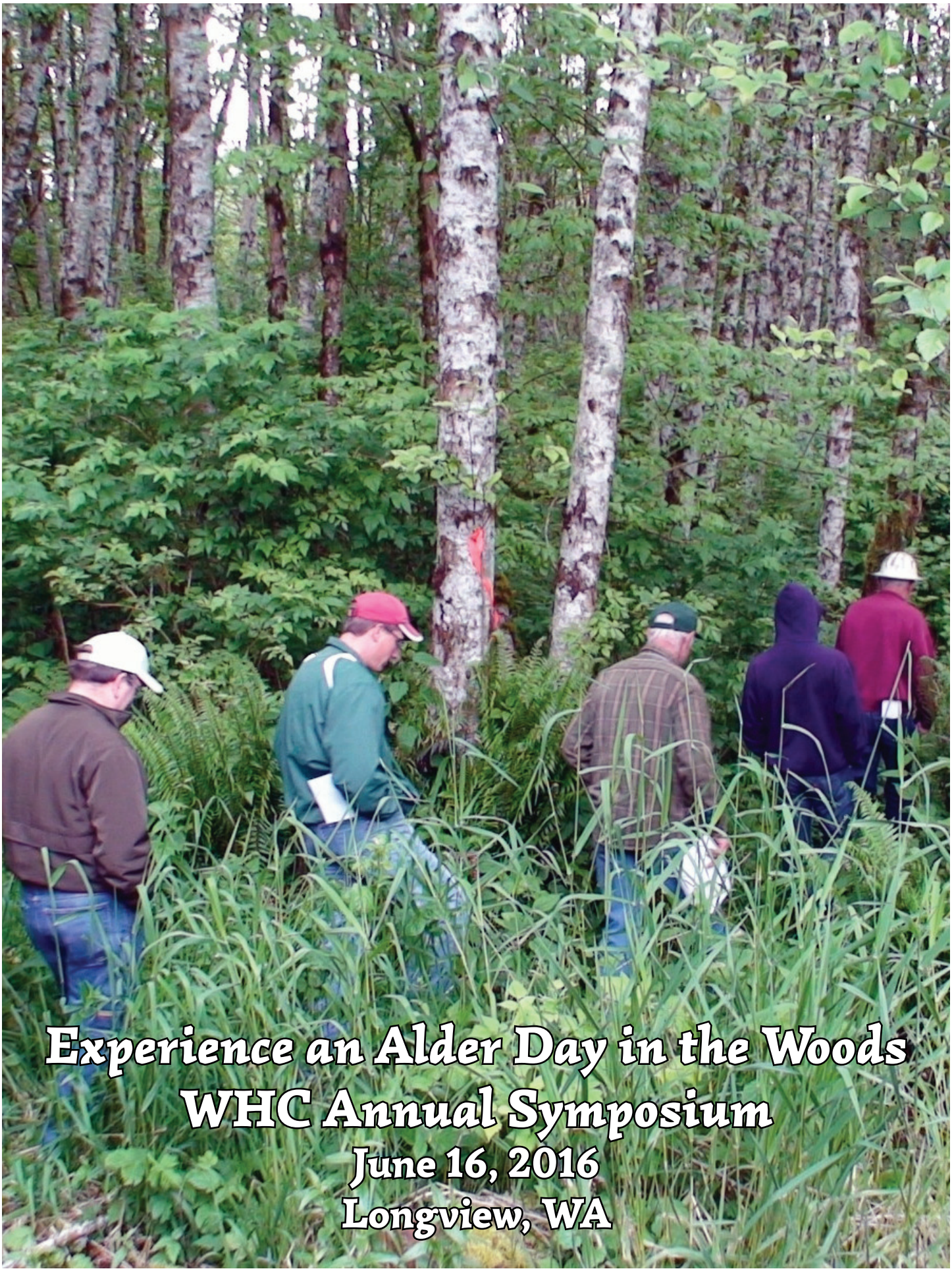


Experience an Alder Day in the Woods

WHC Annual Symposium

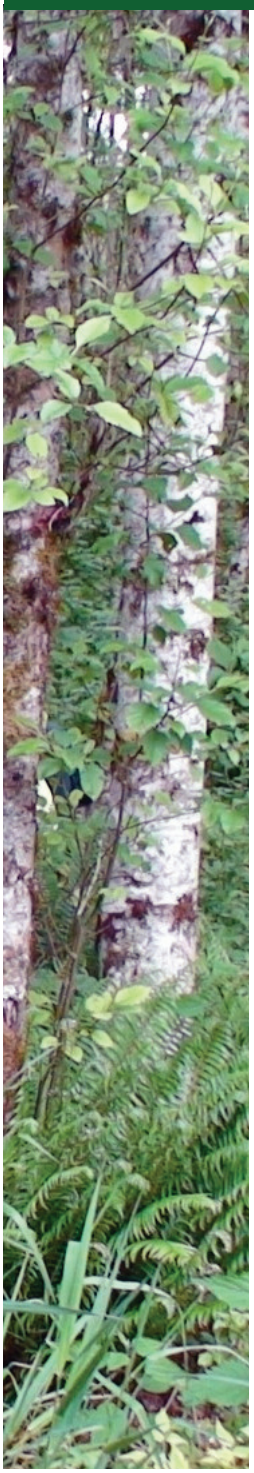
June 16, 2016

Longview, WA

Washington Hardwoods Commission

Experience an Alder Day in the Woods
June 16, 2016 Longview, WA

Agenda



STOP	LOCATION	ARRIVE	DEPART	TOPIC
0	**PARKING**	**7:30 AM**	**8:15 AM**	
	Three Rivers Mall			Safety (Rod Meade)
	Kelso, WA			Field Tour Overview (Alex Dobkowski)
1	**HEADQUARTERS**	**8:45 AM**	**10:15 AM**	
1.1	*1342A Rd.*			Introduction (Alex Dobkowski)
	Plantation Age 16 yrs.			Hardwood Silviculture Cooperative (HSC) Overview (Glenn Ahrens)
				Plantation Overview (Alex Dobkowski)
				Planting Site Selection/DNR Site Selection Model (Brian Morris)
				Stocking Control/PCT (Mica Keralis)
1.2	*1342 Rd.*			Soil Site Index/Expressed Site Index (Alex Dobkowski)
	Plantation Age 29 yrs.			
	Plantation Age 19 yrs.			
2	**HEADQUARTERS**	**10:30 AM**	**11:30 AM**	
2.1	*1394 Rd.*			Plantation Overview (Alex Dobkowski)
	Plantation Age 24 yrs.			Commercial Thinning Study Overview (Rod Meade)
2.2	*1390M Rd.*			Plantation Establishment/Planting Stock (Alex Dobkowski)
	Plantation Age 24 yrs.			Commercial Thinning Contrast
3	**SEAQUEST ST PARK**	**12:00 PM**	**12:45 PM**	
				Rest Rooms & Lunch
4	**RYDERWOOD**	**1:30 PM**	**2:15 PM**	
	Natural Red Alder			Drive By
	Age 24 years			
4.1	*9100 Rd.*			Plantation Overview (Alex Dobkowski)
	Plantation Age 23 yrs.			Commercial Thinning Study Details (Rod Meade)
				Commercial Thinning Operations (Mica Keralis)
5	**RYDERWOOD**	**2:15 PM**	**3:30 PM**	
5.1	*9400 Rd.*			Stand Density Management/HSC Results (Andy Bluhm)
	Plantation Age 26 yrs.			
6	**Parking**	**4:00 PM**		
	Three Rivers Mall			
	Kelso, WA			

Note: Very full agenda - Please enter and exit vans quickly. Please no side converstions during presentations.

Commissioners

Michael Johnson, Chairman Term: June 2019
Hancock Forest Management
273 SR 4 W
Cathlamet, WA 98612
(360)795-3221
Email: (360)795-3221

Randy Bartelt, Vice Chairman Term: June, 2019
Port Angeles Hardwood LLC
333 Eclipse Industrial Parkway
Port Angeles, Wa 98363
(360)452-6041
Email: randyb@chwa.com

Alex Dobkowski` Term: June, 2019
Weyerhaueser forester, Retired
PO Box 188
Longview, WA 98632
(360)827-5632
Email: alex.dobkowski@centurylink.net

Tom Fox Term: June, 2017
Tree Management Plus
PO Box 311
Ethel, WA 98542
(360)978-4305
Email: tomfox@tds.net

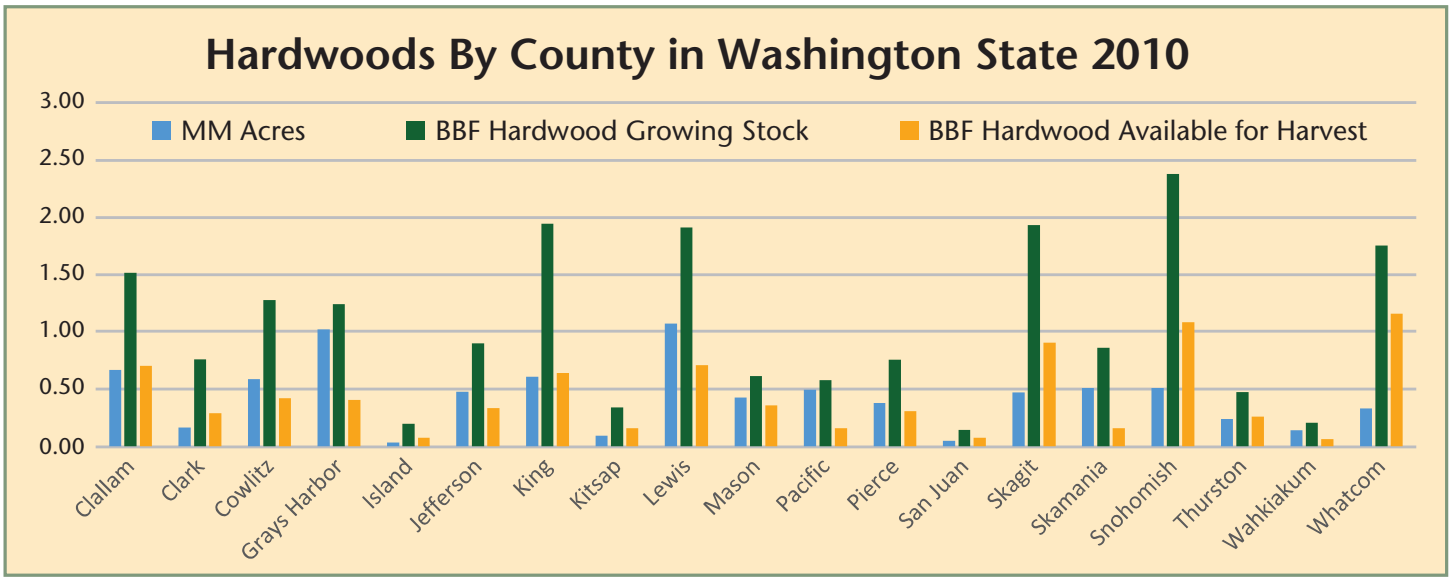
Joe Monks Term: June, 2017
Northwest Hardwoods
1855 Boyer Avenue E
Seattle, WA 98112
(425)210-5880
Email: joe.monks@northwesthardwoods.com

Ed Orcutt Term: June 2018
Cascade Forest Management
PO Box 1820
Kalama, WA 98625
(360)673-6309
cascadefm@kalama.com

Steve Witherspoon Term: June 2018
Georgia Pacific Corporation
349 NW 7th Avenue
Camas, WA 98607
(360)834-8304
Email: slwither@gapac.com

WASHINGTON
HARDWOODS
COMMISSION

Washington Hardwood Facts at a Glance



Economic Impact - $147,000,000 – direct and indirect salaries and wages
Employment – 5783 – direct and indirect
Growing Stock – 19.8 BBF (8.3 BBF available for harvest)
Acres – 8.3 MM unreserved (PLUS 4.8 MM acres reserved)
Harvest – 192.9 MMBF
Consumption – 216.6 MMBF
Sustainable Rate Of Removal – 400 MMBF/YEAR

Counties Growing Hardwoods

Ecological Benefits of Native Hardwoods

Hardwoods may produce seeds or fruits eaten by birds or small mammals and their leaves can be a seasonally important food source. Hardwoods can support different species of lichens, mosses, and ferns on their stems and on the ground nearby. Alder adds nitrogen to the soil and other species serve different roles in nutrient cycling. Alder is also resistant to root rots affecting conifers.

Notable Alder Features

Alder ranks high in workability, such as machining, resistance to splitting, joint strength, gluing, sanding/polishing, and finishing.

Alder is recognized as the "magician of finishes" imitating other hardwoods and is the 3rd most abundant species in Washington forests.

WASHINGTON HARDWOODS COMMISSION

Washington Hardwoods Commission
PO Box 1095 • Camas, WA 98607 • 360-835-1700
whc@wahardwoodscomm.com • www.wahardwoodscomm.com

Washington Hardwood Facts at a Glance

Washington Hardwood Uses

Including Furniture, Cabinets, Doors, Mouldings, Flooring, Core Stock, Boxes & Crates, Toys, Musical Instruments and Wine Boxes.

WASHINGTON HARDWOODS COMMISSION

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PO Box 1095
Camas, WA 98607
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whc@wahardwoodscomm.com
www.wahardwoodscomm.com

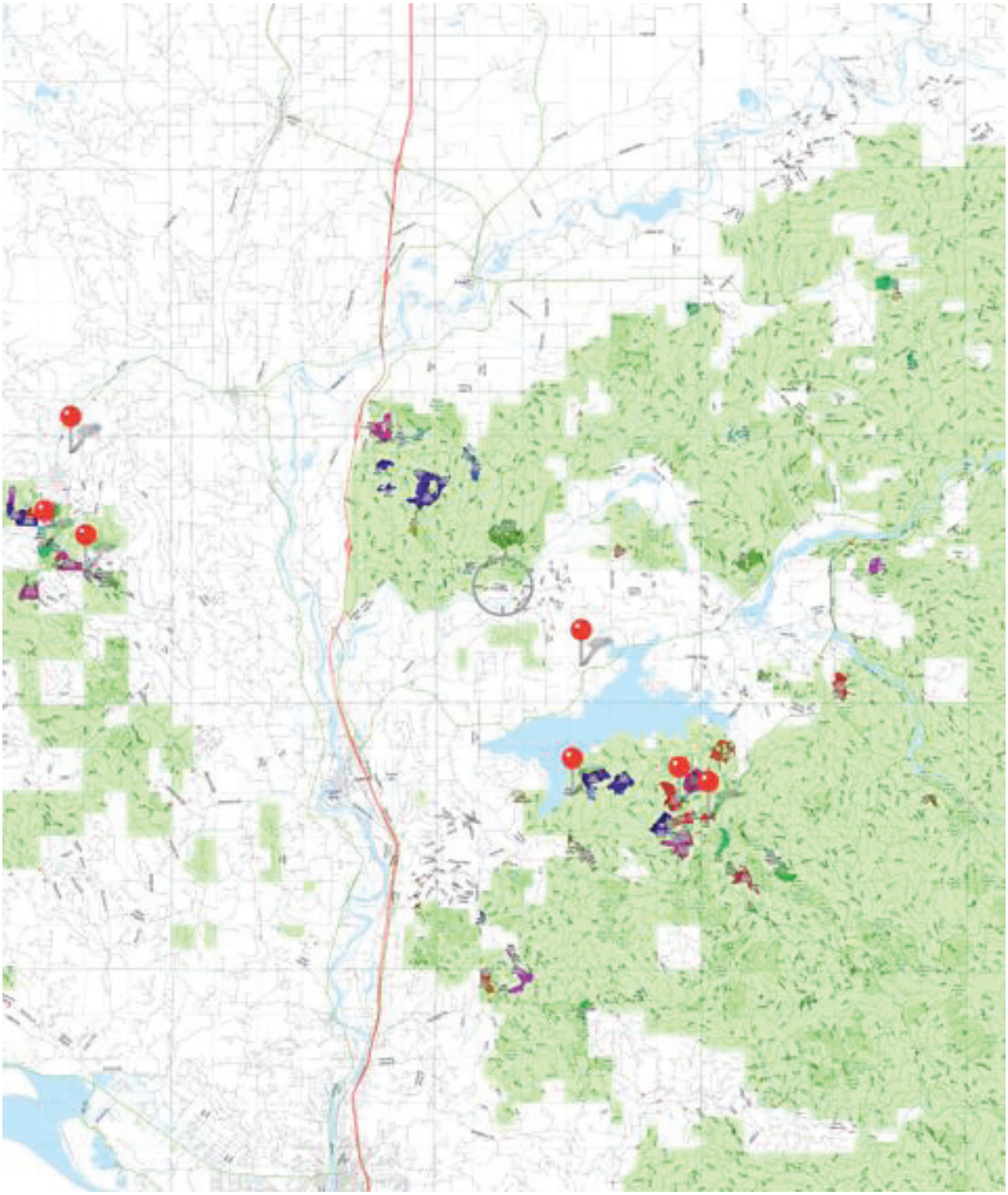
Experience an Alder Day in the woods.

A special guided tour of alder plantations.

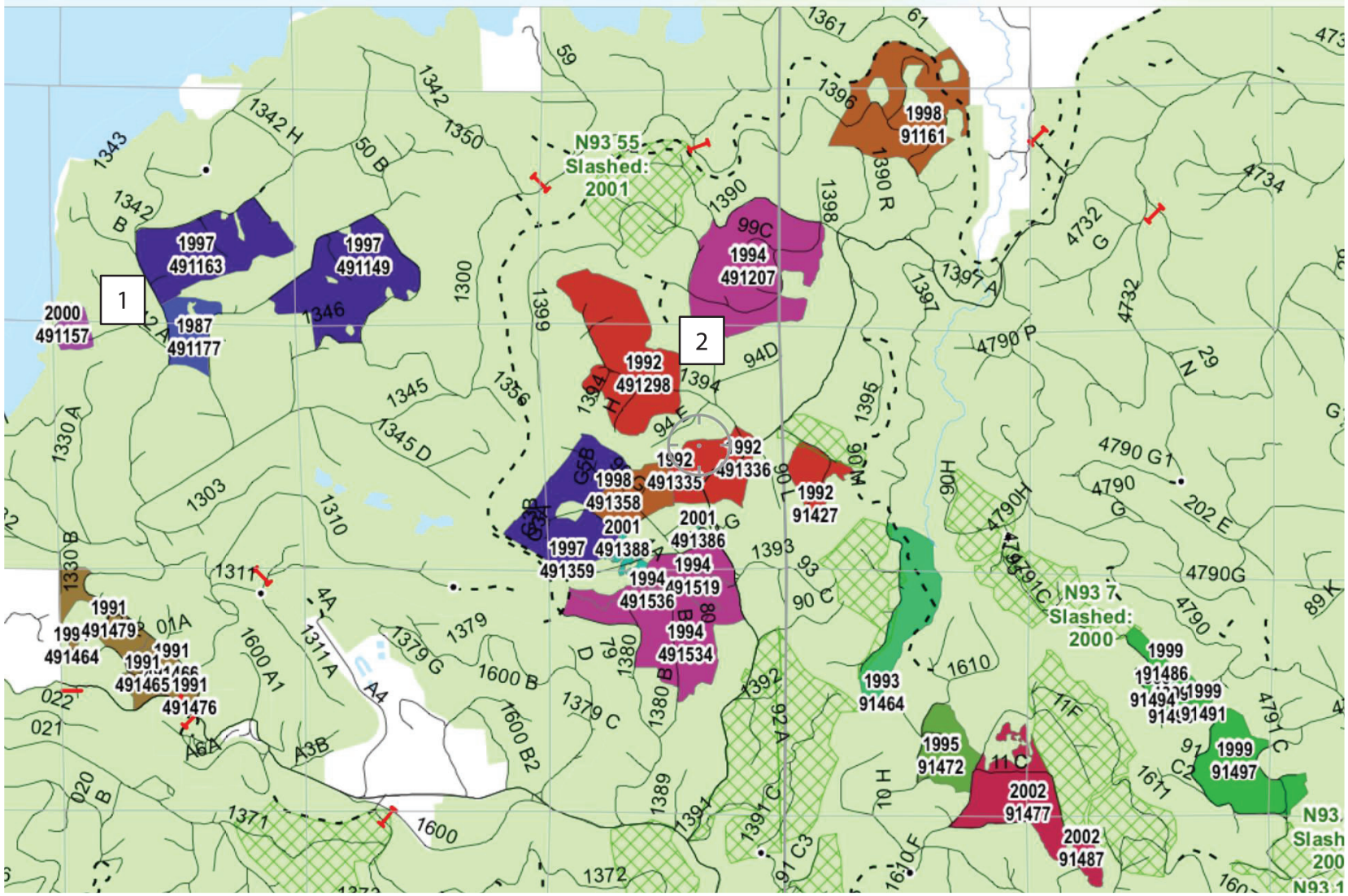
Thank you to our excellent presenters and Weyerhaeuser.

Weyerhaeuser Red Alder Plantations Established
1987 -2002

Tour Route



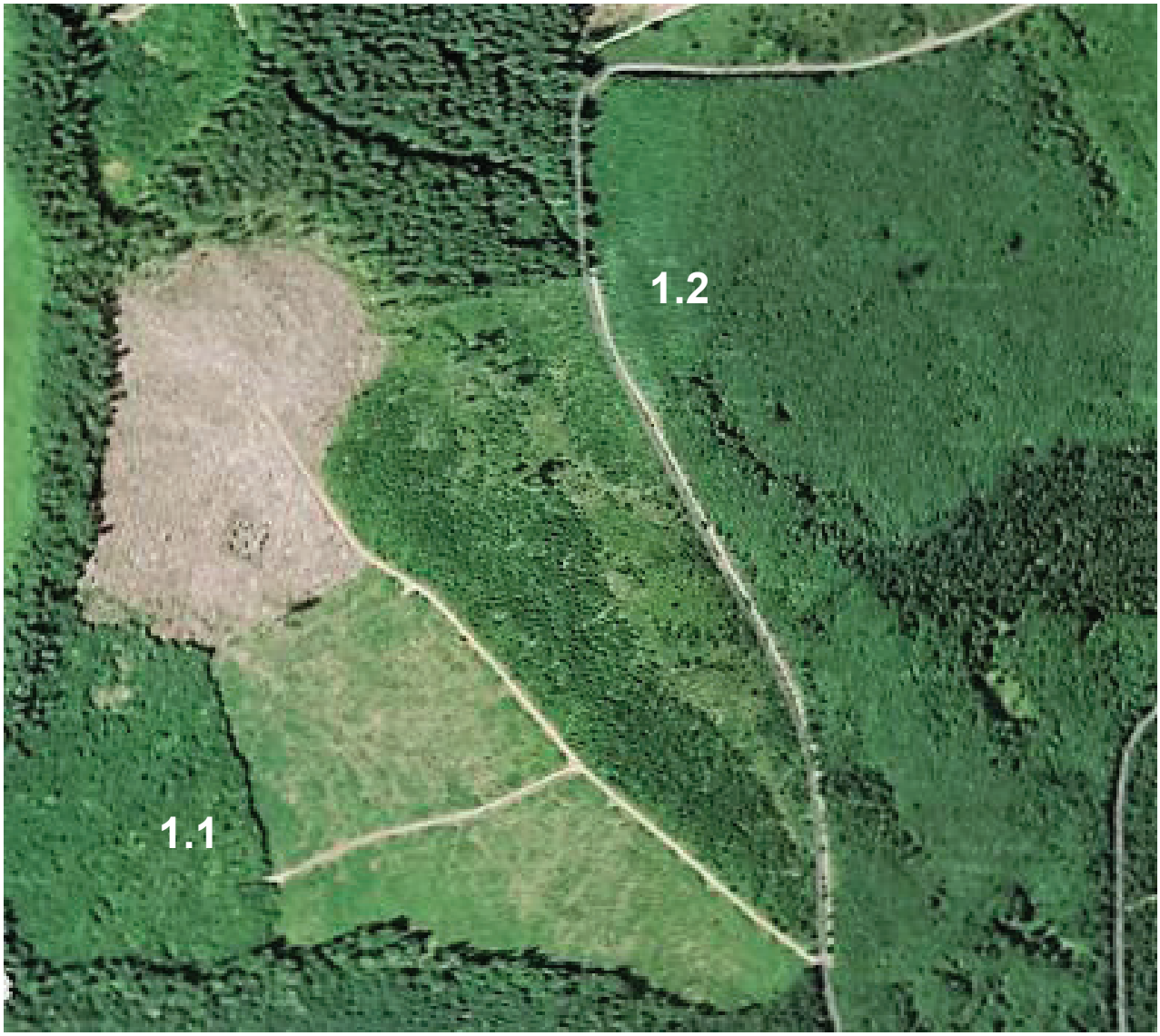
RED ALDER PLANTATIONS near Castle Rock, WA
STOPS 1 & 2



6/16/2016

Prepared by Alex Dobkowski

Stop 1 Headquarters – Sucker Creek



Intoduction

- Weyerhaeuser began planting red alder because the company owned Northwest Hardwoods.
    - The target was to establish 1,000 to 2,000 acres per year.
    - Between 1990 and 2002 15,000-20,000 acres of red alder plantations were established in the WA Coast Range and in the foothills of the WA Cascades.
    - Objective was to grow high quality logs.
- A red alder plantation management research program was initiated in 1986 and received ample annual funding through 2010.
    - Red alder had never been planted on an operational-scale.
    - Information available in the literature was mostly of an academic nature – with only a very few small case studies with planted alder.
    - Partnering between scientist, nursery growers and foresters resulted in best-management for seedling propagation, site selection, site preparation, planting and density management.
    - All of these best practices were shared with the public.
    - Almost all informational literature on red alder plantation establishment is based on Weyerhaeuser research and operational experience.
- Weyerhaeuser stopped planting red alder in 2010 because the company sold Northwest Hardwoods.

Presenters

- In my opinion there are relatively few people that are very knowledgeable about red alder tree growing.
- There are even fewer people that have successfully established and managed red alder plantations on a large operational scale.
- We have a number of these people here today.

Glenn Ahrens
Hardwood Silviculture Cooperative
OSU Extension Forester
Oregon State University Extension Service
200 Warner-Milne Rd.
Oregon City, OR 97045
503-655-8631
glenn.ahrens@oregonstate.edu

Andrew Bluhm
Hardwood Silviculture Cooperative
Oregon State University
321 Richardson Hall
Corvallis, OR 97331-5752
541-737-6100
andrew.bluhm@oregonstate.edu

Mica J. Keralis
Forester / Commercial Thinning Manager
Coastal Operations Team
Weyerhaeuser WTL
O: (360) 537-8247
C: (360) 489-5844
F: (360) 532-9035
PO Box 1000, Cosmopolis, WA 98537
Mica.Keralis@Weyerhaeuser.com

Rod Meade
Senior Research Forester
Western Timberlands Research
The George R. Staebler Forest Resources Research Center
505 North Pearl Street, P.O. Box 420
Centralia, WA 98531
tel. 360.330.1763
fax 360.330.1742
mobile 360.269.1318

Brian C. Morris
Assistant Division Manager (Acting)
Silviculture, Research, and Monitoring
Forest Resources Division
Washington Department of Natural Resources
Cell: (360) 773-5724
brian.morris@dnr.wa.gov
www.dnr.wa.gov

Alex Dobkowski
Research Forester
Weyerhaeuser WTL (Retired)
C: (360) 489-5844
alex.dobkowski@centurylink.net

Acknowledgements

Circa 1986 - 2002

- Heinz Hohendorf -- Northwest Hardwoods -- advocate for plantation grown red alder and its through the mill value to NW Hardwoods.
- John Keatley, Weyerhauser Land &Timber Manager that supported operational implementation of red alder plantations when his peers did not.
- Yasu Tanaka and Mark Triebwasser, Weyerhaeuser scientist and nursery manager, that learned how to grow high quality red alder seedlings in large operational quantities.
- Lance Christensen, Christensen Forestry Services, for quality science in the establishment and measurements of research studies and operational monitoring of red alder plantations – highly knowledgeable "eyes-in-the-field" for research and operations.
- Paul Figueroa, Weyerhaeuser Research Forester, for learning how to kill weeds without killing red alder.
- Connie Harrington, USFS, for research on red alder productivity.

Circa 1988 – Present

- Rod Meade, Weyerhaeuser Research Forester, lead role in the establishment of red alder research and operational plantations, technology transfer to forestry operations, and advocate for the pre-commercial and commercial thinning of Red Alder.
- Nameless Weyerhaeuser foresters that planted and thinned red alder following best management practices, even after it wasn't required for them to do so.

Hardwood Silviculture Cooperative, Oregon State University

The Hardwood Silviculture Cooperative (HSC) is a research and education program focused on the silviculture of red alder (*Alnus rubra*) and mixes of red alder and Douglas-fir (*Pseutotsuga menziesii*) in the Pacific Northwest. The goal of the HSC is improving the understanding, management, and production of red alder. Established in 1988, HSC is a combination of industry and both federal and state agency members, each with their own reasons for pursuing red alder management. Members provide direction and funds annually to sustain the Cooperative. They also provide the land for research sites and the field crews for planting, thinning, pruning, 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 established *The Red Alder Stand Management Study*, consisting of 26 variable-density plantations extending from Coos Bay, Oregon to Vancouver Island, British Columbia. The plantations cover a wide range of geographic conditions and site qualities in the Coast Range and Cascades. 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 variable-density plantations, the HSC has four thinning studies in naturally regenerated red alder stands.

Objectives of the *The Red Alder Stand Management Study* are to:

Understand and characterize the effects of stand density management on red alder growth, yield, and wood quality

Provide tools such as growth models and yield tables to help land managers evaluate and implement red alder management options.

The HSC has also established seven mixed species plantations of red alder and Douglas-fir on land designated as Douglas-fir site class III or below. Each mixed plantation was planted at 300 trees per acre with five proportions of 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 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.

Red alder stand management study plantations now range from 19 to 27 years of age, providing immediate opportunities for updating yield estimates for managed stands of alder. 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. An initial growth and yield model for red alder was developed with data from 12-17 year old plantations (2011, Red Alder Plantation version of ORGANON). See the HSC web-page http://hsc.forestry.oregonstate.edu for more information.

Hardwood Silviculture Cooperative, Oregon State University

Since 1988, HSC membership has ranged from 8 to 12 members, with financial support ranging from $64,000-$87,000 annually (including OSU). The HSC budget currently supports about 40% of one full time person. A key challenge is sustaining the HSC given the variability in membership and cooperator ability to provide financial support for ongoing activities of the HSC. Activities include:

Maintenance of all study sites, continued thinning and pruning treatments.
Data collection across all study sites.
Data input and data management.
Data analysis, reporting, and development of products.
- Stem taper and tree volume equations.
- Growth and yield models.
- Yield tables for red alder in managed stands.
- Relationships between wood quality and tree characteristics.

Outreach and education on red alder management.

Priorities for 2016 are:

Pursue renewed membership and increased annual support for all ongoing activities of the Hardwood Silviculture Cooperative.
Develop extra funding and in-kind support for effort to produce yield tables for red alder in managed stands along with decision tools for evaluating red alder management options.
Continue field installation maintenance, treatments, data collection, and data management.
Continue efforts in outreach and education; workshops, conferences, and field tours.
Continue adding content and updating the HSC website.

HSC Membership in 2015:

BC Ministry of Forests
Bureau of Land Management
Goodyear-Nelson Hardwood Lumber Company
Hancock Forest Management
Oregon Department of Forestry
Oregon State University
Siuslaw National Forest
Washington Department of Natural Resources
Washington Hardwoods Commission

Hardwood Silviculture Cooperative, Oregon State University

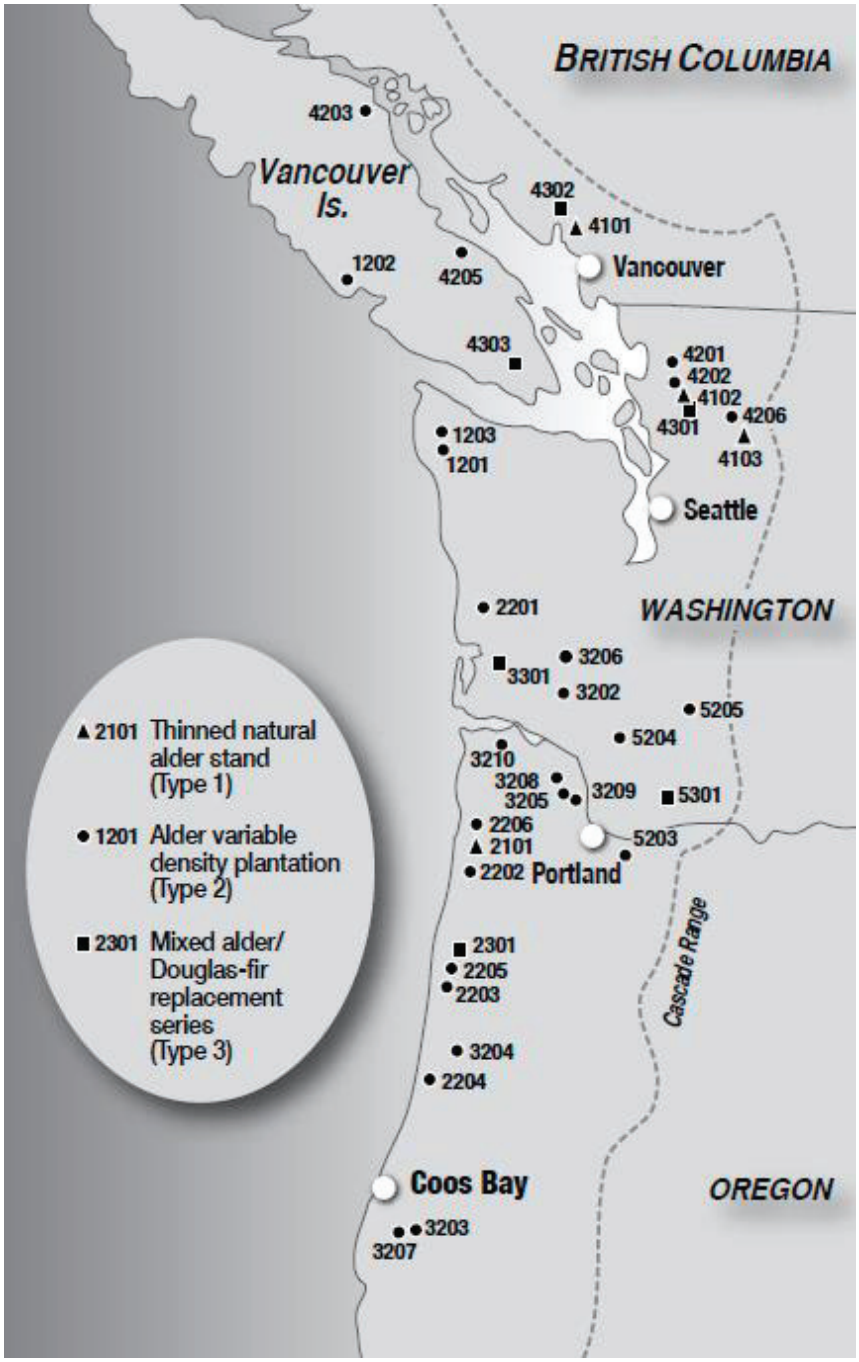
Hardwood Silviculture Cooperative *Red Alder Stand Management Study* sites.

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, BC.

Type 1 is a natural red alder stand thinned to 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.

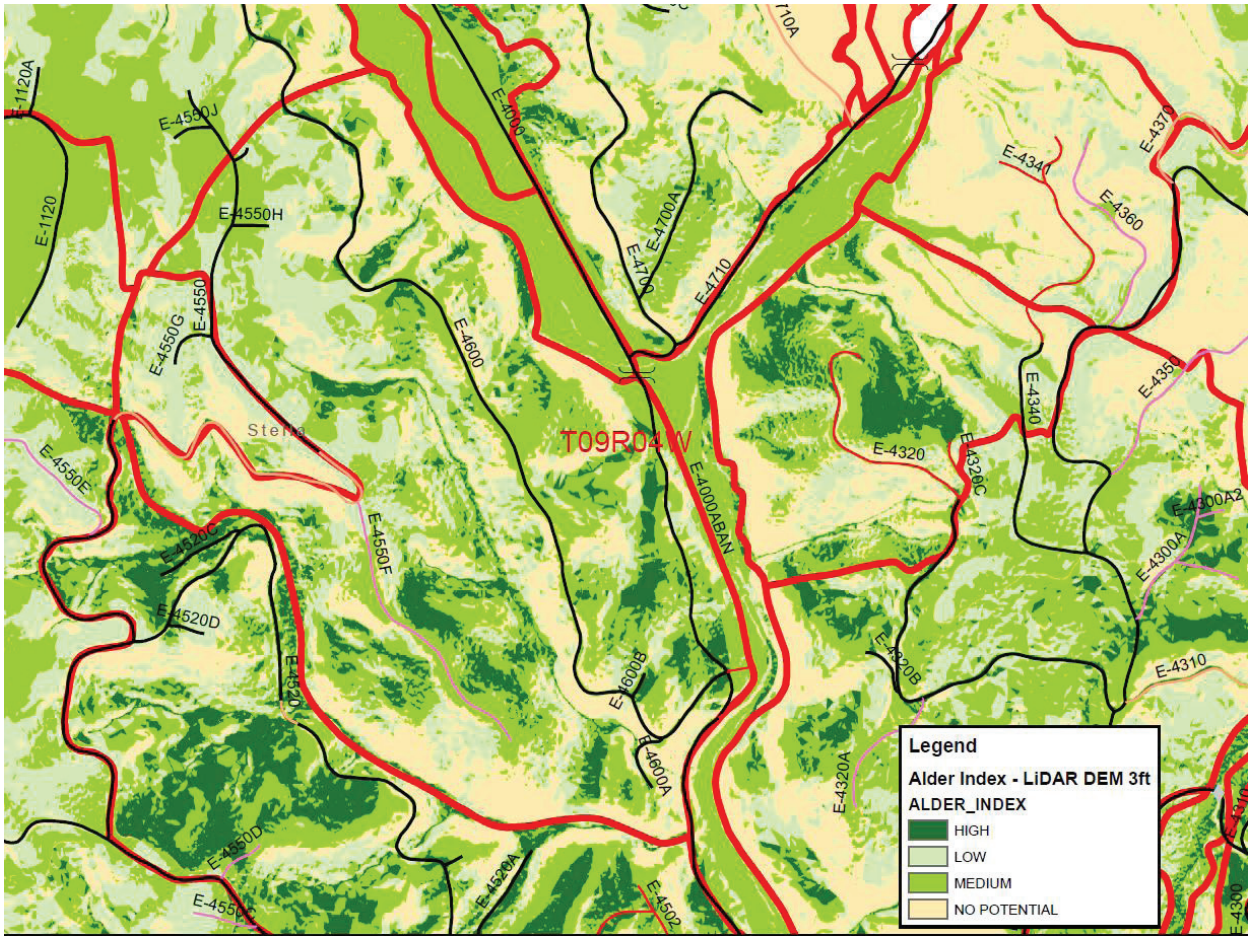


The primary focus of the Red Alder Stand Management study continues to be the Type 2 variable-density plantations.

Red Alder Plantation Site Selection

- Almost all published procedures on red alder site selection have as a basis the publication, A method of site quality evaluation for red alder. (Harrington, 1986: http://www.treesearch.fs.fed.us/pubs/5556).
- Site selection for red alder requires evaluation of site characteristics relative to the risk of plantation failure from environmental factors, red alder productivity potential, and the need for herbaceous weed control.
- The objective is to exclude from consideration planting units that will have obviously low red alder productivity potential and/or obviously high risk of plantation failure due to poor soil drainage, frost, drought or inability to control weed competition.
- The general steps to making the determination on site suitability for red alder are as follows:
    1. Have a map showing the location (Section-Township-Range) and boundaries of the land parcel to be evaluated;
    2. Use the NRCS soil survey website to evaluate topography, soils and adjacent stands;
    3. Estimate growing season precipitation (April through September) and soil water-holding capacity;
    4. Fill out a site evaluation checklist;
    5. Evaluate the site by applying the information on the checklist to the Relative Effect of Site Factors on Red Alder Site Quality (after Harrington, 1986) and rating each category as either Good (+), Intermediate (0), or Poor (-);
    6. Make a judgement on the general site suitability for red alder based on the pluses, zeros and minuses; and
    7. Conduct a site visit to verify the soil survey, check red alder site productivity indicator plant species, assess the candidate area for within site frost pockets, heat/drought stress, and weed competition potential.
- All of the topography and soils information needed, including aerial photography is available on National Resource Conservation Service (NRCS) website following procedures given in the publication http://wahardwoodscomm.com/Should_a Landowner_Plant_Red_Alder.pdf.
- GIS application can be developed to simplify the procedures given above, such as the WA DNR Red Alder Site Selection Tool.

WA DNR Red Alder Site Selection Tool



WA DNR Red Alder Site Selection Tool

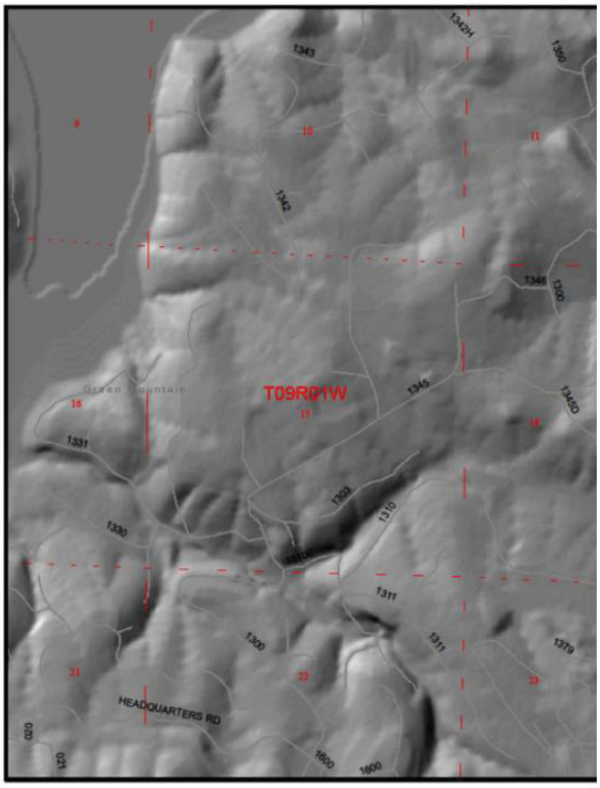
RED ALDER INDEX MODEL

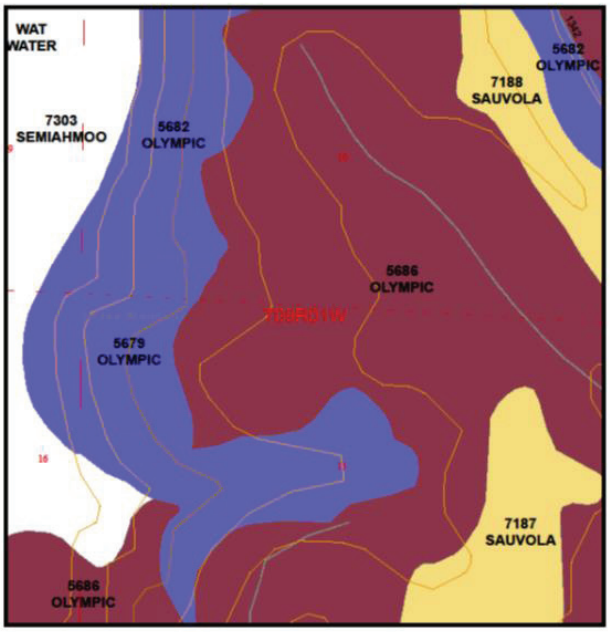
Author: Florian Deisenhofer
April 27, 2010

Criteria	HIGH	MEDIUM	LOW
Elevation / Topographic Position	0-1000' for valley, lower slope, flat slope, middle slope	0-2000' for valley, lower slope, flat slope, middle slope	0-2500' for valley, lower slope, flat slope, middle slope
		0-1000' for upper slope, ridge top	0-2000' for upper slope, ridge top
Aspect/Slope	Flat, SW, S, SE for slopes <= 5%	Flat, SW, S, SE for slopes <= 20%	Flat, SW, S, SE for slopes <= 35%
	NW, N, NE for slopes <= 30%	NW, N, NE for slopes <= 45%	NW, N, NE for slopes <= 60%
	E or W for slopes <= 20%	E or W for slopes <= 35%	E or W for slopes <= 50%
Site Index (SI_{50}) Conifer	>= 100	>= 90 and < 100	< 90
Site Index (SI_{50}) Alder	>= 100	>= 80 and < 100	< 80
Soil Types	loam, silt, silt loam, silt clay loam	loam, silt, silt loam, silt clay loam, clay loam, cobbly loam, cobbly silt loam, gravelly clay loam, gravelly loam, gravelly silt loam, gravelly silt clay loam, sandy loam, silty clay, variable loam	loam, silt, silt loam, silt clay loam, clay loam, cobbly loam, cobbly silt loam, gravelly clay loam, gravelly loam, gravelly silt loam, gravelly silt clay loam, sandy loam, silty clay, variable loam, clay, cobbly fine sandy loam, cobbly sandy loam, corse sandy loam, fine sandy loam, gravelly coarse sandy loam, gravelly fine sandy loam, gravelly sandy loam, rocky silt loam, sandy clay, stony clay loam, stony loam, stony silt loam, very fine sandy loam
Soil Depth	>= 30"	>= 30"	All

WA DNR Red Alder Site Selection Tool

WA DNR Red Alder Site Selection Tool





Soil□Precipitation□Texture□Depth□Drainage□Water Holding Capacity
7188□45-55□Loam□>60"□Moderately Well Drained□High
5679□40-70□Gravely Silt Loam□>60"□Well Drained□High
5682□40-70□Gravely silt Loam□>60"□Well Drained□High
5686□40-70□Silt Loam□>60"□Well Drained□High

Stop 1.1 1342A Rd.
Stocking Control – PCT
Mica Keralis

Planted Year	PCT Year	PCT Age	TPA PrePCT	TPA PstPCT	CT Year	CT Age	TPA_PreCT	TPA_PstCT
2000	2011	12	592	267				

Estab Yr.	Age	Forested Acres	DBHQ (in.)	Height(ft.)	Height to Live Crown(ft.)	Crown %	TPA	BA/Ac	CCF/Ac
2000	16	14.4	7.0	57	28	0.51	265	71	14

Soil Site Index DF	Site Index RA	SDI	RDI
135	85	145	0.35

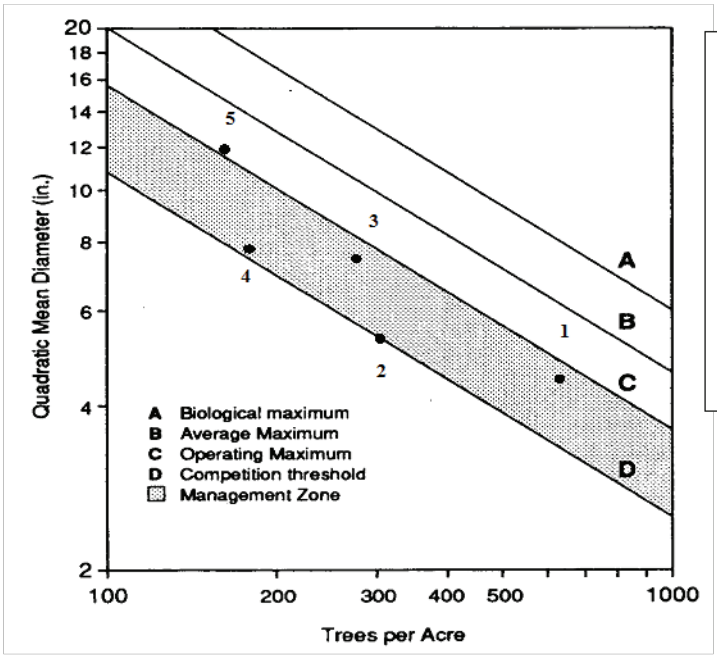
Stocking Control/Pre-commercial Thinning

Neonectria major

Armillaria Root Disease

Pre-commercial Thinning

Red Alder Stand Density Diagram (From Puettmann, *et al.* 1993)



Red Alder Plantation
1 - Age 10 (Before PCT)

2 – Age 10 (After PCT)

3 - Age 15 (Before Thin)

4 – Age 15 (After Thin)

5 – Age 30 (Harvest)

LINE	THRESHOLD	SDI	RD
A	Biological Maximum	433	1
B	Average Maximum	281	0.65
C	Operating Maximum	195	0.45
D	Competition Threshold	108	0.25

Stocking Control/Pre-commercial Thinning

Operational Aspects to Consider:

- Stand Density
  - Target 35% - 45% relative density (RD) at the time of PCT & CT. This will help to optimize volume growth response post-thinning by the alder.
  - Thinning stands above 45% relative density (Operating Maximum) is acceptable, but not optimal.
  - Stands thinned above the Operating Maximum can experience a 2 – 5 year growth lag due to the loss of crown that occurs at the upper limits of full site occupancy. During the lag time, the crown is re-building and the tree is not adding desired volume.
  - By targeting 35% - 45% RD the live-crown should be 50% - 70% of total tree height. This “greater than 50% live-crown” threshold will significantly decrease the growth lag time, and in turn will optimize the volume growth response.
- Relative Density = (TPA x ((QMD/10)^1.605)) ÷ SDI_{MAX}
- SDI = TPA(QMD/10)^1.605

Stocking Control/Pre-commercial Thinning

Operational Aspects to Consider:

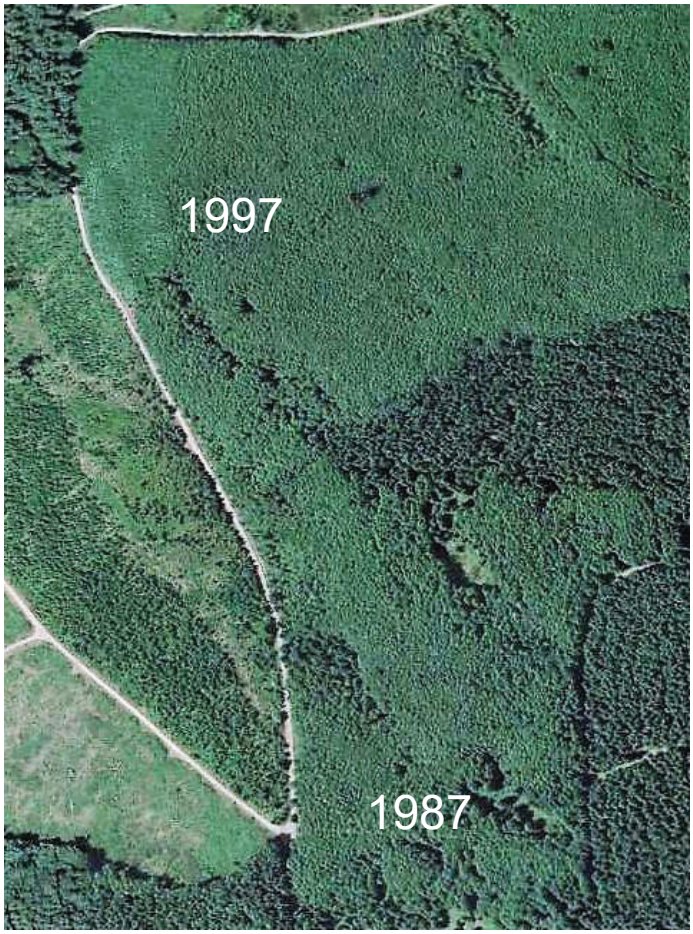
- The decision to thin or not to thin should happen at the time of planting.
- Your desired product at harvest will dictate your thinning decision.
- When done timely & correctly…
    - Thinning will accelerate growth and allow a stand to reach the appropriate size for final harvest sooner.
- Thin from below while focusing on
    - Tree spacing, Tree quality, and Tree size (DBH)
    - Proper spacing releases the tree & allows it to grow straighter
    - Best quality gives you a better product at harvest
    - Larger DBH gives you more volume at harvest

Stocking Control/Pre-commercial Thinning

Operational Aspects to Consider:

- **<u>Early Thinning (Thin-to-waste)</u>**
  - Occurs between ages 7 – 12
    - Based on establishment/planted age
  - Post-Thinning Relative Density should target 25% - 35%
    - 25% is the Crown Closure Threshold
    - 35% is the Crown Competition Threshold, or the Lower Limit of Full Site Occupancy
    - Example
      - You planted 540 TPA or 9' spacing. At age 10 mortality has reduced your stocking to 500 TPA with a QMD of 5.5", Live Crown of 60% and a RD of 44%.
      - <u>You decide to thin, but what stocking do you thin to?</u> It depends on if you plan to thin again, i.e. 2nd thin-to-waste or Commercial Thin, ~or~ don't plan to thin and will allow the stand to grow to final harvest after the Early Thinning.
      - **Thin Again**: Target 300 – 360 TPA. Assume Post-thin QMD = 6.0".
        - Relative Density would be 30% - 36%
      - **Grow to harvest**: Target 150 - 200 TPA to attain a 12" to 10" QMD at final harvest. This will drop your post-thin RD to ≤ 20%, well below the Crown Closure Threshold of 25%, but it will allow you reach your desired product size.
        - Issues: By thinning below the Crown Closure Threshold you will release the trees for added diameter & volume growth response, but you may also have a lag in height growth, a lowering of stem quality, increased epicormic branching, and sun scald.

Stop 1.2 1342 Rd.
Expressed Site Index



Planted Year	PCT Year	PCT Age	TPA PrePCT	TPA PstPCT	CT Year	CT Age	TPA_PreCT	TPA_PstCT
1987								
1997	2004	8	650	317				

Estab Yr.	Age	Forested Acres	DBHQ (in.)	Height(ft.)	Height to Live Crown(ft.)	Crown %	TPA	BA/Ac	CCF/Ac
1987	29	30.6	8.4	71	32	0.55	276	106	27.75
1997	19	90.9	8.7	69	28	0.59	296	123	33.32

Soil Site Index DF	Site Index RA	SDI	RDI
135	75	205	0.45
134	95	235	0.55

Notes

Stop 2 Headquarters – Hemlock Creek

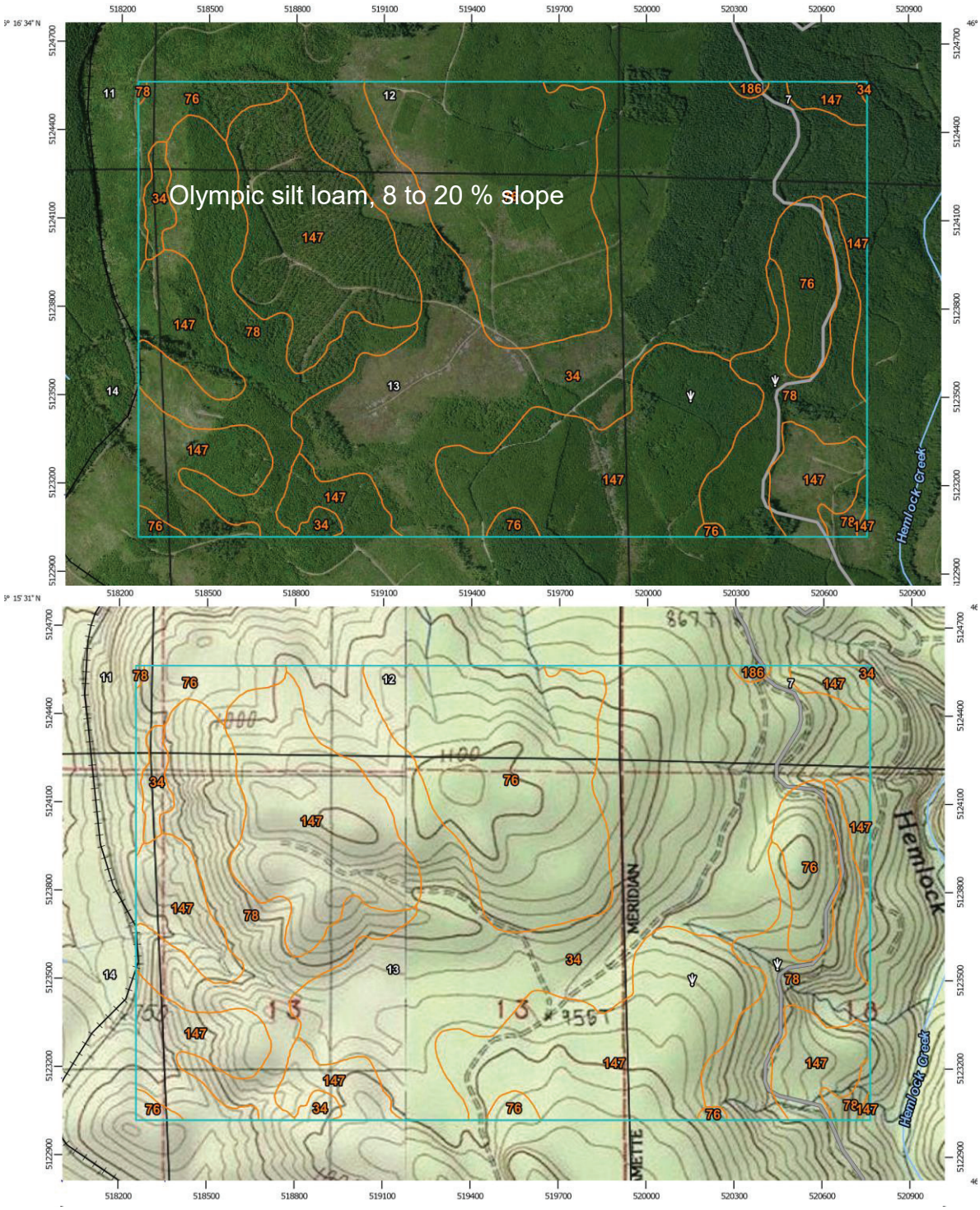
Stop 2.1 1394 Rd.
Commercial Thinning Study Overview
Rod Meade

Planted Year	PCT Year	PCT Age	TPA PrePCT	TPA PstPCT	CT Year	CT Age	TPA_PreCT	TPA_PstCT
1992	2002	11	650	358	2009	18	303	169

Age	Forested Acres	DBHQ (in.)	Height(ft.)	Height to Live Crown(ft.)	Crown %	TPA	BA/Ac	CCF/Ac
24	114.7	9.7	68	35	0.49	185	95	27

Soil Site Index DF	Site Index RA	SDI	RDI
133	80	175	0.40

Stop 2.1 1394 Rd.
NRCS Soil Survey
Alex Dobkowski



1394 Commercial Thinning

- Pre-planting soil-site index was 95 feet – underestimated the ridge-top effects of exposure/wind.
- Epicormic branching is more abundant on stressful sites with less than 50% crown length at time of thinning and slow crown closure following thinning.
- Thinning harsher sites require multiple light thinnings.
- Start when crop tree crown length is 60-70%
    - Main stand at a RD of about 0.35 -- leaving 300, 250 and 200 TPA

Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock
Alex Dobkowski

Planted Year	PCT Year	PCT Age	TPA PrePCT	TPA PstPCT	CT Year	CT Age	TPA_PreCT	TPA_PstCT
1992					2011	20	501	136

Age	Forested Acres	DBHQ (in.)	Height(ft.)	Height to Live Crown(ft.)	Crown %	TPA	BA/Ac	CCF/Ac
24	25.3	9.9	70	30	0.57	130	70	19

Soil Site Index DF	Site Index RA	SDI	RDI
135	90	130	0.30

Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock
Alex Dobkowski

- The keys to achieving good yields for red alder is to plant it on favorable sites and capture the early rapid growth.
- Red alder height growth is very much age dependent – factors that impede growth during the first 4-5 years of a plantation can reduce exhibited site productivity below expected productivity based on soil and physiographic characteristics.
- Steps for Achieving Plantation Establishment Success
    - Selecting a suitable growing site
    - Site Preparation
    - Planting Stock
    - Seedling Care and Planting

Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock

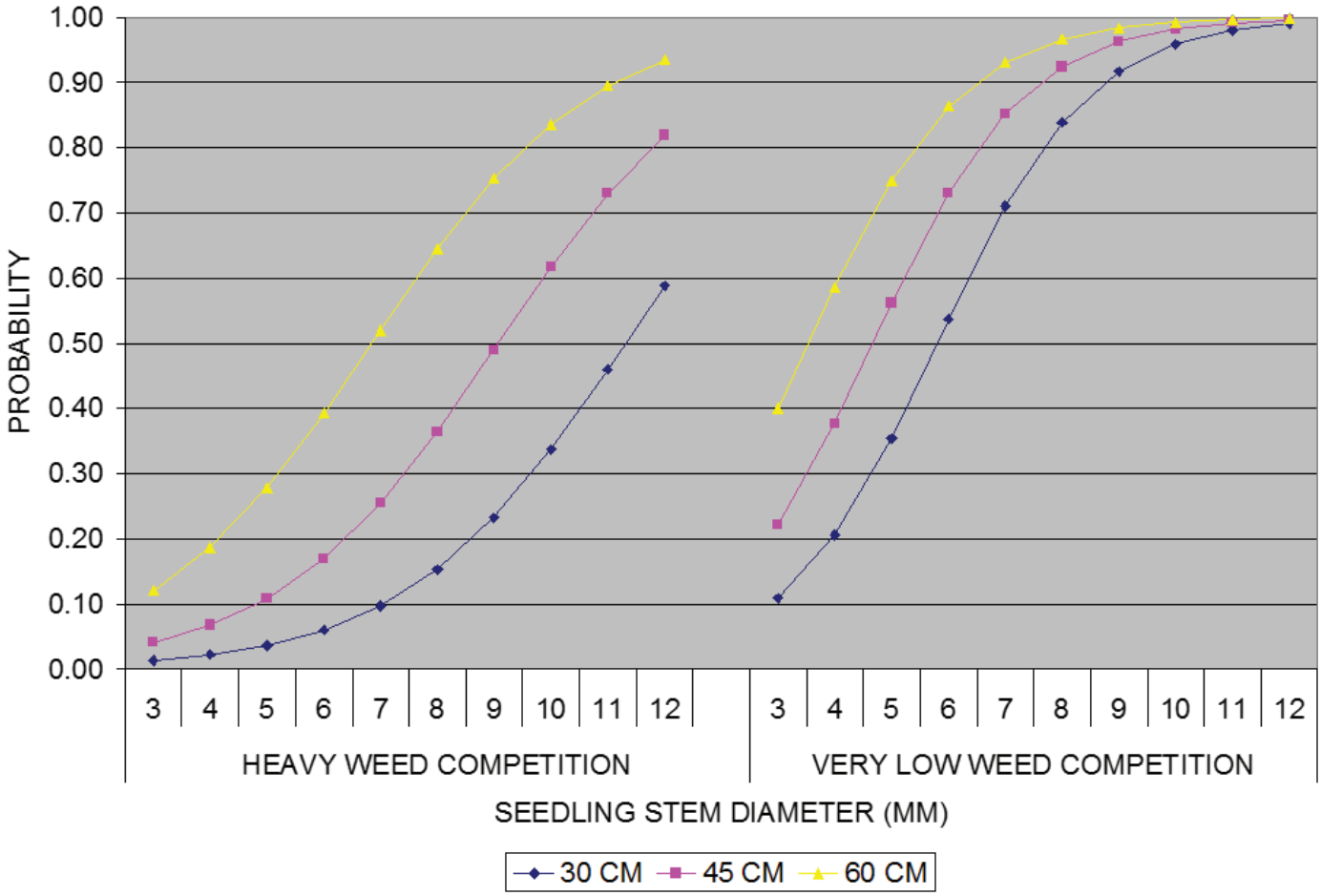
Target Seedlings - Bareroot, Plug+0.5, and Large Plugs (Styro-45)

- **Height** – range 18 - 54 in. – with approximately 70%+ of the seedlings between 24 and 36 in.;
- **Basal caliper** (measured 25 mm above the root collar) –- 5 mm minimum caliper – with approximately 70%+ of the seedlings > 7 mm;
- **Root systems** characterized by an abundance of fibrous, flexible, heavily branched roots, and an absence of heavy, stringy, unbranched roots, root mass dense enough to indicate a good balance with the shoot; many *Frankia* nodules;
- **Healthy branches or buds** along the full-length of the stem;
- **Free from disease and top-damage**.

Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock

Probability of achieving Height/Age Targets for Red Alder

	Height (ft)		Basal Caliper (in)		Dbh (in)	
Age	mean	cv	mean	cv	mean	cv
1	4	0.20	0.6	0.15	-	-
2	7	0.20	1.4	0.15	-	-
3	14	0.15	-	-	1.1	0.30



Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock

Stock types grown outdoors during rainy summers can get very big.

This is not desirable – but it's not necessarily a bad thing.

Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock

Excessively Large Seedlings – CONS

- **Nursery**
  - Very difficult to package.
  - Requires more space and time to process.
  - Requires more cooler and freezer storage.
  - Requires abundant water to frost-protect.
- **Planting**
  - More costly to plant.
    - Transportation to planting site.
    - Requirers more packers to keep planters supplied with trees.
    - Opening and closing planting hole properly slows production.
  - Finding Contractors who want the work.
    - Higher risk of fines for poor quality planting.
    - Plenty of work planting DF and regular size RA.

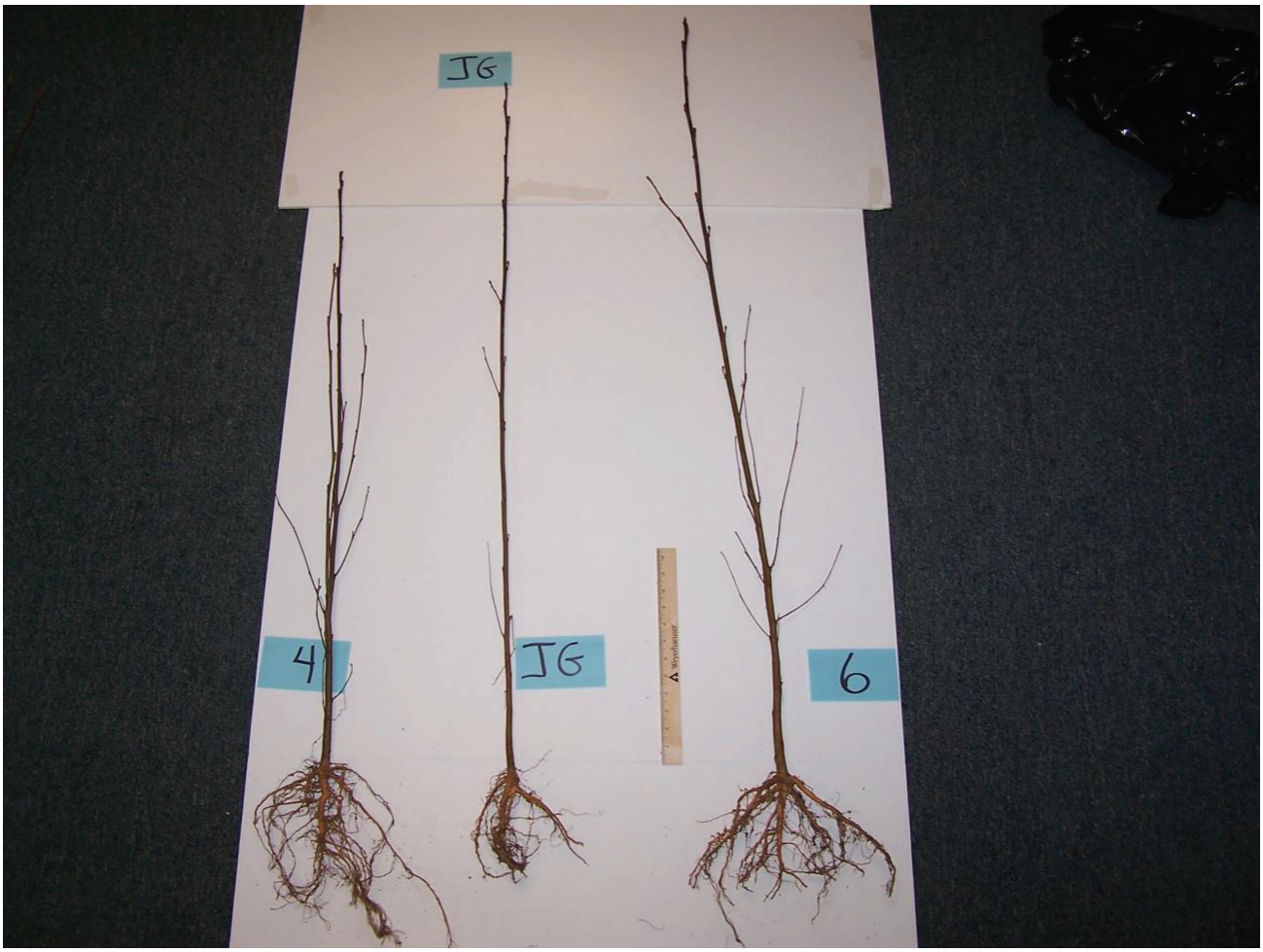
Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock

Excessively Large Seedlings – PROS

- There is a strong relationship between seedling size (particularly caliper) and the amount of stored carbohyrates, root system mass, and new root growth.
- Tremendous new root growth in March and April balances any root:shoot imbalance present at time of planting.
- Large number of big buds results in rapid crown expansion providing current photosynthate for superior growth during the first growing season.
- Very resilient to basal girdling from frost, heat, and insects – can quickly bridge-over the wound.
- Can tolerate weed competition hard for weeds to over-top.
- High survival and very rapid first year growth allows planting TPA to be reduced with little risk of not capturing the site.
- Planting fewer TPA can offset higher planting costs.
- Can lessen the risk of plantation failure on marginal sites.

Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock

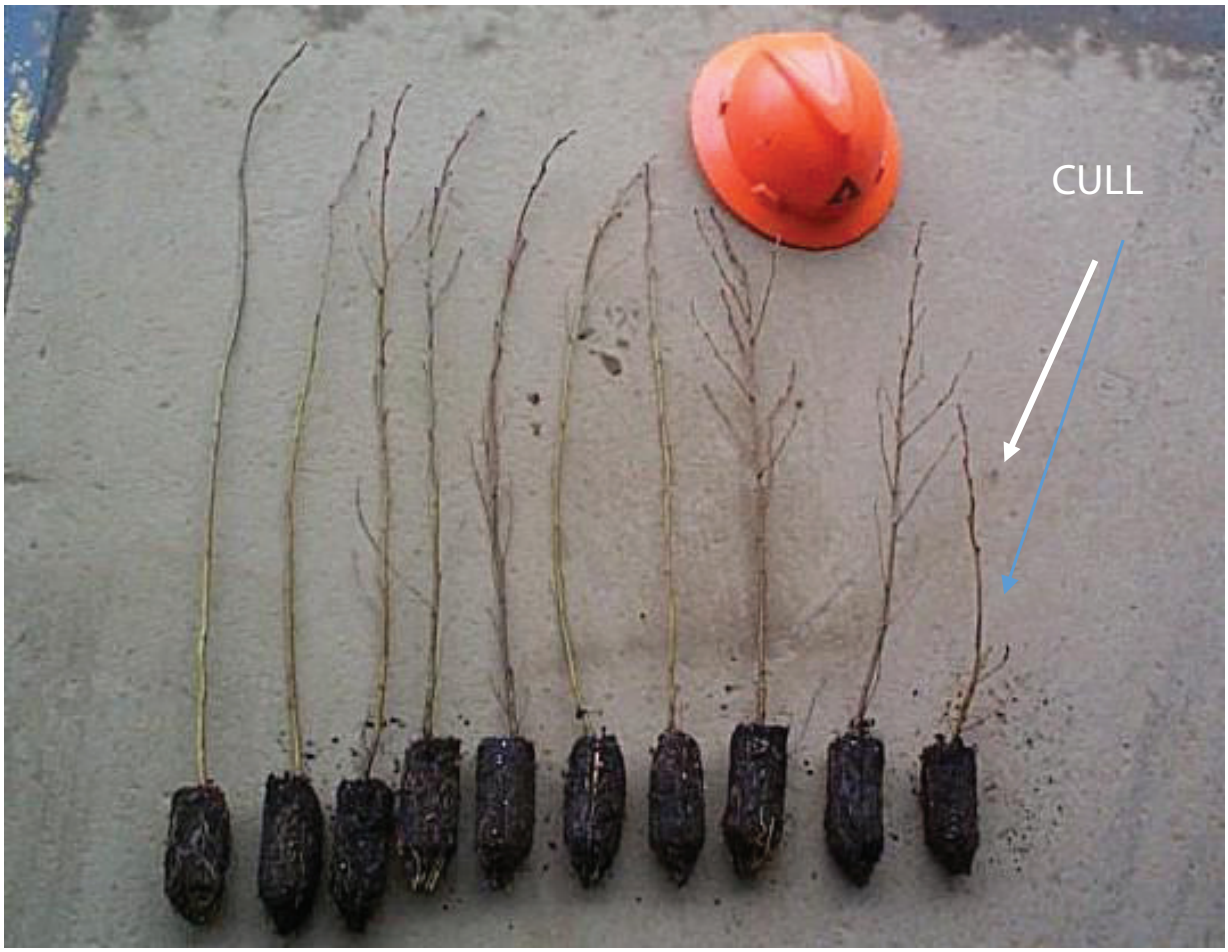
Excessively Large Seedlings – PROS



Stop 2.2 1390M Rd.
Plantation Establishment/Planting Stock

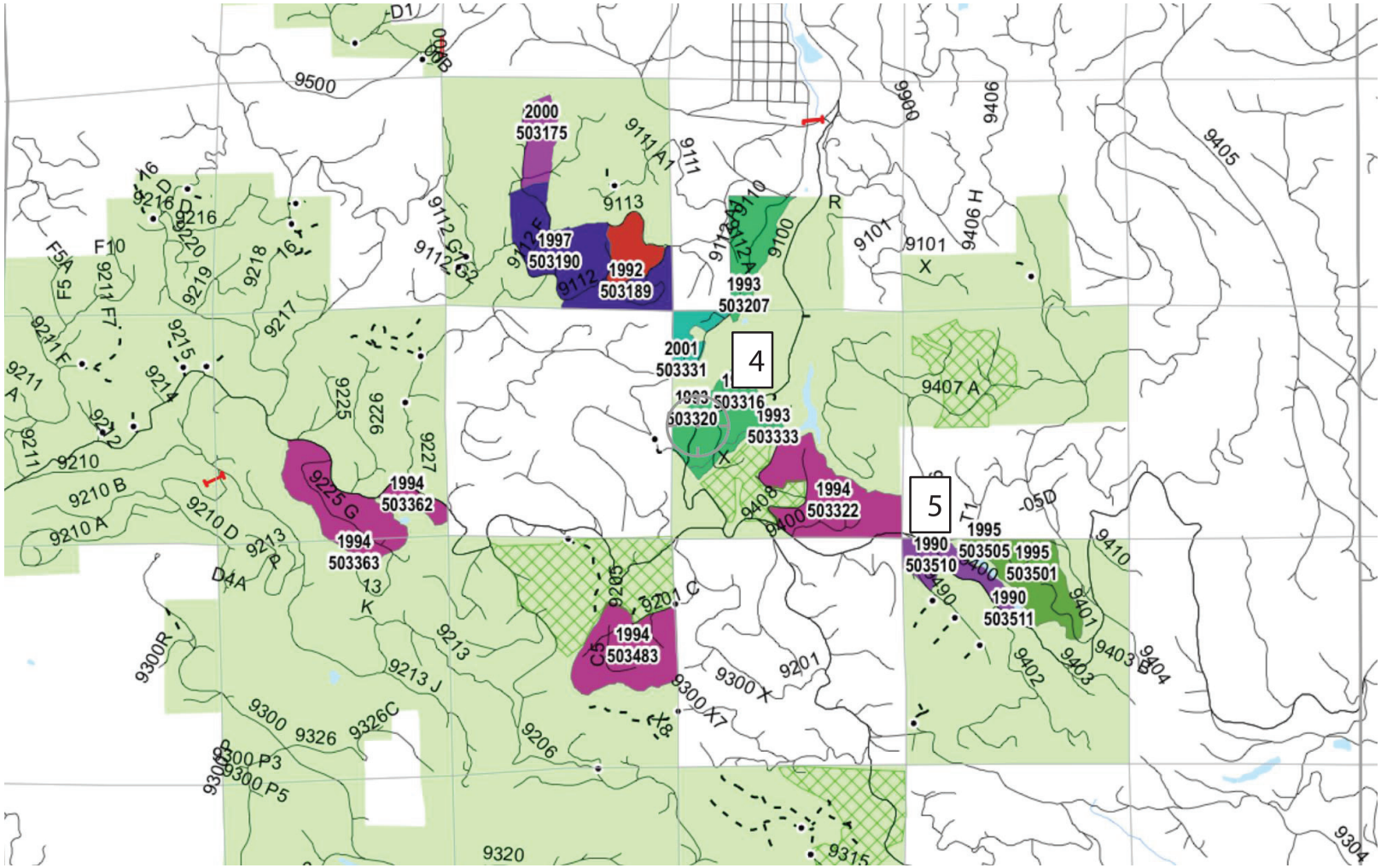
Recommended Stock Type – Best Bet

- Local seed source collected from as close to planned plantation as possible.
- Minimum would be the same drainage and elevation.
- Large plug such as Styro-45 - large cavity need to prevent hard, root bound plugs.
    - Stock can effectively be progtected from frost with a bed cover or moving stock into a cold-frame.



Notes

RED ALDER PLANTATIONS near Ryderwood, WA
STOPS 4 and 5



6/16/2016

Prepared by Alex Dobkowski

Commercial Thinning
Mid - rotation Red Alder Plantations
Rod Meade and Mica Keralis

Stop 3. 9100 Rd.
2009 Commercial Thinning
Rod Meade & Mica Keralis

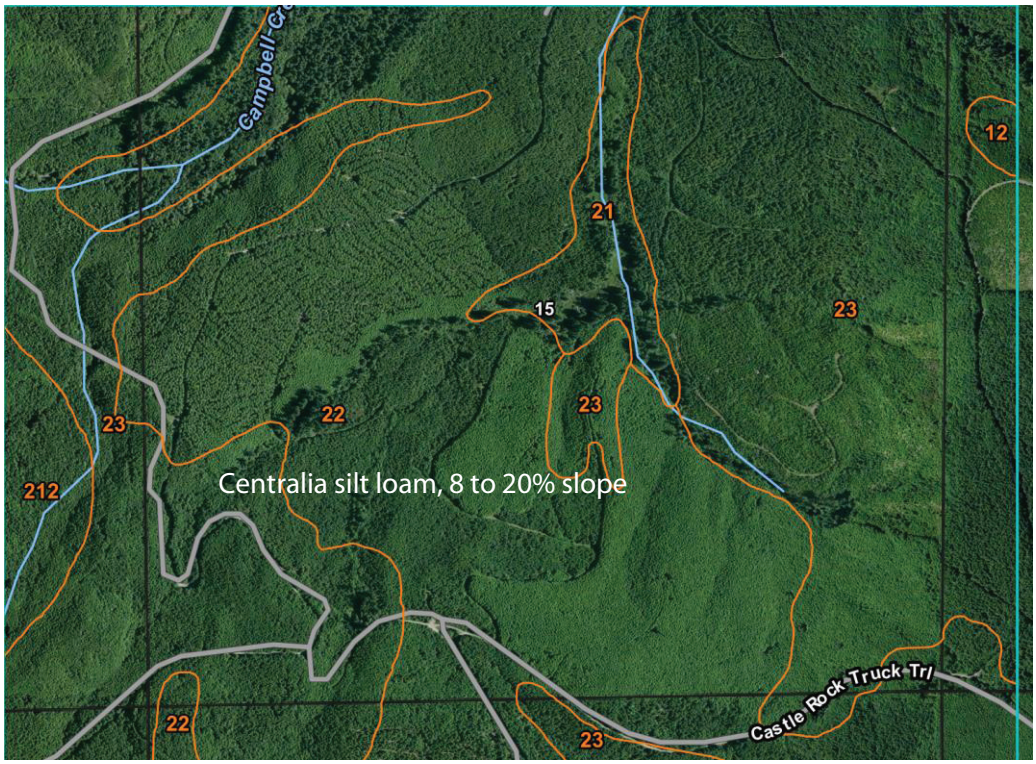
Planted Year	PCT Year	PCT Age	TPA PrePCT	TPA PstPCT	CT Year	CT Age	TPA_PreCT	TPA_PstCT
1993	2002	10	620	350	2009	17	290	178

Estab Yr.	Age	Forested Acres	DBHQ (in.)	Height(ft.)	Height to Live Crown(ft.)	Crown %	TPA	BA/Ac	CCF/Ac
1993	23	54.6	10.0	78	40	0.49	175	95	28

Soil Site Index DF	Site Index RA	SDI	RDI
135	100	175	0.40

6/16/2016 Prepared by Alex Dobkowski

Stop 3. 9100 Rd.
NRCS Soils & Topography
Alex Dobkowski



2009 Commercial Thinning – Unit 9100

2009 Commercial Thinning – Unit 9100

2009 Commercial Thinning – Unit 9100

2009 Red Alder Commercial Thinning Study

- **Thinning Prescription:**
  - Plantation density 360-435 tpa
  - Pre-Commercial Thinning leave stand at age 10-12 years 250-300 tpa
  - Commercial Thinning at stand age 17-20 when following stand structure is achieved:
    - Piece size approximately 7-8” dbh before thinning (i.e. 5-6” 16-20’ logs)
    - Stand height is between 50-60’
    - Crown recession is approximately 30-40% of the total height maintaining 60-70% live crown to achieve the desired growth rate and piece size for harvest of 12”+
  - Estimated leave stand after CT = 160 tpa with emphasis on piece size at harvest age approximately 30-35 years

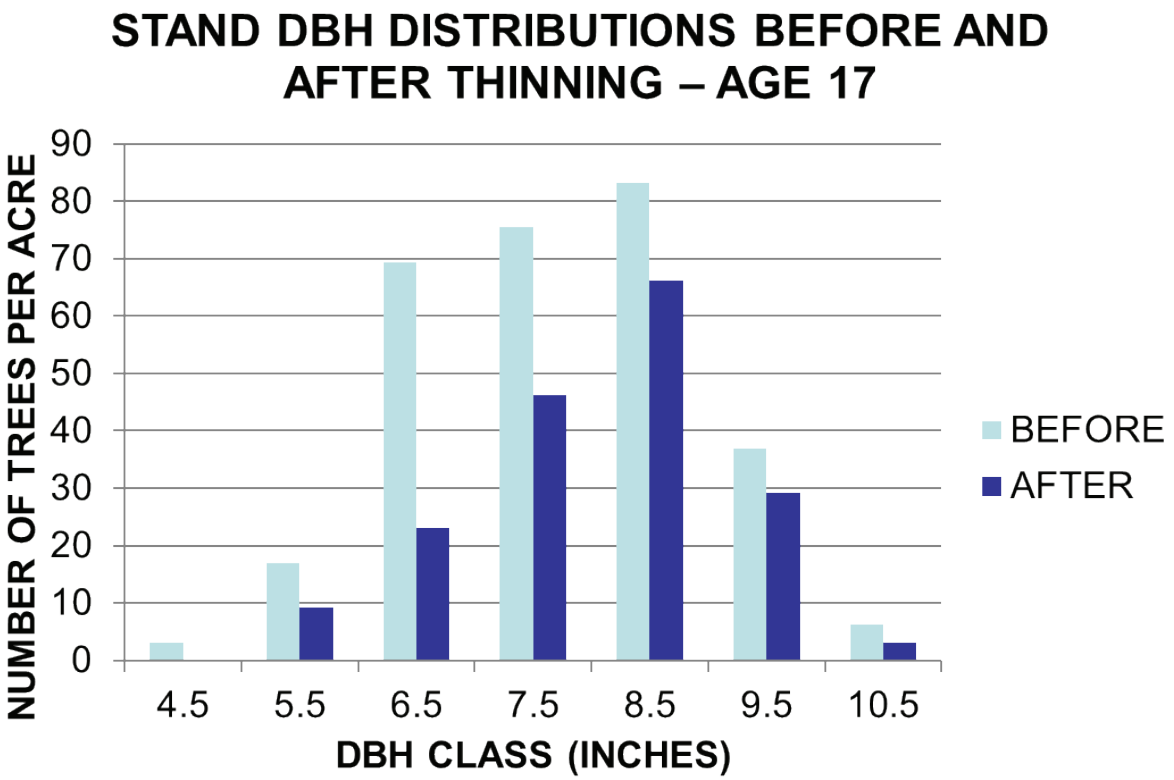
2009 Red Alder Commercial Thinning Study Stand Statistics

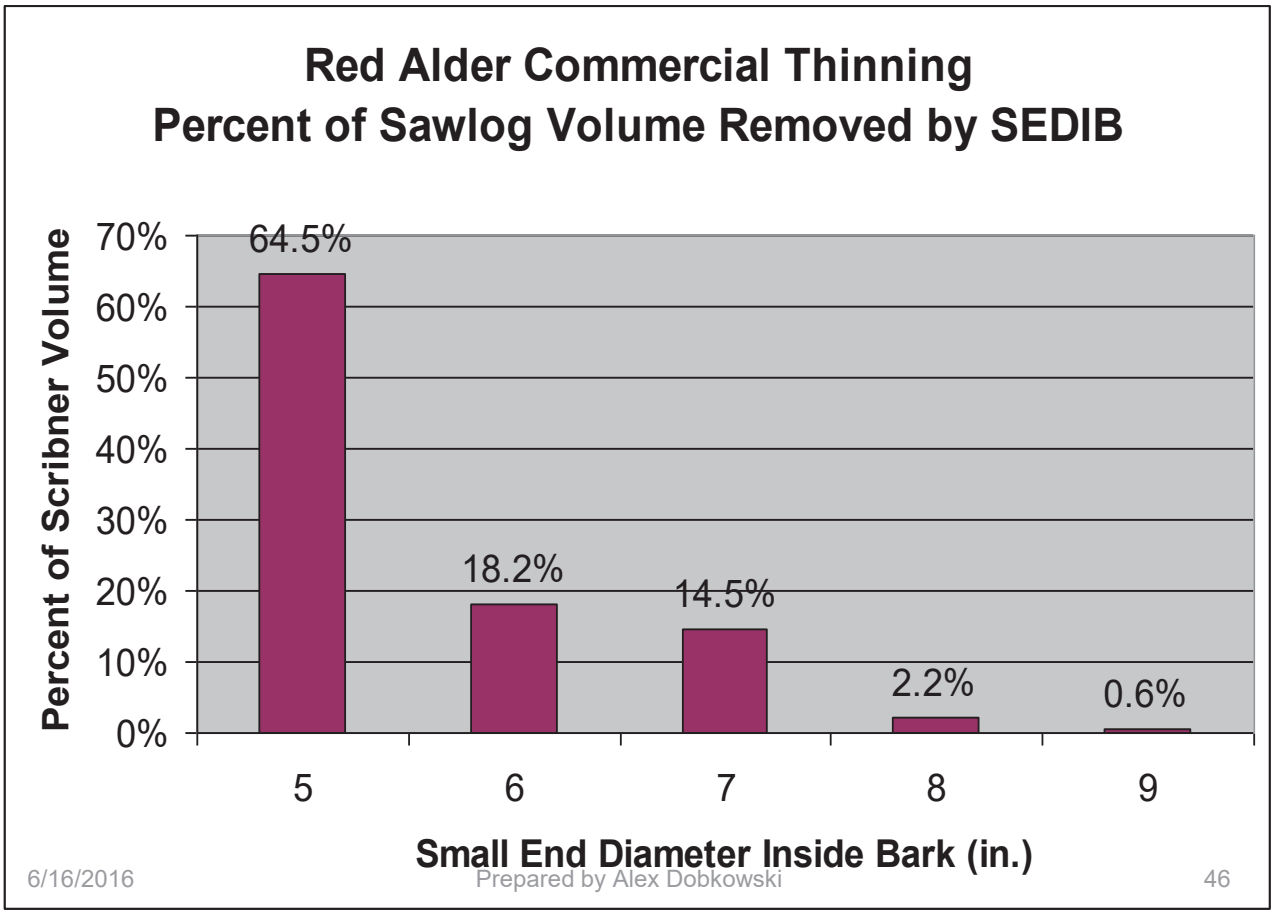
Stand Statistics Before Thinning & Estimated Removals

Unit Road#	Acres	TPA	Total Volume Per Acre	Average DBH in inches	CCF / Acre to be Removed	% Sawlogs	% Fiber
1394	115	350	20.5	7.0"/53'	10	35	65
9100	70	340	19.6	7.7"/62'	10	40	60

Stand Statistics After Thinning with Actual Removals

Unit Road#	Acres Thinned	TPA Post CT	Total Volume Per Acre Post CT	Average DBH/Ht Post CT	CCF / Acre Removed	% Sawlogs from Scale	% Fiber from Scale
1394	110	157	10.1	7.5"/55'	10.4	57.8	42.2
9100	60	161	11.0	8.2"/64'	8.6	61.5	38.5


STAND DBH DISTRIBUTIONS BEFORE AND AFTER THINNING – AGE 17
NUMBER OF TREES PER ACRE
90
80
70
60
50
40
30
20
10
0
4.5
5.5
6.5
7.5
8.5
9.5
10.5
DBH CLASS (INCHES)
BEFORE
AFTER


Red Alder Commercial Thinning
Percent of Sawlog Volume Removed by SEDIB
Percent of Scribner Volume
70%
60%
50%
40%
30%
20%
10%
0%
64.5%
18.2%
14.5%
2.2%
0.6%
5
6
7
8
9
Small End Diameter Inside Bark (in.)
6/16/2016
Prepared by Alex Dobkowski
46

2009 Red Alder Commercial Thinning Study Estimated Financials

- Proposed Scenario for the 2 CT stands:
  - If sawlogs and pulp were sorted at the landing and sold to the appropriate conversion facility for the going prices the outcome might have been:
    - Estimated Prices:
      - Pulp logs $34 per ton
      - Sawlogs 5”+ $350 / mbf
  - Total Acres Logged = 170
  - Total tons delivered = 4186 (approx 25 ton / acre)
  - Average % of sawlogs 5”+ = 60% (approx 15 ton / acre
  - Average sawlog MBF / acre = approx 2.1 mbf – i.e 7 ton / MBF)
    - Average sawlog gross profit = $350 / mbf * 2.1 = $730 / acre
  - Average % Pulp Chips = 40% (10 ton /acre)
    - Average pulp gross profit = $34/green ton * 10 = $340 / acre
  - Estimated total gross profit per acre = $1070
  - Estimated Cost Stump to Truck for harvesting per acre = $28/ton = $700 / acre
  - Estimated Cost for transportation = $8 /ton = $200 / acre
  - Estimated expected net profit per acre = $1070 - $700 - $200 = $170 / acre

- **CONCLUSIONS**
  - Commercial thinning red alder plantations should return a net estimated revenue of $100+ per acre after harvesting and transportation costs.
    - The net profit revenue is only if mills accept 5” – 16’ logs (60+% of CT removals).
  - The alternative to this positive cash flow is a silviculture with an estimated cost of approximately $150+ per acre for thinning to waste.
  - All ground-operable acres of red alder plantations ready for a second thinning should be thinned commercially.
  - Red Alder Plantations too steep for ground-based harvest should be evaluated for cable thinning before incurring the silviculture expense of thinning to waste.
  - Commercial thinning logs should be sorted at the landing into saw-log and pulp sorts and sold into the appropriate market.
    - Doing so could increase thinning revenues per acre by 50 to 70 percent over just sending to a Fiber market.

Red Alder Commercial Thinning

Operational Aspects to Consider:

- **Late Thinning (Thin-to-waste or Commercial Thin):**
  - Occurs between ages 17 – 20
  - This can be a 1st thinning, a 2nd thinning to waste, or a CT
  - Depends on planting density and/or previous thinning history
  - Post-Thinning Relative Density should target 25% - 35%
    - 25% is the Crown Closure Threshold
    - 35% is the Crown Competition Threshold, or the Lower Limit of Full Site Occupancy
    - Example
      - You planted 450 TPA or 9.8' spacing. At age 17 mortality has reduced your stocking to 430 TPA with a QMD of 6.5", Live Crown of 50% and a RD of 49.7%
      - *You decide to thin, but what stocking do you thin to & do you thin-to-waste or CT*? It depends on two things:
        1. Your desired product size at harvest, i.e. a 10", 12", or 14" QMD
        2. Current Red Alder small log market
      - ***Thin***: Target 150 – 200 TPA. Assume Post-thin QMD = 7.5"
        - Relative Density would be 21% - 29%
        - Target 150 - 200 TPA to attain a 12" to 10" QMD at final harvest. This will drop your post-thin RD to ≤ 30%, well below the Crown Competition Threshold of 35%, but it will allow you to reach your desired product size

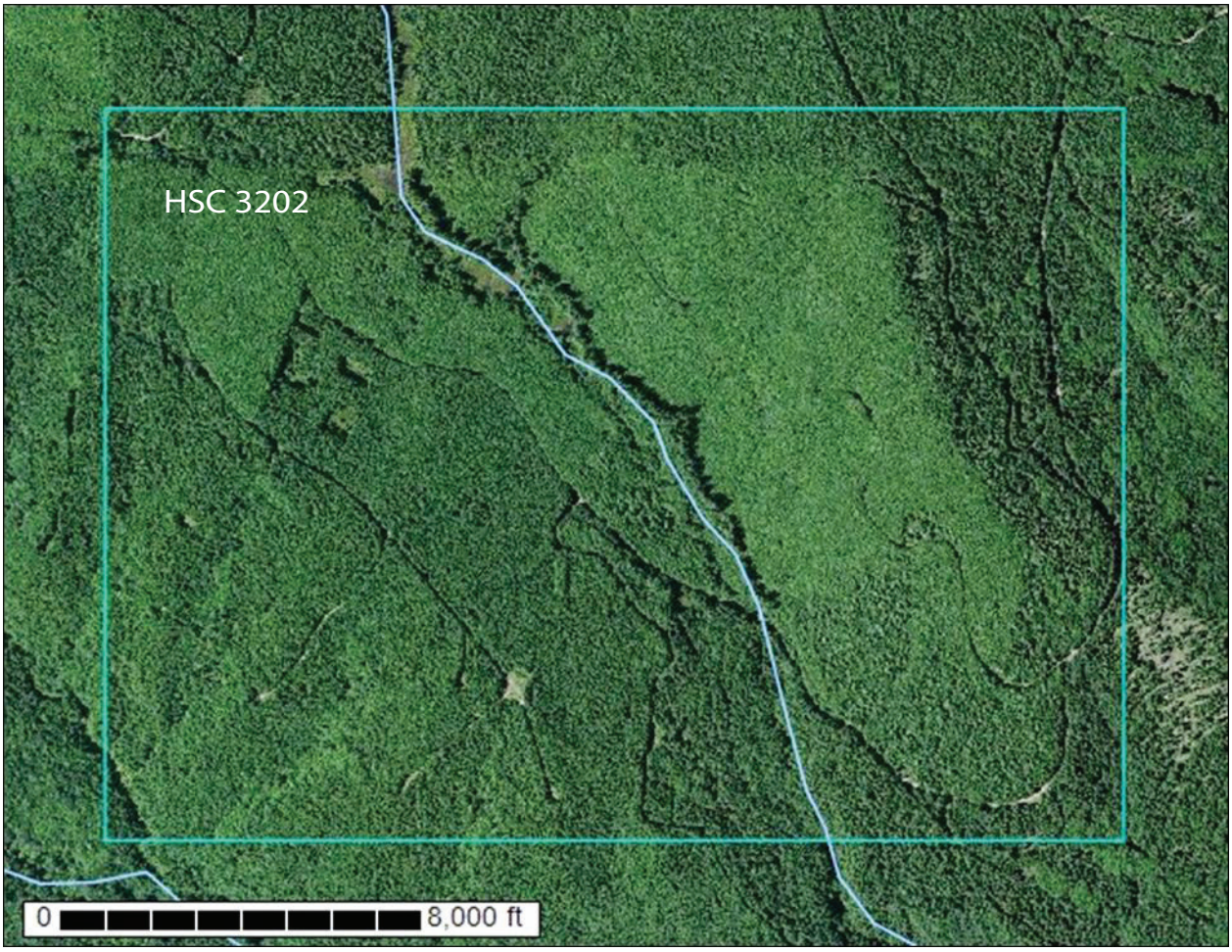
Red Alder Commercial Thinning

Operational Aspects to Consider:

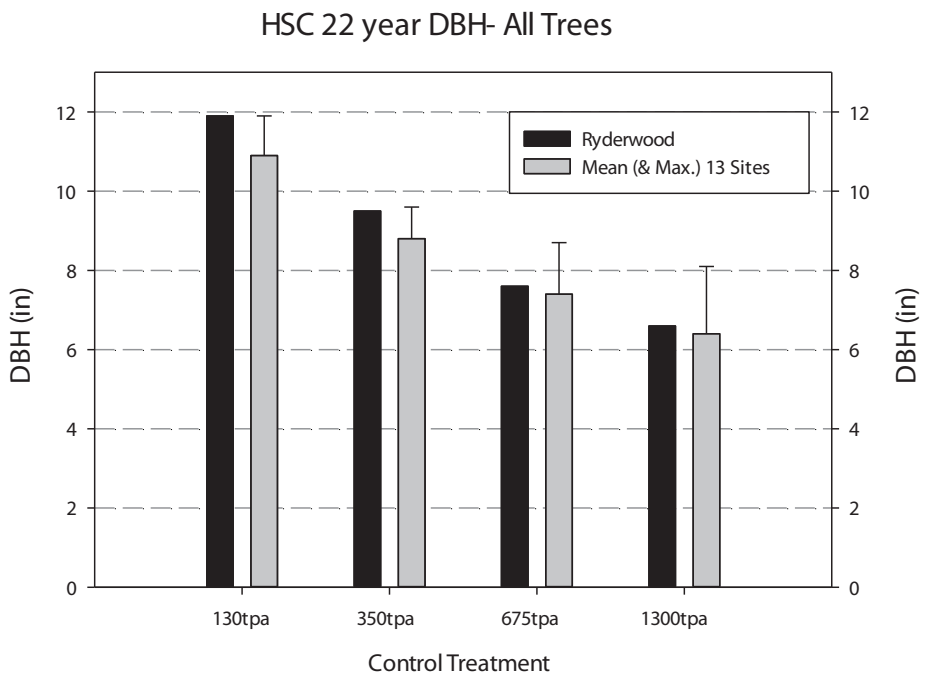
- **Thin-to-waste or Commercial Thin**
  - Small log market value at the time of thinning
  - If mills are paying for a SED 5” – 16’ log = *Commercial Thin*
  - If mills only want SED 6”+ log then the Red Alder pulp price has to be higher than normal to try to breakeven
  - Example) *Based on Rod Meade’s example*:
  - 25 tons/acre of thinning removal wood
  - SED 5”+ sawlogs = 60% (15 tons/acre)
  - Pulp Chips = 40% (10 tons/acre)
  - **Net profit = $170/acre**
    - ~HOWEVER~ if there is no SED 5”+ sawlog market, then assume all wood less than a SED 6”+ is now sent as fiber…
  - There are still 25 tons/acre of thinning removal wood
  - SED 6”+ sawlogs = 20% (5 tons/acre)
  - Pulp Chips = 80% (20 tons/acre)
  - Net loss = -$40/acre

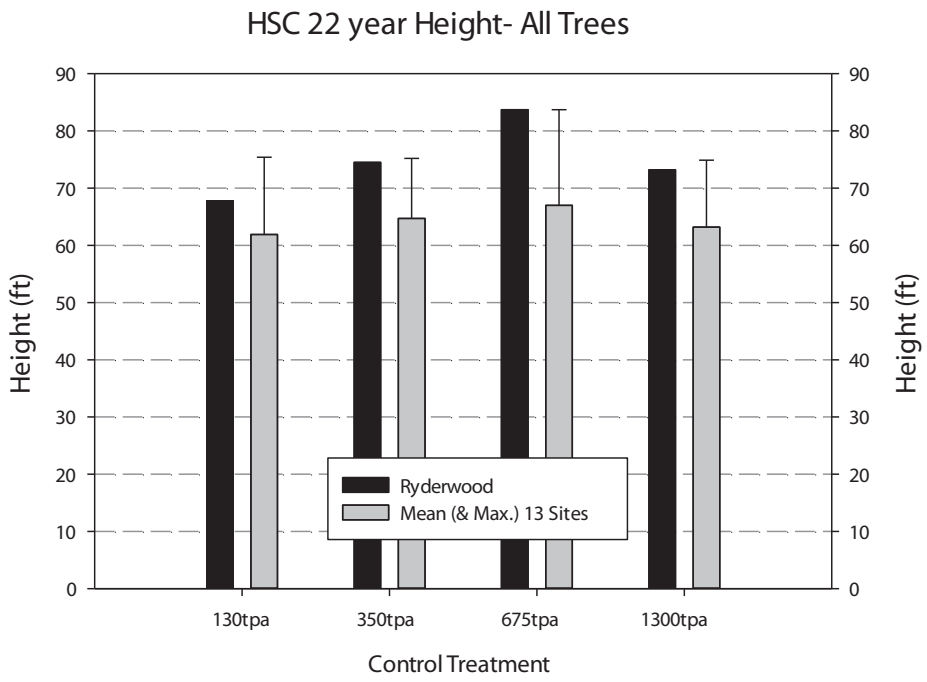
Notes

Stop 5. 9400 Rd. - HSC 3202
Plantation Age 26 Yrs.
Stand Density Management/HSC Results
Andy Bluhm

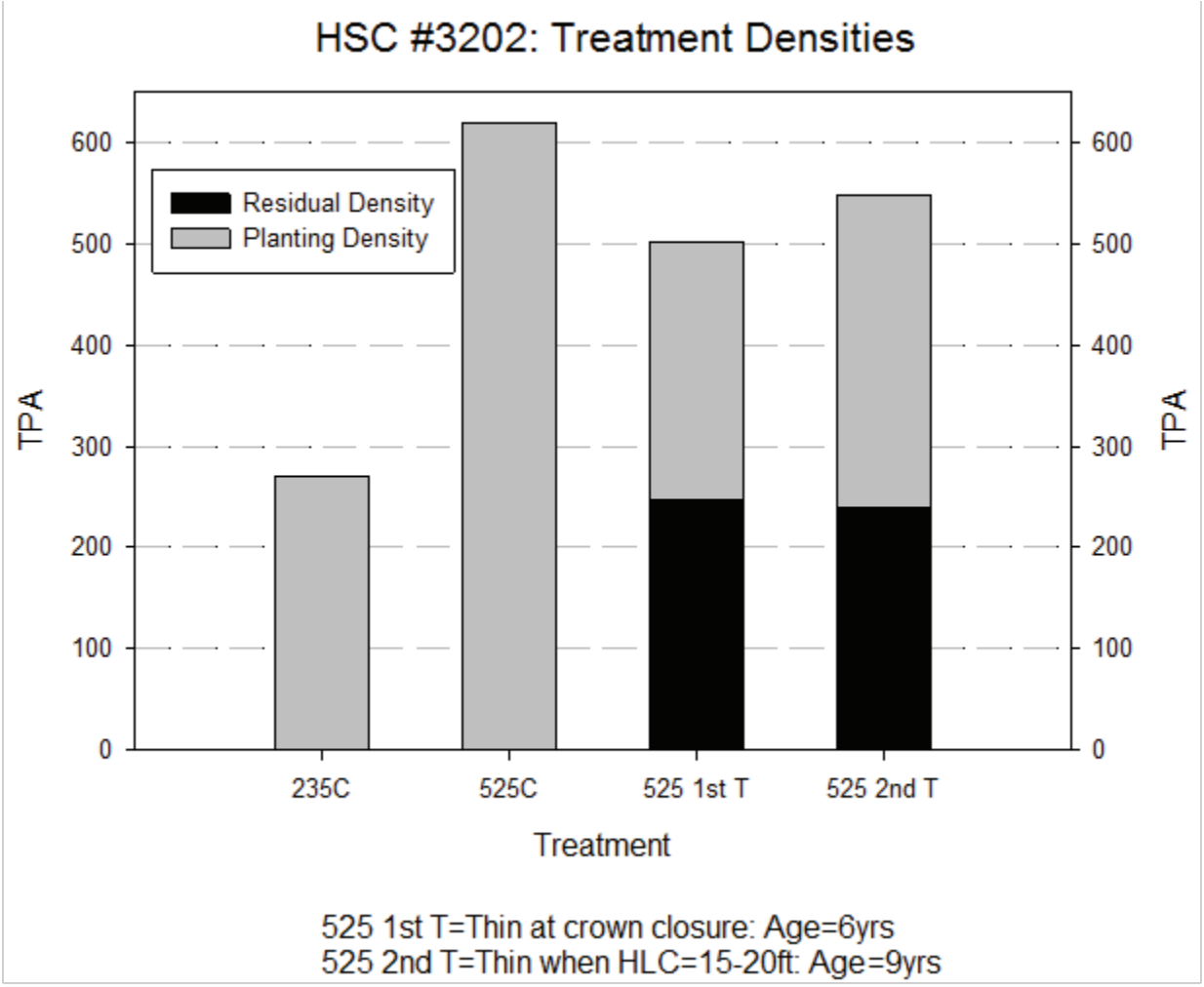


Stand Density Management

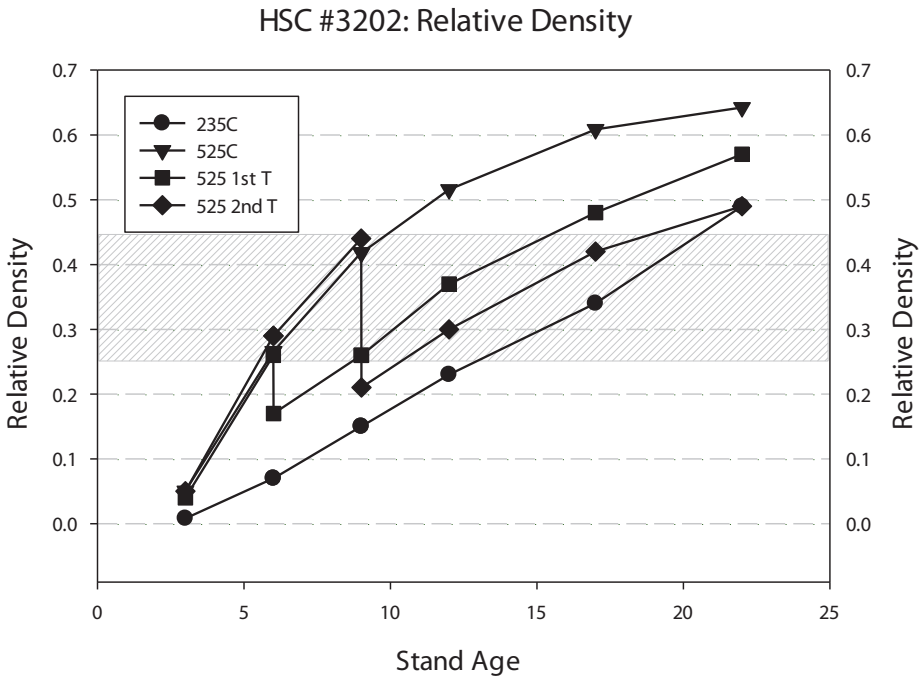


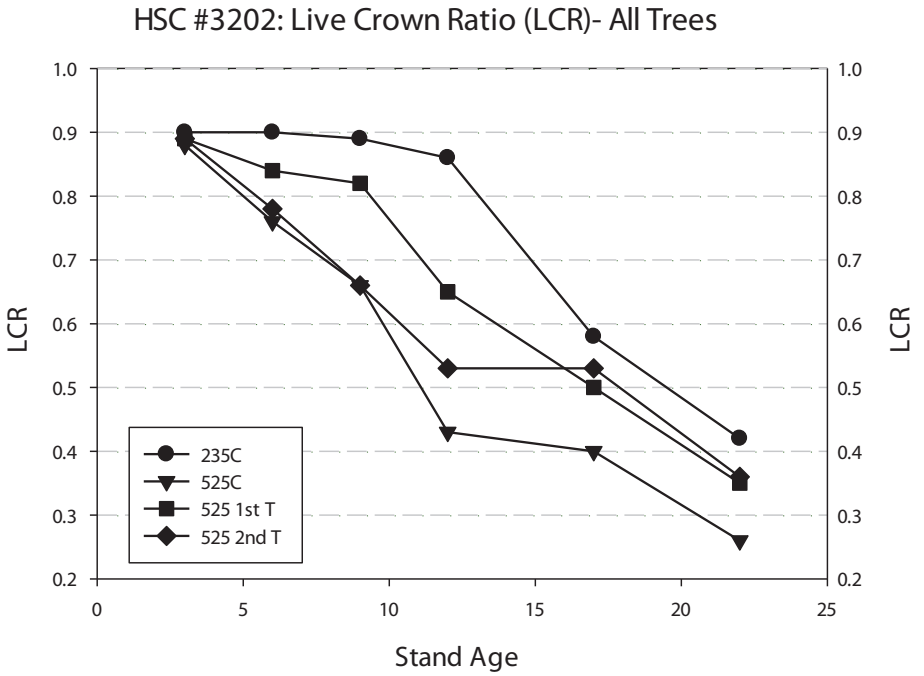


Stand Density Management

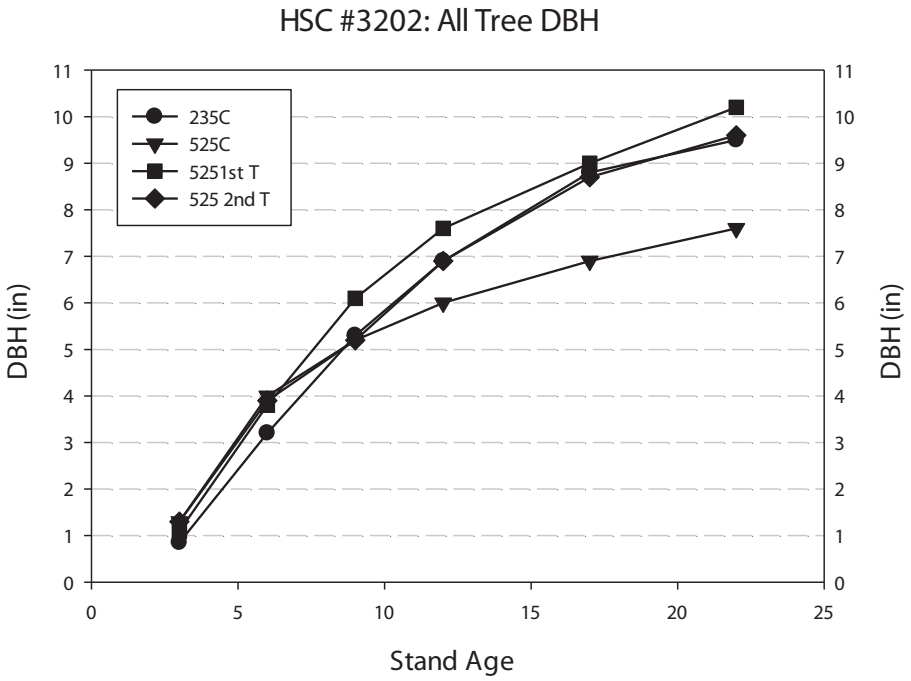


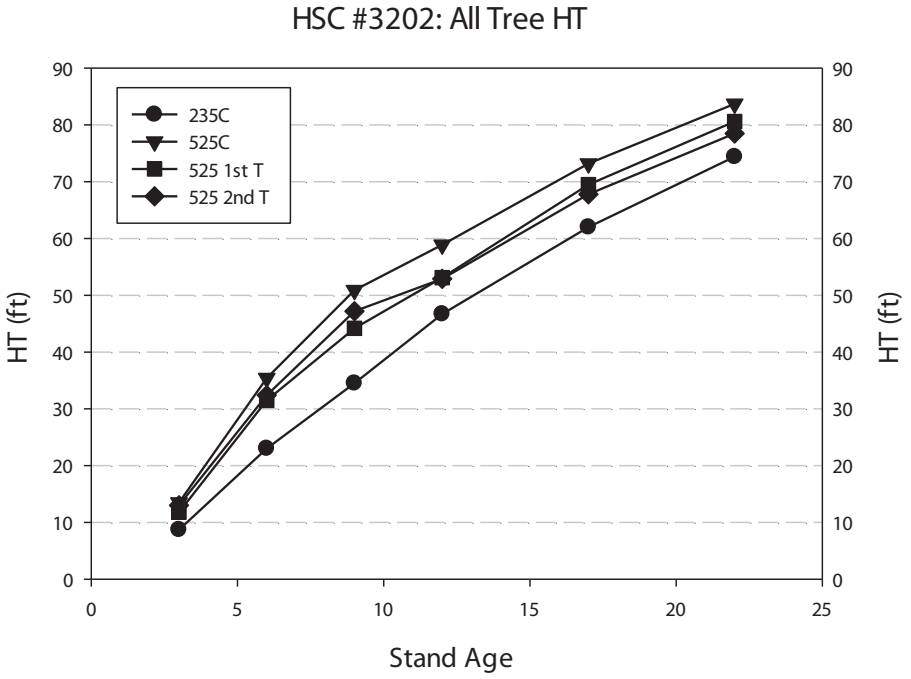
Stand Density Management



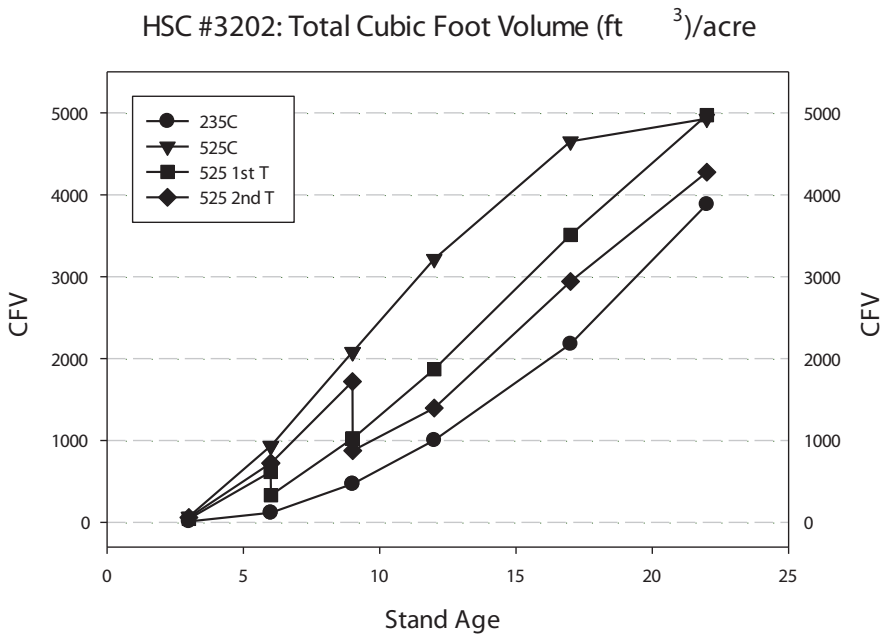


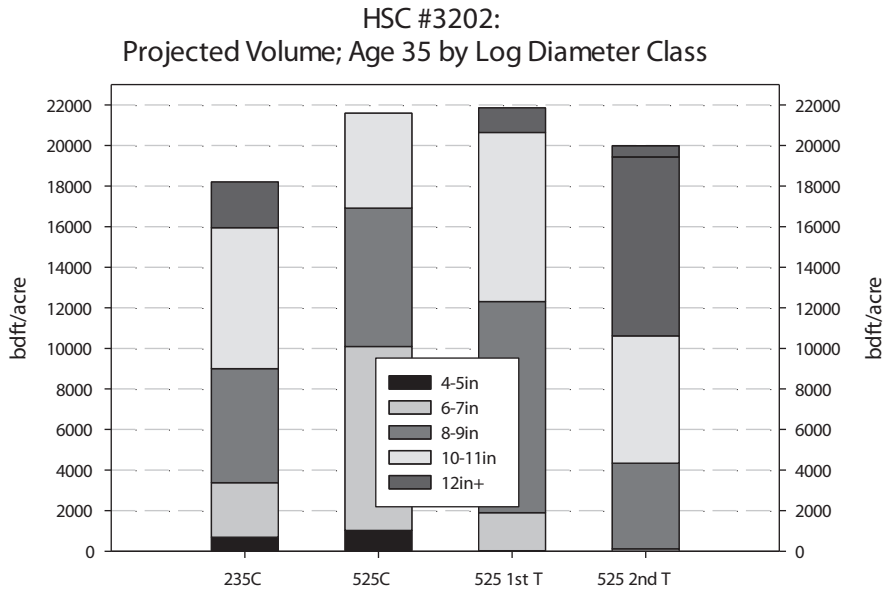
Stand Density Management





Stand Density Management





Stand Density Management

- This stop- HSC #3202/WeyCo #4113 is a top performing red alder site across the region. Using the “soil-site method” of estimating site index (Harrington 1986), site index (base age 50 years) was 105ft. Site index estimates of twelve other HSC sites greater than 20 years old ranged from 85ft to 115ft. Therefore, tree and stand growth responses (i.e. DBh and HT) from this site could be considered “optimal” or “exceptional”.
- The silvicultural treatments presented here (plant at 235tpa & leave alone [235C], plant at 525tpa & leave alone [525C], plant at 525tpa and thin to 240tpa at crown closure [525 1st T], and plant at 525tpa & thin to 240tpa when HLC=15-20ft [525 2nd T]) fall within what is currently considered operational and furthermore, allow for meaningful comparisons across treatments.
- Stand density management provides opportunities for foresters to influence stand yield, individual tree size, and stem form. Relative density and the associated relative density diagram developed by Puettman, et. al. (1993) is a useful tool in deciding the timing (i.e. “window”) and intensity (post-thinning or residual density) of pre-commercial thinning. The recommended management zone (RD=25% to 45%) is the stand condition that is a compromise between individual tree growth, stand yield, and mortality. Using data from this site the following were observed:
    - For the 235C treatment, the recommended management zone (RD=25% to 45%) occurred between the ages of 13 & 20.
    - For the 618tpa planting density treatment (525C), the plot was in the recommended management zone (RD=25% to 45%) between the ages of 6 &10.
    - For the 525 1st T treatment, thinning occurred at age 6; just as the stand was entering the management zone (RD=26%). It was thinned to a relative density below what is recommended (RD=16%).
    - For the 525 2nd T treatment, thinning occurred at age 9; just as the stand was approaching the upper limit of the management zone (RD=44%). It was thinned to a relative density just below what is recommended (RD=21%).
    - By age 22, only the 525C treatment has reached the “self-thinning line” (RD=65%).
- The increased diameter growth resulting from an increase in resources (i.e. thinning) is, among other factors, a function of crown size. Therefore, identifying crown size is another useful way of deciding when to pre-commercially thin. A simple and useful measure of crown size is live crown ratio (LCR). For red alder plantations, it is generally considered that a 50% LCR of the trees/ stand is a desirable “trigger” for when to PCT- thinning when LCR>50% sacrifices stand yield, while thinning when LCR<50% sacrifices individual tree growth. In regards to LCR, the following were observed:
    - For the 235C treatment, the trees/stand reached LCR=50% at age 20.
    - The 525C treatment was 12 years old when LCR dropped below 50%.
    - The LCR at time of thinning for the 525 1st T, and 525 2nd T was 84% and 66%, respectively. So, using the 50% rule, these treatments were thinned early.
    - PCTing maintained higher LCRs than the unthinned 525C treatment (~37% vs 27%).

Stand Density Management

- Diameter:
  - Trees either planted at a wider spacing (235C) or thinned to a wider spacing (525 1st T & 525 2nd T) had, on average, diameters 2 to 3 inches (30%) greater than the closer spaced treatment (525C) at age 22.
- Height:
  - Height at age 22 differed by treatment although differences were relatively small. Stands planted at a wider spacing (235C) were shortest (74ft) , followed by thinned stands (~79ft) with closer spaced stands (525C) were tallest (84ft).
- Total cubic foot volume at 22 years:
  - Through age 20, total stand cubic foot volume (CFV) followed the same patterns as height: stands planted at a wider spacing had the least volume followed by thinned stands followed by closer spaced stands. However, a severe weather event around 2010/2011 damaged the closer spaced treatment, resulting in a significant loss of volume.
  - The stand planted at the wider spacing (235C) had the least volume (3900ft3/acre).
  - Thinning at age 6 (525 1st T) resulted in more volume (5000ft3/acre) than thinning at age 9 (4300ft3/acre).
- Board foot volume (BDFV) at 35 years:
  - Using the data collected at age 22 and the red alder growth and yield model (RAP-ORGANON), board foot volume per acre by log diameter class was projected to age 35 (merchandising specifications= log length 32ft, minimum log length 12ft, minimum log diameter 4in, stump height 1ft, and trim 6in).
  - At age 35, BDFV ranged between 18MBF and 22MBF.
  - The greatest volumes were found in the 525C stand (21.6MBF) and the 525 1st T (21.8MBF). Although these two stands had nearly identical total volumes, log diameter distributions varied greatly- the 525C stand had a much higher proportion of smaller logs.
  - The 235C stand had the lowest volume (18.2MBF) as well as the greatest range in log sizes.

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Notes

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WASHINGTON
HARDWOODS
COMMISSION

PO Box 1095 · Camas, WA 98607
Phone: (360) 835-1700 · Fax: (360) 835-1910
Web: www.wahardwoodscomm.com · Email: whc@wahardwoodscomm.com