One Type 1 sites.
- ▲ Eight Type 2 sites, with seven of the eight requiring either a thinning treatment, pruning treatment, or both.
- ▲ Two Type 3 sites.
- ▲ Complete GPS'ing.

Table 5. Hardwood Silviculture Cooperative field activities, Fall 2002-Winter 2003.

Type	Activity	Installation	Cooperator
Type 1	9yr Measurement	4103	MBSNF-Sauk River
	14yr Measurement	4101	BCMin-Sechelt
Type 2	3-5yr Thin	3210	OSU-Wrongway Creek (1 plot + 1st lift)
	Measure & Prune	3208	ODF-Weebe Packin (1 plots + 1st lift)
		5205	GPNF- Tongue Mtn. (1 plot)
	6yr Measurement	3210	OSU-Wrongway Creek
		3208	ODF-Weebe Packin
		5205	GPNF- Tongue Mtn.
	15-20ft HLC Thin,	2205	NWH-Siletz (2 plots + 2nd lift)
	Measure & Prune	2204	SNF- Cape Mtn.(2nd lift)
		3207	BLM- Dora (2 plots + 1st lift)
		4205	BCMin-French Creek (2 plots and 2nd lift)
	9yr Measurement	2205	NWH-Siletz
		1202	BCMin-Lucky Creek
		2204	SNF- Cape Mtn.
		3207	BLM- Dora
		4205	BCMin- French Creek
	30-32ft HLC Thin,	2202	SNF- Pollard Alder (3rd lift)
	Measure & Prune		
	12yr Measurement	1201	DNR-LaPush/Forks
		2202	SNF- Pollard Alder
Type 3	6yr Measurement	5301	GPNF- Puge
	9yr Measurement	2301	NWH- Monroe-Indian
		4301	GYN- Turner Creek
		4303	BCMin- Holt Creek

Table 6. Hardwood Silviculture Cooperative field activities, Fall 2003- Winter 2004.

Type	Activity	Installation	Cooperator
Type 1	14yr Measurement	2101	SNF- Battle Saddle
Type 2	15-20ft HLC Thin,	2206	SNF- Mt. Gauldy (2nd lift)
	Measure & Prune	3209	BLM- Scappoose (2nd lift)
		4206	WDNR- Darrington (3rd lift, thin 1 plot)
	9yr Measurement	2206	SNF- Mt. Gauldy
		3209	BLM- Scappoose
		4206	WDNR- Darrington
	30-32ft HLC Thin,	2203	NWH- Pioneer Trail (3rd lift)
	Measure & Prune	3203	NWH-Sitkum (3rd lift)
		3205	ODF-Shamu (3rd lift)
		5203	BLM-Thompson Cat (3rd lift)
	12yr Measurement	2203	NWH-Pioneer Trail
		3203	NWH-Sitkum
		3204	SNF- Keller Grass
		3205	ODF-Shamu
		5203	BLM-Thompson Cat
Type 3	9yr Measurement	3301	WDNR- Menlo
	12yr Measurement	4302	BCMIN- East Wilson

Current Research

Diameter and height growth in red alder/Douglas-fir mixtures

Introduction

Mixed-species plantations of red alder and other conifer species may be attractive for a number of reasons. First, red alder contributes to biodiversity both on the stand and landscape level. Secondly, red alder is resistant to laminated root rot and may help ameliorate the effects of root disease on Douglas-fir. Third, red alder can improve the growth of Douglas-fir (or other conifers) on nutrient poor sites. This improvement is mainly due to the nutrient cycling characteristics and the nitrogen fixing ability of red alder. Previous studies have been developed to improve the understanding of these species mixtures and investigate the effects on survival, growth, stand dynamics, and various nutrient characteristics.

Objectives

To help further understand survival and growth effects of species mixtures, the HSC has established seven mixed species plantations of red alder and Douglas-fir throughout the Pacific Northwest (Figure 2). They

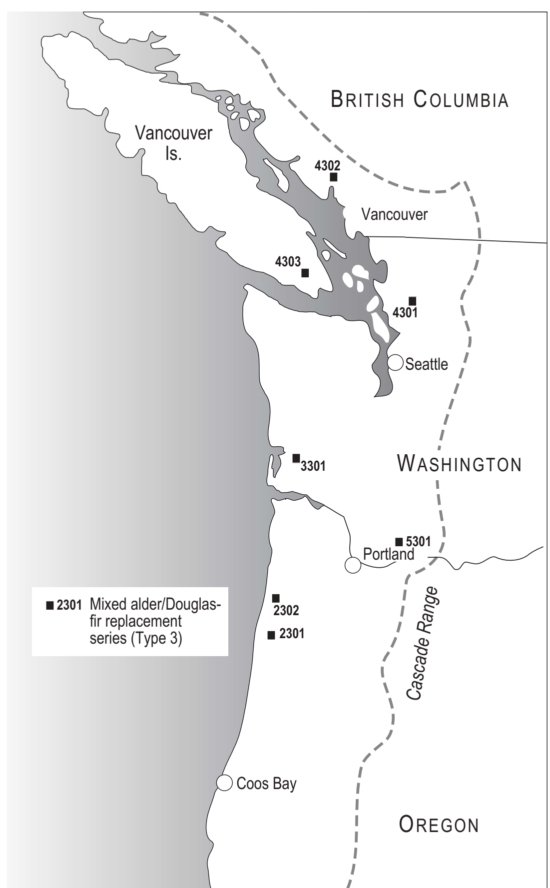


Figure 2. Location of Type 3 HSC installations.

are located on nutrient poor land and planted with 740 trees per hectare (300 trees per acre) with five proportions of the two species (Table 7). The design for these plots is a replacement series, with a constant total stand density and changing proportions of each species. The objective of this analysis is to examine the effects of differing species proportions on 1) survival, 2) diameter growth, and 3) height growth of both red alder and Douglas-fir.

Table 7. Type 3 treatment description.

Treatment	%RA	%DF	TPA	Spacing (ft)
314	100	0	300	12
315	50	50	300	12
316	25	75	300	12
317	11	89	300	12
318	0	100	300	12

Methods

All seven sites are located throughout the Pacific Northwest, on land designated as Douglas-fir site class III or below. The sites were established between 1993 and 2000, following harvesting. At each site there are five mixed-species treatment blocks. Each block contains a measurement plot of 36.7 m by 36.7 m (120.5 ft by 120.5 ft) and a buffer of at least 15 m (50 ft) on all sides. To achieve the desired pattern and density, seedlings were planted in pre-marked planting spots using wire flags (Figure 3). First and second year tree mortality and understory vegetation characteristics were measured (but not included in this analysis). Before age three, if stocking fell below desired levels, interplanting may have taken place. At age three all trees in the 0.13 ha (0.33 ac) measurement plot were permanently tagged and measured for diameter and height. Measurements were repeated at age six.

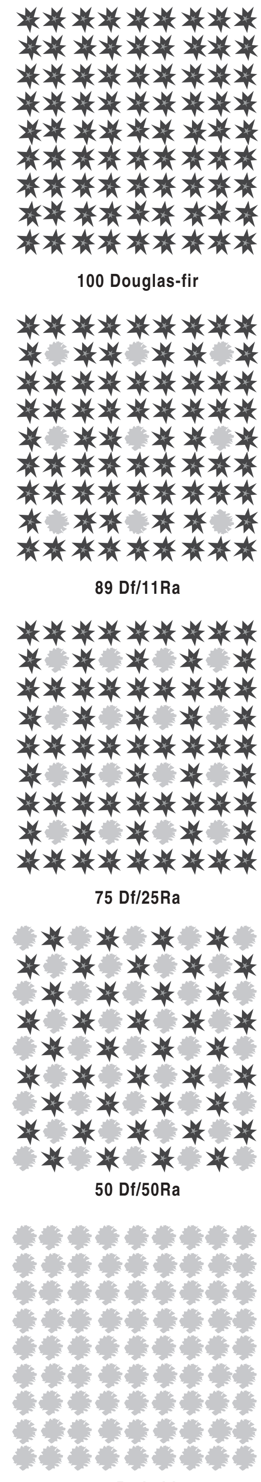


Figure 3. Type 3 species mixture patterns for differing proportions of Douglas-fir and red alder.

Statistical Analysis

The total number of trees used in the analysis was 3122 for year 3 and 3106 for year 6. All other tree species (Grand fir, western red cedar and western hemlock) were excluded from the analysis . Mortality was calculated as a percent, as the number of trees per measurement plot at age 6 minus the number of trees per plot at age 3. DBH was calculated as the treatment quadratic mean diameter (QMD). For trees with a height less than DBH (1.35m), zero was assigned as the diameter measurement. Height was calculated as the treatment arithmetic mean.

All statistical analyses were performed in SAS, using the general linear models procedure. F-tests were completed to detect differences in treatment means. However, to detect which means differ from which other means Fisher's LSD multiple comparisons method was used. An alpha=0.05 was used in all comparisons.

Results

Mortality

Red alder mortality ranged from 0.3-10.3% and increased with increasing Douglas-fir density (Table 8). However no statistical differences among treatments were detected (p=0.48) nor did treatments explain much of the variation (r-square=0.10). Douglas-fir, however, experienced either slight mortality or an increase in density (range 0.8 to –8.0%). No statistical differences among treatments were detected (p=0.18) yet treatments explained slightly more of the variation (r-square=0.19) than for red alder. The lack of mortality patterns by species is most likely explained by interplanting activities. Furthermore, the analysis of competiting vegetation could yield more explanatory results (not included in this analysis).

Table 8. Type 3 red alder (RA) and Douglas-fir (DF) density (trees/acre), proportion (%), and mortality (%) at ages 3 and 6 (standard deviations are in parentheses).

	Year 3				Year 6				% Mortality	
Treatment	RA tpa	DF tpa	% RA	% DF	RA tpa	DF tpa	% RA	% DF	RA	DF
314	263 (52.5)	—	100	0	262 (54.3)	—	100	0	0.3[a]	—
315	131 (21.3)	157 (87.6)	45	55	129 (21.6)	170 (76.8)	43	57	2.0[a]	-8.0[a]
316	71 (20.0)	248 (89.4)	22	78	65 (19.7)	246 (90.3)	21	79	8.4[a]	0.8[a]
317	29	265	10	90	26 (7.4)	272 (55.1)	9	91	10.3[a]	-2.6[a]
318	—	288 (34.7)	0	100	—	286 (428)	0	100	—	0.7[a]

Diameter

Not surprisingly, in both year three and six, diameter or red alder was much greater than that of Douglas-fir. At age three, red alder diameter ranged from 1.5 to 2.5cm with the greatest diameter occurring in the treatments with proportionally more red alder. At age six, red alder diameter ranged from 6.1 to 7.9cm. Once again, the greatest diameter occurred in the "intermediate" red alder proportions. Statistical treatment differences were detected in both years. The greatest diameter red alder was found in treatment 315 (50%RA, 50%DF), and the smallest diameter was found in treatment 317 (11%RA, 89%DF). See Figures 4 and 5 for mean treatment values and statistical comparisons. These results indicate that red alder diameter growth is reduced under high Douglas-fir proportions.

Douglas-fir diameter for both ages was extremely uniform. Diameter ranged from 0.1 to 0.2cm at age 3 and from 2.2 to 2.3cm at age six. No statistical differences between treatments were detected. These results indicate that at this age the diameter of Douglas-fir

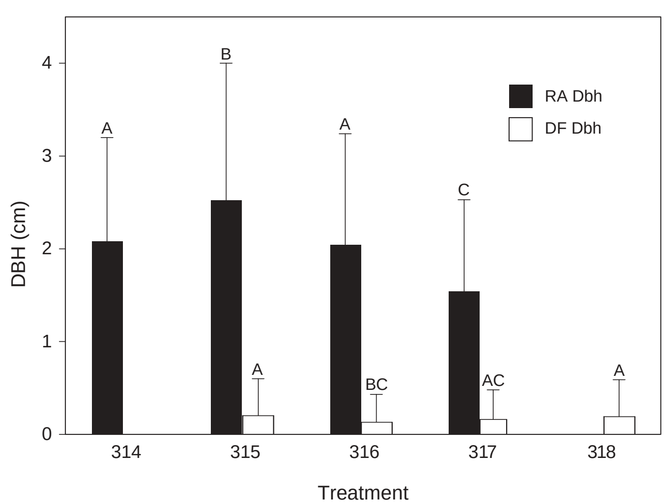


Figure 4. Year 3 quadratic mean diameter (cm) for red alder (RA) and Douglas-fir (DF) from HSC Type 3 installations. Error bars are one standard deviation of the mean and means with the same letter are not significantly different.

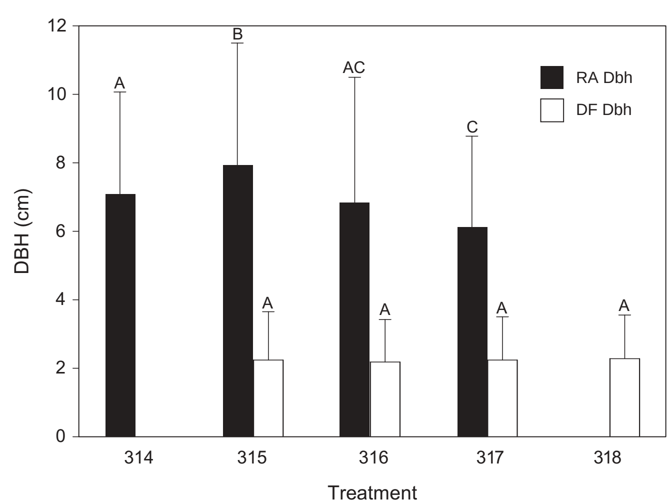


Figure 5. Year 6 quadratic mean diameter (cm) for red alder (RA) and Douglas-fir (DF) from HSC Type 3 installations. Error bars are one standard deviation of the mean and means with the same letter are not significantly different.

is independent of red alder proportions.

Height

Height growth patterns of both red alder and Douglas-fir closely matched those of diameter. Red alder height at age 3 ranged from 2.6 to 3.4m, with the tallest red alder being found in treatment 315 (50%RA, 50%DF), and the shortest in treatment 317 (11%RA, 89%DF). However, by year six, height in the pure red alder treatment (314) equaled that of treatment 315 and declined with increasing proportion of Douglas-fir. See Figures 6 and 7 for mean treatment values and statistical comparisons. These results suggest that early red alder height growth is greatest in pure stands or under low Douglas-fir proportions.

Like diameter, the height of Douglas-fir was extremely consistent across treatments for both ages. Height ranged from 1.0 to 1.1m at age 3 and from 2.5 to 2.6m at age six. No statistical differences between treatments were detected. Once again, these results indicate that early height growth of Douglas-fir is independent of red alder proportions.

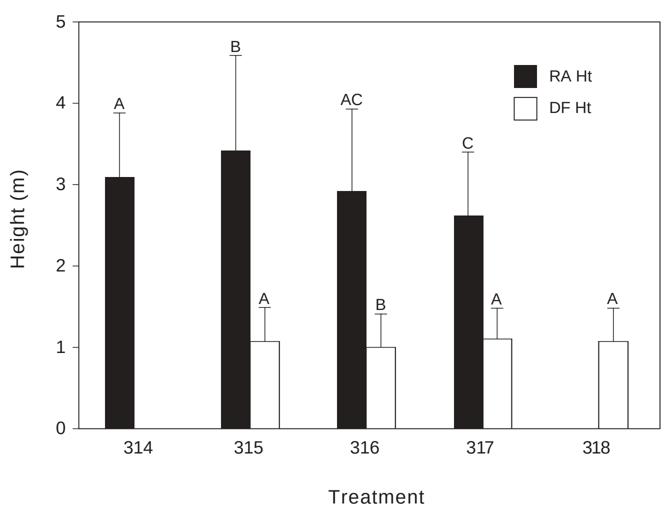


Figure 6. Year 3 height (m) for red alder (RA) and Douglas-fir (DF) from HSC Type 3 installations. Error bars are one standard deviation of the mean and means with the same letter are not significantly different.

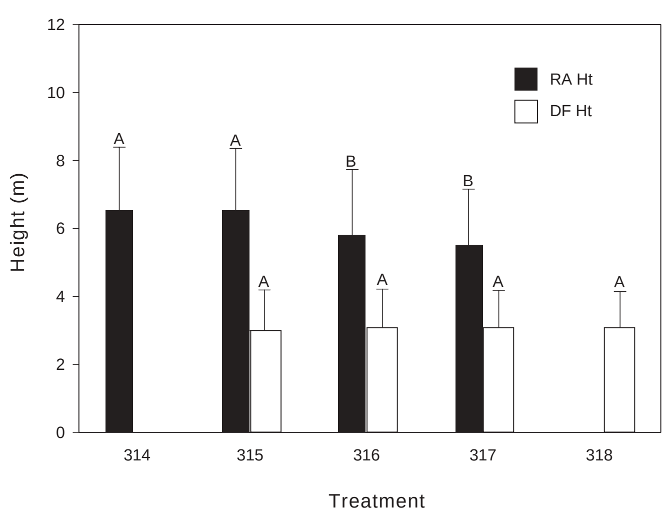


Figure 7. Year 6 height (m) for red alder (RA) and Douglas-fir (DF) from HSC Type 3 installations. Error bars are one standard deviation of the mean and means with the same letter are not significantly different.

Recent Presentations

The following are summaries of presentations given by Dave Hibbs and/or Andrew Bluhm during the last year. The full presentations can be obtained by contacting Andrew Bluhm.

The contents of the last presentation are more fully listed since they provide a nice summary of red alder management principles.

Effect of thinning on red alder tree form and volume

Andrew Bluhm- HSC Summer meeting July 11, 2002

The data presented there is from a natural stand of red alder originating in 1967, thinned (using two types of thinning and two residual densities) at age 14 (1981), and remeasured this spring (stand age of 35).

The main points of the talk were as follows:

1) Thinning, both to a 20' and 14' spacing, reduced total volume from 20,000mbf/acre to approximately 15,000mbf/acre.
2) However, thinning shifted the diameter distribution and resulted in more revenue than unthinned stands (i.e. larger piece sizes). The amount of increase in value depended on the economic assumptions used.

Plantation density effects and red alder

David Hibbs- HSC summer meeting July 11, 2002

1) Using HSC Type 2 data from 10 sites, observed heights were greater than predicted heights through age 9.
2) This increase in observed versus predicted heights was more noticeable on "poor" sites.
3) Total height for both all trees and 'crop trees' was greatest in the intermediate to high planting densities (525-1200tpa).

4) Diameter for all trees was greatest in low planting densities (100tpa) but for ‘crop trees’ the largest diameters was greatest in the intermediate planting densities (230-525tpa).

5) By age nine, the live crown ratio was rapidly decreasing with increasing density, however, the total live crown length was still greater than 8m across all densities.

These results seem to indicate that ‘crop trees’ (i.e. the trees that would most likely make it to final harvest) grow best in intermediate to high densities up to age 9 and that a precommercial thin (PCT) in alder plantations may need to be reconsidered. However, data from one Type 2 plantation that showed an increase in both diameter and volume following a PCT. The final take-home message? We do not yet know the long-term response (and therefore the feasibility) of red alder plantations to a PCT, but data from the HSC Type 2 sites is coming on-line and will allow us to answer this question.

Effect of planting density and site quality on height and diameter of red alder plantations

Andrew Bluhm- HSC summer meeting July 11, 2002

This preliminary research explores some general principles between stand growth and density and site quality; principles that underlie many forest management practices. The first principle is that there is a ubiquitous negative relationship between density and diameter growth. Secondly, height growth is relatively insensitive to density. Third, that both diameter and height growth are positively correlated with site quality. Recently, however, some experimental results question the validity of the former two principles. Therefore, the purpose of this study was to test 1) if managed plantations of red alder exhibit a negative relationship between diameter and density, 2) if height is independent of density, and 3) if both mean diameter and height of red alder plantations increase with increasing site quality (i.e. site index).

Density Effects

-Early in stand development, diameter increased with density, especially for crop trees. Then as stands aged, a negative relationship developed between density and diameter for all trees. However, by year nine, crop trees did not exhibit this relationship but trends indicate it may occur later in stand development. These responses indicate that managed stands of red alder benefit from high initial stocking and that these stands differentiate into crown classes very early in development with the larger trees maintaining similar diameter growth rates across a range of densities.

-Height generally increased with density until one got to the densest treatment. This relationship got stronger with age. However, the strengthening was more pronounced for all trees than for crop trees. This result is contrary to the general belief that height is independent of stand density.

Site Index Effects

- Very early in stand development diameter and height were positively correlated with site index. However, this relationship weakened with age for both all trees and crop trees. By year nine site index did not significantly effect either diameter or height. This result is contrary to what is generally believed in forest management and indicates that the growth of managed plantations of red alder is relatively independent of site quality.

Red alder; Nursery stock, planting, and growing success

Andrew Bluhm: Western Hardwood Association symposium October 8, 2202, SAF Coos Bay Chapter October 17, 2002 and WA Farm Forestry Association meeting April 4, 2003

Seed Collection (See Red Alder: Guidelines for Seed Collection, Handling and Storage)

Genetic Considerations:

- Seed Zones-similar to other seed zones of PNW conifers. Seed should be collected within the same zone as the intended planting site.
- Transfer Rules-Avoid 1) those between North and South facing slopes (for slopes >20%), and 2) those between river bottoms and side slopes (elevation difference >700ft).

Seed Tree Selection:

- Collection should be avoided in stands less than 1 acre in size.

- Seed production usually begins at age 10-15 years and peaks between 25-35 years.
- Trees should have good growth form and free of insect and disease problems.
- Selected trees should be at least 100ft apart.
- More trees the better. Collect from at least 5-10 trees per stand.
- Collect from the upper 1/3 of the tree crown.

Assessing Seed Quality:

- Seed yields vary widely however each year at least a moderate seed crop is produced.
- Seed crop is best assessed in August by counting cones and counting filled seeds within cones.

Assessing Seed Maturity:

- Seed ripens between early September and mid-October depending on latitude and elevation (correlated with fall frosts).
- Test for maturity by 1) twisting the cone (should twist easily), and 2) assessing the color (should be mottled green and brown).

Methods of Seed Collection:

- Most effective technique is to fell trees into an open space and then strip the cones off.

Seed Storage:

- Each seed lot should be identified.
- Cones are dried at 60-80 degrees F until the scales begin to flair and the seed is loose.
- Seed is extracted by tumbling then cleaned.
- Seed viability can be variable but may be as high as 85%.
- Seed does not need stratification.
- Refrigeration is adequate. Can store seed for many years without significant losses in viability.

Seedling Quality

As with other species, seedling quality dramatically affects early performance. But, what is a quality red alder seedling? Criteria usually based on morphological characteristics.

- ▲ minimum basal diameter of 4 mm
- ▲ seedling height 30-100cm
- ▲ healthy branches or buds along the entire length of stem
- ▲ full and fibrous root system
- ▲ free of disease and damage

Using multiple criteria is best but as a general rule of thumb healthy buds and branches is the best indicator of quality seedlings (avoid spindly seedlings).

Nursery Practices

The most common red alder stocktypes are as follows:

- ▲ 1+0 open-bed bare-root: Currently considered the best combination of cost and quality
- ▲ 1+0 plug: Choice of container size and density are crucial.
- ▲ Plug+0.5: Seedlings initially grown in small containers then transplanted to nursery beds. This method consistently produces robust seedlings but at a higher cost.

Artificial inoculation with *Frankia* may be necessary to obtain consistent establishment and growth of seedlings in the nursery, especially in containers.

Seedbed Density:

Nursery bed densities are extremely important to red alder nursery practice.

Uniform spacing and lower seedbed densities are desired because they result in :

- ▲ greater average diameter, root mass, and shoot mass
- ▲ sturdier seedlings (lower H/D and lower S/R)

- reduced damage from insects (alder flea beetle), disease (*Septoria alnifolia*) and sunscald

For 1+0 bare-root less than 100 stems per square meter.

For container 60ml plugs (3 x 10cm) to 131ml.

Comparison of Field Performance Among Red Alder Stocktypes

Bare-root alder seedlings grown in open nursery beds are generally superior to greenhouse or bedhouse seedlings in regards to survival, growth, and resilience to damage. However, large plug-transplant stock may be preferable for harsh sites.

Natural vs. Artificial regeneration

Achieving uniform spacing using natural regeneration is extremely difficult. Therefore, on a commercial scale, artificial regeneration is the method of choice.

Plantation Establishment (See Red Alder: Guidelines for Successful Regeneration, Keys to successful red alder plantation establishment)

Proper site selection (See: A Method of Site Quality Evaluation for Red Alder):

Red alder occupies sites with a wide range of physical properties. However, the best growth is achieved on well-drained upland or alluvium sites.

- Good drainage
- Avoid heavy frost pockets
- Avoid summer drought and heat stress
- Consider damage agents- deer, elk, mountain beaver, insects, etc.

Site preparation:

Weed competition is crucial. Pre-planting vegetation control measures are required. Weed cover, especially herbaceous weeds, significantly affects growth and survival. Poor site preparation can result in failed plantations. The quicker red alder ‘occupies the site’ the better.

Techniques: scarification, broadcast burning, herbicides, or a combination. The exact treatments, combinations, timings, and rates are best determined by experienced foresters.

Time of outplant:

Red alder must be planted in spring, mid-March through mid-April after the risk of frost is over but before the summer drought stress. Red alder seedlings are more susceptible to injury than conifers, care must be taken in handling and closing the planting hole. Red alder seedlings are also susceptible to heat stress so deep planting and minimal scalping are recommended.

Plantation Management (See Density Management Guide for Red Alder, Managing Red Alder)

Goal: Capitalize on the rapid early growth of red alder. It has been repeatedly shown that managed plantations of red alder can dramatically out produce natural stands.

Factors to Consider:

- ▲ **Site Quality:**

  With managed stands, increases in height can be achieved across the whole range of all site indices, especially on lower quality sites. However, when looking only at plantations, site index has very little influence on both the diameter and height of young plantations.

- ▲ **Planting Density:**

  Of all the tools land managers have, the manipulation of stand density holds the most promise for achieving higher yields and better log quality. Stand density management guidelines do exist for red alder and can be an important tool.

  Observed tree height in plantations are always greater than the predicted heights from natural stands, especially at higher densities. Density not only affects the growth rate of red alder, it also affects the growth form; a very important consideration for red alder.

  Early in stand development (through age 6), diameter and height increase with increasing density. By year 9 a there is a negative relationship between diameter and density for all trees, but not for crop trees (the largest 100 trees per acre) and best height growth shifts to the intermediate densities.

▲ **Pruning:**

Goal: To improve wood quality through the removal of both dead and living branches.

There are two main objectives, 1) confine the knotty core to less than 4”DOS, and 2) retain at least 60% live crown. However, due to the rapid taper of widely spaced red alder, it is difficult, if not impossible to achieve both. Therefore, combining pruning with some type of thinning treatment promises the most success.

▲ **Thinning:**

Thinning is performed to open up growing space, free up resources, and concentrate growth into fewer individuals. It has been shown to positively shift diameter distributions, thereby increasing the value of the remaining trees. However, there is a trade-off with pre-commercial thinning; fewer, but larger, more valuable trees after thinning, with the elimination of growing stock.

The HSC has installed variable density plantations with a wide range of thinning treatments. However, it is too early to quantify the growth response following thinning.

Direction for 2004

The specific goals for 2004 are a continuation of our long-term objectives:

- ▲ Continue treatment and measurements of Red Alder Stand Management Study installations.
- ▲ Continue working with the BC Ministry of Forests in calibrating and testing the red alder growth model.
- ▲ Continue working with the "Regional Alder Modeling Group" in database formatting and to organize support for the modeling effort.
- ▲ Publish the results of data analyses efforts in peer-reviewed journals.
- ▲ Continue collecting GPS coordinates for potential creation of a GIS database.
- ▲ Update HSC website.
- ▲ Continue efforts to recruit new members.

Appendix 1.

Summary of Red Alder Stand Management Study Treatments

Type 1- Thinned Natural Red Alder Stands

1. Control- measure only, stand left at existing density
2. 230 trees/acre (tpa) re-spacing density in year 3 to 5
3. 525 tpa re-spacing density in year 3 to 5
4. 230 tpa re-spacing density when height to live crown (HLC) is 15 to 20 feet
5. 525 tpa re-spacing density when HLC is 15 to 20 feet
6. Control- measure only, stand left at existing density
7. 100 tpa re-spacing density when HLC is 30 feet
8. 230 tpa re-spacing density when HLC is 30 feet
9. Control- measure only, stand left at existing density

Type 2- Red Alder Variable Density Plantations

1. 100 tpa control- measure only
2. 230 tpa control-measure only
3. 230 tpa pruned to 6 ft. lift, 12 ft lift, 18 ft lift, 24 ft lift
4. 525 tpa control -measure only
5. 525 tpa thin to 230 tpa in year 3 to 5
6. 525 tpa thin to 230 tpa when HLC is 15 to 20 feet
7. 525 tpa thin to 230 tpa when HLC is 30 to 32 feet

8. 1200 tpa control- measure only

9. 1200 tpa thin to 230 tpa in year 3 to 5

10. 1200 tpa thin to 230 tpa when HLC is 15 to 20 feet

12. 1200 tpa thin to 100 tpa when HLC is 15 to 20 feet

13. 525 tpa thin to 100 tpa when HLC is 15 to 20 feet

Type 3- Mixed Red Alder Douglas-fir Plantations

1. 100% red alder planted at 300 tpa density

2. 50% red alder and 50% Douglas-fir planted at 300 tpa density

3. 25% red alder and 75% Douglas-fir planted at 300 tpa density

4. 11% red alder and 89% Douglas-fir planted at 300 tpa density

5. 100% Douglas-fir planted at 300 tpa density

Appendix 2.

HSC Management Committee Meeting Minutes

Summer Management Committee Meeting,

Wednesday July 10, 2002:

Today was a joint field day with the Levels of Growing Stock (LOGS) group and the Hardwood Silviculture Cooperative (HSC). The tour began at 8:00am in the parking lot of the Best Western Columbia River Inn, Cascade Locks, OR and was organized by David Marshall and Connie Harrington, PNW Research Station, Olympia, WA. The itinerary follows:

1) T.T. Munger natural Area Old-Growth Stand – Dean DeBell

2) Trout Creek Hill Spacing and Species Studies

a) Douglas-fir spacing and WH/DF mix

b) Western white pine spacing and WWP/DF mix

c) Nable fir spacing and true fir/DF mix

3) Planting Creek Studies

a) Douglas-fir/Red Alder Plantation

b) Douglas-fir wide spacing

c) Douglas-fir Nitrogen fertilizer

However, due to emergencies, neither Dave Hibbs nor Andrew Bluhm were able to attend this tour. Handouts were included in this tour. If you did not attend but would like the handouts, please contact Andrew Bluhm. The day ended at the old alder fire break. This site, where the presence of alder greatly increased the growth of Douglas-fir, is the classic example of the potential benefits of alder/Douglas-fir mixtures on low soil N sites.

Thursday July 11, 2002:

Attendees: Dave Hibbs and Andrew Bluhm- OSU; Paul Courtin- BC Ministry of Forests; Dale Anders- ODF; Norm Anderson and Pete Holmberg- WA DNR; Larry Larsen and Jeanette Griese- BLM; Connie Harrington- PNW, Olympia, WA; Robert Deal- PNW, Portland, OR; Del Fisher- Washington Hardwood Commission; Paul Kriegel- Goodyear Nelson.

The meeting began at 8:30am at the Char Burger restaurant in Cascade Locks, OR. Dave welcomed all of the attendees. Most of the attendees were familiar faces with the exception of Pete Holmberg, Assistant Division Manager for the WA DNR. Pete is very interested in the prospect of increasing the role of red alder management on WA state lands and brought a great deal of experience and insight to the meeting.

Andrew Bluhm updated the group on the status of HSC data collection. He reviewed last year's data collection schedule and presented the coming year's fieldwork. Last year, two Type 2 sites scheduled for measurements were not ready for treatment and are therefore scheduled for this coming year. Both installations are orphaned sites. Next year is a very busy year with two Type 1 sites, four Type 3 sites and eleven Type 2 sites to measure. Also presented was an overview of the long-term data collection schedules for all three types of installations. The amount of data that has been collected is impressive: after the coming year, there will be six sites with 12 year data, and twenty-two sites with 9 year data.

Next was a discussion of miscellaneous HSC issues. First, was the ongoing effort to measure "orphaned" sites. The HSC does not have the financial resources to hire contract crews to measure these sites. Discussed was the use of prison crews. All were in agreement that prison crews are the most cost-effective means to measure these sites, however it was mentioned that the quality of the measurements is questionable. Dale Anders and Norm Andersen provided important information on the use of prison crews on non-state land in OR and on state lands in WA, respectively. At this time, it was agreed that hiring prison crews to measure orphaned sites was a good option.

The next main topic was the fact that Dave Hibbs (HSC Program Director) is going on sabbatical to France for one year starting this fall. He is not overly concerned with the operation of the HSC while he is away, however two issues regarding his absence were discussed. First, the idea brought up last winter of having a red alder symposium in the summer of 2003. It was agreed that with him gone, the symposium would be pushed back. A new date was not set. It was suggested that the HSC try to coordinate a date with Charlie Peterson (PNW Olympia) who is organizing a symposium on PNW research in the summer of 2004.

The second topic was whether or not to have the next winter meeting. Concerns were that because this upcoming field year is the busiest in 4 years, that Andrew would be better off focusing on the fieldwork and not spend the effort on a winter meeting. All agreed that this was a valid concern but it was the general consensus that winter meetings are an essential part of the HSC. Furthermore, it was agreed this winter meeting can accomplish two purposes, 1) getting all of the Committee together to tour a selected site, and 2) to measure an orphaned site, thereby reducing the need to hire prison crews. It was decided that the winter meeting would be held January 14-15, 2003. The location will be either in the Longview, WA area or in the Corvallis- Newport, OR area and will be announced as soon as fieldwork schedules are finalized.

The next topic of discussion was next year's summer committee meeting. Norm Andersen mentioned that the LOGS meeting would be held in the central/coastal area of Oregon July 8-9, 2003, and for ease of travel, to try to schedule the HSC meeting with that. It was decided that the HSC summer 2003 meeting will be held Thursday and Friday, July 10-11, 2003 in Corvallis, OR. Finally, Dave Hibbs suggested that the group should consider whether or not to keep the Type 2 measurement cycle at three years instead of switching it to five years after age twelve (as previously agreed). His suggestion is based on the upcoming modeling efforts and what type of data would be most useful for modeling purposes. It was decided to keep the schedule as is until discussions with modelers are undertaken.

Andrew Bluhm then presented a talk on the "Effect of thinning on red alder tree form and volume". The data presented here is from a natural stand of alder originating in 1967, thinned (using two types of thinning and two residual densities) at age 14 (1981), and remeasured this spring (stand age of 35). Please contact Andrew for the full content of the presentation.

The main points of the talk were as follows: 1) Thinning, both to a 20' and 14' spacing, reduced total volume from 20,000mbf/acre to approximately 15,000mbf/acre, 2) however, thinning resulted in more revenue than unthinned stands due to larger piece sizes. The amount of increase in value depended on the economic assumptions used.

Following the talk, it was mentioned that the assumption that there are 4.45 tons/MBF was incorrect: it is more like 8-8.5 tons/MBF. Also, it was agreed that this analysis was preliminary and a more-detailed economic analysis could/should be performed. Andrew mentioned that his collaborator, Glenn Ahrens (the keeper of the data) is interested in just this and a final analysis could be done with the assistance of more industry-focused members, especially the Washington Hardwood Commission. Furthermore, Paul Kriegal, with Goodyear Nelson stated he has data from a thinned natural alder stand and will try to measure it again and get it to the HSC for analysis.

David Hibbs then addressed the topic of thinning alder plantations with a presentation on “Density effects and red alder”. Once again, please contact Andrew for the content of the presentation. The main points of the talk were as follows:

- ▲ Using HSC Type 2 data from 10 sites, observed heights were greater than predicted heights through age 9.
- ▲ This increase in observed versus predicted heights was more noticeable on “poor” sites.
- ▲ Total height for both all trees and ‘crop trees’ was greatest in intermediate to high planting densities (525-1200tpa).
- ▲ Diameter for all trees was greatest in low planting densities (100tpa) but for ‘crop trees’ the largest diameters was greatest in the intermediate planting densities (230-525).
- ▲ The live crown ratio was rapidly decreasing with increasing density, however, the total live crown length was still greater than 8m across all densities.

These results seem to indicate that ‘crop trees’ (i.e. the trees that would most likely make it to final harvest) grow best in intermediate to high densities up to age 9 and that a precommercial thin in alder plantations may need to be reconsidered. However, he then presented data from one Type 2 plantation that showed an increase in both diameter and volume with a precommercial thin. The final take-home message? We do not yet know the long-term response (and therefore the feasibility) of red alder plantations to a precommercial thin, but data from the HSC Type 2 sites is coming on-line and will allow us to answer this question.

Andrew Bluhm then gave the final presentation entitled the “Effect of planting density and site quality on tree height and diameter of managed red alder plantations”. The purpose of the analysis was to test if 1) height and diameter are positively related to site index, 2) diameter is negatively related to density, and 3) height is relatively insensitive to density. Once again, please contact Andrew for the content of the presentation. The main points of the talk were follows:

1) The early growth (both diameter and height) of managed plantations of red alder is generally independent of site index.
2) Managed stands of red alder benefit from high initial stocking levels. By year nine, a negative relationship of diameter with density was found for all trees. For

'crop trees' however, similar diameter growth rates were maintained across a range of densities.

3) Height increased with increasing density for both all trees and 'crop trees' through age 6. By age 9 this relationship statistically holds true, but trends indicate best height growth will be in intermediate densities.

These results are somewhat surprising and contradict some of the widely held principles in forest management. However, Connie Harrington and Robert Deal quickly agreed with Andrew that this analysis is preliminary and violates some statistical assumptions. Andrew then mentioned that in his investigation, he found that the vast majority of forestry experiments with repeated measurements are analyzed incorrectly. This led him and Dave to seek the advice of statisticians at the OSU forestry school. These statisticians indicated that techniques do exist to analyze repeated measures experiments (and correlated measurements) but that these techniques have largely been ignored in forestry. Therefore, Dave and Andrew are currently working with the statisticians to apply the method of hierarchical linear regression to the data and to publish peer reviewed papers in both statistical and forestry journals.

Dave Hibbs then reviewed the HSC budget. The financial support is stable and remained the same over last year and this year. The actual expenses for 2001/02 were less than estimated resulting in an excess of funds. What to do with this excess was discussed and it was decided to leave as-is and decide what to do at a later date. The estimated expenses for 2002/03 are within the expected support, however, in 2004, OSU will begin charging overhead, effectively reducing the HSC budget.

The last topic of discussion was about the modeling efforts using HSC data. Two modeling efforts are underway: 1) TASS modeling with the BC Ministry of Forests, and 2) development of a regional red alder database.

TASS

As previously described, all of the Type 2 data (not including last year's) was cleaned, formatted, and sent up to BC Ministry of Forests to be used to develop an alder version of the TASS model. George Harper has been busy with modeling BC's permanent plot data from natural red alder stands. To date he has not modeled the HSC plantation data. He has made several trial runs with the natural stand dataset in TASS and (as of December) has been looking at the discrepancies between the datasets and the model output. The original TASS model was developed for conifers and it is a big job to apply the model to hardwoods. George and his colleagues are busy with the conceptual differences between hardwood growth and conifer growth. Their hope is that once these differences are understood and quantified, TASS can be modified to produce accurate results. However, currently the management and modeling of quaking aspen has become a priority in BC and red alder is now on the back burner. As Dave Hibbs pointed out, aspen and red alder, although different species are similar enough and using aspen to work out the kinks of modeling hardwood growth may possibly make the modeling effort with red alder quicker, easier, and more accurate.

TASS is a biologically oriented spatially explicit individual tree model. TASS is not available for public use but generates the yield table database for the model TIPSY. TIPSY is a growth and yield program that provides access to the stand yield tables generated by TASS. TIPSY retrieves and interpolates yield tables from its database, customizes the information and displays summaries and graphics for a specific site, species and management regime. Therefore, for TIPSY to be successful, TASS must include the range of silvicultural options that a manager would most likely be interested in. Dave and Andrew have outlined a wide range of silvicultural options for managed red alder, but request the input of the HSC members.

Talk switched to which silvicultural option is ‘best”. Pete Holmberg provided a useful insight, that ‘best’ for his organization and to most groups managing red alder as a timber commodity is some benchmark of worth (i.e. present net value, bare land value, etc.) followed by minimum cash input. Once these parameters are defined, one would then work ‘backwards” to determine the best silvicultural management regime.

Pruning then came up as one silvicultural option that could be used to increase the value of red alder logs. However, pruning is expensive and the exact cost/benefit ratio is still unknown but of interest to many cooperators. Del Fisher and Paul Kriegal were especially interested and wondered if the HSC has pruning guidelines. Dave stated that Connie Harrington has done a lot of work with the timing and method of pruning, and the results should be available soon. Also of interest was the topic of timber recovery. The HSC has not started working with this issue but the plot design allows for this type of work. Paul Courtin stated that a model predicting value and yield already exists, however not for red alder. The model, SYLVER, is a stand level system that helps forest managers evaluate the impact of **S**ilvicultural treatments on **Y**ield, **L**umber **V**alue, and **E**conomic **R**eturn. It was developed for several species of conifers, integrates the yield data from TASS and other subsystems, and predicts wood quality, product recovery and financial return for various management regimes.

Regional red alder database

The topic of assembling a regional alder database was proposed at last year's winter HSC meeting. There, Del Fisher, commissioner of the WA Hardwood Commission expressed a strong desire in WA to assemble all red alder databases into a common database with the goal of developing a red alder growth model. To this effect, the HSC, WHC, and WeyCo. have been working on a draft memorandum of agreement. In summary, as currently written, this MOA states:

1) The objective is to assemble a region-wide growth and yield database for Red Alder (A*lnus rubra*).
2) Each Cooperator will assign a technical person to the project Technical Committee.
3) Each Cooperator will provide their error-checked data to the Coordinator.
4) The Cooperators will agree upon the type of database, selection of a Coordinator and consideration for the Coordinator.
5) No Cooperator shall make available any portion of the combined database to a third party except their own contribution.
6) No Cooperator will engage in modeling activities with the combined data until work on a publicly available model has commenced.

The group agreed to go forward with this database and Dave said he would keep the group informed on the progress. Dave and Andrew will try to finalize the wording of the MOA, and begin discussions with modelers about type of model, form of the data, amount of data required, etc.

Winter Management Committee Meeting, January 13-14, 2003, Kelso, WA

Attendees: Andrew Bluhm- OSU; John Johanson- Siuslaw National Forest; Paul Courtin- BC Ministry of Forests; Doug Robin- ODF; Pete Holmberg- WA DNR; Larry Larsen, Jeanette Griese, and Floyd Freeman- BLM; Connie Harrington and Warren Devine- PNW, Olympia, WA; Robert Deal- PNW, Portland, OR; Del Fisher- Washington Hardwood Commission; Rod Meade-Weyerhaeuser Company; Jim Murphy- Pacific Forest Technicians; Larry Mason- Rural Technology Initiative, University of WA.

Andy gave a brief update on what Dave Hibbs, the HSC program director is doing on his sabbatical in Orleans, France. It seems Dave is investigating seed dispersal rates and mechanisms. This is of great importance in France since most of the countryside is composed of agricultural land with islands of forest in-between. Are these islands decreasing in size? Increasing? And if so, how? Hopefully, Dave will help answer some of these questions.

Next, Andy went over the alder modeling efforts underway with both the BC Ministry of Forests and the “regional” modeling effort here in the states.

As previously described, all of the Type 2 data (not including last year’s) was cleaned, formatted, and sent up to BC Ministry of Forests to be used to develop an alder version of the TASS model.

George Harper has been busy with modeling BC’s permanent plot data from natural red alder stands. To date he has not modeled the HSC plantation data. He has made several trial runs with the natural stand dataset in TASS and (as of December) has been looking at the discrepancies between the datasets and the model output.

A more recent alder modeling effort is currently under way using a cooperative style arrangement. As we all know, producing a public alder growth model is a key step in legitimizing and promoting the management of red alder. Up until now, however, growth data has been scarce and only from very young stands. But now a large and expanding database is available, from many various organizations. The Washington Hardwood Commission and Weyerhaeuser Company have recognized this fact and have taken the initiative to get together all of the organizations with alder growth data, and pool the data to develop a regional growth model.

On August 15, 2003, organizations with alder growth data met at the PNW Olympia Lab to discuss and develop a memorandum of agreement pertaining to the development of a public alder growth model. Present were representatives from Washington Hardwood Commission, Weyerhaeuser Company, BC Ministry of Forests, Hardwood Silviculture Cooperative, Olympia PNW Research Lab, the Stand Management Cooperative, Rayonier, and The Campbell Group. After much discussion, four topics were agreed upon.

1) The modeling effort would be split into two phases. The first is the data acquisition and formatting of the database. The second would be the actual model development.

2) The technical committee was formed. This committee has the responsibility of developing and agreeing to a set of technical specifications. Each cooperator assigned a person to this committee, with David Briggs as its chair.

3) The Stand Management Cooperative (headed by David Briggs, UofW) would

act as the Technical Coordinator and be responsible for the acquisition and formatting of the entire database.

4) The memorandum of understanding, covering phase one of the effort, was finalized and sent to each cooperator to be signed. Of importance to the HSC is the requirement that no individual cooperator will receive the entire database until the development of a public model is underway.

Then, on November 1, 2003 the technical committee met at the Weyerhaeuser Technology Center to discuss the technical specifications of the database. The following were topics of discussion: definition of a cooperator; GPS coordinates should be included with the data, the submitted dataset should conform to the format defined by the technical coordinator (i.e. english or metric units, not both), formatting and error-checking are primarily the responsible of the cooperator, pure alder stands versus mixed-species stands, definition of ‘plot’ and ‘tree age’, etc. The data format scheme that was adopted is the one used by the Stand Management Cooperative. Randal Collier, the modeler with the SMC then sent to each cooperator the data formats to be used. A tentative date for the completion of phase one is the end of the summer 2003.

Currently, four main items remain to be accomplished regarding this modeling effort.

1) Signing of the MOA by members who have not already done so.

2) The formatting, error-checking, and submission of the individual datasets to the SMC.

3) Procuring funds to support phase one of this effort.

4) Deciding what modeling strategy to use once the database is compiled.

Andrew is the technical committee representative for the HSC. He is keeping abreast of the developments and, when he has time between field work, is formatting the HSC database.

Andrew Bluhm then updated the group on the status of HSC data collection. He reviewed this year’s data collection schedule. This year is a very busy field year with an unusually high number of orphaned sites to measure. So far, he has received gracious help from the Gifford Pinchot and the Mt. Baker Snoqualmie National Forests, both non-coop members. The remaining orphaned sites will most likely be measured by Andrew alone, since the HSC current budget is not sufficient to hire field crews. However, Andrew is currently trying to recruit HSC members helping out with the remaining orphaned sites.

Also presented was an overview of the long-term data collection schedules for all three types of installations. The amount of data that has been collected is impressive: after this year, all Type 2 sites will have had their 6^{th} year measure and 19 (of 26) sites will have had their 9^{th} year measure: every Type 1 site will have had their 9^{th} year measure: and every Type 3 site will have had their 6^{th} year measure with 4 (of 7) having their 9^{th} year measure.

Cooperators then brought up the concern about the protection of the HSC installations. With changing personnel, the restructuring of many organizations, and a longer measurement cycle, there is a concern that installations would be forgotten/unknown and be destroyed. Recommendations included: continual plot maintenance and posting of “research area” signs, GPSing the sites and getting the coordinates into each cooperators GIS database, reminding each cooperator that these sites do exist by forming an email list and periodically sending it to each sites contact person, and finally, defining the length of the study. The group agreed that these actions should be undertaken.

Also of interest was the topic of timber recovery. This is not a new topic, but one that is becoming more and more important as these stands become commercially valuable. The HSC has not started working with this issue. However, the plot design allows for this type of work. Up until now, the HSC has focused on biological research, not market research but it was identified that both types are research are necessary for a comprehensive alder management strategy. It was agreed that focusing on the biological research/modeling effort is the priority but effort should be made to address the topic of product recovery. It was decided that Andrew and Dave should develop list of options on how to address the issue of product recovery and have the HSC members rank their importance.

Next came three presentations pertaining to alder management. Please contact Andrew for the contents of the presentations.

Andrew Bluhm, HSC Associate Program Director, OSU:

“Red alder; Nursery stock, planting, and growing success”

Robert Deal, Research Silviculturist, USFS PNW Research Station, Portland, OR:

“Mixed red alder Sitka spruce stands: Opportunities for multiple resource management”

Larry Mason, Rural Technology Initiative Project Coordinator, University of WA:

“Cedar and alder: The other red woods”

The last topic of discussion was next year's summer committee meeting. It was decided to have the meeting in conjunction with the summer LOGS meeting in the west-central/ area of Oregon July 8-9, 2003. The tentative date for the HSC summer 2003 meeting will be held Thursday and Friday, July 10-11, 2003 in the central OR area. Andrew will talk with the LOGS group and finalize dates, locations, and agendas.

The group then spent the remainder of the day and the following morning conducting the 6th year measurement of a Type 2 installation. The installation, Wrongway Creek, is on OSU Forest Research property and is effectively an "orphaned site". The group (10 in all) knocked out the measurements in no time at all. We were able to see alder "in action", maintain the integrity of the HSC's database, and get to know one another a little better. We finished just when the fog burned off, Andrew thanked everyone for their help, and we said our goodbyes until the next summer meeting.

Appendix 3.

Financial Support Received in 2002-2003

Cooperator	Support
BC Ministry of Forests	$8,500
Bureau of Land Management	$8,500
Goodyear-Nelson Hardwood Lumber Company	$4,500
Oregon Department of Forestry	$8,500
Siuslaw National Forest	$8,500
USDA Forest Service PNW Station	
In kind	
Washington Department of Natural Resources	$8,500
Washington Hardwood Commission	$8,500
Subtotal	$55,500
Forestry Research Laboratory	$42,000
Total	$97,500