HSC

2013 Annual Report

Oregon State University

Hardwood Silviculture Cooperative

Staff

David E. Hibbs, Professor
Program Leader
Email: david.hibbs@oregonstate.edu

Andrew A. Bluhm, Associate Program Director
Email: Andrew.Bluhm@oregonstate.edu
Department of Forest Ecosystems and Society
College of Forestry
321 Richardson Hall
Oregon State University
Corvallis, OR. 97331-5752
(541) 737-6100
http://hsc.forestry.oregonstate.edu/.

Hardwood Silviculture Cooperative

Annual Report 2013

Highlights of 2013

- Two more 22nd year measurements were collected on the Type 2 installations (variable-density red alder plantation), bringing the total to six of the 26 installations.
- One more Type 2 installation had the 17th year measurement, bringing the total to 23 of the 26 installations.
- 16 of the 26 Type 2 installations have had all the treatments completed.
- All four of the Type 1 installations (thinned natural stands) have had the 19th year measurement. This concludes the regular measurement cycle.
- One more Type 3 installation (mixed red alder/Douglas-fir plantation) had the 17th year measurement; bringing the total to six of the seven installations.
- The field data that was collected investigating potential stem form and volume effects resulting from thinning natural red alder was analyzed. These preliminary results are included in this report.
- The HSC website has undergone a makeover. The new version is more user-friendly and has expanded contents, including previously unpublished research results and presentations. The new web address is: http://hsc.forestry.oregonstate.edu/.
- A new interface was designed for the red alder variant of ORGANON. Created by the Center for Intensive Planted-forest Silviculture (CIPS) and the HSC, this Excel program can calculate red alder site index, provide stand and tree growth and yield under different treatment scenarios, estimate board foot volume by scaling diameter of cut logs, and provide economic analysis of any simulated treatment scenario. This red alder Growth Simulator can be downloaded at: www.fsl.orst.edu/cips/Tools.htm.

Contents

Executive Summary 2013

The Hardwood Silviculture Cooperative (HSC) has spearheaded the effort to develop and provide information for foresters interested in red alder management for over 25 years. The HSC established 37 study installations located from the Southern Oregon Coast, up through Vancouver Island and across into the Cascade Mountains. There are three types of research installations:

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

Last year's data collection went well. Data collection and/or treatment application occurred on six of the installations. Two Type 2 installations (pure red alder plantations) had the 22^{nd} year measurement and one had the 17^{th} year measurement. The last Type 1 installation had the 19^{th} year measurement; concluding the regularly scheduled measurements for these thinned natural stands. Finally, one Type 3 installation (the red alder/Douglas-fir species mixtures) had the 17^{th} year measurement.

I am glad to announce a new user-friendly interface for the red alder variant of the ORGANON growth and yield model. Created by the Center for Intensive Planted-forest Silviculture (CIPS) and the HSC, this Visual Basic program allows users to run the growth model using Microsoft Excel. A description of this program is included in this report.

In addition, the HSC has analyzed the data collected with the WA Department of Natural Resources investigating the effects of thinning on stem form and tree and stand volume. These preliminary results asses the performance of the existing red alder volume/taper equation, highlight the stem form and log volume changes associated with thinning, and are included in this report.

The understanding and management of red alder has come a long way. More and more knowledge and more and more tools are being developed regarding the management of red alder, with the HSC and its members responsible for many of these developments. The vision, dedication, and continued support of the HSC members have made this possible.

Thank you members for your original vision, continued patience, and ongoing support,

Andrew Bluhm

History of the HSC

The Hardwood Silviculture Cooperative (HSC) is a multi-faceted research and education program focused on the silviculture of red alder (*Alnus rubra*) and mixes of red alder and Douglas-fir (*Pseudotsuga menziesii*) 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 bio-diversity. 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 to understand 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 may 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 through time 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://hsc.forestry.oregonstate.edu 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 management on red alder growth and yield, and wood quality and to develop red alder growth and yield models.

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.

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:

Type 1 is a natural red alder stand thinned to 100, 230 and 525 trees per acre. There are four Type 1 installations.

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.

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. There are seven Type 3 installations.

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 quality classes (Table 1).

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

Table 1. Matrix of Type 2 installations. Each 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	X	1201 DNR '91	1202 BCMin '94 1203 DNR '96
2) Sitka Spruce South	2202 SNF '91 2206 SNF '95	2203 ANE '92 2204 SNF '94	2201 WHC '90 2205 ANE '94
3) Coast Range	3204 SNF '92 3209 BLM '95	3202 WHC '90 3205 ODF '92 3207 BLM '94 3208 ODF '97	3203 CAM '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

ANE-ANE Hardwoods.
BCMin-British Columbia Ministry of Forests.
BLM-Bureau of Land Management.
CAM-The Campbell Group
DNR-Washington Department of Natural Resources.
GYN-Goodyear-Nelson.
GPNF-Gifford Pinchot National Forest.
MBSNF-Mt. Baker Snoqualmie National Forest.
ODF-Oregon Department of Forestry.
OSU-Oregon State University Forest Research Laboratory.
SNF-Siuslaw National Forest.
WHC-Washington Hardwood Commission.

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

Table 2a. 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	John's R.	Ryderwood	Clear Lake	LaPush	Pollard	Pioneer	Sitkum	Keller-Grass	Shamu	Thompson	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	1999/07	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	2010	2002	1999	2008	2003	2004	2001	2009	2004	2004	2002	2007
12th yr Measure	2001	2002	2002	2002	2003	2003	2004	2004	2004	2004	2004	2005	2005
30-32' HLC Thin	2001	NA	NA	2002	2011	2008	2009	2004	NA	2007	2009	2007	2010
Prune Lift 4 22 ft	2001	NA	2002	2002	2011	2008	2009	2004	2014	2007	2009	2005	2010
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
27th yr Measure	2016	2017	2017	2017	2018	2018	2019	2019	2019	2019	2019	2020	2020

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

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	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	2003/06	2003/07
Prune Lift 1 6ft	NA	1999	1999	1999	NA	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	2006/08	2006	2003/06	2003	2003/16	2004/07	2004/07	2002/07	2005/08	2007/12	2007/09	2009/14
Prune Lift 2 12ft	NA	2006	2003	2003	NA	2003	2004	2004	2002	2005	2009	2006	NA
9th yr Measure	2002	2003	2003	2003	2003	2003	2004	2004	2004	2005	2006	2006	2006
Prune Lift 3 18ft	NA	2016	2013	2011	NA	2006	2012	2010	2004	2011	2012	2011	NA
12th yr Measure	2005	2006	2006	2006	2006	2006	2007	2007	2007	2008	2009	2009	2009
30-32' HLC Thin	2007	NA	2016?	2011	2016?	2016?	2012	2010	2012	2011	2012	2011	2014?
Prune Lift 4 22 ft	NA	2021?	2021?	2016	NA	2016	2017	2010	2007	2018	2014	2014	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
27th yr Measure	2020	2021	2021	2021	2021	2021	2022	2022	2022	2023	2024	2024	2024

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

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

Owner	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

Winter 2012/13 was a somewhat light field season regarding work load. Measurements and various treatments were completed on 6 of the 37 installations (see Table 5). Last year's work included:

- One Type 1 installations had fieldwork.
  - Sauk River (4103, MBSNF) had its 19th year post-thinning measurement.

This was the last of the four Type 1 sites to have the 19th year post-thinning measurement. This was the last scheduled measurement for the Type 1 sites since two of the four sites, Janicki (4102, DNR) and Battle Saddle (2101, SNF), have or will have been logged before the next measurement, reducing the number of sites to two and thus compromising the integrity of the study design. Therefore, the 22nd year post-thinning measurement scheduled for this winter at Sechelt (4101, BCMin) was dropped.

- Four Type 2 installations had fieldwork.
  - Two sites- Pollard Alder (2202, SNF) and LaPush (1201, DNR) had their 22nd year measurement. All treatments at Pollard Alder are complete. LaPush has its 4th and final pruning lift remaining.
  - One site, Maxfield (1203, DNR) had its 17th year measurement. This site has only its 4th and final pruning lift remaining.
  - One site, Cape Mtn. (2204, SNF) had its 3rd pruning lift completed.
- One Type 3 installation had fieldwork.
  - Cedar Hebo (2302, SNF) had its 17th year measurement.

In addition to the measurements and treatments completed above, there was substantial plot maintenance required including: replacing measurement plot corner markers, retagging trees that outgrew the zipties, refreshing or establishing DBH paint lines, and rouging out invading conifers and/or hardwoods.

Table 5. Hardwood Silviculture Cooperative Field Activities, Winter 2012/13

Type	Activity	Installation	Cooperator
Type 1	19yr Measurement	4103	MBSNF- Sauk River
	~~24yr Measurement~~	~~4101~~	~~BCMIN- Sechelt~~
Type 2	3rd Pruning Lift	2204	SNF- Cape Mtn.
	17yr Measurement	1203	DNR- Maxfield
	22yr Measurement	1201	DNR- LaPush
		2202	SNF- Pollard Alder
Type 3	17yr Measurement	2302	SNF- Cedar Hebo

So, in the big picture to date:

- All scheduled measurements for the four Type 1 sites are completed.
- Six of the twenty-six Type 2 sites have had their 22nd year measurement.
- Twenty three of the twenty-six Type 2 sites have had their 17th year measurement.
- Fourteen of the twenty-six Type 2 sites have all treatments completed.
- Six of the seven Type 3 sites have had their 17th year measurement.

This coming year's fieldwork (Winter 2013/14) will have a large amount of fieldwork. A total of 10 installations need either a measurement or a treatment. See Table 6 for the list of activities.

Fieldwork includes:

- Nine Type 2 installations need fieldwork.
  - A whopping five installations- Pioneer Mtn (2203, ANE), Sitkum (3203, CAM), Keller-Grass (3204, SNF), Shamu (3205, ODF) and Thompson Cat (5203, BLM) need their 22nd year measurement.
  - Three installations- Weebe Packin (3208, ODF), Wrongway Creek (3210, OSU), and Tongue Mtn (5205, GPNF) need their 17th year measurement. In addition these installations need either the 4th and final pruning lift (Weebe Packin and Wrongway Creek) or their 15-20ft HLC thin (Tongue Mtn.).
  - One installation- French Creek (4205, BCMin) needs its 4th pruning lift (to 22ft).
- One Type 3 installation needs fieldwork.
  - Puget (5301, GPNF) needs its 17th year measurement.

Of important note, there are four "orphaned" installations without personnel support for completing the measurements (Tongue Mtn, Wrongway Creek, Sitkum, and Puget). In addition, fieldwork on one of the sites formerly the responsibility of Forest Capital (Pioneer Mtn), which is now Hancock Forest Management, needs to get completed. Completing measurements on these orphaned sites is extremely problematic and will require discussions and solutions among and from the HSC members.

Table 6. Hardwood Silviculture Cooperative Field Activities, Winter 2013/14

Type	Activity	Installation	Cooperator
Type 1	Completed		
Type 2	15-20ft HLC Thin	5205	GPNF- Tongue Mtn (?)
	4th Pruning Lift	3208 3210 4205	ODF- Weebe Packin (?) OSU- Wrongway Ck. BCMIN- French Creek
	17yr Measurement	3208 3210 5205	ODF- Weebe Packin OSU- Wrongway Ck. GPNF- Tongue Mtn.
	22yr Measurement	2203 3203 3204 3205 5203	ANE- Pioneer Mtn CAM- Sitkum SNF- Keller-Grass ODF- Shamu BLM- Thompson Cat
Type 3	17yr Measurement	5301	GPNF- Puget

Current HSC Activities

Thinned Natural Red Alder Stand Volume and Stem Form

Project Rationale

The WA Dept. of Natural Resources (WADNR) conducted a timber harvest in a naturally regenerated red alder stand that contained the HSC Type 1 installation #4102 (Janicki). The stand was 33 years old and was thinned at age 14. Prior to harvest however, the HSC and the WADNR decided capitalize on this opportunity to collaborate on a stem form and volume estimate project.

Study Objectives

The full set of study objectives are varied and many. Presented here are the results from the following three objectives:

1. How well did the taper/volume equation developed from plantation grown trees predict diameter at multiple points along the tree stem?
2. Did thinning affect stem form/shape?
3. How well did the taper equation predict individual tree merchantable volume?

Methods

Site Characteristics

This site located about eight miles East of Mt. Vernon, WA (T34N R5E Sec 4; N48^0 27.824 W122^0 10.460) regenerated naturally in 1976 following a harvest in 1975. Site index (base age 50 years) was estimated at 108ft based on height/age pairs using Harrington and Curtis' site index equation and 94ft based on soil/site characteristics using the red alder site evaluation method of Harrington. Three treatment plots (unthinned, thin to 100tpa and thin to 230tpa) were established in 1989 and thinning was done in 1990 (age 14). At the time of thinning, stand density averaged 760 trees/acre.

Sampling Procedures

Plot Measurements

Immediately after thinning, all trees in the measurement plot were permanently tagged and DBH (stem diameter at 4.5ft), stem defect (fork, lean, sweep) and presence or absence of damage (animal, weather, etc.) was recorded for each tree. Total tree height (HT) and height to live crown (HLC) was measured on a subsample of 40 trees spatially well distributed over the plot that included 10 trees of the smallest DBH, 10 trees of the largest DBH, and 20 mid-range trees. Missing HTs, HLCs, and crown ratios (CR=1-HLC/HT) were estimated using the RAP-ORGANON growth model. Measurements were then repeated 3, 6, 9, 12 and 19 years post-thinning. The last measurement was in the fall of 2009, corresponding to 19 years after thinning and a total stand age of 32 years.

Taper Measurements

Prior to harvest (fall of 2010, stand age of 33 years), up to ten trees per treatment were selected across the range of diameters and free of obvious defect (broken tops and major forking). Once the sample trees were felled, multiple measurements along the entire stem of fallen trees were taken. Of the 13 total measurement points per tree, seven were used in this analysis: 0.5ft, 2.2ft, 4.5ft, 17.3ft, 32.0ft, height to the live crown (HLC), and height to a broken top (BT) if present. At each measurement location, diameter outer bark (DOB) and double bark thickness (DBT) was taken. Diameter inner bark (DIB) was calculated as DOB-DBT. HT was measured and if the top was broken because of the falling impact, HT was determined by piecing together the top section. The observed mean, minimum, and maximum DIBs for the seven measurement points are presented in Table 7.

Objective 1:

How well did the taper equation predict DIBs?

Individual tree observed DIBs vs. predicted DIBs, by treatment, for measurement points 0.5ft, 17.3ft, 32.0ft and HLC are shown in Figure 2, respectively (data for measurement points 2.2ft, 4.5ft, and BT not shown).

Bias, the difference between observed (measured) DIB and predicted (calculated from the taper equation) DIB was used to determine how well the taper equation fit these sample trees.

Table 7--Taper tree observed diameter inner bark (DIB) values by measurement point and treatment.

Treatment	Thin to 100tpa	Thin to 230tpa	Unthinned
Density (tpa)	84	180	200
Sample size (# trees)	10	10	6
0.5ft (in)			
Minimum	10.2	7.8	6.5
Mean	15.7	14.9	12.8
Maximum	18.8	20.4	17.4
2.2ft (in)			
Minimum	9.1	7.7	6.2
Mean	13.1	13.0	11.4
Maximum	15.6	17.6	15.3
4.5ft (in)			
Minimum	8.3	7.5	5.8
Mean	12.2	11.9	10.5
Maximum	14.3	16.0	13.7
17.3ft (in)			
Minimum	7.1	5.9	4.9
Mean	10.6	10.1	9.1
Maximum	12.2	14.3	12.4
32.0ft (in)			
Minimum	5.6	5.0	4.1
Mean	9.6	9.4	8.1
Maximum	12.2	12.2	10.8
Height to Live Crown (in)			
Minimum	4.0	3.1	2.9
Mean	7.3	5.7	5.6
Maximum	9.8	7.6	8.1
Height to Broken Top (in)			
Minimum	1.9	2.4	1.7
Mean	3.6	4.5	3.7
Maximum	6.5	6.4	6.0

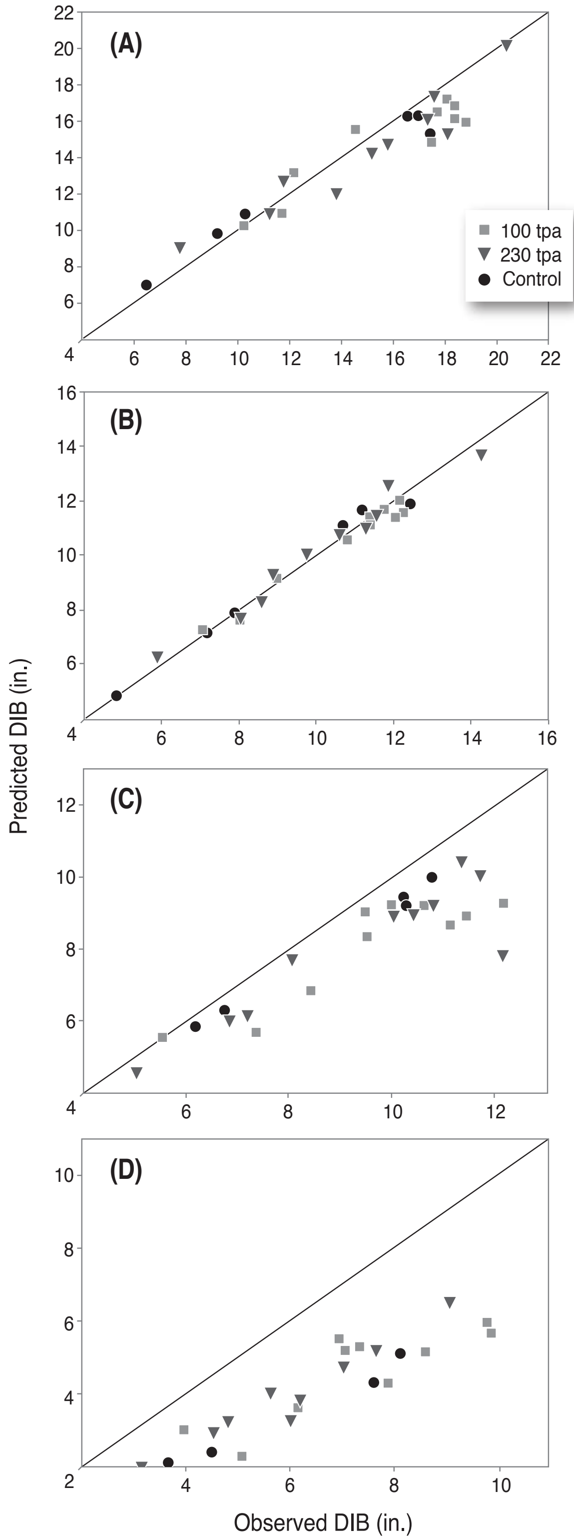

Figure 2. Observed vs. predicted diameter inner bark (DIB) for the (A) 0.5ft, (B) 17.3ft, (C) 32.0ft, and (D) height to live crown (HLC) measurement point, by treatment.

Mean, relative, and maximum bias, by measurement point and treatment is shown in Table 8. The taper equation under predicted DIB (i.e. observed DIB was greater than predicted DIB) in all but one of the 21 treatment x measurement combinations.

Mean bias was less than or equal to one inch up to and including the 17.3ft measurement point and increased consistently and substantially from there up the stem. This pattern occurred for all treatments.

Relative bias ((observed DIB-predicted DIB) /observed DIB) is a way to assess the taper equation performance as a function of the DIB measurement. Like mean bias, relative bias was very low (<5%) for all lower measurement points (up to and including the 17.3ft measurement point), between 10% and 15% for the 32.0ft measurement point and increased dramatically within the crown.

Absolute maximum bias (either positive or negative) was greater at the tree base and within the tree crown than along the stem. Absolute bias has practical implications concerning the estimation of log scaling diameter. The greater the variability (i.e., the greater the maximum bias values) in estimating the DIB of the small end of the log, the greater the chance of mistaking the log scaling diameter, and thus less reliable board foot volume estimates. The absolute maximum bias estimates for the 32.0ft measurement point (a common small end log position) for the 100tpa thin treatment was about twice (3.0in) that of the two other treatments, indicating much less reliable DIB estimates for that measurement point, treatment combination.

Table 8--Diameter inside bark (DIB) bias by measurement point (MP) and treatment.

MP	Thin to 100tpa			Thin to 230tpa			Unthinned		
	Mean Bias (in)	Relative Bias (%)	Max Bias (in)	Mean Bias (in)	Relative Bias (%)	Max Bias (in)	Mean Bias (in)	Relative Bias (%)	Max Bias (in)
0.5 ft	1.0	5.3	2.9	0.5	2.1	2.6	0.2	0.5	2.2
2.2ft	0.2	1.0	1.6	0.4	3.1	1.3	0.3	1.7	0.9
4.5ft	0.2	1.4	0.4	0.2	1.9	0.6	0.1	1.1	0.5
17.3ft	0.2	1.9	0.7	-0.5	-1.1	-0.7	0.0	0.4	0.6
32ft	1.5	15.0	3.0	1.1	14.0	1.6	0.8	10.8	1.3
HLC[1]	1.6	21.9	3.1	2.0	35.5	3.0	2.0	36.8	3.5
BT[1]	2.2	62.1	4.5	2.8	67.1	4.0	3.4	80.6	3.6

[1] See Table 7 For mean height by treatment.

Graphical illustrations of measurement point bias by individual tree and treatment are presented in Figure 3.

These preliminary results indicate that the taper equation predicts DIBs below the live crown well and consistently over predicts DIBs within the crown. Furthermore, the taper equation seemed to do a slightly better job predicting DIBs for the unthinned treatment as compared to either of the thinned treatments.

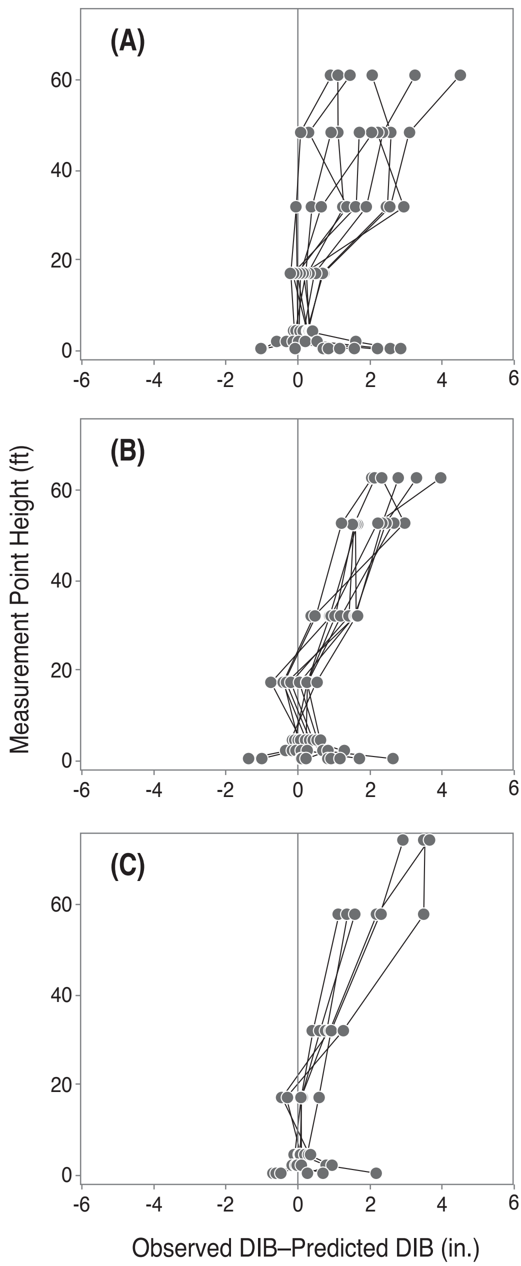

Figure 3. Diameter inner bark (DIB) bias (observed DIB– predicted DIB) for the (A) thin to 100tpa treatment (n=10), (B) thin to 230tpa treatment (n=10), and (C) unthinned treatment (n=6).

Objective 2:

Did thinning affect stem form/shape?

Using the taper data and the mean DIB data from each measurement point, thinning did seem to affect the shape of the stem. As seen in Table 7, the mean observed DIBs across treatments were smallest for the control/unthinned treatment and increased with thinning intensity, for all measurement points. However, when statistically tested, treatment had no significant effect on any of the seven measurement points (data not shown). This lack of treatment effect is most undoubtedly due to the small sample sizes per treatment. However, when using the plot data (averaged for each treatment), treatment had a statistically significant and consistent pattern (Table 9). Plot tree DBHs and CRs, were smallest for the unthinned treatment and increased with thinning intensity. Plot tree HLCs, and HTs, were the opposite; these values were greatest for the unthinned treatment and decreased with thinning intensity.

Table 9--Plot tree characteristics (DBH, HLC, HT, CR) by treatment. Mean values with the same letter were not significantly different across treatment.

Treatment	Thin to 100tpa	Thin to 230tpa	Unthinned
Density (tpa)	84	180	200
Sample size (# trees)	21	40	46
DBH (in)			
Minimum	8.8	6.4	6.0
Mean	12.7a	11.6a	10.6b
Maximum	16.1	17.2	15.6
Height to Live Crown (ft)			
Minimum	33.0	37.0	44.0
Mean	45.4a	51.0b	59.4c
Maximum	54.0	61.0	72.0
Crown Ratio			
Minimum	0.2	0.2	0.1
Mean	0.31a	0.27b	0.19c
Maximum	0.4	0.4	0.3
Total height (ft)			
Minimum	53.0	45.0	54.0
Mean	66.0a	70.1b	73.8c
Maximum	76.0	82.0	85.0

Objective 3:

How well did the taper equation predict individual tree volume?

Combining various diameter and height measurements is a useful way to express tree form and thus, log form. Three form quotients were used in this analysis:

1 Girard form class (GFC)- ratio of diameter inner bark (DIB) at 17.3ft to the diameter outer bark (DOB) at breast height (4.5ft)

2 Olney form class (OFC)- ratio of diameter inner bark (DIB) at 32.0ft to the diameter outer bark (DOB) at breast height (4.5ft)

3 Form factor (FF)- ratio of the volume of the tree to the volume of a cylinder having the same length and cross section (basal area at 4.5ft)

As seen in Table 10, observed form quotients did not differ substantially across treatments, indicating that thinning did not affect these measures of stem/log form. Predicted form quotients and relative bias estimates of these form quotients are also shown in Table 10. Observed and predicted GFC were very similar and did not differ across treatments (ranging from 0.83 to 0.85). Thus, relative bias was very small; ranging from 1.9% for the thin to 100tpa to no bias for the unthinned treatment. Moving up the stem to 32ft, observed OFC was similar across treatment (ranging from 0.74 to 0.77) and although predicted OFC values were similar across treatments they were less than the observed values (ranging from 0.65 to 0.66). Thus, relative bias increased to about 13%; ranging from 14.9% for the thin to 100tpa to 10.9% for the unthinned treatment. Form factor varied little across treatments (mean=0.42).

Because every sampled tree had DIB measurements at 0.5ft and 32.0ft, those values were used to test how well the taper equation predicted individual log volumes. To simplify matters, the volume of that 31.5ft length was calculated as a single log. As seen in Table 10, observed cubic foot volume was smallest for the unthinned

Table 10--Observed, predicted, and percent bias for Girard form class, Olney form class, form factor, and volume (ft^3) by treatment.

MP	Thin to 100tpa			Thin to 230tpa			Unthinned/Control		
	Observed	Predicted	Bias (%)	Observed	Predicted	Bias (%)	Observed	Predicted	Bias (%)
Girard Form Class[1]	0.85	0.83	1.9	0.83	0.83	-0.8	0.84	0.84	0.0
Olney Form Class[2]	0.77	0.65	14.9	0.77	0.66	13.9	0.74	0.66	10.9
Form Factor[3]	0.42	--	--	0.42	--	--	0.43	--	--
Volume[4]	25.47	19.74	20.5	23.25	19.33	16.0	18.28	15.96	13.0

[1] DIB at 17.3ft/DOB at 4.5ft (DBH)
[2] DIB at 32.0ft/DOB at 4.5ft (DBH)
[3] Total stem volume (inside bark)/a cylinder with equal diameter and height
[4] One 31.5ft log above a 0.5ft stump height

trees and increased with thinning intensity (ranging from 18.3ft^3 to 25.5ft^3). Predicted volume followed the same pattern as observed volume. Like OFC, predicted volume values were less than the observed values (ranging from 16.0ft^3 to 19.7ft^3). This resulted in a mean relative bias of 16.5%. Bias was least for the unthinned trees (13.0%) and greatest for the thin to 100tpa trees (20.5%).

Conclusion

These results indicate that the taper equation developed from plantation-grown red alder did a good job predicting DIBs from ground level to about 32ft or so) then consistently under predicted DIBs from there up the stem and into the crown. Because of this under prediction, the three measures of tree shape (i.e. form quotients) and log volume (one, 31.5ft length) were also less than the observed values. Under predictions ranged from 10% to 20%. Across treatments, the taper equation yielded better predictions for the unthinned treatment as compared to the thinned treatment.

CIPS Red Alder Growth Simulator

A new interface was created by Doug Mainwaring of the Center for Intensive Planted-forest Silviculture (CIPS) at OSU for the ORGANON growth and yield model. This interface, called the CIPS Growth Simulator is a Microsoft Excel/Visual basic program designed only for the three Douglas-fir versions of ORGANON, links the CIPS/VMRC variant of CONIFERS to ORGANON, calculates 30-yr and 50-yr Douglas-fir site indices, simulates stand and tree growth under different treatment scenarios, including nitrogen fertilization and three types of thinning (user code, TPA, or RD), enables use of ORGANON genetic worth and Swiss needle cast modifiers, estimates board foot volume by scaling diameter of cut logs, and provides economic analysis of any simulated treatment scenario.

After using this program, Andrew Bluhm, with the HSC consulted, then assisted in the development of this tool for the red alder variant of ORGANON. Much of the program remained the same, but due to the differences in the ORGANON variants, many changes had to be made.

Some features available for the Douglas-fir variants did not apply to red alder and thus were deleted, making the Red Alder Growth Simulator a “slimmed down” version.

Both the CIPS Growth Simulator for Douglas-fir, and the CIPS Red Alder Growth Simulator and their associated instructions are available for download at www.fsl.orst.edu/cips/Tools.htm.

The following is an abridged list of the instructions and features of the Red Alder Growth Simulator:

Installing Programs:

- Download ORGANON DLL 9.1 from ORGANON web site (http://www.cof.orst.edu/cof/fr/research/organon/downld.htm)
- Download the CIPS Red Alder Growth Simulator and the associated Instructions from the CIPS web site (http://www.fsl.orst.edu/cips/tools.htm)
- When CIPS_Red_alder_Growth_Simulator.xls has been downloaded, activate the visual basic capability of Excel so the program knows where to find the downloaded ORGANON DLL. This procedure differs depending on which version of Microsoft is being used. This is really the only difficult part of the downloading/activating sequence and more detailed instructions can be found in the instructions, or by contacting Andrew Bluhm.

Setting up for projections/runs

- Model projections (runs) are controlled on the Input worksheet. The yellow boxes are those that need to be set prior to making a projection/run. Required inputs are:
- Red alder site index
- Number of plots in the TreeList worksheet data
- Breast-height age and total age
- Planting density
- The red alder site index (Weiskittel et al., base age 20 years), can be calculated on the SI worksheet. Individual, dominant tree heights, total age (i.e. age from seed) and planting density are required fields. Enter (or cut and paste) up to 25 individual tree heights, then hit the "Calculate SI_{20}" box to obtain the average site index which then gets entered back into the red alder site index box on the Input worksheet.
- If there are no existing red alder height/age data, site index (Harrington, base age 50 years) can be estimated using the "Method of Site Quality Evaluation for Red Alder" also found on the SI worksheet.
- Once calculated, a conversion tool is included to adjust from a 50-yr base age to a 30-yr base age.
- Back on the Input worksheet, merchandising specifications need to be entered (note: if the merchandising specifications are changed, a new run needs to be done).
- The default output for the simulator is stand-level data, but tree-level data for each growth period can be generated by requesting an output of the "Treelist output?".

TreeList worksheet

- The stand/plot/tree data is then entered (or cut/pasted) on the TreeList worksheet. Required fields are tree, plot, species, user code, DBH, and EXPF.

- Species is a numerical value used by ORGANON. Red alder species = 351. See the ORGANON manual for other tree species numbers.
- User code default is zero unless specific, individual trees want to be selected for removal in a thinning by changing the value from 0 to 1.
- Total tree height and crown ratio are optional (but encouraged) values. If no or only incomplete values are used, ORGANON will calculate the missing values.
- EXPF is the expansion factor (on a per acre basis) for each plot used in the treelist.
- Once the TreeList data is entered, click the "OrgEdit" button.

Completed TreeList worksheet

- Once the "OrgEdit" button is clicked, go to the Completed TreeList worksheet. Here, all calculated HTs and CR are displayed as well as any errors in the treelist input. Errors are displayed on an individual tree and a stand level basis. All errors should be addressed and corrected on the TreeList worksheet and the "OrgEdit" button needs to be clicked again.

Treatment Scenarios

- Stand treatment requests are made on the Input worksheet.
- Total age is equal to harvest age/rotation age, etc
- Thinnings can be applied within a projection. There are two thinning types:
    - User thin: Used to remove specific trees indicated on the TreeList worksheet
    - TPA thin: This is a thinning from below to a specific residual trees per acre.

Projection and ProjErrors worksheet

- Once the tree data is error-free, and all required inputs are entered on the Input worksheet, the stand can be projected (i.e. grown) using the "Run Organon" button in the Projection worksheet. Any individual tree or stand level errors occur during the projection will be displayed on the ProjErrors worksheet.
- Anytime the tree data on the TreeList worksheet or the settings on the Input worksheet are changed, the *OrgEdit* button needs to be rerun before a new projection is made.

TreeList output

- If individual tree-level data was requested on the Input worksheet, a new worksheet labeled Treelist Output will appear. This worksheet displays DBH, HT, CR, CFVOL (cubic foot volume), BFVOL (boardfoot volume), and TPA (i.e. expansion factor) for each tree and for every year of the projection.

WQ_output

- If wood quality output was requested on the Input worksheet, a new worksheet labeled WQ_output will appear. This worksheet provides estimates of board foot volume by scaling diameter of cut logs (according to the merchandizing specifications provided on the Input worksheet). These values will be displayed for each thinning and for the final harvest.

Economic analysis

- The present net worth, by stand age, can be performed by clicking on the “Economic analysis” button on the Projection worksheet after clicking the “Run ORGANON” button. Before doing so, however, certain economic factors need to be entered in the pale yellow cells on the Economics worksheet. These factors are:
  - The interest rate, inflation rate, and rate of timber price increase above that of inflation.
  - The log price for any and all thinnings.
  - The log price for final harvest logs.
  - Costs incurred during the rotation.
- Note: All and any changes performed in the required user entered values on the Economic worksheet (the pale yellow cells) are updated instantly. In other words, the “Economic analysis” button on the Projection worksheet does not have to be re-clicked.

Graphs worksheet

- Once the stand is projected, graphs of trees per acre, basal area, cubic foot volume per acre, and board foot volume per acre are displayed on the Graphs worksheet.

Many thanks go out to CIPS and Doug Mainwaring as this CIPS Red Alder Growth Simulator is a great new tool now available for anyone interested in projecting the growth and yield of red alder plantations. However, this tool is still a work in progress. Changes to the simulator will be made as problems are identified and new features are added.

Any questions/comments/problems encountered with the simulator, or any assistance with the installation or use of the simulator can be directed to Andrew Bluhm.

Accomplishments of 2013

In addition to performing the necessary HSC tasks, Andrew was invited to speak at two meeting this past year.

Forest Owner Field Day

This conference, sponsored by Washington State University Extension, was held in Maytown, WA August 18, 2012. This educational event provided practical "how-to" information to a wide array of forest owners. For the second year running, Andrew taught the "Advanced Hardwood Management" course.

Western Hardwood International Convention & Exposition

This conference, sponsored by the Western Hardwood Association and the Washington Hardwood Commission was held in Portland, OR April 30-May 2, 2012. This event, geared toward Asian, European, and U.S. East Coast buyers, primary and secondary producers, wholesalers, importers and exporters, had dozens of exhibitors, training seminars, and a mill tour. Andrew was invited to present the red alder variant of the ORGANON growth and yield model and the new Red Alder Growth Simulator interface.

Direction for 2014

As always, the specific goals for 2014 are both continuations of our long-term objectives and new projects:

- Continue efforts to recruit new members.
- Continue HSC treatments, measurements and data tasks.
- Continue adding content and updating the HSC website.
- Continue efforts in outreach and education.
- Continue working with and analyzing the HSC data.
- Continue growth and yield modeling efforts; primarily to update and test the CIPS Red Alder Growth Simulator and continue testing RAP-ORGANON outputs/predictions.

Appendix 1

Summary of Red Alder Stand Management Study Treatments

Type 1- Thinned Natural Red Alder Stands

104. 230 tpa re-spacing density when height to live crown (HLC) is 15 to 20 feet
105. 525 tpa re-spacing density when HLC is 15 to 20 feet
106. Control- measure only, stand left at existing density
107. 100 tpa re-spacing density when HLC is 30 feet
108. 230 tpa re-spacing density when HLC is 30 feet
109. Control- measure only, stand left at existing density

Type 2- Red Alder Variable Density Plantations

201. 100 tpa control- measure only
202. 230 tpa control-measure only
203. 230 tpa pruned to 6 ft. lift, 12 ft lift, 18 ft lift, 24 ft lift
204. 525 tpa control -measure only
205. 525 tpa thin to 230 tpa in year 3 to 5
206. 525 tpa thin to 230 tpa when HLC is 15 to 20 feet
207. 525 tpa thin to 230 tpa when HLC is 30 to 32 feet
208. 1200 tpa control- measure only
209. 1200 tpa thin to 230 tpa in year 3 to 5

210. 1200 tpa thin to 230 tpa when HLC is 15 to 20 feet

212. 1200 tpa thin to 100 tpa when HLC is 15 to 20 feet

213. 525 tpa thin to 100 tpa when HLC is 15 to 20 feet

Type 3- Mixed Red Alder Douglas-fir Plantations

314. 100% red alder planted at 300 tpa density

315. 50% red alder and 50% Douglas-fir planted at 300 tpa density

316. 25% red alder and 75% Douglas-fir planted at 300 tpa density

317. 11% red alder and 89% Douglas-fir planted at 300 tpa density

318. 100% Douglas-fir planted at 300 tpa density

Appendix 2

HSC Summer Management Committee Meeting Minutes-Tuesday July 17, 2012

Attendees: Andrew Bluhm, David Hibbs- OSU;
Florian Deisenhofer, Scott McLeod,Jared Larwick- WA DNR;
Robert Deal- PNW Research Station;
Paul Kriegal- Goodyear Nelson;
Dar-Hsiung Wang; Tiawan Forestry Research Institute.

We started the meeting at 9:00 AM at the Wind River Training Center outside of Carson, WA with the morning session being indoors and after lunch, visiting some field stops.

The morning session started with a presentation by Andrew titled “Species mixtures of red alder and Douglas-fir: An analysis”. This analysis used up to 17 year-old data from five of the HSC’s Type 3 replacement series sites. Andrew examined the effect of species proportion (or %) on survival, DBH, HT, individual tree stem volume index (SVI/tree), SVI/acre, and relative land output (RLO).

A summary of the results are as follows.

Survival:

- At age 17, the range of survival for both species across all treatments was nearly identical from 75 to 95%
- Due to site variation, treatment (i.e. red alder proportion) had little statistical effect on survival of both species
- Red alder:
  - Survival was greater than 90% through age 12
  - By age 17, survival decreased with decreasing red alder proportion
- Douglas-fir:
  - Survival was greater than 90% through age 12

- By age 17 survival peaked at the 11% red alder treatment and declined thereafter

DBH:

- At age 17, red alder DBH was always greater than that for Douglas-fir
- Red alder:
  - Treatment differences in red alder DBH were minimal through age 9
  - By age 17, DBH was greatest in the two intermediate red alder percentages

Douglas-fir:

  - Not much treatment difference at age 17
  - DBH declined slightly with increasing red alder proportion

Height:

- Red alder:
  - HT varied by 2.5m across treatments
  - HT increased with increasing red alder proportion
- Douglas-fir:
  - HT varied by 1.0m across treatments, therefore HT was generally insensitive of treatment
  - HT declined slightly with increasing red alder proportion

Individual tree Stem volume Index (SVI/tree):

- Red alder:
  - SVI/tree was always greater than Douglas-fir SVI/tree
  - SVI/tree was significantly greater at the two intermediate red alder proportions; almost double that of the two extremes
  - These SVI/tree values reflect greater DBHs at the two intermediate red alder proportions
- Douglas-fir:
  - Pure stands of Douglas-fir had a substantially greater SVI/tree (18%) than any of the species mixture treatments

Stem volume Index per acre (SVI/acre):

- SVI/acre was greatest for the pure red alder followed by the 50% red alder, 25% red alder, 0% red alder, and lowest for the 11% red alder
- The low SVI/acre for the 11% red alder is because the individual trees were the smallest for both species, not because of a lower total density
- Even though the 50% red alder had the lowest density its SVI/acre was nearly highest

Relative Land Output (RLO):

- Please see the presentation material for the definition and how RLO is calculated
- A positive mixture effect (RLO>1) was observed only for the 50% red alder

- Even though the 50% red alder had the lowest density its SVI/acre was nearly highest
- For the 50% and 25% red alder treatments, red alder over performed while Douglas-fir under performed
- For the 11% red alder treatment just a slight under performance of Douglas-fir was observed

These results were then put into the context of the following three questions:

- Does increasing red alder proportion correlate with increasing red alder performance?
    - Survival: Yes, survival increased with increasing red alder proportion
    - DBH: No, DBH was greatest in the intermediate red alder proportions
    - HT: Yes, HT increased with increasing red alder proportion
    - SVI/tree: No, SVI/tree was greatest in the intermediate red alder proportions
- Does any red alder proportion correlate with decreasing Douglas-fir performance?
    - Survival: Kind of, survival was greatest in the 11% red alder and only then decreased with increasing red alder proportion
    - DBH and HT: Kind of, DBH and HT was mostly independent of red alder proportion with only a slight reduction with any red alder proportion
    - SVI/tree: Yes, SVI/tree was greater in pure stands than any red alder proportion
- Are mixed species stands more productive than pure stands?
    - SVI/acre: No, SVI/acre was greatest in pure red alder stands
    - RLO: Kind of, RLO was slightly greater in the 50% red alder than pure stands

In summary:

- Red alder:
    - To date: growth/stand dynamics influenced by other red alder (interspecific competition). Except for maybe the lowest red alder proportion
    - Future: growth/stand dynamics will be increasingly influenced by increasing DF% and with time
- Douglas-fir:
    - To date: Growth independent of red alder proportion (except perhaps a slight penalty on SVI/tree at high red alder proportions)
    - No penalty with red alder, but then again, no benefit either
    - Future: the stand will grow like the red alder is not there
- Productivity of species mixtures:
    - To date: growth/stand dynamics influenced by other red alder (interspecific competition). Except for maybe the lowest red alder proportion

   - Future: growth/stand dynamics will be increasingly influenced by increasing Douglas-fir proportions and with time

Andrew then presented the group with updates on current HSC activities. These include:

A project investigating the potential effects of climate change on red alder. Using HSC and BC Ministry of Forests data, a manuscript was just published in Forest Ecology and Management titled "Climate effects on red alder growth in the Pacific Northwest of North America".

- The objectives were to:
   - Investigate the effects of climatic variables on the growth of red alder throughout a broad latitudinal gradient in the PNW.
   - Then, in order to evaluate the potential effects of climate change on tree growth the developed models were used to project the growth of red alder under three future climate scenarios
- Results include:
   - Of the 17 climate variables tested, the Summer Heat Moisture index (SHM) and the Mean Temperature of the Warmest Month (MWMT), spring precipitation (PPTsp), and initial tree height (Hti) proved to be the strongest predictors of SVI, explaining 78% of the variation
   - Potential increases in SVI differed by time period and climate scenario but ranged from 2.7 to 12.1%
   - In conjunction with potential increases in SVI, it was predicted that there would be an expansion of the range of red alder under most future climate scenarios

Thinned natural red alder stand volume and stem form project.

- The objectives were to:
   - Test to see if thinning affected stem form
   - Test to see if thinning affected log size distribution
   - Complete a 100% cruise of all treatment plots
   - Calculate merchantable volumes using existing red alder volume/taper equations
   - Compare cruise volume estimates with volume equation estimates
- The data has been entered and partially analyzed, but no new results have been obtained.

RAP ORGANON Excel Interface.

A new user-friendly Excel interface for using the RAP ORGANON growth model has been developed at Oregon State University by the Center for Intensive Planted-forest Silviculture (CIPS). Originally developed for Douglas-fir, a version was developed for RAP-ORGANON and a copy of the program (as well as user instructions) can be obtained at the CIPS website (www.fsl.orst.edu/cips). Andrew then demonstrated how the interface works using plot data from one of the HSC sites. If interested in using this growth simulator, please see the CIPS website or contact Andrew directly.

Andrew then proceeded with a review of last years' fieldwork, the coming years' fieldwork and an overview of the data collection schedule for all three installation types.

Winter 2011/12 was typical field season (if you don't take into account of all of the late-season, low-elevation snow!). Measurements and various treatments were completed on 8 of the 37 installations. Last year's work included:

- No Type 1 installations had fieldwork.
- Seven Type 2 installations had fieldwork.
  - Three sites- John's River (2201, WHC), Ryderwood (3202, WHC), and Clear Lake Hill (4202, GYN) had their 22nd year measurement.
  - Three sites- Mt. Gauldy (2206, SNF), Scappoose (3209, BLM), Darrington (4206, WADNR) had their 17th year measurement.
  - One site- Weebe Packin (3208, ODF) had its second thinning treatment (when HLC= 15-20ft), its last thinning treatment (when HLC~30ft), and its 3rd pruning lift (to 18ft).
  - One site- Mt. Gauldy (2206, SNF) had its 3rd pruning lift.
  - One site- Darrington (4206, WADNR) had its last thinning treatment (when HLC~30ft).
- One Type 3 installation had fieldwork.
  - Menlo (3301, WADNR) had its 17th year measurement.

In addition to the measurements and treatments completed above, there was substantial plot maintenance required including: replacing measurement plot corner markers, retagging trees that outgrew the zipties, refreshing or establishing DBH paint lines, and roquing out invading conifers and/or hardwoods.

So, in the big picture:

- Four of the twenty-six Type 2 sites have had their 22nd year measurement.
- Twenty two of the twenty-six Type 2 sites have had their 17th year measurement.
- Fourteen of the twenty-six Type 2 sites have all treatments completed.
- Five of the seven Type 3 sites have had their 17th year measurement.

This coming year's fieldwork (Winter 2012/13) will likewise be typical. A total of 8 installations need either a measurement or a treatment. Work includes:

- Two Type 1 installations: Sauk River (4103- MBSNF) and Sechelt (4101-BC-MIN) need their 19th and 24th year measurements, respectively.

- Five Type 2 installations need fieldwork.
  - Two installations- LaPush (1201, WADNR) and Pollard Alder (2202, SNF) need their 22nd year measurement.
  - One installation- Maxfield (1203, WADNR) needs its 17th year measurement.
  - One installations- Cape Mtn. (2204, SNF) needs its 3rd pruning lift (to 18).
  - Three installations- LaPush (1201, WADNR), Maxfield (1203, WADNR), and French Creek (4205-BCMIN) need their 4th and final pruning lift (to 22ft).
- One Type 3 installation needs fieldwork.
  - Cedar Hebo (3202, SNF) needs its 17th year measurement
- Of note, the Type 1 installation, Sauk River is an "orphaned" installation without support for completing the measurements.

As fall approaches, Andrew will contact each HSC member to provide specific on the activities and schedule the fieldwork.

Next, the topic turned to the HSC budget. Just like in the last few years, dues received in FY 2012 were less than expected. This allowed the HSC enough income to fund Andrew for only 4 months at 0.8 FTE. For FY 2013, uncertainty exists in the level of funding: the sale of Forest Capital to Hancock and the potential re-joining of Cascade Hardwood Group may affect dues.

To help identify what Andrew has time for and conversely what he is not able to accomplish with his reduced time, Dave and Andrew assembled a list of deliverables- what's being done, and what is not. Please see the associated handouts for the specifics on the budget and future directions.

After lunch, the group went to visit the "old firebreak study". This seminal experiment, established in 1929, is often cited when trying to describe the benefits of nitrogen-fixing red alder on the Douglas-fir growth on low-quality sites. A somewhat similar experiment was also established on a very high-quality site on the Oregon Coast (Cascade Head). The most current results of these two studies can be found in a manuscript entitled "Seven decades of stand development in mixed and pure stands of conifers and nitrogen-fixing red alder" by Dan Binkley in the Canadian Journal of Forest Research. The discussion centered on the results presented within the paper. Please see the handout for more details. The improvement of the Douglas-fir growth due to the red alder was visually striking. It was well worth the visit.

Unfortunately, the group was not able to visit a field trial site for the Assisted Migration Adaptation Trial (AMAT). Under the assumption that future changes in climate may occur faster than trees/forests can adapt, the British Columbia Ministry and Range have initiated this study to better understand tree species climate tolerances. Please see the attached handout describing this research in more detail.

Next, we traveled to the HSC Type 3 site #5301 (Puget). This is one of the seven red alder Douglas-fir mixed-species replacement experiments. The site was used as a forum to continue the discussion of the results presented in the morning session. However, because this site is only 15 years old, it was not included in the previous analysis. Using 12 year old data, the performance of this one installation was also placed in the context of the same three questions:

- Does increasing red alder proportion correlate with increasing red alder performance?
  - Survival: Yes, survival increased with increasing red alder proportion
  - DBH and HT: Yes, DBH and HT increased with increasing red alder proportion
  - SVI/tree: Yes, SVI/tree was greatest in the two highest red alder red alder proportions
- Does any red alder proportion correlate with decreasing Douglas-fir performance?
  - Survival: No, survival was independent of red alder proportion
  - DBH, HT, and SVI/tree: Kind of, DBH, HT (and thus SVI/tree) was mostly independent of red alder proportion with (as expected) considerable variation by treatment
- Are mixed species stands more productive than pure stands?
  - SVI/acre: Mostly Yes, SVI/acre was greater in two of the three mixed-species treatments as compared to either of the pure stands
  - RLO: Yes, RLO was greater in all the three mixed-species treatments as compared to either of the pure stands

The last stop was a relaxed walk to visit the old Wind River Canopy Crane Research Facility. Although no longer active, it is part of the Wind River Research Station and participates in several environmental monitoring networks while incorporating numerous research projects and providing educational and outreach opportunities. As with the old firebreak study, this facility has played a historically important role in the forestry of the Pacific Northwest.

As a reminder, there was general consensus to have a Winter 2012/13 winter meeting near Darrington, WA to measure the orphaned site. Potential dates are sometime in the first two weeks of November. If you have any preference as to the dates, please contact the HSC.

Appendix 3

Financial Support Received in 2012-2013

Cooperator		Support
BC Ministry of Forests		$8,500
Bureau of Land Management		$8,500
Goodyear-Nelson Hardwood Lumber Company		$4,500
Hancock Forest Management		$4,500
Oregon Department of Forestry		$8,500
Siuslaw National Forest		------
Trillium Corporation		------
Washington Department of Natural Resources		$4,250
Washington Hardwood Commission		------
	Subtotal	$38,750
Forestry Research Laboratory		$25,400
	Total	$64,150

http://hsc.forestry.oregonstate.edu/