



SILVICULTURE ■ NUTRITION
WOOD QUALITY ■ MODELING

**STAND MANAGEMENT COOPERATIVE
ANNUAL REPORT
JANUARY-DECEMBER 2007**

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ANNUAL REPORT

JANUARY – DECEMBER 2007

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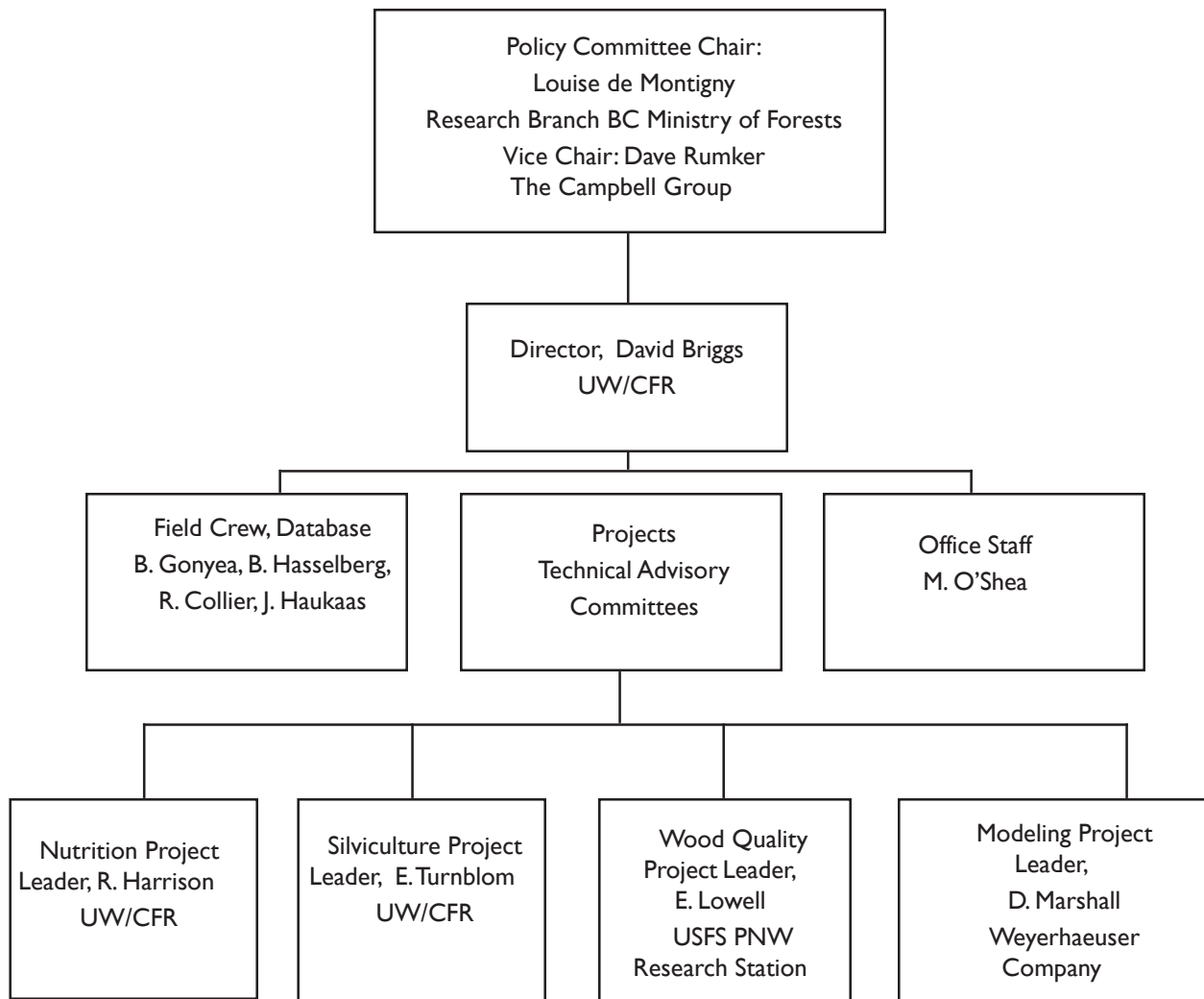
MISSION AND ORGANIZATION

Mission

To provide a continuing source of high-quality information on the long-term effects of silvicultural treatments and treatment regimes on stand and tree growth and development and on wood and product quality.

Organization

The SMC is composed of forest industry, state, provincial, and federal agencies, suppliers, and universities and other institutions who commit resources and expertise to the mission. The voting Policy Committee, composed of dues-paying members, controls policy with the goal of establishing the highest possible technical standards in carrying out its mission. Technical Advisory Committees (TACs) in Silviculture, Nutrition, Wood Quality, and Modeling, comprised of leading scientists, have been created to develop plans for research projects that are approved by the Policy Committee. The SMC is headquartered at the College of Forest Resources, University of Washington, which provides administration and staffing.



2007 HIGHLIGHTS

I. Budget

Cumulative SMC funding from all sources since 1985 reached \$17.1 million of which 62% was member dues, 2% contracts, 16% external grants, and 20% institutional contributions.

In 2007 total funding was \$986,690, of which \$570,699 was member dues, \$8,480 contracts, \$200,064 external research project grants, and \$207,447 institutional contributions. Included in the institutional contributions is \$70,652 from the BC Ministry of Forests Research Branch for installation field work in BC. Operating funds were \$553,412, net of a \$16,809 deficit from 2006 and \$8958 for in-kind credits to landowners for maintenance of the GGTIV installations. The largest component of expenses supports the staff for field work and the database. Graduate students were supported on new and continuing external grants and by University of Washington funds.

2. Research

Grant Funds: A total of \$200,064 was received as supplements to existing grants, new grants, and University of Washington support for graduate students.

- “Sun tree identification in tree lists of multi-strata stands” \$73,339 to Eric Turnblom from OESF and ONRC.
- \$40,000 from NCASI to Rob Harrison for continued work at the Fall River LTSP site.
- \$46,725 from the UW College of Forest Resources Gessel Fund for graduate student support.
- \$40,000 from the UW College of Forest Resources Corkery Family Chair to support graduate students and the summer field crew.

Young stand model: Funded by AGENDA 2020 and the SMC, this project, by Martin Ritchie, David Marshall, Eric Turnblom and Nick Vaughn, completed development and testing of equations. Coding of the final model is underway with expected completion in early 2008.

3. Field Installations, Database, and Software

Genetic Gain Trial – Type IV (GGTIV) Installations: First growth measurements of the three installations planted in 2005 were obtained during the 06/07 field season. Site characterization of these installations was completed by the summer 2007 field crew. First growth measurements and site characterization of the three installations planted in 2006 will be obtained during the 07/08 field season and summer 2008.

Fertilization Installations: Agreement was reached on a paired-tree design for a new series of fertilization trials. Criteria and candidate area selection forms for selecting installations, to be called Type V, were developed. Several potential installation sites have been visited and some selected for installation during the 07/08 field season. A proposal to AGENDA 2020 for funding to support instrumentation of these sites will be submitted.

2007/2008 57 installations (338 plots) were visited for full measurements, to conduct treatment trigger checks, or to conduct thinning, fertilization, or pruning treatments. A summer field crew visited installations to conduct site characterization on the GGTIV installations, vegetation surveys, habitat assessments, pitch moth surveys, and soil sampling. Funding of the summer crew was achieved through grant funds, the Precision Forestry Cooperative, Corkery Family Chair, and the SMC.

Database: The database was updated and sent to members who had requested it in June. It currently contains data from 457 installations of which 90 are currently active SMC installations. The contract to produce a database to support a future red alder modeling effort was completed. Work on a database management system for the long term site productivity (LTSP) studies has progressed through prototype design and testing with data sets from a small number of the LTSP studies. The next step will be to incorporate data from the remaining LTSP sites with completion planned for mid-2008.

4. Graduate Students

During 2007 nine graduate students were affiliated with the SMC.

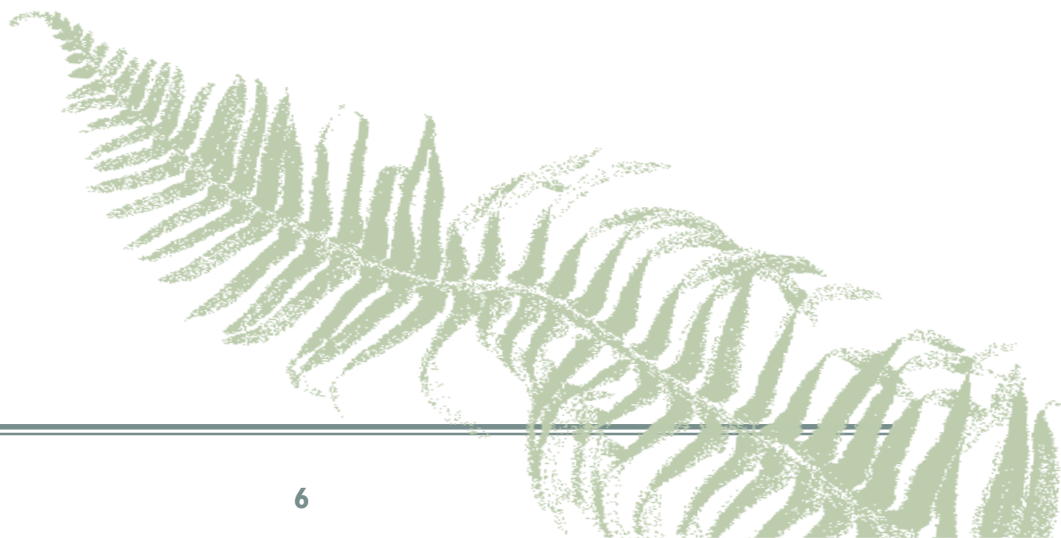
- Cindy Flint began her Masters in Fall 2005 with Rob Harrison and completed her thesis in Spring 2007. She was funded by the UW Gessel Fund, the Fall River and Matlock projects, and Green Diamond Resources.
- Andrew Hill began his PhD in 2002 with Eric Turnblom. His dissertation “Using Climate-Related Information to Improve Short Term Growth Projections” is in final draft form and is expected to be complete in early 2008. His research is funded by the USFS FIA program.
- Rapeepan Kantavichai began her PhD in Fall 2004 with David Briggs. She is funded through the Corkery Family Foundation Chair and the AGENDA 2020 Project “Non-destructive evaluation of wood quality in standing Douglas-fir trees and logs”. She is focusing on how to incorporate wood quality measures into harvest planning models.
- Gonzalo Thienel began his Masters in Summer 2005 with David Briggs. He is funded through the Corkery Family Foundation Chair and the AGENDA 2020 Project “Non-destructive evaluation of wood quality in standing Douglas-fir trees and logs”. He is examining the effects of season, tree and growing condition variables on acoustic velocity of standing Douglas-fir trees and expects to graduate in June 2008.
- Nick Vaughn began his Masters thesis in Fall 2005. He finished his thesis on the young stand model in summer 2007 with Eric Turnblom and Martin Ritchie. This research was funded by the SMC, UW CFR, and an AGENDA 2020 grant. Nick continues as a Ph.D. student with Eric Turnblom.
- Paul Footen began his Masters with Rob Harrison in Spring 2007. He has been working on the carry-over-effects study and the Fall River and Matlock long-term site productivity projects.
- Kim Littke began her PhD in Fall 2007 with Rob Harrison. She is funded by UW sources and will be working on the new paired-tree fertilization study.
- Ben Shyrock began his Masters in Fall 2007 with Rob Harrison. He is funded by the Gessel Scholarship and the Fall River and Matlock projects.
- Kevin Ceder began his PhD in 2007 with Eric Turnblom. He is working on the “Vegetation Composition, Succession and Understory Diversity in Managed Ecosystems” project funded by NCASI.
- Brian Strahm, who finished his PhD with Rob Harrison in 2006, is now continuing as a post-Doc.

5. **Technology Transfer**

During 2007, two Masters theses were completed, 4 publications appeared in journals and proceedings, 11 technical reports/working papers were published, and 13 presentations/posters were given at various professional meetings.

6. **Strategic Plan**

The strategic planning committee met in February to develop goals and objectives for discussion at the Spring meeting. The Strategic plan was adopted and will be revisited next year for progress assessment and potential changes.



SMC MEMBERS AND POLICY COMMITTEE REPRESENTATIVES

Land Managing Organizations

Bureau of Land Management	George McFadden
Campbell Group	Dave Rumker
Cascade Timber Consulting	Bill Marshall
Forest Capital Partners	Scott Ketchum
Forest Systems, Inc.	Dan Stransky
Green Diamond Resource Co.	Randall Greggs
Hampton Resource, Inc.	Dennis Creel
Hancock Forest Management	Dean Stuck
Lone Rock Timber Company	Jake Gibbs
Longview Timberlands, LLC.	Chris Lipton
Olympic Resource Management	Scott Holmen
Oregon State Department of Forestry	Doug Robin
Pacific Denkman	Allen Staringer
Plum Creek Timber Company	Connor Fristoe/Steve Wickham
Port Blakely Tree Farms	Mike Mosman
Quinalt Department of Natural Resources	Jim Plampin
Rayonier Forest Resources	Candace Cahill
TimberWest - Coast Timberlands	John Mitchell
Washington State Department of Natural Resources	Scott McLeod
West Fork Timber Company	Gene McCaul/Scott Swanson
Weyerhaeuser Company	Greg Johnson

Analytic Organizations

FORSight Resources, LLC	Karl Walters
ImageTree Cooperation	Mark Hanus
Jim Flewelling Biometrics Consultant	Jim Flewelling
Mason, Bruce & Girard	Steve Fairweather

Suppliers

Agrium US INC.	Alan Levy
Dyno Nobel	Robert Handford
J.R. Simplot	Terry Kendall
King County Department of Natural Resources	Roberta King/Peggy Leonard

Institutions

B.C. Ministry of Forests, Research Branch	Louise de Montigny
FP Innovations-Forintek Canada	Gerry Middleton
Oregon State University	Doug Maguire
University of British Columbia	Bruce Larson
University of Washington	David Briggs
U.S. Forest Service PNW Research Station	Charley Peterson
West Coast Lumber Inspection Bureau	Brad Shelly

TECHNICAL ADVISORY COMMITTEES

Modeling Project

Project Leader, David Marshall
Weyerhaeuser Company
David Briggs, University of Washington
Burt Dial, Hancock Forest Management
Jim Flewelling, Biometric Consultant
Dave Hamlin, Campbell Group
Greg Johnson, Weyerhaeuser Company
Dave Lortz, Campbell Group
Fred Martin, Washington Dept. of Nat. Res.
Mark McKelvie, Weyerhaeuser Company
Bob Meurisse, USFS Pacific Northwest Region
Bob Monserud, USFS PNW Research Station
Eric Turnblom, University of Washington
Larry Wiechelmann, Quinalt Dept. of Nat. Res.

Nutrition Project

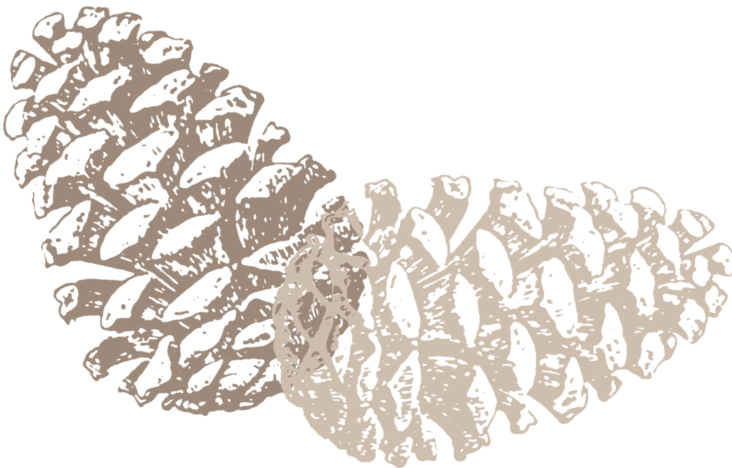
Project Leader, Rob Harrison,
University of Washington
David Briggs, University of Washington
Louise de Montigny, B.C. Ministry of Forests
Bob Edmonds, University of Washington
Barbara Gartner, Oregon State University
Jake Gibbs, Lone Rock Timber Co.
Randall Greggs, Green Diamond Resource Co.
David Hann, Oregon State University
Andy Hiegel, Hancock Forest Management
Denny Hill, Campbell Group
Scott Holub Weyerhaeuser Company
Greg Johnson, Weyerhaeuser Company
Bob Meurisse, USFS Pacific Northwest Region
Stephen H. Schoenholtz, Oregon State University
William Scott, Weyerhaeuser Company
Brian Sharer, Hancock Forest Management
John Shumway, USFS PNW Research Station
Tom Terry, Weyerhaeuser Company
Eric Turnblom, University of Washington
Gordon Weetman, University of British Columbia
Steve Wickham, Plum Creek Timber Co.

Silviculture Project

Project Leader, Eric Turnblom,
University of Washington
Norm Andersen, Washington Dept. of Nat. Res., retired
David Briggs, University of Washington
Robert Curtis, USFS PNW Research Station, retired
Louise de Montigny, B.C. Ministry of Forests
Burt Dial, Hancock Forest Management
Alex Dobkowski, Weyerhaeuser Company
Candance Cahill, Rayonier Forest Resources
Randall Greggs, Green Diamond Resource Co.
David Hann, Oregon State University
Connie Harrington, USFS PNW Research Station
Rob Harrison, University of Washington
Denny Hill, The Campbell Group
David Hyink, Weyerhaeuser Company, retired
Keith Jayawickrama, NWTIC, Oregon State Univ.
Greg Johnson, Weyerhaeuser Company
Scott Ketchum, Forest Capital partners, LLC
Eini Lowell, USFS PNW Research Station
Steve Loy, Hancock Forest Management
Jeff Madsen, Port Blakely Tree Farms
Gene McCaul, West Fork Timber Co.
Dave Marshall, USFS PNW Research Station
Peter Marshall, University of British Columbia
Bob Monserud, USFS PNW Research Station
Mike Mosman, Port Blakely Tree Farms
Jim Plampin, Quinalt Dept. of Nat. Res.
Jim Vander Ploeg, Hancock Forest Management
Doug Robin, Oregon Department of Forestry
Bill Scott, Weyerhaeuser Company
Nick Smith, Weyerhaeuser Company
Allen Staringer, Pilchuck Tree Farm

Wood Quality Project

Project Leader, Eini Lowell, USFS PNW Research Station
Jamie Barbour, USFS PNW Research Station
David Briggs, University of Washington
Jeff DeBell, Washington Dept. of Nat. Res.
Burt Dial, Hancock Forest Management
Roger Fight, USFS PNW Research Station
Barbara Gartner, Oregon State University
Jake Gibbs, Lone Rock Timber Co.
David Hann, Oregon State University
Denny Hill, The Campbell Group
Doug Maguire, NWTIC, Oregon State Univ.
Greg Johnson, Weyerhaeuser Company
Bob Megraw, Weyerhaeuser Company, retired
Gerry Middleton, FP Inocations -Forintek Canada
Bob Monserud, USFS PNW Research Station
Dave Rumker, Campbell Group
Brad Shelley, West Coast Lumber Inspection Bureau
Eric Turnblom, University of Washington



2007 BUDGET

The dues calculations for 2007 were based on the following formula, approved by the Policy Committee at the Fall 2004 meeting.

If acres > 100,000	dues = \$5,845 + \$0.033976 Acres
If acres ≤ 100,000	dues = \$11,690 + \$0.033976 Acres
Dues cap = \$75,730	

Member dues in 2007 were \$570,699 (Table 1, Figure 1) compared to \$568,248 in 2006. Special contracts were \$8,480, down from \$26,168 in 2006. The BC Ministry of Forests Research Branch contributed \$70,652 to support measurement and treatment costs associated with SMC Installations in BC. Other institutional members provided the equivalent of about \$136,795 in the form of salaries of scientists, facilities, and administrative support. Funding from external sources totaled \$200,064; \$113,339 from external grants and \$86,725 of student funding from the UW Gessel Fund and Corkery Family Chair. These external funds support several graduate students and some SMC staff time thereby producing savings in the SMC budget. Total funding from all sources was \$986,690 and increased the cumulative total since 1985 to \$17.1 million. This does not include substantial in-kind time contributed by members participating on SMC committees nor donations of expertise and materials by supplier members.

Table 2 and Figure 2 provide a balance sheet for 2007 which began with a deficit of \$16,809. In-kind credits to landowners associated with the GGTIV installations were \$8,958. Therefore, funds available for operations were \$553,412. Salaries include the permanent SMC staff, hourly helpers and occasional student support. Most of the salary expense along with a large share of travel and supplies supports field measurement activities and the associated database management. The salary shown is the net amount after charges to grants and the Precision Forestry Cooperative for work done by SMC staff. A summer field crew consisting of 5 persons was hired, with expenses split between the Corkery Family Foundation Chair, external grants, the Precision Forestry Cooperative and the SMC. The 2007 budget year ended with a surplus of \$11,555.

Figure 1:

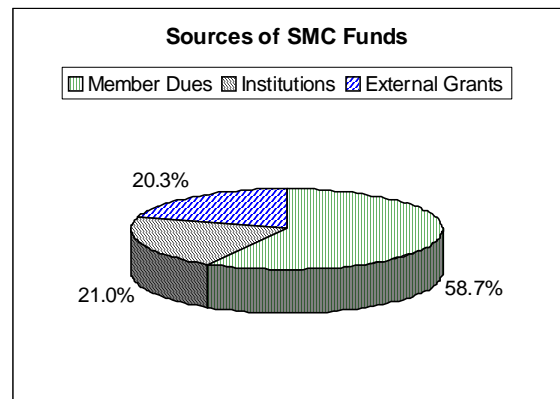


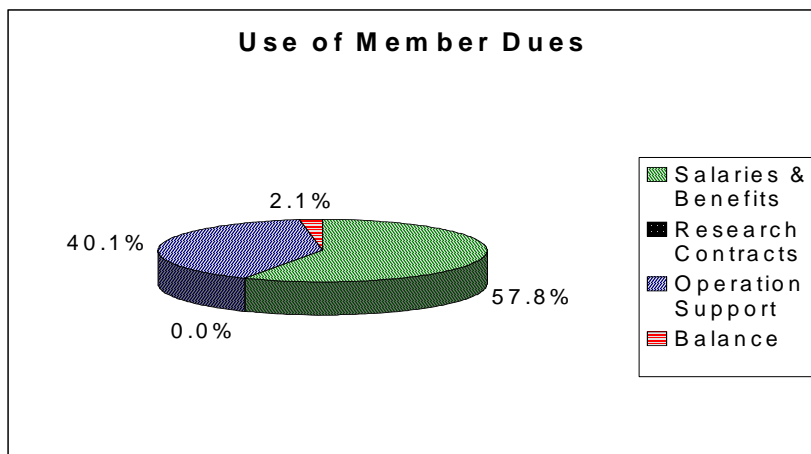
TABLE I: 2007 FINANCIAL SUPPORT

Cooperator	Amount	%
Formula dues:		
Bureau of Land Management	\$ 79,517	
Campbell Group	\$ 18,875	
Cascade Timber Consulting	\$ 17,376	
Forest Capital Partners	\$ 17,768	
Forest Systems, Inc.	\$ 8,189	
Green Diamond Resource Co.	\$ 24,796	
Hampton Tree Farms	\$ 18,232	
Hancock Forest Management	\$ 29,836	
King County Dept. Nat. Res.	\$ -	
Lone Rock Timber Company	\$ 16,598	
Longview Fibre Company	\$ 29,346	
Olympic Res. Mgt/Pope Res.	\$ 16,377	
Oregon Dept. Forestry	\$ 37,545	
Pacific Denkman	\$ 6,672	
Plum Creek Timber Co./TTC	\$ 25,373	
Port Blakely Tree Farms	\$ 17,254	
Quinault Dept. Nat. Res.	\$ 8,387	
Rayonier Forest Resources	\$ 24,582	
Timberwest	\$ 37,291	
Washington Dept. Nat.Res.	\$ 49,162	
West Fork Timber Co. LLC	\$ 8,006	
Weyerhaeuser Co.	\$ 79,517	
Total	\$ 570,699	
Member Contracts, Grants, etc.	\$ 8,480	
Subtotal	\$ 579,179	58.7%
Less in-kind credits	\$ (8,958)	
Net Cash Contributions	\$ 570,221	
Institutional Contributions		
B.C. Ministry of Forests	\$ 70,652	
Oregon State University	\$ 10,000	
University of Washington	\$ 106,795	
USFS PNW Research Station	\$ 20,000	
Subtotal	\$ 207,447	21.0%
External Research Grants	\$ 200,064	20.3%
TOTAL	\$ 986,690	100.0%

TABLE 2: 2007 BUDGET

INCOME	Amount	%
Formula Funding	\$ 570,699	103.1%
Contracts	\$ 8,480	1.5%
Subtotal	\$ 579,179	104.7%
In-kind credits	\$ (8,958)	-1.6%
Net Cash Contributions	\$ 570,221	103.0%
2005 Ending Balance Forward	\$ (16,809)	-3.0%
Total Funds Available	\$ 553,412	100.0%
EXPENSES	Amount	%
Salaries	\$ 258,720	46.8%
Benefits	\$ 61,130	11.0%
Travel	\$ 68,125	12.3%
Equipment & supplies	\$ 18,808	3.4%
Contract Services	\$ 24,859	4.5%
Tuition		0.0%
Subtotal	\$ 431,642	78.0%
Indirect	110,185	19.9%
Total Direct & Indirect	\$ 541,827	97.9%
Research Contracts	\$ -	0.0%
Total Expenditures	\$ 541,827	97.9%
2007 Ending Balance	\$ 11,555	2.1%
Total Funds Available	\$ 553,382	100.0%

Figure 2:



FIELD WORK AND DATABASE REPORTS

FIELD INSTALLATION DESCRIPTIONS

Regional Forest Nutrition Research Project (RFNRP) 1969-2000

- PHASE I Unthinned natural stands of Douglas-fir and western hemlock. Installations were established in 1969-70, received as many as 4 fertilization treatments, and were measured for 20 years. Completed in 1990. 117 installations, 702 plots.
- PHASE II Thinned natural stands of Douglas-fir and western hemlock. Installations were established in 1971-72, received as many as 4 fertilization treatments, and were measured for 20 years. Completed in 1992. 43 installations, 266 plots.
- PHASE III Young thinned plantations of Douglas-fir and western hemlock, and low site quality stands of Douglas-fir. Installations were established in 1975, received as many as 4 fertilization treatments, and were measured for 20 years. Completed in 1996. 29 installations, 234 plots.
- PHASE IV Pre-commercially thinned (300 trees/acre) plantations of Douglas-fir and western hemlock, and Douglas-fir stands of naturally low stocking. Installations were established in 1980, received as many as 4 fertilization treatments, and were measured for 20 years. Completed in 2000. 34 installations, 306 plots.
- PHASE V Single-tree screening trials in young noble fir and Pacific silver fir stands; established 1986-1988. One fertilizer application. Completed in 1991. 22 installations.

Stand Management Cooperative: 1985-Present

- TYPE I Established between 1986 and 1994 in juvenile (age 7-15) Douglas-fir and western hemlock plantations with uniform stocking ranging from 300-680 stems per acre. Established before the onset of substantial inter-tree competition. At establishment, some plots were systematically thinned to 50% or 25% of the existing trees per acre. Seven plots constitute a common core on all installations and are following pre-defined thinning regimes based on Curtis' relative density. At some installations counterparts to some of the core plots received best tree rather systematic thinning and others have either pruning or fertilization treatments. 38 installations, of which 30 are Douglas-fir, 322 plots, and 8 are western hemlock, 56 plots.
- TYPE II Established between 1986 and 1991 in Douglas-fir plantations that were approaching commercial thinning stage and considered to approximate the expected future condition of the Type I installations. Five plots, one unthinned control and four following thinning regimes based on Curtis' relative density constitute the treatments. 12 installations, 60 plots.
- TYPE III Planted between 1985 and 2001 with the best current regeneration practices at 100, 200, 300, 440, 680, and 1210 stems per acre. Plantings were at least 3 acres per spacing to provide experimental material for future research. A control measurement sample plot was established in each spacing. In the three widest spacings additional plots were established to create a matrix of density and pruning (pruned with unpruned "followers" with pruning to either 50% live crown removal or pruned to 2.5 inch top) treatments. In the three dense spacings a matrix of thinning treatments; early/light, early/heavy, late/light,

late/heavy, and a late one time, was established based on relative spacing. 47 installations; of which 38 are Douglas-fir, 6 are western hemlock, and 3 with a 50/50 mix of Douglas-fir and western hemlock. Collectively they have 564 plots.

CARRYOVER Planted in 1997-1999 on plots of the former Regional Forest Nutrition Research Program after harvesting to assess if fertilization of the previous stand affects development of its successor. 7 installations, 17 plots.

GENETIC GAIN TRIAL/TYPE IV (GGTIV)

“Genetic Gain/Type IV” Planted in 2005 and 2006. A Douglas-fir genetic gain and spacing trial collaboration with Northwest Tree Improvement Cooperative. Planting spacings are 7x7, 10x10, and 15x15. Genetic levels are elite, unimproved and intermediate stock. Vegetation control levels are current practice and complete until crown closure. 6 installations, 132 plots in the Grays Harbor breeding zone.

LTSP “Long-term site productivity” Sites at Fall River, WA; Matlock, WA; Mollalla, OR. Collaboration with USFS PNWRS, OSU, and companies.

TYPE V Paired-tree study consisting of two treatments, 0 and 224 Kg N/ha to study effects on growth and yield, carbon, and wood quality. Stratified by parent material, vegetation zone, slope location. Detailed site characterization. Each installation to have 24 tree pairs. Currently being installed, with an expected 40+ total.



FIELD WORK

Bob Gonyea, Field Coordinator, Bert Hasselberg, Field Technician.

The following table indicates the number of times that SMC plots on the different types of installations have been measured.

Meas	Type I ¹		Type II ¹		Type III ²		Carryover ³		GGTIV ²	
	# plots	%	# plots	%	# plots	%	# plots	%	# plots	%
0	0	0%	0	0%	0	0%	0	0%	0	0%
1	2	1%	0	0%	3	1%	0	0%	132	100%
2	0	0%	0	0%	33	11%	0	0%	0	0%
3	0	0%	1	2%	59	19%	0	0%	0	0%
4	43	11%	5	8%	54	17%	0	0%	0	0%
5	246	65%	20	33%	60	19%	2	11%	0	0%
6	86	23%	34	57%	100	32%	0	0%	0	0%
7	1	0%	0	0%	0	0%	6	32%	0	0%
8	0	0%	0	0%	0	0%	9	47%	0	0%
9	0	0%	0	0%	0	0%	2	11%		
Total	378	100%	60	100%	309	100%	19	100%	132	100%
1. Number of full measurements at establishment and every 4th year thereafter										
2. Number of full measurements at establishment, every 2 years until 30 ft in height, & every 4 years thereafter										
3. Number of full measurements at establishment and annually thereafter										

The following table summarizes the number of field installations and plots visited during the past three field seasons along with the planned visits for the 07/08 season. This table does not indicate the multitude of activities performed on these installations. A fuller appreciation of the scope of the 06/07 workload is detailed in the summary following the table.

Installation	Activity	2005/2006		2006/2007		2007/2008		2008/2009 Plan	
		Number of installations	Number of plots	Number of installations	Number of plots	Number of installations	Number of plots	Number of installations	Number of plots
Type I	Full Measurement	8	75	12	109	7	70	11	109
	Thin check	7	9	8	9	11	16	18	30
	Thinned	6	7	7	7	2	2	1	3
	Fertilized	2	6	2	6				
	Pruned								
	Stem analysis								
	Foliage samples	3	18	2	12	2	12		
Type II	Full Measurement	3	5	6	25	2	10	1	5
	Thin check	3	3	1	1	1	1	1	1
	Thinned			1	1				
	Stem analysis								
Type III	Full Measurement	8	72	7	54	9	90	6	64
	Thin check	4	7	6	9	3	3	4	4
	Thinned		5	5	7	1	1	3	18
	Pruned measured	2	12	2	12	2	15	2	9
	Pruned	2	6	3	9	2	9	5	14
	Stem analysis								
Carryover	Full Measurement	6	16	5	14				
GGTIV	Plot installation	3	66						
	Seedling Assessment	3	66	3	66				
	Full Measurement			3	66	3	66	3	66
Contracts	Full Measurement	5	74	2	56	6	43	2	56
	New								
Type V	Installed					6	Individual Trees	15	
Total		65	447	75	463	57	338	72	379

Type I

- ✓ Full re-measurement on 7 installations (70 plots). Complete re-measurement includes 100% dbh, 42 height and height to live crown measurements, branch measurements on all height trees, and comments and observations, all per plot.
 - o RD checks on 5 plots of which 1 was thinned
- ✓ Partial measurement on 11 installations (16 plots). Partial measurement for RD check includes dbh only unless the plot reached the trigger; if so, then also obtain height on 42 trees per plot.
 - o Relative density check on 16 plots of which 1 was thinned
 - o Foliage sampling on 12 plots

Type II

- ✓ Full measurement of 2 installations (10 plots)
 - o Relative density check on 2 plots of which 0 were thinned

Type III

- ✓ Full measurement of 9 installations (90 plots). Complete re-measurement includes 100% dbh, 100% heights until average height exceeds 30 feet after which 42 heights are taken, 42 heights to live crown and crown width, branch measurements on all height trees, and comments and observations, all per plot.
 - o Thinned 1 plot
- ✓ Partial measurement on 2 installations (15 plots)
 - o Pruned 9 plots

Genetic Gain Trial/Type IV Installations

- ✓ Full measurement of 3 installations (66 plots)
- ✓ Site characterization of 3 installations (66 plots)

Contracts

- ✓ Measurement of 6 installations (43 plots)

Summer field crew

- ✓ Site characterization (vegetation, habitat, soil disturbance, slash, red rot) of the three GGTIV installations (66 plots) planted in 2005
- ✓ Soil pits at 4 plots on 4 installations
- ✓ Understory vegetation & habitat assessment (cover board & duff) surveys at 150 plots on 20 installations
- ✓ Douglas-fir pitch moth surveys on 26 plots on 5 installations



SMC summer crew completed acoustic testing at Installation 803-Beeville Loop.



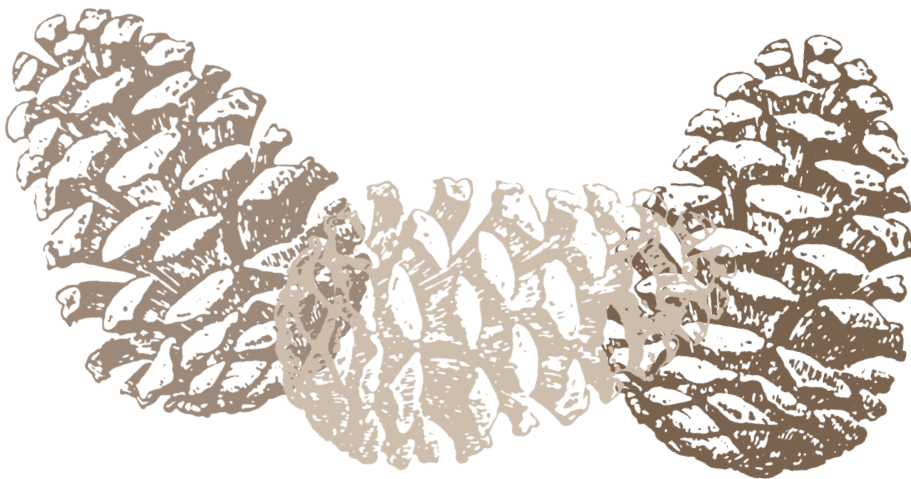
SMC summer field crew members Gonzalo Thienel and Royce Anderson.

DATABASE

Database Personnel: Randy Collier, Senior computer Specialist; John Haukaas, Research Consultant

The SMC database has 457 installations containing 5,019 plots which have been measured 27,791 times. This represents a total of 276,340 individual trees which, in aggregate, have been measured a total of 1,530,176 times. Of this total, 90 are active SMC research installations with the balance (353 installations) either inactive RFNRP installations or active/inactive installations associated with contract projects.

Of the 90 active SMC installations, 7 are from the RFNRP carry-over effects study and 83 are Type I, II, and III installations. These 84 installations contain 737 plots which have been measured 2948 times and received 565 treatments. These plots contain 101,634 trees which have been measured a total of 382,233 times.



NUTRITION PROJECT PROGRESS REPORT

Project Leader: Rob Harrison, University of Washington

A copy of this report is available at:

<http://soilslab.cfr.washington.edu/publications>

Progress to Date

A great deal of nutrition-related work was completed and continued by the SMC during 2007, but perhaps the most important and exciting work is the approval and initiation of the SMC Type V Paired-Tree fertilization study. There is not enough room in this annual report to detail everything about the design and installation of the Type V sites, so a summary is given here. A more detailed installation design can be downloaded from the following site:

<http://soilslab.cfr.washington.edu//publications> and scrolling down to [SMCFertilization070917.doc](#)

Type V Paired-Tree Fertilization Study Summary

Objectives: The primary objectives of the proposed study are to evaluate the potential for response of 15-25 year-old stands to N fertilization within a given vegetation/geology type. Secondary objectives include being able to predict potential response from site and stand variables such that cooperators would be able to focus scarce fertilization resources into sites most likely to respond. A third objective would be to acquire outside funding to expand the scope and usefulness of the fertilization studies by providing a field laboratory for additional work. Such studies have the potential to attract already-funded graduate students and visiting faculty further amplifying the impact of the study.

Methods: The design for installing fertilizer treatments are copied almost exactly from the design utilized by Weyerhaeuser Company in similar research studies, as well as the CIPS fertilizer studies of Doug Maguire and Doug Mainwaring. A copy of the establishment report for the CIPS study is available at:

<http://soilslab.cfr.washington.edu//publications/MaguireFertilizationProject2007.pdf>

Copying their installation design not only allows this study to utilize the combined earlier thought that went into designing these studies, but also to greatly increase the coverage and “n” available when results of several studies are combined.

Stand and Site Selection: SMC Type V installations are being located across the major geologic parent materials/soils and climate zones in the western Douglas-fir region of Oregon and Washington. Climate zone and parent materials are being used to stratify the land for sampling. Earlier, the same strata were used as a basis for selecting locations for RFNRP and SMC installations. As an example, in Oregon the Coast Range was divided into two climate zones, the Coastal Spruce Zone and the interior Hemlock. The Hemlock Zone could be divided into two major sedimentary formations and a series of basic igneous formations. This same type of stratification will be done for the rest of Oregon and Washington.

A copy of the candidate area selection form is available from:

<http://soilslab.cfr.washington.edu//publications> and scrolling down to [TypeV_SingleTreeFert.doc](#)

Initially, with SMC cooperator input, we are selecting the strata with the most land coverage selected by each cooperator ensuring that each cooperator is included, but anticipate that we will also include minor strata that could provide meaningful information about response diagnostics. A portion of the stands will be selected with attempts to include stands near the endpoints of the range of elevation, precipitation, site index, slope, etc to allow interpolation of statistical models rather than extrapolation. Position on slope (ridge, sideslope, toeslope) will also be considered when selecting sites, but it proving difficult to find toeslopes. Stands are normally 15-25 yr-old Douglas-fir plantations to facilitate foliage sampling. Priority will be those stands that have not received fertilization or thinning in the past 10 years. Lists of possible candidate stands are being completed and field reconnaissance done to select the final stands.

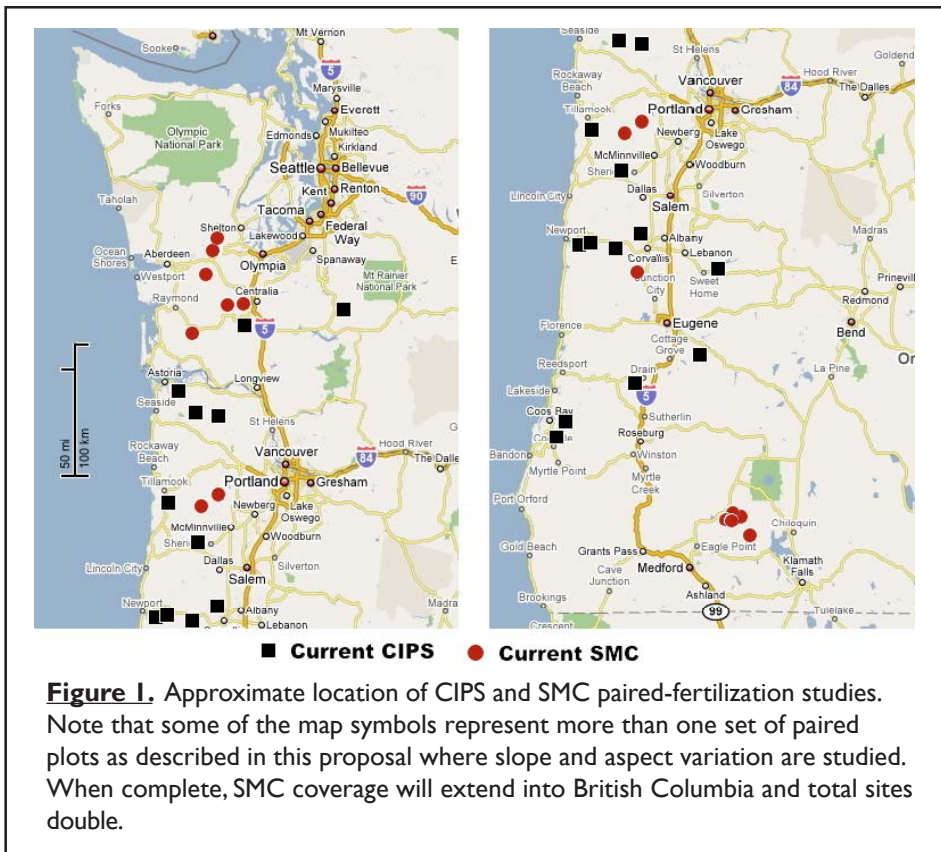


Figure 1. Approximate location of CIPS and SMC paired-fertilization studies. Note that some of the map symbols represent more than one set of paired plots as described in this proposal where slope and aspect variation are studied. When complete, SMC coverage will extend into British Columbia and total sites double.

Existing SMC and Swiss Needle Cast co-op “Beyond Nitrogen” installations are also being evaluated for suitability to fill as much of the sampling frame as possible.

Experimental Design: The experimental design (at an “installation”) is a randomized complete block with two treatments and nominally 12-15 paired tree blocks at each location. The experimental unit consists of a 1/50th acre circular plot centered on a single subject tree. Each block consists of two experimental units selected to make the paired tree block as uniform as possible, primarily with respect to tree size, crown dimension, stocking in relation to surrounding trees, aspect, slope, soils, vegetation etc. Even though these ‘blocks’ will not be physically contiguous, the matching of similar trees will reduce variation, thereby increasing the probability of detecting differences between treatments. The sampling

unit is the single tree at the center of

the plot. There are about 12-15 paired tree blocks per location with two treatments for a total of 24-30 single tree plots that are being established. One of the paired tree subplots is being randomly chosen to be fertilized.

Analysis is at the installation level and grouping by parent material types or other soil property choices for stratification as well as by position on slope within parent material types. A small difference in response should be detectable by this design.

A joint SMC/CIPS equipment proposal was selected for funding in the latest Agenda 2020 program, entitled “Agenda 2020 Management of PNW forest plantations: Additional site characterization and instrumentation for SMC/CIPS Paired-Tree Fertilization Projects”. Support for new research for the fertilization project is at \$25K/year for 3 years. A copy of the proposal is available at:

<http://soilslab.cfr.washington.edu/publications> and scrolling down to [Agenda2020ProposalFinal.doc](#)

Kim Littke, who is the full-time Ph.D. student working on the fertilization project, has managed to secure all of her personal support (stipend and tuition) from CFR scholarships and assistantships, which is a contribution of approximately \$36,000 per year in terms of member dues plus overhead.

Such funding will help us greatly to multiply the impact of SMC member contributions to the overall project.

Other SMC Nutrition Studies

The year 2007 saw continued work on current SMC nutrition projects including continuing and new work on the Fall River, Matlock and Molalla Long-Term Soil Productivity studies, continuing and new work on the “carryover” study as the plantations develop, further work on the impacts of fertilization and forest management on carbon sequestration, and mid-term results from a fertilization study aimed at determining potential impacts of forest fertilization on Hood Canal hypoxia.

Fall River/Matlock/Molalla LTSP: The Fall River LTSP continues to be supported by several different sources of funding, continuing until at least the end of 2009. Most funding has continued over the entire current life of the project and will likely continue into the future since the Fall River LTSP is now producing useful results and major publications. The Fall River LTSP study design has been considered as a model for additional studies on the effects of forest management in the Pacific Northwest for some time now.

Weyerhaeuser Company remains strongly committed to the project, as does the SMC, the U.S. Forest Service PNW Lab, the National Council for Air and Stream Improvement, and the College of Forest Resources (CFR) at the University of Washington. An article in "Western Forester" magazine highlighted results of the Fall River study and how the design and initial results are helping answer some of the dilemmas facing the forest management industries in the PNW as well as the rest of the US:

<http://soilslab.cfr.washington.edu/publications/WesternForester-Aug06.pdf>

A summary publication detailing the entire Fall River study was published as a USFS technical report.

http://soilslab.cfr.washington.edu/publications/FallRiver-pnw_gtr691.pdf

The Matlock and Molalla LTSP studies, now showing differences in growth after several years of study, are adding to the utility of the Fall River LTSP and efforts have pretty much been combined. Tim Harrington's hard work got the sites installed, and we are now doing comparative work. The year 2007 finished the project "Effects of organic matter retention and management on long-term productivity of Pacific Northwest Douglas-fir plantations: Nutrient-process and leaching responses", which was funded for \$50,000 per year for 3 years. This project was a joint project with the following researchers: Rob Harrison, Stephen Schoenholtz, Tom Terry, Randall Greggs, Tim Harrington, Jeff Madsen, D. Briggs, A.B. Adams, Brian Strahm and Cindy Flint. Lysimeters were installed at both Matlock and Molalla sites, and leachate samples have now been collected at Matlock for 2 years.

A new proposal was developed and reviewed for the Agenda 2020 program for continued Fall River, Matlock and Molalla work. Unfortunately, it was not funded this year. We will continue to develop proposal to keep the SMC LTSP sites going.

Brian Strahm, now a postdoc at Cornell, published two journal articles in the Soil Science Society of America Journal related to the LTSPs, either initiated or published in 2007. The first is titled: "Mineral and organic Matter Controls on the Sorption of Macronutrient Anions in Variable-Charge Soils". The research considers some of the soil properties responsible for retention of anions (such as nitrate), as a mechanism for nutrient retention and availability. An abstract of the article follows:

Partitioning ions between the solid and solution phase is one of the most important processes controlling nutrient mobility and bioavailability. Despite this, less research has focused on the interactions of nutrient anions at soil interfaces, although variable-charge components are present to some extent in nearly all soils. The objective of this study was to develop equations using commonly measured soil properties (particle size analysis, organic matter content, and extractable Fe and Al fractions) to predict sorption isotherms for NO_3^- , SO_4^{2-} , and H_2PO_4^- . Six subsurface soils, ranging spatially and temporally from heavily weathered Oxisols of the tropics to a recently glaciated Entisol from the U.S. Pacific Northwest, were used to generate sorption isotherms of the three macronutrient anions using initial solution concentrations from 0.1 to 5 mmol L^{-1} . Before batch sorption experiments, soils were saturated with KCl, rinsed free of excess salts, and adjusted to $\text{pH} = 4.0 \pm 0.1$ to eliminate the confounding effects of competing ions or differing pH regimes. Almost all soils from temperate latitudes had a greater capacity to sorb anions than the Oxisols included in this study for comparison. This was particularly true for the soils with volcanic parent materials from the Pacific Northwest. For any given soil, the capacity to sorb the macronutrient anions was in the order $\text{H}_2\text{PO}_4^- > \text{SO}_4^{2-} > \text{NO}_3^-$. Multiple regression analyses generally suggest that the electrostatic sorption of NO_3^- and SO_4^{2-} is positively related to the presence of active Al fractions and negatively correlated with organic C content.

The entire article is available at:

<http://soilslab.cfr.washington.edu/publications/Strahm&Harrison-2007.pdf>

The second article is titled: "Controls on the Sorption, Desorption and Mineralization of Low-Molecular-Weight Organic Acids in Variable-Charge Soils", and covers some of the mechanisms that might be responsible for the high potential of PNW soils to retain organic matter (and to be as productive as they are). Here is the abstract:

Understanding the controls on interactions between soluble organic compounds and the solid soil matrix is important in understanding soil organic matter dynamics in general, including specific impacts on pedogenic processes, nutrient bioavailability, and C sequestration. This study investigated the pH-dependent relationship between low-molecular-weight organic acids (LMWOAs) and variable-charge soils as a control on the retention of an otherwise highly mobile and bioavailable class of organic compounds. Sorption isotherms of three LMWOAs (one amino acid [glycine], one monocarboxylic acid [propionic acid], and one dicarboxylic acid [malonic acid]) were generated for three forest soils using batch equilibration techniques. Before equilibration, soils were saturated with KCl to control for competing ions, and both soils and solutions were adjusted to one of three pH levels (4.0, 6.0, or 8.0 ± 0.1). Bioavailability was assessed by generating desorption isotherms for each LMWOA-pH combination as well as through laboratory incubations for mineralization rates. Results indicate that sorption of the three LMWOAs followed the general trend: malonic acid >> glycine > propionic acid. Sorption tended to increase with acidity and short-range-ordered aluminosilicate content, and was correlated ($r = 0.69, P < 0.001$) with the magnitude of the difference between the positive charge on the mineral surface and the negative charge of the LMWOA. This trend remained true for the amino acid, which demonstrated sorptive maximums that were more strongly correlated with anion exchange ($r = 0.62, P = 0.1$) than cation exchange ($r = 0.05, P = 0.9$). These observations, coupled with decreased desorption and lower mineralization rates at lower pH levels, suggest the potential for an electrostatic mechanism to contribute to the abiotic retention of organic matter in variable-charge soils under acidic conditions.

The entire article is available at:

<http://soilslab.cfr.washington.edu/publications/Strahm&Harrison-2008.pdf>

Brian also submitted a related article he presented at the North American Forest Soils Conference to Forest Ecology and Management entitled "Postharvest organic matter retention as a potential mechanism for soil carbon sequestration". The article considers the impacts of different levels of organic matter retention after harvest on movement of organic carbon into the soil profile in a soluble form. An abstract of the paper follows:

Research into postharvest management of forests often focuses on balancing the need for increased biomass yield against factors that directly impact the productivity of the subsequent stand (e.g. nutrient and water availability, soil microclimate, etc.). Postharvest organic matter management, however, also exerts a strong influence over the translocation of carbon (C) into and through the soil profile and may provide a mechanism to increase soil C content. The effects of contrasting postharvest organic matter retention treatments (bole-only removal, BO; whole-tree removal, WT) on soil solution C concentration and quality were observed at the Fall River and Matlock Long-term Soil Productivity (LTSP) studies in Washington state. Solutions were collected monthly at depths of 20 and 100 cm and analyzed for dissolved organic C (DOC), dissolved organic nitrogen (DON) and DOC:DON ratio. Comparisons of DOC concentrations with depth illustrate divergent trends between the two treatments, with an overall decrease in DOC with depth in the BO treatment and either an increase or no change with depth in the WT treatment. Trends in DON concentrations with depth were less clear, although the relationship of DOC:DON with depth shows a decrease in the BO treatment and little to no change in DOC quality in the WT treatment. This illustrates that the more recalcitrant organic matter (higher DOC:DON) is being removed from solution as it moves through the soil profile. Only 35-40% of the DOC moving past 20 cm in the BO treatment is present at 100 cm. Conversely, 98-117% of the DOC at 20 cm in the WT treatment is present at 100 cm. Thus, 11 and 30 kg C ha⁻¹ yr⁻¹ are lost from solution in the BO treatment at the Matlock and Fall River LTSP studies, respectively. Although much of this C is often assumed to be utilized for microbial respiration, DOC:DON ratios or the potential organic substrates and the unique mineralogy of the soils of this region suggest that a significant portion may in fact be incorporated into a more recalcitrant soil C pool. Thus, postharvest organic matter retention may provide a mechanism to increase soil C sequestration.

A copy of the entire article is available at:

<http://soilslab.cfr.washington.edu/publications> and scrolling down to [Strahm-et-al-NAFSC.doc](#)

Kyle Petersen's M.S. thesis work developing biomass estimation equations for Fall River was published in the journal *New Forests* in 2007. A copy of the abstract from Kyle's paper follows:

Vegetation control (VC) in forest plantations often increases growth of crop trees but can also affect biomass and nutrient partitioning to tree components. We examined above-ground biomass and macronutrients, leaf area and crown structure in 5-year old Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) growing with VC and with no vegetation control (NVC) in coastal Washington, United States of America. Trees in VC had larger stem, branch, foliage and total biomass than trees of equal stem diameter at 1.3 m above ground in NVC. The difference in component biomass between treatments was in the order: branch >

foliage > stem. Trees in the VC regime did not differ in macronutrient concentration in stem, branch and foliage except for branch N which was greater in NVC than in VC. Differences in tree macronutrient stores between VC and NVC ranged from 2.2 times for Mg to 2.6 times for N and K. The relationship between stem diameter and leaf area was linear in both VC treatments. The relationship between stem diameter and foliage biomass was curvilinear for both VC treatments. Results of this study support the need for separated allometric equations to estimate biomass for young Douglas-ŕ growing in areas with and without VC.

Of particular interest in Kyle's work is the observation of major impacts of vegetation control on the amount of canopy trees carry for a given DBH, and the huge difference in total biomass and LAI due to the vegetation control.

The entire paper is available at:

<http://soilslab.cfr.washington.edu//publications/Petersen-et-al-2007.pdf>

Additional publications and reports from these projects continue. For instance, a recent progress report for Matlock is available at:

<http://soilslab.cfr.washington.edu//publications> scroll down to [Matlock-Progress2007.doc](#)

and a copy of the combined progress report for Fall River, Matlock and Molalla with a proposal for continued funding is at:

<http://soilslab.cfr.washington.edu//publications> scroll down to [TSPProgress2008.doc](#)

Hood Canal Hypoxia vs. Fertilization Study. Initially, forest fertilization was considered to be a potential major source of Nitrogen, the nutrient considered to be responsible for Hood Canal hypoxia problems. The assumptions (10% of N applied directly winds up in Hood Canal) seemed impossibly high for regular forest applications, but no research on similar soils with the same application techniques as is applied in the region by SMC members was available. Thanks to funding from Green Diamond, SMC, the Gessel Foundation and the Puget Region Integrated Research Model (PRISM), Cindy Flint carried out a study as part of her M.S. degree. Here is the abstract from Cindy's article in the Journal of Environmental Quality:

Leaching of nitrogen (N) after forest fertilization has the potential to pollute ground and surface water. The purpose of this study was to quantify N leaching through the primary rooting zone of N-limited Douglas-ŕ r [Pseudotsuga menziesii (Mirb.) Franco] forests the year after fertilization (224 kg N ha⁻¹ as urea) and to calculate changes in the N pools of the overstory trees, understory vegetation, and soil. At six sites on production forests in the Hood Canal watershed, Washington, tension lysimeters and estimates of the soil water ŕux were used to quantify the mobilization and leaching of NO₃-N, NH₄-N, and dissolved organic nitrogen below the observed rooting depth. Soil and vegetation samples were collected before fertilization and 1 and 6 mo after fertilization. In the year after fertilization, the total leaching beyond the primary rooting zone in excess of control plots was 4.2 kg N ha⁻¹ (p = 0.03), which was equal to 2% of the total N applied. The peak NO₃-N concentration that leached beyond the rooting zone of fertilized plots was 0.2 mg NO₃-N L⁻¹. Six months after fertilization, 26% of the applied N was accounted for in the overstory, and 27% was accounted for in the O+A horizon of the soil. The results of this study indicate that forest fertilization can lead to small N leaching ŕuxes out of the primary rooting zone during the ŕst year after urea application.

Cindy's thesis, which has a great more detail than the journal article, is available at:

<http://soilslab.cfr.washington.edu//publications> scroll down to [ThesisCindyFlint2007.doc](#)

and the article in the Journal of Environmental Quality is available at:

<http://soilslab.cfr.washington.edu//publications/Flint-et-al-2008.pdf>

Carryover Study. The results of this study show that previous N fertilization has continuing effects on N availability of previously-fertilized forests. Here is a summary of results from a journal article submission from Paul Footen for the North American Forest Soils conference:

The carryover effects of N-fertilization on five coastal PNW Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) plantations was studied. “Carryover” is defined as the long-term impact of N fertilizer added to a previous stand impacting growth of a subsequent stand. Average height and diameter at 1.3 m above-ground (DBH) of 11-12 year old Douglas-fir trees and biomass and N-content of understory vegetation were assessed on paired control (untreated) and urea-N fertilized plots that had received cumulative additions of 810-1120 kg N ha⁻¹ to a previous stand. Overall productivity was significantly greater in the fertilized stands compared to the controls. In 2006, the last growth measurement year, mean seedling height was 15% greater ($p = 0.06$) and mean DBH was 29% greater ($p = 0.04$) on previously-fertilized plots compared to control plots. Understory vegetation biomass of fertilized plots was 73% greater ($p = 0.005$), and N-content was 97% greater ($p = 0.004$) compared to control plots. These results show that past N fertilization markedly increased seedling growth in these plantations as well as biomass and N-content of understory vegetation in a subsequent rotation. These findings suggest that N fertilization could potentially increase site productivity of young Douglas-fir stands in the Pacific Northwest 15-22 years after application by a carryover effect, though these plantations have not yet reached the age where marketable materials can be harvested from them, and the growth of trees should be monitored over a longer time period before potential impacts on older stands, if any, can be determined.

The growth of the previously-fertilized vs. unfertilized trees show significant differences for DBH (Figure 2), total height (Figure 3), and understory biomass and N content (Figure 4).

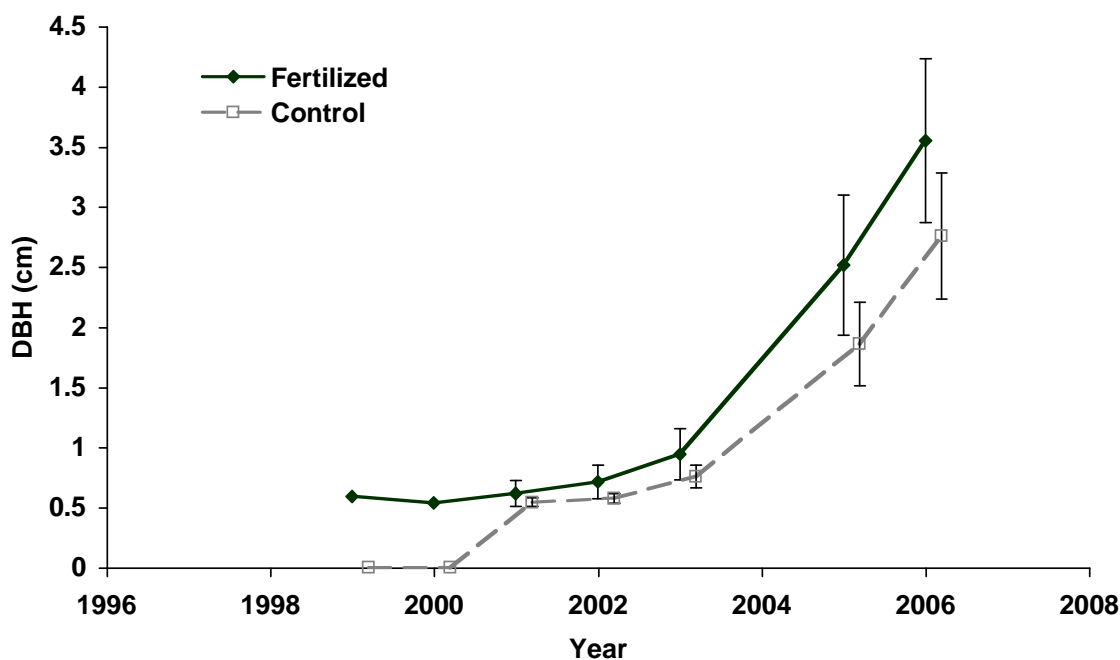


Figure 2. Mean DBH (cm) of Carryover study Douglas-fir trees. The differences in DBH were statistically significant ($p < 0.1$) in years 2005 and 2006. In 2006 mean DBH was 29% greater on the previously fertilized plots than on the control. Control points are offset to show (+/- 1) standard error bars.

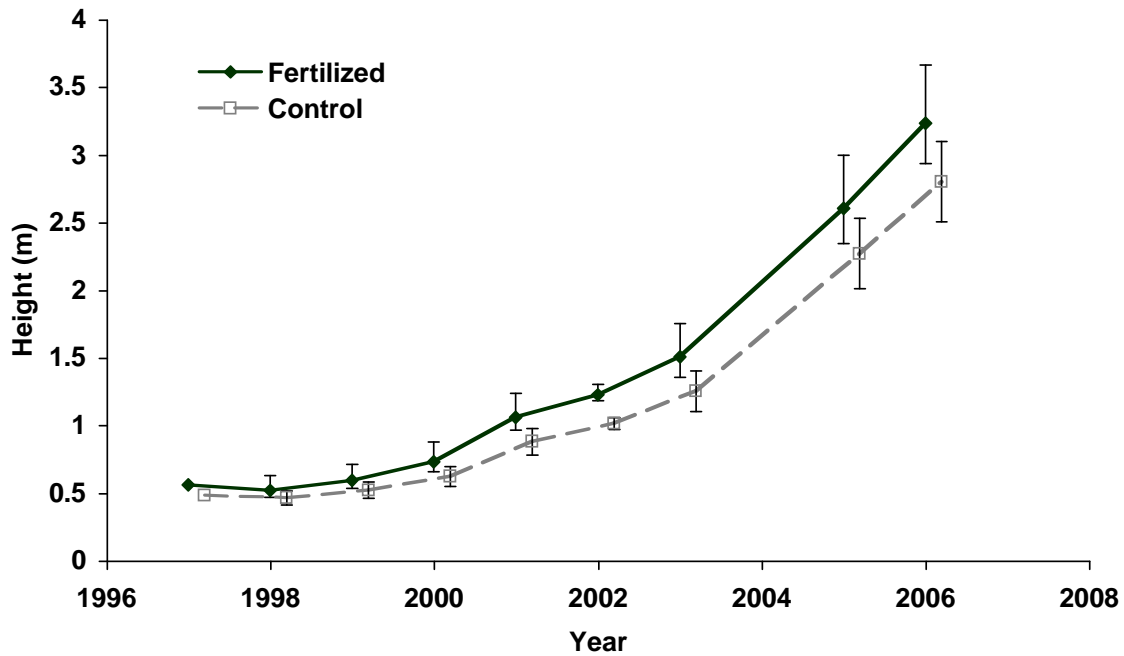


Figure 3. Mean height (m) of Carryover study Douglas-fir trees. The differences in height were statistically significant ($p < 0.1$) every year measured from 2001 to 2006. In 2006 mean tree height was 15% greater on the previously fertilized plots than on the control. Control points are offset to show (+/- 1) standard error bars.

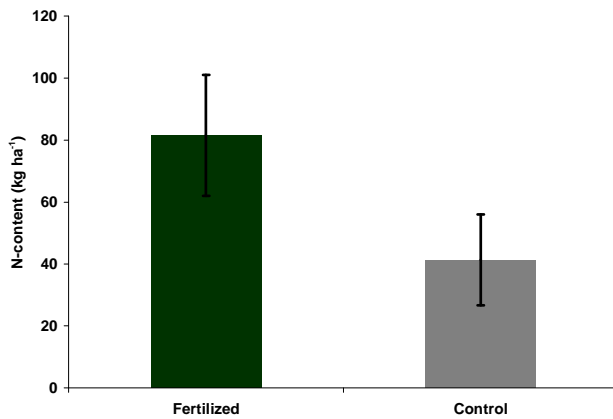


Figure 4. N content for understory vegetation on Carryover study sites. The differences in biomass of understory were statistically significant ($p < 0.1$) in 2006.

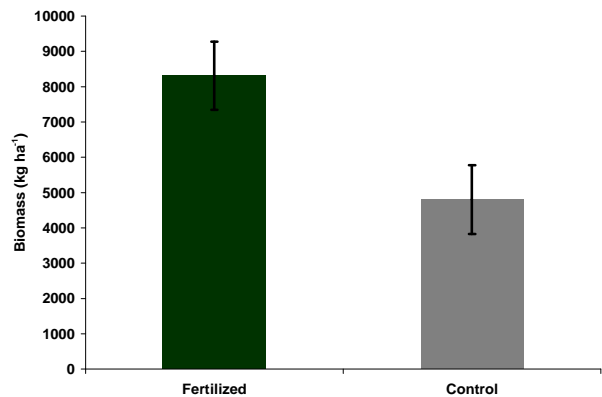


Figure 5. Biomass for understory vegetation on Carryover study sites. The differences in biomass of understory were statistically significant ($p < 0.1$) in 2006.

A copy of a paper recently submitted to the journal Forest Ecology and Management from Paul's work is available at: http://soilslab.cfr.washington.edu/publications_sroll down to PaulFooten-NAFSC-submission.doc

SILVICULTURE PROJECT PROGRESS REPORT

Project Leader: Eric Turnblom, University of Washington

A graphical user interface for the Tree-List Generation Database (TLG), dubbed the Tree-List Generator/Graphical User Interface, or “TLGUI,” was written and tested by John Haukaas and unveiled at the Spring Policy Meeting. TLGUI should provide a more intuitive front-end for those wishing to run the TLG software in an interactive mode, rather than in the straight “batch run” mode in its original design. It is available on the SMC website for download.

In summer of 2007, the first three GGTIV sites planted in 2005 were characterized using the newly developed site characterization protocol. The protocol is designed to capture attributes of the site that are not normally reported in a soil survey or a description of the soils. Attributes such as depth and breadth of red rot, depth and breadth of slash, depth of forest floor, and depth to red rot, as well as soil disturbance class are included in the measurements. A preliminary analysis of these data was performed and reported at the Fall 2007 Policy Committee Meeting.

The Silviculture Technical Advisory Committee (TAC) met jointly with the Nutrition TAC following the Northwest Tree Improvement Cooperative meeting held in Vancouver, WA at Gifford Pinchot NF HQ in winter 2007. Final plans for weed control in the GGTIV were made. Fruitful discussion followed regarding the proposed new fertilization trials. Objectives for those trials were significantly changed and improved.

Work is getting under way on investigating the relationship between the upper canopy or trees in young, intensively managed stands of Douglas-fir and lower canopy vegetation in SMC research plots. The objectives of the study include developing overstory / understory relationships in young, managed Douglas-fir stands at the species level, and to test their interpolative and extrapolative properties by comparing model forecasts to actual observations from a data set not used in the model building / fitting stage of the analyses. The Silviculture Project Leader also worked closely with the Olympic Natural Resources Center (ONRC) and the US Forest Service to develop a grant to study the identification of sun trees in multi-layer tree lists. A graduate student assistant is being sought to help with this new project.

Genetic Gains / Type IV Joint Trial (GGTIV) Preliminary Growth Analysis

The genesis of these joint trials began with discussions between the Northwest Tree Improvement Cooperative (NTIC), the Stand Management Cooperative (SMC), and other interested parties on how best to study the interactions between genetic improvements and silvicultural treatments. The SMC Type IV trials began to emerge as one possible way to accomplish this. The original Type IV design tackled four experimental factors: genetic gain level, spacing, vegetation control, and fertilization regime. That original design also covered three coastal Douglas-fir and three western Cascade breeding zones placing six installations within each breeding zone. Due to logistical constraints and further discussions with NTIC, fertilization was dropped from the design and a single breeding zone was identified (Grays Harbor) to get things started. The resultant study essentially is one replication of the original six planned.

The objectives of the GGTIV trials are fourfold: 1) to provide information to guide managers currently applying combinations of genetics, spacing and vegetation control; 2) to provide linkages with other studies (such as Genetic Gains Trials, intensive vegetation management trials, and spacing trials like the SMC Type III), that will assist modeling efforts; 3) to compare estimates of growth & yield parameters among genetic populations with different expected growth potential; and 4) to develop a predictable relationship between expected genetic gain based on individual-tree growth characteristics and realized genetic gain on a per unit-area basis.

The trials examine three factors: genetic gain level, spacing, and vegetation control level. The genetic gain (G) factor is defined to have three levels: G1 – Unimproved, G2 – Intermediate gain (the SMC Type IV Trial portion does not use this level), and G3 – Elite gain. The three spacing (S) factor levels chosen for are: S1 – 15 x 15', nominally 200 Stems Per Acre (SPA), S2 – 10 x 10', nominally 440 SPA (Genetic Gain Trial portion uses this single density only), and S3 – 7 x 7', nominally 900 SPA. Finally, the vegetation control (V) factor has two levels defined as: V1 – Current Practice (defined as a single site prep; used only in SMC Type IV Trial portion and is consistent with SMC Type III practices), V2 –

Complete (defined as 80% or greater bare ground until crown closure; standard on all Genetic Gain Trial and on Type IV). A schematic diagram of a typical installation layout appears in Figure 1.

Early results from the first three GGTIV installations planted in 2005 are available so far in 2007. Browse was minimal on installations 601 and 603 (one or two trees). Wood rat is suspected culprit. Elk damage (browse) in plots 1-5 in installation 602 is not insignificant. Beetles appear to be girdling some trees at Donaldson Creek (602) and may be related to amount of slash present.

There is strong evidence to indicate that site influences growth of Douglas-fir seedlings even at this young age. There was essentially no detectable effect of gain level on height or basal diameter after two growing seasons. Survival appeared to be marginally better in the 7 x 7 foot spacing. The most significant effect, however, was gain level on crown width. Woods run seedlots had the widest crowns, intermediate gain seedlots had medium wide crowns, and the elite gain level exhibited the narrowest crowns.

We will be carefully monitoring any and all differences in tree and stand attributes and any developing trends as these stands age.

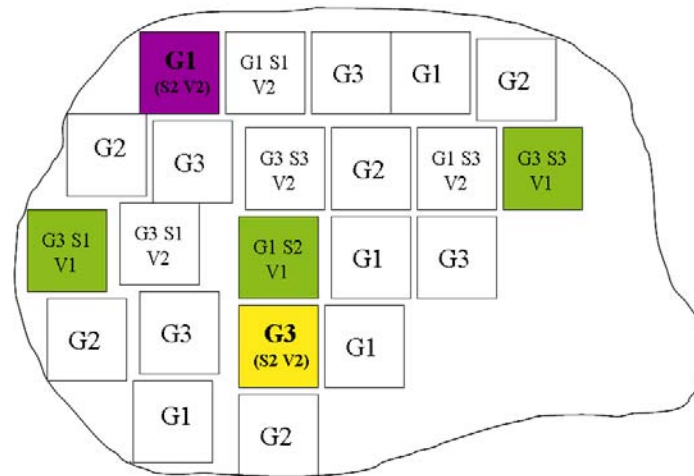


Figure 1. Schematic layout of a typical GGTIV installation showing expected genetic gain level (G1, G2, G3), spacing level (S1, S2, S3), and vegetation control level (V1, V2). All plots are planted at 10 x 10 foot spacing and receive complete vegetation control unless otherwise indicated, i.e., unless they have a “V” or “S” label as well as a “G.” Purple and gold colors denote shared GG and Type IV trial plots.

Vegetation Composition and Succession in Managed, Coastal Douglas-fir Ecosystems (NCASI project)

This study aims to develop overstory/understory relationships at the species level in young managed Douglas-fir stands over time and forge links with silvicultural practices. The impacts of cultural treatments on critical wildlife habitat requirements will be deduced from analyzing the vegetation that supports, or comprises habitat quality in general, rather than by analyzing habitat requirements of any particular species.

Specifically, the objectives of this study are to 1) develop overstory / understory relationships in young, managed

Douglas-fir stands at the species level, 2) benchmark the developed relationships against a small, independent vegetation data set, and 3) test the extrapolative power of the models by comparing them to observed data from differently treated stands (thinned and pruned) not used in model building. Graduate student Kevin Ceder has begun work on this project with the Silviculture Project Leader.

Efforts to date have focused on data cleaning, organization, and preliminary exploration of potential trends between major life forms (such as shrubs, ferns, forbs, grasses, etc.) and overstory stand attributes such as dominant height, basal area, and stems per acre (density).

Sun-Tree Identification in Tree Lists of Multi-Strata Stands

The Silviculture Project leader proposed and received funding for this new research project this year. It is conjectured that although Stand Density Management Diagrams (SDMDs) were originally developed for single canopy (single stratum, and by implication single cohort) stands, the limiting size-density relationships upon which they are based apply equally well to mixed species stands, which probably possess multiple strata, perhaps even multiple cohorts. In a light-limited environment such as the Olympic Experimental State Forest (OESF), there is reason to conjecture that the top (or uppermost) level stratum (cohort) drives size/density dynamics. This study will test and/or modify existing stratum-identification algorithms or develop new ones to identify objectively the individual strata in multi-strata (multi-cohort) stands. By direct imputation, the tallest or top level stratum should be composed of so-called sun-trees, further identifiable by their shade intolerance, rapid growth rates, high light compensation points, etc. A suitable candidate Graduate Student Assistant is being sought to work on this project.

Student Research and Activity

Undergraduate Forestry student Royce Anderson completed the data collection for his Senior Thesis project after spending two summers on the SMC field crew collecting data on Douglas-fir pitch moth severity in Type I and III installations and wrote a report of his findings.

Graduate student Nick Vaughn completed work on the SMC young tree model and graduated with his M.Sc. in Fall 2007. He was advised by Martin Ritchie, PSW Research Station, the Silviculture Project Leader, others on his MS graduate committee (Jim Flewelling, David Marshall, Dave Briggs), and the Modeling TAC. Nick is continuing with graduate work at CFR, UW pursuing a Ph.D.

Andrew Hill, Ph.D. candidate, continued work on relating weather and long-term climate to the growth of Douglas-fir occurring in pure and mixed conifer stands growing in eastern Washington. Andrew has submitted two manuscripts for publication consideration, one to Forest Science; the other to Canadian Journal of Forest Research. Results to date indicate that short-term weather has a significant impact on periodic (5-yr.) diameter growth, and by implication, the accumulated effects of changing weather (climate) will also.

The Silviculture Project Leader also worked closely with graduate students Rapeepan Kantavichai and Gonzalo Thienel, supervised by SMC Director Dave Briggs on modeling the diameter of the largest limb at breast-height (DLLBH) and Non-Destructive wood testing techniques using acoustic velocity values, respectively.

New Publications / Theses / Reports in 2007

1. Anderson, R. 2007. **Survey of the Douglas-fir pitch moth, *Synanthedon novoroensis*, in 9 forests in western Oregon and Washington with an overview of *Synanthedon* (Lepidoptera: Sesiidae).** Senior Project Report, College of Forest Resources, University of Washington, Seattle, WA 98195. 16 p.
2. Vaughn, N.R. 2007. **An Individual-tree Model to Predict the Annual Growth of Young Stands of Douglas-fir (*Pseudotsuga menziesii* (Mirbel) Franco) in the Pacific Northwest.** M.Sc. Thesis, College of Forest Resources, University of Washington, Seattle, WA 98195. 106 p.

WOOD QUALITY PROJECT PROGRESS REPORT

Project Leader: Eini Lowell, USFS PNW Research Station

Project Title: “Non-destructive evaluation of wood quality in standing Douglas-fir trees and logs”

Principle Investigators: David Briggs¹, Eini Lowell², Eric Turnblom¹, Bruce Lippke³, Peter Carter⁴



Bert Hasselberg and Bob Gonyea weighing cookies at Installation 808

Collaborators: **Robert J. Ross, Xiping Wang**, USDA Forest Service Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI. **Dennis Dyksta**, USDA Forest Service Pacific Northwest Research Station, Portland, OR. **Glenn Howe, Marilyn Cherry, Vikas Vikram**; Pacific Northwest Tree Improvement Research Cooperative, Oregon State University, Department of Forest Science, 321 Richardson Hall, Corvallis, OR, 97330-5752. The following members of the SMC provided support for the Objective 1 portion of the study; **Green Diamond Resource Company** (timber, harvesting, transportation), **Port Blakely Tree Farms** (timber, harvesting, transportation), **Washington Department of Natural Resources** (timber, harvesting, transportation), **Weyerhaeuser Company** (timber, harvesting, transportation, milling, x-ray densitometry). **Olympic Resource Management**, a member of both PNWTIRC and SMC provided support (seed orchard, progeny trials, harvesting) for the Objective 2 portion of the study.

Funding: This project leverages funding a grant (\$87,500) from the USFS AGENDA 2020 FY 05/07 into a total effort of \$476,591 as indicated in the following table.



Dennis Dyksta and Eini Lowell at Installation 805

	1/FS Cash	2/FS Inkind	3/Industry Cash	4/Industry Inkind	5/Universities	Subtotal
FY 2005	29,700	5,000	2,941	25,000	25,000	87,641
FY 2006	30,200	59,150	42,000	30,000	35,000	196,350
FY 2007	27,600	75,000	30,000	25,000	35,000	192,600
Subtotal	87,500	139,150	74,941	80,000	95,000	476,591

1/FSR Cash: Regional Agenda 2020 + any other team \$ operating

2/FSR Inkind: Cost-to-govt of scientists and staff working on the study

PNWRS \$5000 initial planning, site selection; \$59,150 veneer & lumber recovery studies

USFPL \$75,000 veneer and lumber testing

3/Industry Cash

FibreGen \$2941 equipment

Industry: timber, logging, transport @ \$8,000 per 4 sites = \$42,000

Industry:milling = \$30,000

4/Industry Inkind:

Stand Management Cooperative field crew & database management

Planning meetings, site selection visits.

5/Universities:

UW CFR and Precision Forestry Cooperative equipment, RA's, field crews

¹ Stand Management Cooperative (SMC) University of Washington, Seattle, WA

² USFS PNW Research Station, Portland, OR

³ Rural Technology Initiative (RTI), University of Washington, Seattle, WA

⁴ Manager Resource Technology & Commercialization, CHH Fibre-Gen, New Zealand

Project Description

Douglas-fir (*Pseudotsuga menziesii* var. *menziesii* [Mirb.] Franco) is renowned as a building construction material due to its abundance and high strength and stiffness. Non-destructive testing technology, based on the velocity of acoustic waves propagated through wood, provides a method for indirectly measuring wood stiffness, an important property in structural and other applications. Within the past decade, technology has been developed that permits rapid, convenient measurement of acoustic velocity of wood in logs, and studies have found excellent relationships between the acoustic velocity of a log and the resultant stiffness of lumber or veneer recovered from the log. More recently, technology has been developed for measuring acoustic velocity of wood in the lower bole of standing trees, enabling the use of acoustic methods for assessing wood quality and sorting raw material along the chain of custody. The overall purpose of this study was to determine these relationships for Douglas-fir and to understand how genetics and silvicultural treatments may be used to influence the stiffness; hence quality, of Douglas-fir.

Research Objectives: (1) *What are the relationships between the average stiffness of lumber or veneer in a log, stiffness of the log, and stiffness of the parent tree and to what extent are these relationships influenced by stand, tree, or log variables?*

Hypothesis: We hypothesize that relationships between average stiffness of product in a log, the HM 200 log stiffness measure, and the ST 300 stiffness measure of the parent tree are all linear and that these relationships are unaffected by tree and stand variables. (2) *What are the effects of cultural treatments and genetics on these stiffness relationships?* **Hypothesis:** Silvicultural treatments (planting spacing, thinning, fertilization, pruning) and genetics do not alter the basic relationships found by Objective # 1. That is, treatment or genetic effects would simply have the same slope and intercept as the baseline relationship between tree and log stiffness values. (3) *How can the natural variability of stiffness among trees within a stand be monitored and incorporated into decision support tools that assist managers in assessing if stands and stand treatments are within desired specifications and in making improved marketing decisions?*



Weyerhaeuser log yard in Foster OR.

Results

Objective 1: To accomplish objective 1, tree-to-product (lumber and veneer) milling studies were conducted IN 2006-2007. Approximately 50 trees from the 5 treatment plots on four Stand Management Cooperative (SMC) Type II installations were measured for acoustic velocity in August/September 2006. In total 19 plots were sampled as one plot was not usable due to storm damage. A stratified random sample of 12 trees per plot was chosen for harvesting (228 trees total); one-half of the trees were designated for conversion to veneer, and the other half for conversion into lumber. The chosen trees were re-measured for acoustic velocity and harvested in November 2006. The veneer conversion study was conducted in December 2006 and the lumber conversion in March/April 2007. Detailed tree and log measurements, including acoustic velocity, were recorded and all full and half-sheet veneer and all 2x4 and 2x6 lumber was tested for stiffness at the US Forest Products Laboratory. Cross-section disks from the ends of each log were taken and measured for moisture content, green and oven-dry density, age, percent heartwood, percent wood 10 years and younger and percent wood 20 years and younger. Strips from these disks were removed for x-ray densitometry by Weyerhaeuser company which should be completed by mid-2008.



Weyerhaeuser veneer mill in Foster OR.

Statistical models are being developed to (1) predict log acoustic velocity from tree acoustic velocity, (2) predict veneer (lumber) stiffness from log acoustic velocity, and (3) investigate effects of log height position, log diameter, knots, and percent juvenile wood as further explanatory variables. These models will be useful for understanding how silviculture decisions, such as rotation age and stocking, affect the acoustic velocity that will be present when trees are harvested. To date models have been developed to (1) predict MOE of lumber from log acoustic velocity which are consistent with results found for other species and (2) predict butt log acoustic velocity from tree acoustic velocity and (3) predict tree acoustic velocity from other tree (e.g. DBH) and growing condition (AGE, stand density, site)

variables. Master student Gonzalo Thienel is performing this latter analysis and is assessing the variability of acoustic velocity within and between trees and the effect of season. These results will be useful for companies that are marketing timber to manufacturers of engineered wood products where stiffness is a critical criterion. The results also provide insight to forest managers as to how they may be able to improve stiffness through silviculture. Together improved marketing and silviculture can increase value and profitability and help ensure sustainability of forestry as opposed to conversion of the land to other. Further work to complete analysis of the lumber trees and to develop counterpart models for the veneer phase of the study is underway and is expected to be completed in 2008.

Objective 2: To accomplish objective 2, we collaborated with the Pacific Northwest Tree Improvement Research Cooperative (PNWTIRC), Oregon State University, to gain an understanding of the potential use of genetics to improve stiffness (acoustic velocity). In 2005, we studied wood stiffness (MOE), wood density, wood moisture content, and growth in a coastal Douglas-fir progeny test (50-130 families per trait; 1-3 sites) and clonal seed orchard (66-82 parental clones per trait). We used thinned trees from the progeny test to conduct a tree-to-log-to-lumber study. We measured MOE directly using lumber bending tests on recovered 2x4's from butt logs, and indirectly using the tools that measure acoustic velocity in logs and standing trees. "Acoustic" MOEs were also obtained from the tree and log velocities and wood density. We examined the genetic relationships (heritabilities, genetic gains, and genetic correlations between traits) of wood stiffness and growth measures. This research has found that seed orchard and progeny tests can be used to measure wood properties and select genotypes with superior wood stiffness. Gains can be made in bending stiffness by selecting on acoustic velocity measures. Acoustic velocity from the log and standing tree tools offer rapid inexpensive assessments of wood quality in breeding programs. However, it was found that the log tool is more efficient than the standing tree tool for improving lumber stiffness. Furthermore, use of wood density separately was found to be inferior to using acoustic velocity and supplementing acoustic velocity with wood density did not provide justifiable improvements. These results are important to tree breeders who are seeking to improve wood properties of intensively managed planted forests. Work is underway to determine the most efficient way to incorporate stiffness measures into operational breeding programs.

Objective 3: Accomplishment of objective 3 includes the analyses and resulting statistical models associated with Objectives 1 and 2. However, Objective 3 goes further in that we wish to use the information from this study to demonstrate how statistical process control methods could be used to assist in marketing timber through improved and more flexible quantitative linkages between a customer's requirements for stiffness in raw material purchases and the distribution of stiffness (acoustic velocity) in the resource. The same technique could also be used by silviculturists in monitoring acoustic velocity as stands develop and respond to treatments. By quantifying stiffness along the chain of custody and understanding the effect of tree, stand, and site, it may be possible to improve and augment growth models and harvest planning models. Rapeepan Kantavichai, a UW PhD student, is investigating this possibility.

Technology Transfer

Publications

1. Briggs, D. G. 2005. **Assessing and Managing Stands to Meet Quality Objectives.** Harrington Constance A., Schoenholz, Stephen H. eds.; "Productivity of Western Forests: A Forest Products Focus" Gen. Tech. Rep. PNW-GTR-642; U. S. Department of Agriculture, Forest Service Pacific Northwest Research Station, Portland OR. pp 141-152.
2. Carter, P. D. Briggs, R.J. Ross, X. Wang 2005. **Acoustic Testing to Enhance Western Forest Values and Meet Customer Wood Quality Needs.** Harrington Constance A., Schoenholz, Stephen H. eds.; "Productivity of Western Forests: A Forest Products Focus" Gen. Tech. Rep. PNW-GTR-642; U. S. Department of Agriculture, Forest Service Pacific Northwest Research Station, Portland OR. pp 121-129.
3. Carter, P. X., Wang, R.J. Ross, D. Briggs. 2005. **NDE of Logs and Standing Trees Using New Acoustical Tools: Technical Applications and Results.** In Proc. 14th International Symposium on the Non-destructive Testing of Wood, May 2-4, 2005, Messe Ligna, Hanover, Germany.

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4. Briggs, D.G., E.C. Turnblom, B.B. Bare. 2005. **Non-destructive Methods and Process Capability Analysis to Assess Conformance of Douglas-fir Stands to Customer Quality Specifications.** New Zealand Journal of Forestry Science 35(2/3):170-188.
 5. Briggs, D.G., L. Mason. 2006. **The Future of Wood Products and How This May Affect Small Woodland Owners.** Northwest Woodlands 22(2): 8-11, 28-29.
 6. Cherry, M.L., Howe, G.T., Briggs, D., Cress, D., Vikram, V. 2007. **Genetic Variation in Wood Quality in a Clonal Douglas-fir Seed Orchard.** PNWETIRC Report 26. Pacific Northwest Tree Improvement Research Cooperative, Oregon State University, Corvallis, OR. 11 pp.
 7. Cherry, M.L., Vikram, V., Briggs, D., Cress, D., Howe, G.T. 2007. **Genetic Variation in Direct and Indirect Measures of Wood Stiffness in Coastal Douglas-fir.** PNWTIRC Report 27. Pacific Northwest Tree Improvement Research Cooperative, Oregon State University, Corvallis, OR. 30pp.
 8. Briggs, D.G., G. Thienel, E. C. Turnblom, E. Lowell, D. Dykstra, R. J. Ross, X. Wang, P. Carter. (In press). **Influence of Thinning on Acoustic Velocity of Douglas-fir Trees in Western Washington and Western Oregon.** In Proc. 15th International Symposium on Nondestructive Testing of Wood, Duluth MN. Sept 10-12, 2007.
 9. Cherry, M.L., Vikram, V., Briggs, D., Cress, D., Howe, G.T. (In review) **Genetic Variation in Direct and Indirect Measures of Wood Stiffness in Coastal Douglas-fir.** Canadian Journal of Forest Research.

Project Title: “Effect of Thinning and Fertilization on Diameter of the Largest BH Region Branch in Douglas-fir Plantations”

Principle Investigators: David Briggs, Rapeepan Kantavichai, Eric Turnblom

Funding: UW Corkery Family Chair \$30,000 (2005), \$30,000 (2006)

Project Description: Nine SMC Type I Installations contain a fertilization/density management experiment where 3 plots at the ISPA, ISPA/2, and ISPA/4 densities have counterparts that received 200 lb/a N at plot establishment and every 4 years thereafter until 1000 lb /a have been applied. The SMC has been collecting data on the diameter of the largest branch in the breast-height region (DLLBH) of the approximately 40 height sample trees on each plot. Thus there are 54 total plots with 2254 trees measured for DLLBH.

Research Objectives: (1) *What are the relationships between the tree and growing condition variables and DLLBH at (1) the plot mean level and (2) the individual tree level?*

Results

Objective 1: To accomplish objective 1, regression models were developed to predict the mean DLLBH of the trees on the 54 treatment plots from other mean tree and growing condition variables. Models were developed from the following perspectives (a) using tree variables only, (b) using growing condition variables only, (c) using a combination of tree and growing condition variables, and (d) using only variables that could be measured with remote sensing (LIDAR) combined with variables that would be known from management records (e.g. stand age). The mean treatment plot models would be useful for linking with stand-level growth and yield models and for estimating and mapping stand-average DLLBH across landscapes. It was found that the best model used a combination of mean tree and growing condition variables to predict mean DLLBH. We also succeeded in finding a model that used only data that would be obtained from LIDAR in combination with information that managers would know from stand history. This phase was completed and an article has been accepted in the Canadian Journal of Forest Research.

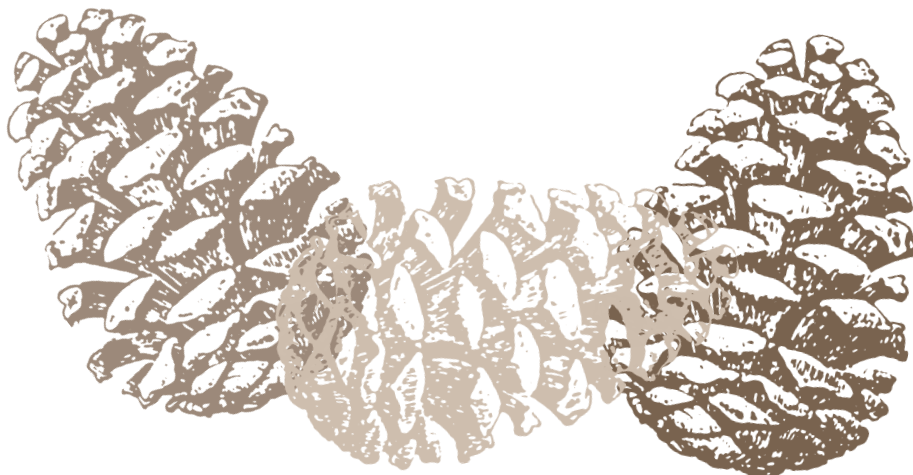
Objective 2: To accomplish objective 2, regression models were developed to predict the DLLBH of individual trees on the 54 treatment plots (n = 2254 trees) from other individual tree and growing condition variables. Models were developed from the same perspectives as for Objective 1: (a) using tree variables only, (b) using growing condition variables only, (c) using a combination of tree and growing condition variables, and (d) using only variables that could be measured with remote sensing (LIDAR) combined with variables that would be known from management records (e.g. stand age). The individual tree models would be useful for linking with individual tree-level growth and yield models and for providing estimates of individual tree DLLHB within stands across landscapes.

The rationale for DLLBH models is based on prior research that established relationships between DLLBH of trees and the largest limb average diameter (LLAD), also known as branch index (BIX) of logs milled from those trees. LLAD is a common log quality variable used to predict product grade mix in product recovery studies. Knowledge of how DLLBH is affected by tree and growing condition variables establishes an important linkage between stand development, silvicultural treatments, log quality and product grade mix.

Technology Transfer

Publications

1. Briggs, D.G., L. Ingaramo, E.C. Turnblom. 2007. **Number and Diameter of Breast-height Region Branches in a Douglas-fir Spacing Trial and Linkage to Log Quality.** Forest Products Journal. 57(9):28-34
2. Briggs, D.G. R. Kantavichai, E.C. Turnblom. In press. **Effect of precommercial thinning followed by a fertilization regime on branch diameter in coastal Douglas-fir plantations.** Can. J. For. Res.
3. Briggs, D.G. R. Kantavichai, E.C. Turnblom. In preparation. **Effect of precommercial thinning followed by a fertilization regime on branch diameter of individual trees in coastal Douglas-fir plantations.**



MODELING PROJECT PROGRESS REPORT

Project Leader: Dave Marshall, Weyerhaeuser Company

The SMC Modeling TAC did not meet officially this year, but members participated in other TAC meetings and graduate committee meetings during the year. Greg Johnson has stepped down after about 8 years of leading the Modeling TAC (thanks Greg) and has handed the reigns to David Marshall.

Young Stand Model

This project was funded by the USFS Pacific Southwest Research Station Agenda 2020 program and by the SMC. The objective was to develop a young stand (0-15 years) model for plantation Douglas-fir using the SMC and RVMM databases. The PI's were Martin Ritchie, David Marshall and Eric Turnblom. Eric Turnblom supervised Masters student Nick Vaughn who developed equations for the model as his Masters Thesis which was completed in summer 2007. Jim Flewelling also contributed to Nick's graduate work. The model was completed and a workshop given at the April 2008 spring meeting.

Vaughn, Nick. 2007. "An individual-tree model to predict the annual growth of young stands of Douglas-fir in the Pacific Northwest" MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 106 pp

The new model will grow a tree list for plantation Douglas-fir to an age where it can be handed off to older stand models like SMC-ORGANON or FVS. The impacts of removal of competing vegetation, thinning and genetic gain can be simulated.

Version 4.00 of the Conifers model, which includes the SMC model, has been released as of 6/26/2008 and can be downloaded from:

http://www.fs.fed.us/psw/programs/ecology_of_western_forests/projects/conifers/

SMC-ORGANON <http://www.cof.orst.edu/cof/fr/research/organon/>



RESEARCH PROJECTS

A. Externally Funded

Project Title	Organic Matter and Management Effects on Forest Productivity
Investigators	Rob Harrison, Professor, University of Washington College of Forest Resources, Tom Terry, Weyerhaeuser Corporation
Granting Agency, Amount, Year	✓ National Council on Air and Stream Improvement (NCASI) \$40,000 for 2005 supplement and extension (1998-2006 total = \$412,000) ✓ Olympic Natural Resources Center 1998 – 1999, \$20,000 ✓ Weyerhaeuser Company 1998 – 2003, \$18,009 ✓ US Forest Service 2000-2001, \$53,698
Project Objectives	Overall support to the University of Washington for work on the Fall River Long-term site productivity project, specifically to determine the impacts of organic matter retention and management (fertilization, vegetation control, and tillage) on the long-term productivity of Douglas-fir stands
Progress	Established test site in 1998 with re-measurements and assessments since. Graduate students supported: Barry Flaming (MS 2001), Christopher Licata (MS 2004), Kyle Peterson (MS 2005), Brian Strahm (PhD 1994-pres), Paul Footen (started 2006).

Project Title	UW College of Forest Resources Gessel Fund & TA sources
Investigators	Rob Harrison, Professor, University of Washington College of Forest Resources
Granting Agency, Amount, Year	College of Forest Resources, U of W \$48,594 in 2006 (1998-2006 total = \$232,125)
Project Objectives	Overall support for work on the Fall River and Matlock Long-term site productivity projects.
Progress	See reports on the Fall River and Matlock projects

Project Title	Forest Management Effects on Nitrogen Retention and Cycling
Investigators	Rob Harrison (UW CFR SMC), Tom Terry (Weyerhaeuser Co.), A.B. Adams (UW CFR SMC), Steve Schoenholtz (OSU), Tim Harrington (USFS Olympia)
Granting Agency, Amount, Year	USFS Agenda 2020 PNW Station through Olympia Lab \$50,000 per year 2005-2007, \$150,000 total
Project Objectives	To determine the impacts of organic matter retention and management (fertilization, vegetation control, and tillage) on the retention and cycling of N at the new Mollala, OR and Matlock WA LTSP sites.
Progress	Another grant established Matlock treatments in 2004; UW instrumented them in 2005 and data collection is ongoing. Molalla was installed in 2005. Graduate students supported: Cindy Flint (MS 2005-pres), Paul Footen (started 2006).

Project Title	Potential Impact of Forest Fertilization on Hood Canal Hypoxia
Investigators	Rob Harrison, and Dave Briggs, Professors, University of Washington College of Forest Resources
Granting Agency, Amount, Year	Green Diamond Resources Co., \$8,000 in 2006
Project Objectives	Conduct a study on forest fertilization leaching on N in the Hood Canal watershed
Progress	Lysimeters installed, data collection in 2006-2007. Cindy Flint thesis http://soilslab.cfr.washington.edu/publications/ThesisCindyFlint.doc ; manuscript in preparation for Journal of Environmental Quality

Project Title	Non-destructive evaluation of wood quality in standing Douglas-fir trees and logs
Investigators	David Briggs (UW CFR SMC), Eini Lowell (USFS PNWRS), Eric Tumbloom (UWCFR SMC), Bruce Lippke (UW CFR RTI), Peter Carter (FibreGen)
Granting Agency, Amount, Year	AGENDA 2020/USFS Rocky Mtn. Res. Station \$87,500 UW College of Forest Resources \$95,000 Industry Cash \$74,941 Industry in-kind \$80,000 USFS PNWRS & USFS FPL in kind \$139,150
Project Objectives	(1) What are the relationships between the average stiffness of lumber or veneer in a log, stiffness of the log, and stiffness of the parent tree and to what extent are these relationships influenced by stand, tree, log, or environmental variables? (2) What are the effects of cultural treatments and genetics on these stiffness relationships? (3) How can the natural variability of stiffness among trees within a stand be monitored and incorporated into decision support tools that assist managers in assessing if stands and stand treatments are within desired specifications and in making improved marketing decisions
Progress	Objective 1: 4 SMC Type II installations provided sample 228 trees; harvesting and veneer milling completed in 2006; sawmilling completed in April 2007; veneer and lumber product testing completed; measurements of cross-section cookies from log ends completed, including samples for x-ray densitometry completed by Weyerhaeuser Co. Analysis of lumber phase of the study underway; 2 conference presentations and one proceedings article. Objective 2: Collaboration in 2005 with PNWTIRC to sample trees from the Hood Canal seed orchard and from 3 progeny trials. All field work completed and analyses underway. Objective 3: Developed and statistical QC method for assessing conformance of trees in a stand to customer specifications. Three publications and two conference presentations PhD student: Rapeepan Kantavichai (2005-pres), MS student Gonzalo Thienel (2006-pres)

Project Title	UW College of Forest Resources Corkery Family Foundation Chair
Investigators	David Briggs, Professor, University of Washington College of Forest Resources
Granting Agency, Amount, Year	College of Forest Resources, U of W \$41,446 (2005); 40,000 (2006); \$74,250 (2007)
Project Objectives	Overall support for students.
Progress	Undergraduate and graduate students for summer field crew

Project Title
Investigators
Granting Agency,
Amount, Year
Project Objectives

Long-term Site Productivity (LTSP) Integrated Database
David Briggs (UW CFR SMC), Rob Harrison (UW CFR SMC)
USFS Pacific Southwest Res. Station. \$100,000, 9/15/04-12/31/07

1. To gather datasets associated with the various LTSP study sites and organize them into an integrated, consistent database. This database will provide access to data and information within and across LTSP sites, thereby fostering improved collaboration, integration and analysis across North America.
2. To develop a plan and process for continued technology support for the continued integration of re-measurements and new data from these sites and others into the database. Procedures will be recommended for database updating and other technical support. Options and estimated budgeting to accomplish this continuing support will be presented.

Progress

An initial meeting to discuss the research plan and establish contacts was held November 2004 at the Soil Science Society of America meeting in Seattle, WA. Presented prototype design to LTSP Administrator Meeting, July, 2005 and revisions in 2006. Data sets from the 28 sites have been received and entered. Expect database delivery in mid-2008

Project Title

Vegetation Composition, Succession and Understory Diversity in Managed Ecosystems

Investigators
Granting Agency,
Amount, Year
Project Objectives

Eric Turnblom, Associate Professor; David Briggs, Professor, Steve West, Professor; David Ford, Professor; University of Washington College of Forest Resources
National Council on Air and Stream Improvement (NCASI)
\$121,592 , 04/01/2006 to 12/31/2008

This study has three main objectives: 1) Developing overstory / understory relationships (models) in young managed Douglas-fir stands at the species level, 2) Calculating measures of diversity and diversity change as affected by management practices, and 3) Forging links with wildlife habitat requirements for the winter wren and creeping vole.

Progress

Summer field crew collected understory vegetation data on selected SMC installations to strengthen the data series.

Project Title

Using climate-related information to improve short-term growth projections

Investigators
Granting Agency,
Amount, Year
Project Objectives

Eric Turnblom, Associate Professor; Andrew Hill, PhD student, University of Washington, College of Forest Resources
USFS Forest Inventory and Analysis (FIA)
\$62,087 | Jan 2003 to 30 Sept 2006

- 1) Evaluate the availability and quality of supplemental weather information for incorporation into basal area growth models.
- 2) Examine various methodologies for employing the most suitable climate / weather-related information into growth and yield models for basal area
- 3) Test methodologies by analytical comparison of methodological outcomes with re-measured FIA forest inventory data.
- 4) Propose technique or algorithm for including best methodology into FIA estimation procedures

Progress

SMC ORGANON modeling framework was chosen over several alternatives to represent the "base" (non-climate) model. Various methodologies to incorporate current weather and climate information into the model as well as more general modeling approaches and frameworks are also being explored. PhD Student Andrew Hill.

B. SMC Funded Projects

Project Title	Young Stand Simulator for Douglas-fir in Western Oregon and Washington
Investigators	Martin Ritchie, USFS Pacific Southwest Research Station; Eric Turnblom UW CFR
Granting Agency, Amount, Year	Stand Management Cooperative \$10,000 match to PSW Agenda 2020 grant totaling \$96,800.
Project Objectives	Use data from SMC Type III installations, VMRC and NTC experiments to fit component equations used by CONIFERS and develop a version of the simulator for western Oregon and Washington
Progress	Masters student Nick Vaughn began in fall 2005. Data sets acquired and organized for modeling, modeling underway, completion expected in 2007. Release in 2008.

C. SMC Staff & Student Projects:

Project Title	Form changes of coastal Douglas-fir in response to pruning.
Investigators	Randy Collier, Eric Turnblom
Granting Agency, Amount, Year	SMC
Project Objectives	This study will produce a report detailing how pruning affects the form of the first log in a tree that has been pruned. The SMC Type I pruning study provides ample data from plots of differing density and site where trees have been pruned to various intensities
Progress	ANOVA has revealed differences in form and log scale between plots that have been pruned differently. In general, pruning improves form and magnifies log scale. A manuscript for a journal article is being revised.

Project Title	Growth response to Pruning immature, coastal Douglas-fir.
Investigators	Andrew Hill, PhD student, Eric Turnblom
Granting Agency, Amount, Year	SMC
Project Objectives	To determine how green crown removal intensity, stand density and site quality impact individual tree growth in terms of diameter, basal area and total height and how total stand growth is impacted as well.
Progress	A manuscript for a journal article is being revised.

Project Title	Carry-over Effects
Investigators	Rob Harrison
Granting Agency	SMC
Project Objectives	The objective of this is to assess the effects of fertilization of a stand on the subsequent stand after harvest
Progress	Seven RFNRP installations were selected, harvested, and replanted in 1997-1999. Competing vegetation, seedling growth are being monitored. Gage Wagoner (MS 2001); Paul Footen is updating this work, starting in 2006 as a graduate student.

Project Title	Nitrogen Mobilization as a Function of Organic Matter Retention in a High Productivity Managed Douglas-fir Stand.
Investigators	Brian Strahm UW PhD Student, Rob Harrison, Tom Terry
Granting Agency	SMC, Weyerhaeuser Company, NCASI, and USFS
Project Objectives	To determine the impacts of organic matter retention as a function of harvest intensity on N mobilization and leaching in a high productivity Douglas-fir stand.
Progress	Monitoring of soil solution chemistry at 1m depth for various forms of N, and calculation of N leaching rates continued through a second year following replanting. Complimentary 20cm lysimeters installed for future analysis of contrasting N pools with depth.

Project Title	Effect of Thinning and Fertilization on Diameter of the Largest BH Branch
Investigators	Rapeepan Kantavichai, David Briggs, Eric Turnblom
Granting Agency, Amount, Year	SMC 2006-2007
Project Objectives	To determine and model the effects of thinning and fertilization on diameter of the largest branch in the BH region (DLLBH) in Type I Douglas-fir installations.
Progress	Models for the mean DLLBH of treatment plots developed based on stand variables, mean tree variables, and combination of both. Paper accepted in Canadian Journal of Forest Research. Models for individual tree DLLBH have been completed, a manuscript is in preparation. One international conference presentation.

TECHNOLOGY TRANSFER

A. MEETINGS, WORKSHOPS & FIELD TOURS, AND CONFERENCES

I. Meetings

- Strategic Planning Committee Meeting (February 27, Seattle, WA)
- SMC Spring Meeting (April 25-26, Vancouver, WA)
- SMC Fall Meeting (September 16-17, Corvallis, OR)
- Nutrition/Silviculture TAC Meeting (September 16, Vancouver, WA)
- Wood Quality TAC Meeting (November 28, Vancouver, WA)

2. Workshops & Field Tours

- Database tutorial, Rayonier Forest Resources, July 5.
- Washington Society of Professional Soil Scientists. 2006 field tour.

3. Conferences, Presentations and Posters

Presentations

1. Briggs, D., R. Kantavichai, E. Turnblom 2007. Predicting Branch Diameter of Thinned and Fertilized Coastal Douglas-fir Plantations at the Mean and Individual Tree Levels. IUFRO & USFS Intl. Scientific Conf. "Forest Growth and Timber Quality: Crown Models and Simulation Methods for Sustainable Forest Management" Portland, OR. Aug. 7-10.
2. Briggs, D., G. Thienel, E. Turnblom, E. Lowell, D. Dykstra, R. Ross, X. Wang, P. Carter. 2007 Influence of thinning on acoustic velocity of Douglas-fir trees in Western Oregon and Washington. 15th International Symposium on Nondestructive Testing of Wood. Duluth MN. Sept 10-12.
3. Briggs, D.G, R. Kantavichai, G. Thienel, E. C. Turnblom, E. Lowell, D. Dykstra, R. J. Ross, X. Wang, P. Carter. Non-destructive evaluation of wood quality in Douglas-fir trees and logs – a pathway toward sustainable forests. 2007 IUFRO All Division 5 Conference, Taipei, Taiwan. Oct 29-Nov 7, 2007.
4. Cherry, M., G. Howe, D. Briggs, D. Cress, V. Vikram. Genetic variation in Douglas-fir wood quality. Annual Meeting Pacific Northwest Tree Improvement Research Cooperative. Vancouver, WA. July 3.
5. Footen, P.W. The Long-term Effects of Nitrogen Fertilization on Understory Vegetation in Pacific Northwest Douglas-fir Plantations. Green Diamond Resource Co., Shelton, WA. March 2007

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6. Vikram, V., M. Cherry, G. Howe, D. Briggs, D. Cress. Stiffness of Douglas-fir lumber: effects of wood properties and genetics. Annual Meeting Pacific Northwest Tree Improvement Research Cooperative. Vancouver, WA. July 3.

Posters

1. Flint, C.M., R.B. Harrison, A.B. Adams, R. Greggs, B.D. Strahm. Effect of urea fertilization on nitrogen leaching fluxes in Douglas-fir plantations. Presented at Soil Science Society of America, Northwest Forest Soils Council Quarterly Meeting, Washington Society of Professional Soil Scientists Bi-annual Meeting, The Water Center Annual Review.
2. Footen, P.W. The Long-term Effects of Nitrogen Fertilization on Understory Vegetation in Pacific Northwest Douglas-fir Plantations. 2007 University of Washington Undergraduate Research Symposium.
3. Footen, P.W. The Long-term Effects of Nitrogen Fertilization on Understory Vegetation in Pacific Northwest Douglas-fir Plantations. 2007 Society of American Foresters National meeting Portland, Oregon
4. Footen, P.W. The Long-term Effects of Nitrogen Fertilization on Understory Vegetation in Pacific Northwest Douglas-fir Plantations. 2007 Soil Science Society of America National Convention New Orleans, Louisiana.
5. Strahm, B.D., R.B. Harrison, T.A. Terry and P.W. Footen. Soluble N Flux as a Function of Organic Matter Retention in an Intensively Managed Stand of the Pacific Northwest. Northwest Forest Soils Council, Jan 23, 2007, Vancouver, WA.
6. Vikram, V., Howe, G.T., Cherry, M.L., Cress, D., and Briggs, D. 2007. Stiffness of Douglas-fir lumber: Effects of wood properties and genetics. In: Annual Meeting of the Stand Management Cooperative, April 25, 2007, Vancouver, WA.
7. Marilyn Cherry, Glenn Howe, Dave Briggs, Dave Neale, Brad St. Clair, and Dan Cress. 2007. Genetics of Douglas-fir Wood Stiffness (MOE) and Strength (MOR) PNWTIRC/ SMC/UC Davis/USFS-PSWRS and -PNWRS Joint project. PNWTIRC Annual Meeting July 2007.

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B. PUBLICATIONS and REPORTS 2004-2007

Listed are all fact sheets, reports, proceedings, and journal articles produced over the last 4 years associated with SMC projects and resources (data, plots, wood samples, etc.). Many can be copied from the SMC website; for others contact the authors.

2004

1. Amoroso, M. 2004. **Are Mixed Species Stands More Productive than Single Species Stands? Douglas-fir and Western Hemlock Plantations in the Pacific Northwest.** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 82 pp.
2. Amoroso, M., E.C. Turnblom, D.G. Briggs 2004. **Growth & Yield of Douglas-fir and Western Hemlock in Pure and Mixed Planted Stands: Results at age 12 from the SMC Type III Trials.** Working Paper # 3, Stand Management Cooperative, College of Forest Resources, University of Washington, Seattle, WA. 45 pp.
3. Licata, C. 2004. **Nitrogen Mineralization in a Coastal Washington Douglas-fir Plantation Under Two Levels of Logging Slash and Coarse Woody Debris Retention.** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 80 pp.
4. Prietzel, J, Wagoner G.L., Harrison R.B. 2004. **Long-term Effects of Repeated Urea Fertilization in Douglas-fir Stands on Forest Floor Nitrogen Pools and Nitrogen Mineralization.** Forest Ecology & Management 193:413-426 pp.
5. Senger, M. 2004. **The Effect of Tree Density on Understory Vegetation: 14-Year Results from Douglas-fir Plantations.** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 63 pp.
6. Sonne, E., E. Turnblom, D. Briggs, G. Becker 2004. **Log and Lumber Quality and Value from a Low Site, 55 Year Old Douglas-fir Stand in Western Washington 20 Years after Thinning and Biosolids Fertilization.** Western Journal of Applied Forestry 19(1):1-8 pp.

2005

1. Adams, A.B., R.B. Harrison, R.S. Sletten, B.D. Strahm, E.C. Turnblom, and C.M. Jensen. 2005. **Nitrogen-fertilization impacts on Carbon Sequestration and Flux in Managed Coastal Douglas-fir Stands of the Pacific Northwest.** For. Ecol. Manage. 220: 313-325 pp.
2. Briggs, D. 2005. **The Stand Management Cooperative: A Source of Information for Cost-effective Reforestation.** Western Forester 50(3):1-3 pp.
3. Briggs, D. G. 2005. **Assessing and Managing Stands to Meet Quality Objectives.** In "Productivity of Western Forests: A Forest Products Focus" Gen. Tech. Rep. PNW-GTR-642; U.S. Department of Agriculture, Forest Service Pacific Northwest Research Station, Portland OR. 141-152 pp.
4. Briggs, D.G., E.C. Turnblom, B.B. Bare. 2005. **Non-destructive Methods and Process Capability Analysis to Assess Conformance of Douglas-fir Stands to Customer Quality Specifications.** New Zealand Journal of Forestry Science 35/(2/3):170-188 pp.
5. Carter, P. D. Briggs, R.J. Ross, X. Wang 2005. **Acoustic Testing to Enhance Western Forest Values and Meet Customer Wood Quality Needs.** In "Productivity of Western Forests: A Forest Products Focus" Gen. Tech. Rep. PNW-GTR-642; U.S. Department of Agriculture, Forest Service Pacific Northwest Research Station, Portland OR. 121-129 pp.
6. Carter, P. X., Wang, R.J. Ross, D. Briggs. 2005. **NDE of Logs and Standing Trees Using New Acoustical Tools: Technical Applications and Results.** In Proc. 14th International Symposium on the Nondestructive Testing of Wood, May 2-4, 2005, Messe Ligna, Hanover, Germany.

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7. Li, Yuzhen 2005. **Effects of Fertilization and Density on Growth and Yield of Young Douglas-fir Plantations in the Pacific Northwest.** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 73 pp.
 8. Li, Y., E. C. Turnblom, D. G. Briggs. 2005 **Effects of Fertilization and Density Control on Growth and Yield of Young Douglas-fir Plantations: Results from SMC Type I Installations.** Working Paper # 4, Stand Management Cooperative, College of Forest Resources, University of Washington, Seattle, WA. 45 pp.
 9. Marshall, D. D. and E. C. Turnblom. 2005. **Wood Productivity of Pacific Northwest Douglas-fir: Estimates from Growth-and-Yield Models.** J. For. 103(2): 71-72 pp.
 10. Peterson, Kyle. 2005. **The Effects of Competing Vegetation Control on the Growth of Douglas-fir at a High Quality Site in Coastal Washington.** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 156 pp.
 11. Strahm, B. D., R. B. Harrison, B.L. Flaming, T.A. Terry, C.W. Licata, and K.S. Petersen. 2005. **Soil Solution Nitrogen Concentrations and Leaching Rates as Influenced by Organic Matter Retention on a Highly Productive Douglas-fir Site.** For. Ecol. Manage. 218: 74-88 pp.
 12. Strahm, B.D., R.B. Harrison, B.L. Flaming, T.A. Terry, C.W. Licata, and K.S. Petersen. 2005. **Factors Affecting Nitrogen Mobility: Organic Matter Retention and Variable-charge Soils.** p. 165. In Proc. of Productivity of Western Forests: A Forest Products Focus. Gen. Tech. Rep. PNW-GTR-642. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
 13. Sucre, E. 2005. **Estimating Response of Douglas-fir to Urea in Western Oregon and Washington.** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 82 pp.
 14. Turnblom, E. C. Y. Li, D. Briggs 2005. **Fertilization and Commercial Thinning Effects on Growth and Yield of Douglas-fir Plantations.** Western Forester 50(3):4-6 pp.
 15. Turnblom, E.C. 2005. **Planting Density: A Consideration in Cost-effective Reforestation.** Western Forester 50(3): 12-13 pp.

2006

1. Amoroso, M.M. and E.C. Turnblom. 2006. **Comparing productivity of pure and mixed Douglas-fir and western hemlock plantations in the Pacific Northwest.** Can. J. For. Res. 36(6):1484-1496 pp.
 2. Amoroso, M.M. and E.C. Turnblom. 2006. **On the effects of tree crop rotation: Red alder following alder or Douglas-fir; Douglas-fir following fir or alder.** In: *Proceedings*. "Red alder: A state of knowledge." International symposium on red alder held at University of Washington Center for Urban Horticulture in Seattle, WA. 23 – 25 March 2005. USDA Forest Service, Pacific Northwest Res. Station, Gen. Tech. Rep. PNW-GTR-669 115-121 pp.
 3. Hann, D.W., D.D. Marshall, and M.L. Hanus. 2006. **Reanalysis of the SMC-ORGANON equations for diameter-growth rate, height-growth rate, and mortality rate of Douglas-fir.** Oregon State University, Forest Research Laboratory, Corvallis, Oregon. Research Contribution 49. 24 pp. A copy can be obtained by emailing a request to ForestryCommunications@oregonstate.edu
 4. Strahm, B.D. 2006. **Abiotic Retention Mechanisms of Organic and Macronutrient Anions in Variable-Charge Soils.** Ph.D. diss. Univ. of Washington, Seattle. <http://soilslab.cfr.washington.edu/publications/>
 5. Strahm, B.D., and R.B. Harrison. 2006. **Nitrate Sorption in a Variable-Charge Forest Soil of the Pacific Northwest.** Soil Science. 17:1:313-321 pp.
 6. Vance, E.D., T.A. Terry, R.B. Harrison, C.A. Harrington, B.D. Strahm, and A. Ares. 2006. **The Fall River Long-term Soil Productivity Study: Linking Processes to Operations in Pacific Northwest Douglas-fir.** Western Forester. 51:12-15 pp.
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7. Weiskettel, A., D. Maguire, R.A. Monserud, R. Rose, E. Turnblom. **Influence of intensive management on Douglas-fir stem form, branch characteristics, and simulated product recovery.** *N. Z. J. For. Sci.* 36(21): 170-188.

2007

1. Ares, A., T.A. Terry, K.B., Piatek, R.B., Harrison, C.A., Harrington, R. Meade, R. Leon, R.E. Miller, B.L., Flaming, C.W. Licata, K. Petersen, B.D. Strahm, H.W., Anderson, L.C. Brodie, and J.M. Kraft. 2007. **Pre- and post-harvest stores of carbon and nitrogen in a highly-productive forest site subjected to increasing biomass removals in coastal Washington.** Weyerhaeuser Company Technical Note. 15 pp.
 2. Ares, A., T.A. Terry, K.B. Piatek, R.B. Harrison, R.E. Miller, B.L. Flaming, C.W. Licata, B.D. Strahm, C.A. Harrington, R. Meade, H.W. Anderson, L.C. Brodie, J.M. Kraft. 2007. **The Fall River long-term site productivity study in coastal Washington: site characteristics, methods, and biomass and carbon and nitrogen stores before and after harvest.** General Technical Report PNW-GTR-691. USDA Forest Service Pacific Northwest Research Station, Portland, OR. 85 pp.
 3. Briggs, D.G. 2007. **Management Practices on Pacific Northwest West-side Industrial Forest Lands: 1991-2005 with Projections to 2010.** Working Paper # 6, Stand Management Cooperative, College of Forest Resources, University of Washington, Seattle, WA. 72 pp.
 4. Briggs, D.G., L. Ingaramo, E.C. Turnblom. **Number and Diameter of Breast-height Region Branches in a Douglas-fir Spacing Trial and Linkage to Log Quality.** *Forest Products Journal.* 57(9):28-34 pp.
 5. Cherry, M.L., Howe, G.T., Briggs, D. G., Cress, D., Vikram, V. 2007. **Genetic Variation in Wood Quality in a Clonal Douglas-fir Seed Orchard.** PNWTIRC Report 26. Pacific Northwest Tree Improvement Research Cooperative, Oregon State University, Corvallis, OR. 11 pp.
 6. Cherry, M.L., Vikram, V., Briggs, D., G. Cress, D., Howe, G.T. 2007. **Genetic Variation in Direct and Indirect Measures of Wood Stiffness in Coastal Douglas-fir.** PNWTIRC Report 27. Pacific Northwest Tree Improvement Research Cooperative, Oregon State University, Corvallis, OR. 30 pp.
 7. Flint, Cindy 2007. **“Leaching of nitrogen from the rooting zone of Douglas-fir forests following urea fertilization and potential impacts on water quality of the Hood Canal.”** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 68 pp. <http://soilslab.cfr.washington.edu/publications/>
 8. Footen, P.W. and R.B. Harrison. **King County METRO Biosolids 5 year Report for 2007.**
 9. Footen, P.W., R. Harrison, B. Strahm. 2007. **Stand growth response of Douglas-fir to biosolids applications. Report to King County DNR.** College of Forest Resources, University of Washington, Seattle, WA. 61 pp.
 10. Hann, D.W, D.D. Marshall, M.L. Hanus 2006. **Reanalysis of the SMC-ORGANON equations for diameter growth rate, height growth rate, and mortality rate of Douglas-fir. Research.** Contribution 49. Forest Research Laboratory. Oregon State University, Corvallis, OR. 24 pp.
 11. Hann, D.W, D.D. Marshall, M.L. Hanus 2007. **Reanalysis of the Western hemlock diameter-growth-rate equation in SMC-ORGANON.** SMC Working Paper 5. Stand Management Cooperative, College of Forest Resources, University of Washington, Seattle, WA 23 pp.
 12. Li, Y., E.C. Turnblom, D.G. Briggs. 2007. **Effects of Density Control and Fertilization on Growth and Yield of Young Douglas-fir Plantations in the Pacific Northwest.** *Can. J. For. Res.* 37:449-461 pp.
 13. Pittman, S. D., B. B. Bare, D. G. Briggs. 2007. **Hierarchical Production Planning in Forestry Using Price-Directed Decomposition.** *Can. J. For. Res.* 37:2010-2021 pp.
 14. Remington, S.M., B.D. Strahm, V. Neu, J.E. Richey, and H. Brandão da Cunha. 2007. **The Role of Sorption in Control of Riverine Dissolved Organic Carbon Concentrations by Riparian Zone Soils in the Amazon Basin.** *Soil Sci.* 172:279-291 pp.
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15. Strahm, B.D., and R.B. Harrison. 2007. **Mineral and organic matter controls on the sorption of macronutrient anions in variable-charge soils.** Soil Science Society of America Journal. 71(6): 1926-1933 pp.
 16. Turnblom, E.C., Andrew Hill, 2007. **Using climate related information to improve short term growth projections.** Final report to USDA Forest Service PNW Research Station JV agreement PNW-02-JV-11261979-145. College of Forest Resources, University of Washington, Seattle, WA. 64 pp.
 17. Vaughn, Nick. 2007. **“An individual-tree model to predict the annual growth of young stands of Douglas-fir in the Pacific Northwest”** MS Thesis. College of Forest Resources, University of Washington, Seattle, WA. 106 pp.

Accepted

1. Briggs, D.G. R. Kantavichai, E.C. Turnblom. Effect of pre-commercial thinning followed by a fertilization regime on branch diameter in coastal Douglas-fir plantations. Can. J. For. Res
2. Briggs, D.G, G. Thienel, E. C. Turnblom, E. Lowell, D. Dykstra, R. J. Ross, X. Wang, P. Carter. In press. Influence of Thinning on Acoustic Velocity of Douglas-fir Trees in Western Washington and Western Oregon. In Proc. 15th International Symposium on Nondestructive Testing of Wood, Duluth MN. Sept 10-12, 2007.
3. Sucre, E.B., R.B. Harrison, E.C. Turnblom, D.G. Briggs. The use of soil and site variables to predict growth response of Douglas-fir to urea for various density management regimes. Can. J. For. Res.

In-review

1. Flint, C.M., R.B. Harrison, B.D. Strahm, A.B. Adams. **Nitrogen leaching from Douglas-fir forests following urea fertilization and impacts on water quality.** (Journal of Environmental Quality).
2. Hill, A., E.C. Turnblom. **Improving modeled predictions of short-term Douglas-fir growth in eastern Washington, USA by incorporating local weather information.** (Forest Science).
3. Hill, A., E.C. Turnblom. **Using local short-term weather and long-term climate information to improve periodic diameter growth prediction for Douglas-fir growing in pure and mixed stands in eastern Washington USA.** (Canadian Journal of Forest Research).

SOFTWARE

1. Sidell, A., R.B. Harrison. 2000. **Productivity Management “Toolbox”**
<http://depts.washington.edu/nitrogen/>.
 2. Gehringer, K., E.C. Turnblom. 2001. **Tree List Generator Software & Manual:**
<http://depts.washington.edu/silvproj/tlghome> [download requires password available from Silviculture Project Leader Eric C. Turnblom].
 3. Pittman, S., E.C. Turnblom. 2001. **Treelab Software & Manual:**
http://www.cfr.washington.edu/research.smc/treelab/Website/TreeLab_home.htm.
 4. Haukaas, J. 2006. **Young Tree List Generation Database System**, available in CD, beta test version, contact John Haukaas for a copy at 206-543-5355.
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5. **SMC ORGANON and associated DLL's** are available on the ORGANON web site:
<http://www.cof.orst.edu/cof/fr/research/organon/>.
 6. **Conifers Version 4.00** is available from the USFS web site:
http://www.fs.fed.us/psw/programs/ecology_of_western_forests/projects/conifers/
 7. Haukaas, J. 2008. **Tree List Generator: Graphical User Interface.** <http://depts.washington.edu/silvproj/tlghome/>.

CD
(Contact the SMC for copies 206-543-5355)

- 2004 RFNRP Publications
- Alder Symposium “Red Alder: A state of knowledge” streaming video
- SMC 20th Anniversary streaming video

BY-LAWS OF THE STAND MANAGEMENT COOPERATIVE

First Adopted: April 22, 2003

Most recent amendment: Sept. 23, 2004

ARTICLE I: Name

The name of this organization shall be the Stand Management Cooperative (SMC).

ARTICLE II: Mission

The Mission of the SMC is “To provide a continuing source of high-quality data and information on the long-term effects of silvicultural treatments and treatment regimes on stand and tree growth and development and on wood and product quality.”

ARTICLE III: Scope and Limitations

The territorial coverage of the programs and activities of the SMC consists of forested lands west of the Cascades in Oregon and Washington, northern California, and coastal British Columbia.

ARTICLE IV: Location and Contact

1. The SMC headquarters are located in the College of Forest Resources, University of Washington, Seattle, WA.
2. Contact with the SMC headquarters can be made via
 - a. Web site <http://www.standmgt.org>
 - b. Telephone 206-543-9744 or 206-543-1581
 - c. FAX 206-685-3091
 - d. Email Director: David Briggs dbriggs@u.washington.edu
Staff: Megan O'Shea moshea@u.washington.edu

ARTICLE V: Membership Categories

1. Land Managing Organizations
 - a. Public agencies and private companies that manage forest land provide funds to support the mission and provide land and operational support for field research sites.
 - b. A Memorandum of Agreement governs the relationship between the Land Managing Organization members and the SMC. Each member agrees to terms presented in the renewable annual Memorandum of Agreement. An example is presented in ANNEX A.
 - c. Organizations wishing to join the SMC as a Land Managing Organization member do so through a written request to the Director. The application is presented to the Policy Committee at its next meeting for approval.
2. Analytic Organizations
 - a. Organizations that utilize information gathered through SMC research and stored in its database for the purpose of producing and marketing information, products and service.

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- b. A Memorandum of Agreement governs the relationship between the Analytic Organization members and the SMC. Each member agrees to terms presented in the renewable annual Memorandum of Agreement. An example is presented in ANNEX B.
 - c. Organizations wishing to join the SMC as an Analytic Organization member do so through a written request to the Director. The application is presented to the Policy Committee at its next meeting for approval.
 3. Institutional Organizations
 - a. Universities, research laboratories, and trade associations are Institutional members that provide scientist time, laboratory and office space and other services to the SMC. Also research grants from external sources leveraging SMC investments in field sites may be received by these institutions or provided by them.
 - b. Organizations wishing to join the SMC as an Institutional member do so through a written request to the Director. The application is presented to the Policy Committee at its next meeting for approval.
 4. Supplier Organizations
 - a. Organizations that provide materials and supplies to the SMC or its members may become a Supplier member.
 - b. Organizations wishing to join the SMC as a Supplier member do so through a written request to the Director. The application is presented to the Policy Committee at its next meeting for approval.

ARTICLE VI: Fees & Continuing Membership

Dues and fees are established by the Policy Committee.

1. Land Managing Organizations
Annual dues are calculated by a funding formula established by the Policy Committee. Membership is retained through payment of assessed dues.
2. Analytic, Institutional, and Supplier Organizations
Annual dues are not assessed. Continuing membership is maintained through an annual vote by the Policy Committee based on active participation and contribution to the SMC mission.

ARTICLE VII: Voting and Representation

1. Organizations under ARTICLE V, paragraphs 1, 2 and 3, are voting members of the SMC Policy Committee.
2. Each such voting organization designates one individual as its representative on the Policy Committee and has a single vote.

ARTICLE VIII: Receipt of SMC Database, Research Tools and Services

1. Each Land Managing Organization member receives
 - a. an annual updated version of the complete SMC database.
 - b. copies of the SMC Annual Report and Quarterly Newsletter.
 - c. one free printed copy of research papers and technical reports with a discount for additional printed copies (electronic copies are free from the SMC website).
 - d. unlimited access to SMC staff for questions and technical support “as available” in consideration of their institutional obligations.
 2. Each Analytical Organization member receives
 - a. An annual updated version of the complete SMC database.
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- b. copies of the SMC Annual Report and Quarterly Newsletter.
 - c. one free printed copy of research papers and technical reports with a discount for additional printed copies (electronic copies are free from the SMC website).
 - d. unlimited access to SMC staff for questions and technical support “as available” in consideration of their institutional obligations.
3. Each Institutional and Supplier Organization member receives
 - a. copies of the SMC Annual Report and Quarterly Newsletter.
 - b. one free printed copy of research papers and technical reports with a discount for additional printed copies (electronic copies are free from the SMC website).
 4. All recipients of any portion of the SMC database must comply with the SMC Database Policy (ANNEX C).

ARTICLE IX: Management

1. The management policies and operations of the SMC shall be vested in a Policy Committee as defined in Article VII.
2. A Director, appointed by the Dean of the College of Forest Resources, University of Washington, and approved by the Policy Committee, will be responsible for operational management of the SMC. A review of the Director’s performance may be initiated by the Dean every 5 years per University of Washington policy or at any time per request from the Chair of the Policy Committee. Enaction of a review and appointment of the review committee membership are at the discretion of the Dean.

ARTICLE X: Election

1. The term of the Chair of the Policy Committee is 2 years. At the end of the term, which is a Fall Meeting, the current Vice-Chair will become Chair effective 30 days after the date of that meeting.
2. At this same Fall Policy Committee meeting, a new Vice-Chair is elected and will serve 2 years as Vice-Chair followed by 2 years as Chair.
3. All elections and resolutions, unless specifically provided for, shall require a majority vote of the members in attendance.
4. Fifty percent of the members shall constitute a quorum at any annual or special meeting of the SMC for the transaction of business. Proxy votes submitted to the Director or Chair of the Policy Committee shall be included in achieving a quorum.

ARTICLE XI: Powers and Duties of the Policy Committee

1. The Policy Committee defines the dues structure of the SMC and approves annual budgets prepared by the Director.
2. The Policy Committee approves all research activities utilizing funds obtained through the dues assessments.
3. The Policy Committee elects a Chair and Vice-Chair.
4. The Policy Committee consults with the Dean of the College of Forest Resources in appointing the Director and any subsequent reviews and consults with the Dean and Director in appointing Technical Advisory Committee leaders and hiring staff.

ARTICLE XII: Meetings

1. Policy Committee. The SMC shall have two meetings of the Policy Committee each year; one in April (Spring Meeting) and one in September (Fall Meeting) at a specific date and location determined by the Policy Committee. Special meetings may be called at the discretion of the Policy Committee. Notices of meetings shall be sent to all members at least 2 weeks prior to the meeting. Such notice will be sent to the last known address of the member as it appears in the membership database.

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2. Technical Advisory Committees. TAC's shall meet on dates and places as determined by the appropriate TAC Project Leader. Notices of meetings shall be sent to all members at least 2 weeks prior to the meeting. Such notice will be sent to the last known address of the member as it appears in the membership database.

ARTICLE XIII: Technical Advisory Committees

Each Technical Advisory Committee (TAC) is headed by a Project Leader approved by the Policy Committee. TAC's provide technical review and advice to the Policy Committee on field activities and research projects being conducted by SMC staff or affiliated scientists. The need for, definition of, and effectiveness of TAC's will be reviewed by the Policy Committee every 2 years.

ARTICLE XIV: Duties of Officers

1. The duties of the Chair of the Policy Committee shall be to preside at the regular and special meetings of the SMC.
2. The Vice-Chair shall perform the duties of the Chair in the absence of the Chair and such other duties as may be delegated by the Policy Committee.
3. The Director shall be responsible for all operations of the SMC, supervision of employees and students. He/she reports to both the Chair of the Policy Committee and to the Dean, College of Forest Resources, University of Washington.

ARTICLE XV: Property

The real property of the SMC shall be in the custody and at the disposal of the Dean of the College of Forest Resources, University of Washington for reallocation to other uses at the College. Each member of the SMC own the data collected from its land holdings. The University of Washington acts as an agent for SMC member data for the purposes of collecting and storing said data. The University of Washington shall be the sole licensor for SMC databases, research tools and other SMC services.

ARTICLE XVI: Conduct of Meetings

The meetings shall be conducted under the rules of procedure contained in M.A. DeVries (1998) *The New Robert's Rules of Order, 2nd Ed.* Signet, NY. When a conflict of interest arises, the member will be recused from voting.

ARTICLE XVII: Vacancies

1. Any vacancy in the Office of Chair of the Policy Committee shall be filled immediately by the Vice-Chair.
2. Any vacancy in the Office of Vice-Chair shall be filled by nominations and vote at the next regular Policy Committee meeting.

ARTICLE XVIII: Amendments

The By-laws of the SMC may be amended by a two-thirds vote of the full membership at any regular or special meeting provided notice of such amendment shall have been sent to all members by the Director at least two weeks prior to such meeting.

ANNEX A

MEMORANDUM OF AGREEMENT BETWEEN LAND MANAGING ORGANIZATION
COOPERATORS AND THE UNIVERSITY OF WASHINGTON IN THE STAND MANAGEMENT COOPERATIVE
(copy available upon request)

ANNEX B

MEMORANDUM OF AGREEMENT BETWEEN ANALYTIC ORGANIZATION COOPERATORS AND THE UNIVERSITY OF WASHINGTON IN THE STAND MANAGEMENT COOPERATIVE (copy available upon request)

ANNEX C

STAND MANAGEMENT COOPERATIVE DATA & PUBLICATION POLICY

I. Data & Database

A. Definition

Data are defined as any measurements of stands, trees, or products (a) developed by the SMC research program or (b) shared with the SMC and another organization and for which the SMC has direct responsibility. The Database is defined as all data resulting from efforts of the integrated program, the Regional Forest Nutrition Research Project (RFNRP), and the Stand Management Cooperative; for policy matters no distinction will be made among these three sources of data.

B. Data & Database Rules

1. All organizations, member or non-member, have access to data from installations on their own land at any time.
2. Upon request, each SMC member receives a CD copy of the annually updated database. Updates are generally available at mid-year. Costs of special requests to SMC staff for retrieving, analyzing, reporting, and/or transmitting data will be borne by the Cooperator requesting the data.
3. SMC members have access to all data collected from SMC-supported studies under the condition that the data will not be released to non-member organizations with the exception that a member may temporarily share data with confidentially bound assigns for the sole purpose of having analyses performed for the benefit of the SMC member with the assign allowed to make no further use of the data or analyses.
4. It is recognized that certain individuals and organizations who are not SMC members may desire access to the SMC database for research or other purposes without joining. Requests for data in these situations will be treated on a case-by-case basis. The individual or organization will submit to the SMC Director a written proposal request outlining the analysis planned, plans for use and/or publication of results, and the specific data requested. The proposer must agree to (a) share results of their analyses with the SMC and (b) to provide a review draft of any related publication. The Director will present the request to the Policy Committee for approval. Upon approval, a formal agreement, including a Licensing Agreement and appropriate fees, will be negotiated by the SMC and the proposing entity through the University of Washington Office of Software and Copyright Ventures.
5. Data shared with the SMC by other organizations will not be available to any other member or non-member organization without the express permission of the sharing organization. Data shared with the SMC are to be used for accomplishment of SMC goals, and only results and summaries from analyses are to be published. Shared data will be considered as proprietary information and the designated analyst(s) will take every precaution to ensure confidentiality.

II. Publications, Software, Models and Other Works

1. SMC members are encouraged to share results from their analyses involving use of SMC data. Any publications or products resulting from the use of SMC data must credit that fact.
2. Analyses and software derived in whole or in part on SMC data may not be shared with non-SMC members except when placed in the public domain.
3. Results of analyses, software, or models based on the SMC database produced by UW faculty, staff, students, and designated analysts appearing in peer-reviewed journals, theses, symposium proceedings, and other media are owned by the University of Washington and administered by the Cooperative Director. SMC members will receive copies of these works. These works may be copyrighted by the UW, the authors, or the publishing entity.
4. Non-UW members may also develop and publish analyses, software, or models based on the SMC database. Copyright, if any, established on any such works remains under the ownership and control of their respective authors (or assignees).
5. SMC members and non-members wishing to use or distribute copyrighted materials must obtain appropriate permissions from the copyright owner(s).
6. The SMC data used in the development of any copyrighted or un-copyrighted works remains the property of the University of Washington and subject to the distribution rules in Section I.

Changes and exceptions to this Policy must be approved by the Policy Committee.

MINUTES OF MEETINGS

Stand Management Cooperative

Spring Meeting, April 25-26, 2007
Gifford Pinchot NF Headquarters, Vancouver, WA

BUSINESS MEETING: April 26

The meeting began at 9:30 on April 26 with 60 attendees from 20 organizations listed in Appendix A. The agenda is presented in Appendix B. Policy Committee Chair Gene McCaul opened the meeting and stressed the importance of the strategic plan document that would be discussed during the meeting in charting the future directions of the SMC.

Accomplishments: Dave Briggs reviewed a handout summarizing accomplishments thus far in 2007. Cumulative funding of the SMC since founding in 1985 has reached \$17.1 million. Regular field work is nearly finished and includes first measurements of the 2005 GGTIV installations and work on the non-destructive testing study. External funds thus far include \$40,000 from NCASI for continued work at Fall River, \$70,600 per year for the next three years supporting the BC Ministry of Forests Research Branch for work on the BC installations, about \$70,000 from the Corkery Family Foundation to support summer field crew work, and Gessel Scholarship funding of graduate students. Three publications are or soon will be in print and several are in review. The Strategic Planning Committee met in February to develop the document that will be discussed later in the meeting. We currently have a Visiting Scholar from Germany and a Post Doc.

Meetings: The Fall Meeting has been scheduled for September 17-18 at Oregon State University. We will be developing a detailed agenda for the business meeting and field trip itinerary.

2006 Budget Review: Operational funding from member dues were \$568,248, about \$23,000 higher than in 2005. Special contract income was \$26,168 and in-kind credits for the second three GGTIV Installations was \$55,735; the total for the two years was \$1,075,507. Institutional Funding from the BC Ministry of Forests Research Branch was a \$CAN 55,000 from a competitive grant and in-kind support for measurement and treatment costs in BC. Other institutional members provided the equivalent of about \$233,147 in the form of salaries of scientists, facilities, administrative support; this also includes time of Dave Marshall and Mark Hanus contributed toward the ORGANON updates. External grant funding received by SMC scientists totaled \$248,317. The Contract Services line of expenses includes the second year of the Hann/Marshall/Hanus ORGANON update project. The salaries and benefits shown are net amounts after charging some SMC staff to other grants. The balance at the end of 2006 was a \$16,809, about \$1,000 smaller than in 2005.

2007 Budget Projection: Operational funding from member dues are \$570,699. Credits for expenditures in maintenance of the GGTIV installations reduce operating funds by \$8,958. Known special contract income is \$8,480 and may increase. The BC Ministry of Forests Research Branch was again successful in obtaining competitive grant funds (\$70,500/year for 3 years to support measurement and treatment costs in BC. Other institutional members are anticipated to provide the equivalent of about \$201,000 in the form of salaries of scientists, facilities, administrative support. Grant funds on the order of \$127,700 have been received. Currently a deficit of almost \$38,000 is shown but much of this represents time and travel by SMC staff on the non-destructive testing study and is in the process of being charged to other budgets. After these adjustments, it is anticipated that the budget will be close to break-even.

SMC Strategic Plan: The Strategic Planning Committee met on February 27, 2007 and developed a strategic plan document which was sent in advance of the meeting. The mission and vision statements were reviewed. The mission statement was unchanged but the Committee had developed several versions for the vision statement that were discussed. A final version was developed and adopted by a vote of 17 in favor, 0 oppose, and 0 abstain. The Committee's list of Goals was reviewed; most were left unchanged but a new one was added and the wording of others was changed. D. Briggs will revise the document and re-align the tables of Objectives within the Goals to reflect the changes. This will be sent for further comments. It was noted that this document is the start of an ongoing process.

Furthermore, the budget implications associated with the plan and any future revisions will need to be investigated. Finally, D. Briggs brought up the subject of merging the Stand Management and Precision Forestry Cooperatives. This has been suggested by individuals from both Cooperatives. After discussion, it was agreed that this should also consider relationships with the Center for Intensive Plantation Silviculture. This will also be discussed at the May 24 Precision Forestry Cooperative Executive Board meeting and, if that group agrees, a joint committee should be formed to investigate this idea further.

Silviculture Project Report: Eric Turnblom reviewed the work for the field season on the installations. A total of 47 installations (462 plots) were visited during the 06/07 season. This includes 12 Type I installations (164 plots) with full measurements and 4 installations (5 plots) with partial measurements and foliage samples from 12 plots. Five type II installations (20 plots) received full measurements, one installation (1 plot) with partial measurement and 4 installations (19 plots) destructively sampled for the tree to product acoustic study. Seven Type III installations (48 plots) received full measurements, six (22 plots) received partial measurement and 5 plots were thinned. The three 2005 GGTIV installations (66 plots) received their first measurement and the three 2006 GGTIV's had survival surveys. Five carry-over study installations (10) plots were measured, and two contact installations (56 plots) were measured. Procedures for continued monitoring of the GGTIV's were reviewed. Eric noted several publications that are now in print and briefly summarized previous TAC meetings. It was announced that the Tree List Generator Graphical User Interface is now available. Randy Collier noted that work on completing the database update is well underway and that members should fill out the database update request form and get it to him. Also those wishing to have a database use tutorial should also contact Randy. Finally there will be a joint SMC/PFC summer crew to do understory vegetation measurements on the GGTIV's and other installations, site characterization work, etc.

Modeling Project Report: Greg Johnson announced that he was stepping down as Modeling Project Leader and that Dave Marshall will take his place. Dave reviewed the recent accomplishments and status of ORGANON and the young stand model. He also reviewed some ideas for future work that lay the groundwork for a future TAC meeting.

Nutrition Project Report: Rob Harrison noted progress reports that students presented later in the meeting. He then summarized the latest information from the carry-over study which warrants continued monitoring as some interesting results are now beginning to emerge. There was discussion to expand this study to some other sites with different treatment levels and it was agreed that this could, and will be done. Rob also reviewed the current status of graduate students and new and proposed external grant funding. He also noted that we would have a discussion session the following day on new fertilization studies. Rob reviewed the current status of the proposal for new fertilization trials. A draft has been circulated, comments are being incorporated, and a budget is under development. The updated proposal will be sent for further review and discussion.

Wood Quality Project Report: Because of the field demands of the bear damage and non-destructive testing studies, the TAC has not yet met as was planned at the Fall meeting; meeting later this Spring is now in early planning. The field and milling aspects of the AGENDA 2020 project "*Non-destructive evaluation of wood quality in standing Douglas-fir trees and logs*" were reviewed. All of the woods and log yard work, veneer milling and sawmilling has been completed. The veneer was shipped to the USFPL in early January and testing is complete. The lumber will be planed on May 1-2 and shipped to USFPL for testing. The bear damage study was also completed. Reports on both were presented in the technical session.

TECHICAL SESSION

The Technical Session began on the afternoon of April 25 and continued through the morning of April 26. See the agenda for titles of speakers and titles of presentations. Many can be downloaded from the SMC website (www.standmgt.org). The meeting adjourned at 1:00pm on April 26.

APPENDIX A: SMC Annual Spring Meeting Attendees; April 25-26, 2007	
Organization	Name
1. Consultant	Jim Flewelling
2. Consultant	Kate Hlavka
3. BC Ministry of Forest	Robertta Parish
4. Bureau of Land Management	George McFadden
5. Campbell Group	Dave Rumker
6. Cascade Timber Consulting	Dave Furtwangler
7. Cascade Timber Consulting	Bill Marshall
8. Forest Capital Partners	Scott Ketchum
9. Forest Systems Inc.	Brian Carbaugh
10. Forest Systems Inc.	Oliver Wolff
11. Green Diamond Resource Company	Randall Greggs
12. Hancock Forest Management	Nathan Grahl
13. Hancock Forest Management	Brent Keller
14. Hancock Forest Management	Matt Kamp
15. Hancock Forest Management	Dean Stuck
16. Hancock Forest Management	Jim Vander Ploeg
17. Lone Rock Timber Co.	Jake Gibbs
18. Mason, Bruce and Girard	Ehen Voth
19. Olympic Resource Management	Dan Cress
20. Olympic Resource Management	Scott Holmen
21. Oregon State Department of Forestry	Doug Robin
22. Oregon State University	Marilyn Cherry
23. Oregon State University	Jeff De Ross
24. Oregon State University	Sean Garber
25. Oregon State University	Glen Howe
26. Oregon State University	Keith Jayawickama
27. Oregon State University	Doug Maguire
28. Oregon State University	Vikas Vikram
29. Oregon State University	Vikram Yadama
30. Plum Creek Timber Co.	Conner Fristoe
31. Port Blakely Tree Farms	Jeff Madsen
32. Quinalt Indian Nation	Jim Plampin
33. Rayonier Forest Resources	Jeff Lehrkind
34. Rayonier Forest Resources	Dave Ragsdale
35. University of Washington	Dave Briggs
36. University of Washington	Johannes Breidenbach
37. University of Washington	Randy Collier
38. University of Washington	Cindy Flint
39. University of Washington	Paul Footen
40. University of Washington	Rob Harrison
41. University of Washington	John Haukaas
42. University of Washington	Rapeepan Kantavichai
43. University of Washington	Kim Littke
44. University of Washington	Larry Mason
45. University of Washington	Megan O'Shea
46. University of Washington	Gonzalo Thienel
47. University of Washington	Eric Turnblom
48. University of Washington	Nick Vaughn
49. PNW USFS	Eini Lowell
50. PNW USFS	Erin Smith-Mateja
51. PNW USFS	Robert Monserud
52. PNW USFS	Charlie Peterson
53. Timber West	Larry Promnitz
54. Washington Department of Natural Resources	Jeff DeBell
55. Washington Department of Natural Resources	Scott McLeod
56. West Coast Timber Co.	Gene McCaul
57. Weyerhaeuser	Scott Holub
58. Weyerhaeuser	Greg Johnson
59. Weyerhaeuser	Dave Marshall
60. Weyerhaeuser	Aaron Weiskel
61. WSU Extension	Ole Helgersen

APPENDIX B	STAND MANAGEMENT COOPERATIVE SPRING MEETING Gifford Pinchot NF HQ, Vancouver, WA. April 25-26, 2007
April 25	AGENDA
9:00	Coffee & Rolls
9:30	Welcome & Introductions: Gene McCaul, Policy Committee Chair; David Briggs, Director
9:40	<ul style="list-style-type: none"> ✓ Accomplishments & Plans for 2007-David Briggs ✓ Nominating Committee next SMC Vice-Chair ✓ Plans for the SMC Fall Meeting week of Sept 17-21 ✓ Future Meetings, Conferences, & Workshops
9:55	2006 Budget Review & 2007 Budget Forecast-David Briggs
10:10	SMC Strategic Plan-David Briggs <ul style="list-style-type: none"> ✓ Summary of Feb 27, 2007 Strategic Planning Committee Meeting ✓ Discussion, Actions, Next steps
11:00	Silviculture TAC Report- Eric Turnblom, Silviculture Project Leader <ul style="list-style-type: none"> ✓ 2005/2006 Field Season ✓ Type IV Installation progress report ✓ Database Update Timetable: Randy Collier, SMC Database Manager
11:20	Wood Quality TAC Report-Eini Lowell, Wood Quality Project Leader <ul style="list-style-type: none"> ✓ AGENDA 2020 Acoustic testing/wood quality study
11:40	"Characterization of Pacific Northwest Softwoods for Wood Composites Production" Vikram Yadama, WSU
12:00	Lunch
1:00	Nutrition TAC Report-Rob Harrison, Nutrition Project Leader <ul style="list-style-type: none"> ✓ Carryover study ✓ LTSP 2006 Meeting Results ✓ Plans for New Fertilization Studies
1:20	Modeling TAC Report-Greg Johnson, Modeling Project Leader <ul style="list-style-type: none"> ✓ Young stand model project
	Research Reports
1:40	"Stiffness of Douglas-fir lumber: Effects of wood properties and genetics." Vikas Vikram, Glenn Howe, Marilyn Cherry, and Dan Cress
2:05	"Effect of Site, Age, and Treatments of Type II Installations on Standing Tree Acoustic Velocity". Gonzalo Thienel, David Briggs, Eric Turnblom, UW
2:30	"Effect of fertilization and thinning on Type I installations on mean treatment plot branch diameter and on individual tree branch diameter." Rapeepan Kantavichai, David Briggs, Eric Turnblom, UW
2:55	Break
3:30	<i>Results of the Bear Damage Study</i> Eini Lowell, USFS PNWRS <i>"N leaching as a result of urea fertilization in Douglas-fir plantations"</i> Cindy Flint, UW
3:50	"Young Stand Model" Nick Vaughn, UW
4:10	"Soil Properties and Processes at the Fall River LTSP Study" Brian Strahm, UW
4:30	Adjourn
April 26	Topic
8:00	Coffee & rolls
8:10	"Owner Survey Summary" David Briggs, UW
8:50	"Carry-over study results" Paul Footen, UW
9:10	1 st Measurements of 2005 GGTIV Installations Eric Turnblom, Keith Jayawickama
9:30	Simulating growth impacts of Swiss needle cast in Douglas-fir: The blood, sweat and tears behind the ORGANON growth multiplier - Sean Garber, Forest Science, OSU
9:50	Break
10:20	Progress Report on "Beyond Nitrogen" Fertilization Trials Doug Mainwaring Forest Science, OSU
10:40	"The history of forest fertilization in the PNW: what we know and what we need to know" - Jeff DeRoss, Forest Science, OSU
11:10	"Wood Quality, Products and Markets" Ivan Eastin
11:30	<i>An update on the Center for Intensive Planted-forest Silviculture: Does wood quality matter to engineered wood products, and does research quality matter to engineered decision-making systems?</i> - Doug Maguire, Forest Science, OSU

Stand Management Cooperative

Fall Meeting, Sept 17-18, 2007 Oregon State University, Corvallis, OR

The business meeting began at 9:00 on Sept. 17. The 44 attendees are listed in Appendix A and the Agenda is presented in Appendix B. Policy Committee Chair Gene McCaul opened the meeting by commenting on the progress of the strategic plan and interest in the proposal for new fertilization trials that would be discussed during the meeting. Following introductions of the participants, Director Dave Briggs emphasized two objectives for the meeting. The first objective was to achieve approval of the Strategic Plan Goals so the TAC's could move forward with detailed planning of objectives, steps, and timetables that contribute toward achieving the goals. The second objective was to achieve approval of the plan for the individual tree-based fertilization study that the Nutrition TAC has developed.

Accomplishments: A handout summarizing accomplishments thus far during 2007 was reviewed. Since the SMC began in 1985, the cumulative budget has reached \$17.1 million of which member dues and contracts constitute 64%, external grants 16%, and institutional members 20%. The field crew completed all field work planned for the 06/07 season including the first measurement of the genetic gain trial – type IV (GGTIV) installations (66 plots) planted in 2005. The field crew also spent a substantial amount of time working on the harvesting, log yard and milling phases of the AGENDA 2020 non-destructive testing study. A summer crew, consisting of graduate students Royce Anderson and Paul Footen, and undergraduates Alice Drury and Melanie Welch, visited installations to gather data for various projects; understory vegetation surveys, habitat assessments, pitch moth surveys, soil sampling. Another crew, consisting of Randy Collier and graduate student Kim Littke visited the three GGTIV installations planted in 2005 for site characterization measures. Two Masters theses were completed, five new articles were published in journals, two have been accepted and six are in review. Seven technical reports were published. Four oral and five poster presentations were given at conferences. So far approximately \$200,000 in new external grant funding has been received and other proposals are in review. These external grants plus the Gessel Scholarship Fund and Corkery Family Chair are the principal means of support for the four PhD and three Masters students associated with the SMC. The Corkery Family Chair and external grants also provided most of the summer field crew funding. We also held meetings of the Silviculture, Nutrition, and Strategic Planning Committees. Owner Survey # 5 information has been compiled and a report is being drafted and is expected to be completed before the end of the year.

Policy Committee Chair: 2007 will mark the end of Gene McCaul's two-year term as chair and Louise de Montigny, the current Vice Chair will become chair for 2008 and 2009. The Nominating Committee reported that Dave Rumker was asked to become the next Vice-Chair and he has accepted this role. Gene was presented with an engraved cedar box and thanked for his work as Chair, especially in moving the Strategic Plan forward.

Data Policy: Doug Maguire presented two articles (Appendix C) that would amend the Data Policy of the SMC By-Laws with respect to use of the database by institutional members. These designate responsibility for ensuring compliance with the data policy to the Institutions' representative on the Policy Committee and ensure that reports and manuscripts are submitted to the SMC Director in advance for approval. During discussion, the second article was reworded to include software and presentations. A motion (Randall Greggs) and seconded (Gene McCaul) to approve these amended articles was unanimously approved. It was recommended that the SMC staff develop a sign-off sheet, acknowledging receipt of the database and understanding of the Data Policy rules, that an individual would be required to sign before the database would be delivered. This form will be sent by the database manager to any who request the database and will be included on the database distribution CD so the Institutional representative can use it with any individual within that institution.

2007 Budget Review and Projection: Operational funding from member dues is \$570,699. Credits for expenditures to maintain the three GGTIV installations reduced operating funds by \$8,958. Income from special contracts income is \$8,480. The BC Ministry of Forests Research Branch was again successful in obtaining competitive grant funds for the next three years (\$70,652/yr) to support measurement and treatment costs in BC. Other institutional members are anticipated to provide approximately \$136,000 in the form of salaries of scientists, facilities, administrative support. Grant funds totaling \$200,000 have been received.

On the expense side, salaries and benefits, about \$310,000, reflect net amounts after charges of staff time to other grants. Expenses for travel, equipment, supplies and contract services, about \$133,000 total, include final expenses Hann/Marshall/Hanus project to update ORGANON. Travel expenses are rising due to higher fuel costs and we are taking measures to economize where possible. By producing and distributing all publications electronically, we have eliminated printing and mailing expenses. Expense for indirect costs (utilities, space, support staff, etc.) paid to the University of Washington are about \$109,000. By the end of the year, it is anticipated the deficit of about \$22,000 that was carried into 2007 will largely, if not completely, be eliminated. This result places the budget close to the status that was projected in 2004. The combination of the external grants and the 5% dues increase implemented in 2006 has accommodated the in-kind expenses associated with the GGTIV sites, the ORGANON update, the young-stand model, and the general rise in salaries and transportation costs.

2008 Budget Projection: Current information indicates that operational funding from member dues will be down by about \$11,000 to \$559,640; changes from 2007 reflecting acreage changes of members. Special contract income, which includes King County DNR, is anticipated to be \$12,000. In-kind credits for 2007 maintenance expenses associated with the GGTIV installations are estimated to be \$15,000. Funding from institutional members is expected to be similar to 2006 levels. Known external grant, Gessel Scholarship Fund and Corkery Family Chair funding for 2007 will be about \$120,000 and could be higher if proposals are successful.

With full loading on the SMC budget, expenses for salaries and benefits will be about \$390,500. At this time, opportunities that are in hand to charge staff time to external grants are very limited. Some opportunities are likely but the timing is uncertain. Expenses for travel, equipment, supplies, and contract services are expected to be about \$123,000. Expense for indirect costs (utilities, space, support staff, etc.) paid to the University of Washington are expected to be similar to the 2007 level. Assuming these income and expense estimates, there may be a deficit of about \$76,000 at the end of 2008.

Discussion centered on possible options to reduce costs. D. Briggs pointed out that most of the funds support field and database staff to accomplish the basic mission and eliminating any positions would compromise capability. The remainder supports 0.5 program assistant work which has been critical for communications, organization of meetings, etc., and about 0.5 fte faculty position equivalent for portions of summer salaries for the Director and the Nutrition and Silviculture project leaders. Cutting these would greatly reduce critical leadership. Several opportunities for future external funds were discussed including funds from the long-term site productivity to pay the SMC for maintenance of the LTSP database, the next round of AGENDA 2020 and other grant programs, and several organizations that are considering, or should be approached for, membership. A clearer picture of this will be known by the Spring meeting.

A motion (Randall Greggs) and seconded (Gene McCaul) to approve the 2008 dues and budget was unanimously approved.

SMC Strategic Plan: Dave Briggs summarized prior actions on the strategic plan which approved the Mission and Vision statements. He then presented the recommendations from the Strategic Planning committee concerning the Goals. With approval of the goals, the next step would be to ask each of the Technical Advisory Committees to examine and revise the tables of objectives, steps and time frames that each is or plans to do as contributions to each of the goals. We would plan to have these TAC revisions returned by March 1, 2008 to the Strategic Planning Committee for review. The Strategic Planning committee will present recommendations on the revisions at the Spring 2008 meeting. A motion (Randall Greggs) and seconded (Steve Wickham) to approve the strategic plan goals was unanimously approved.

Nutrition Project Report: Rob Harrison reviewed the current status of graduate students, new, and proposed external grant funding. Rob then summarized progress by the Nutrition TAC since the Spring meeting to define new fertilization trials. The consensus that has been reached is to use a paired-tree approach in which a set of tree pairs, with members of each pair being as similar as possible, would be established on a site. One member of the pair would be fertilized while the other would act as its control. A sufficient number of pairs, say 30, would provide sufficient replication and power to establish whether or not there is a response on the specific site. Questions raised several issues. One was the choice of the specific fertilization to use and whether or not to try several types of fertilized pairs. The problem with the latter is that the size of site necessary and associated logistics would multiply; it may make more sense to set up similar but separate experiments for different types of fertilizers. It seemed that the consensus was to

start with 200lb/a of N. A second issue was how to distribute experimental sites across the landscape to achieve greater insight as to the conditions that may lead some to show a response while others do not. The consensus was to focus on the parent material base that was the largest owned by SMC members and then stratify by slope position and other factors. It was decided that the Nutrition TAC would use appropriate map overlays to develop a strategy for the site selection matrix and criteria. The intent is to do this as soon as possible in order to get members to offer candidate areas. The SMC staff would then be in a position to determine how this would affect scheduling of field work and how many installations can be set up in this and subsequent years. Other questions were associated with monitoring environmental and other conditions on the selected sites. This aspect is likely to be addressed through development and support of a grant proposal.

Modeling Project Report: Mark Hanus substituted for Dave Marshall and introduced Nick Vaughn who reported on the equations he has developed for the young stand model. At his time, Martin Ritchie is coding the new model and plans to have it ready for testing in the first quarter of 2008. A straw poll suggested that many would be interested in a young-stand growth model workshop, most likely in conjunction with the Spring 2008 Policy Committee meeting.

Silviculture Project Report: Eric Turnblom reviewed the current status of graduate students, new, and proposed external grant funding. He reviewed the field season plans for measuring installations during the 07/08 field season. David Briggs followed with a presentation on work related to modeling the diameter of the largest branch in the BH region of individual trees; a simple non-destructive measurement that has been shown to be related to a commonly used log branch index. This work suggests a good opportunity for linkages with individual tree growth models. Eric Turnblom then presented a summary of the procedures used for site characterization on the GGTIV installations and results that were obtained by the summer crew which visited the three installations (66 plots) planted in 2005.

Wood Quality Project Report: Eini Lowell reported on the AGENDA 2020 project "*Non-destructive evaluation of wood quality in standing Douglas-fir trees and logs*". All of the field work, milling, and product testing is completed. Some work remains to complete data from the cookies and samples from the cookies are being taken by Weyerhaeuser for x-ray densitometry. David Briggs provided a preliminary summary of results for the tree-to-log-to-lumber part of the study. The product chain results appear to be consistent with studies for other species. Unlike many other studies, this project has a good range of treatment plot conditions with known histories. Preliminary modeling to predict acoustic velocity from stand, treatment, and tree variables, revealed some interesting patterns and demonstrated that the results may depend on the stage that a stand is in during its life-cycle. Since this study had only two age groups, more acoustic testing of trees on a broader range of ages and treatment plots will be needed.

The meeting adjourned at 4:30 and was followed by a social in the evening and a field trip on the 18th.

APPENDIX A: SMC Annual Fall Meeting Attendees; Sept. 17-18, 2007

ORGANIZATION	NAME
1. BC Ministry of Forest	Louise de Montigny
2. Bureau of Land Management	George McFadden
3. Campbell Group	Dave Hamlin
4. Forest Capital Partners LLC	Scott Ketchum
5. FPInnovations Forintek Division	Gerry Middleton
6. Green Diamond Resource Company	Randall Greggs
7. Hancock Forest Management	Jim Vander Ploeg
8. Image TreeCorp	Mark Hanus
9. Lone Rock Timber Co.	Jake Gibbs
10. Mason Bruce & Girard	Ellen Voth
11. Olympic Resource Management	Scott Holmen
12. Oregon State University	Marilynn Cherry
13. Oregon State University	Jeff DeRoss
14. Oregon State University	Sean Garber
15. Oregon State University	Dave Hibbs
16. Oregon State University	Keith Jayawickrama
17. Oregon State University	Lewis Jordan
18. Oregon State University	Barb Lachenbruch
19. Oregon State University	Doug Maguire
20. Oregon State University	Doug Mainwaring
21. Oregon State University	Olaf Hoibo
22. Oregon State University	Robin Rose
23. Plum Creek Timber Co.	Steve Wickham
24. Port Blakely Tree Farms	Chris Whitson
25. Quinault Indian Nation	Jim Plampin
26. Quinault Indian Nation	John Mitchell
27. Rayonier Forest Resources	Candace Cahill
28. Roseburg Forest Products	Phil Adams
29. Roseburg Forest Products	Dave Walters
30. TimberWest	Larry Promnitz
31. University of Washington	Bill Bizak
32. University of Washington	Dave Briggs
33. University of Washington	Rob Harrison
34. University of Washington	Bert Hasselberg
35. University of Washington	Kim Little
36. University of Washington	Megan O'Shea
37. University of Washington	Eric Turnblom
38. University of Washington	Nick Vaughn
39. U.S. Forest Service PNW Region	Eini Lowell
40. U.S. Forest Service PSW Region	Martin Ritchie
41. Washington DNR	Scott McLeod
42. West Fork Timber Company	Gene McCaul
43. Weyerhaeuser	Scott Holub
44. Weyerhaeuser	Dave Marshall
45. Weyerhaeuser	Bill Scott

APPENDIX B	STAND MANAGEMENT COOPERATIVE FALL MEETING Willamette Room, Alumni Center, Oregon State University, Corvallis, OR September 17-18, 2007
	AGENDA
Sept 17	Business Meeting
8:30	Registration. Coffee & rolls
9:00	Welcome & Introductions: Gene McCaul , Policy Committee Chair & David Briggs
9:10	2007 Accomplishments, Future Meetings, etc. David Briggs
9:20	Election of Vice-Chair of Policy Committee
9:40	SMC Budget 2007 Review & 2008 Dues-David Briggs
10:00	Strategic Plan-David Briggs
10:30	Break
10:50	Nutrition Project Report-Rob Harrison
11:15	New Fertilization Trial Proposal-Rob Harrison, Eric Tumblom
12:00	Lunch
	Research Projects
1:00	Modeling Project Report-David Marshall
1:10	Young growth model progress report-Martin Ritchie & Nick Vaughn
1:50	Silviculture Project Report-Eric Tumblom ✓ Field Schedule & Database Report
2:15	Individual tree branch modeling-Rapepan Kantavichai, David Briggs, Eric Tumblom
2:40	Site Characterization on the GGTV Installations-Randy Collier
2:40	Break
3:00	Wood Quality Project Report-Eini Lowell
3:20	Effect of Stand Variables on Tree Acoustic Velocity-Gonzalo Thienel, David Briggs
3:40	From tree acoustic velocity to lumber stiffness-David Briggs
4:30	Adjourn
5:30	No host social/dinner at Woodstock Pizza, 1045 NW Kings Blvd, Corvallis, OR
Sept 18	Field Trip
7:30	Depart from Salbaugeon Inn & Suites, 1730 NW 9 th Street
8:30	Stop # 1: Critical Period Threshold Study (VMRC/Starker Forests)
9:30	Depart for Stop # 2
10:00	Stop # 2: SMC Douglas-fir Type I Installation 726 (Toledo/Plum Creek): fertilization, thinning, pruning
12:00	Lunch
12:30	Depart for Stop # 3
1:30	Stop # 3. Paired tree fertilization trial (Starker Forests)
2:15	Depart for Corvallis
3:00	Arrive at Corvallis & Adjourn

APPENDIX C

Data Policy Amendments

Edits made during the meeting are in ***bold italic***.

- 10.** **9.** Requests for data by Institutional Members are made only through the Institution's representative on the Policy Committee. This same representative is responsible for making sure that all users within the Institution: (1) are aware of the proprietary nature of the SMC Database; (2) obtain the data directly from the Institutional representative; (3) do not pass any part of the database to any other party within or outside of the Institution; and (4) secure written permission from the SMC Director to proceed with any analyses. Requests for permission include specific objectives, data required, analysis approach, and intended authors of all planned reports and manuscripts.
- 11.** **10.** Final reports and manuscripts, ***software, and presentations*** based partly or entirely on the SMC Data base are submitted for approval to the SMC Director before authors submit them to journals or other outlets, in order to check for the following items: (1) acknowledgement of the SMC; (2) co-authorship acceptable to the SMC, including associated UW staff and faculty; ***and*** (3) absence of excessive overlap with publications planned by other parties.
- 12.** **11.** Changes and exceptions of this policy must be approved by the Policy Committee.

SMC Wood Quality TAC Minutes

Gifford Pinchot National Forest Headquarters, Vancouver, WA., November 28, 2007

In attendance

Eini Lowell, Glenn Howe, Jim Goudie, George McFadden, Greg Johnson, Judy Mikowski, Olav Hoibo, Barb Lachenbruch, Dave Marshall, Dave Briggs, Eric Turnblom, Doug Mainwaring, Doug Maguire, Dennis Dykstra.

Agenda

- SMC Strategic Plan discussion
 - WQ TAC role for each goal/objective
- Type I installation destructive sampling discussion
 - Maguire, Lachenbruch, Briggs
- Remaining Type II installation discussion
- LOGS plots wood quality research
- Type IV installation genetics/wood quality research ideas
- Other areas of interest:
 - Silvascan
 - Relevant issues to REIT, TIMO
- Tying it all together (the who what how when)

Strategic Plan Discussion

The role of the Wood Quality TAC in the different goals and objectives of the SMC Strategic Plan were discussed.

Goal 1: Define and design research to understand the short and long term effects of silvicultural treatments on timber (growth and yield, wood quality, etc.) and environmental (habitat, carbon, water, etc.) values of forests.

Objective A. Design and Establish Field Research Installations

Discussion revolved around whether the new fertilization installations might have a wood quality component to them. This would be short term response (coring outer rings for density), acoustic testing (does last 4 years alter response?). Comment was made that the other SMC installations provide more information from a broader range for the money. There could be some work in the carbon arena associated with these installations.

Objective C. Develop Field Procedure Manual

Acoustic measurements should be made on a targeted set of installations. Need to determine which ones. A suggestion was made that it could be the subset of 'height trees' on the plots. There was some concern that the standing tree measurements were highly variable based on crew and time of day. The log tool appears more reliable.

Use of ground-based LIDAR to perform some measurements (e.g. branch diameter in first log was suggested). Has some promise but still too expensive and setup time extensive.

Goal 3: Analyze the high quality data to produce information that furthers global competitiveness of the forest products sector and improves environmental benefits to society

Objective A. Develop, refine, & maintain SMC ORGANON

Objective D. Develop decision support tools

Discussed combined objectives A and D. Current wood quality module in ORGANON produces a flat file. It would be useful to develop the capability to produce an Excel or Access file instead. There is the potential to build a more realistic tree and develop a new WQ DLL. No new data are needed. Newer branch models can be incorporated. Upgrading WQ module is a 2-step process. Updating WQ Module to build algorithms for dynamic sort would be of interest to industry members.

Objective C. Database Analyses

Opportunities within the academic communities.

Goal 4: Conduct technology transfer to assist in the application of information gained from the research.

Objective B. Conduct Regular Meetings

Suggestion made to hold meetings in conjunction with Policy meetings to get industry participation.

Objective C. Publications and website

Workshops were added to this objective. It was pointed out that there previously were wood quality workshops put on by the SMC every other year. Eventually, they ran out of audience. There is now a new audience interested in learning about WQ.

Glenn Howe discussed a workshop he and Richard Zabel are putting together. It will be a 2-day workshop with one day focusing on wood quality in general and the second day on wood stiffness, with emphasis on research. It is anticipated that it will occur in late spring 2008.

Barb Lachenbruch brought up the idea of a web site on Douglas-fir wood quality (e.g. WQI, radiata pine). This might also serve the function of identifying research gaps. The website should have a technical focus but written so that a broader audience would find it useful. Extension personnel would be ideal in this capacity. A team of people is needed to accomplish this.

Goal 6: Seek opportunities for collaboration with other organizations and individuals to leverage SMC research programs

Objective A. Define high interest projects

Focus on projects already in development (e.g. proposal from Lachenbruch et al.)

Look at wood quality traits on phenotype through continuing SMC partnerships

Objective B. Funding

AGENDA 2020 RFP announcement due out first week in December. Requires strong industry commitment; cash contribution ranks highest for the 20% match.

Objective C. Collaboration with other cooperatives & organizations

Southern pine consortium and FPInnovations were mentioned.

Objective D. Assist in developing and supporting programs that fund forest management research

Example: AGENDA 2020

Type I installation discussion

The proposal by Lachenbruch et al. makes use of trees in the double buffer zone of Type I installations to model the effects of density regime and nitrogen fertilization on wood quality properties. It would address crown structure over time and how crown dynamics affect properties. The effects of fertilization on the crown last longer than the effects on other wood properties. Later on, data from Type III installations could complement this study.

Type II Installations

There are 7 left. Currently, there are no plans to harvest them. Based on results of current AGENDA 2020 study, could use these sites to supplement/validate findings. May need to fill in with data from Type I installations.

Type IV Installations

Six installations with 22 plots each. Initially being re-measured every 2 years. Similar to Type III protocols. Stem mapped. Small number of families. Gray's Harbor breeding zone. Selected for growth, not quality. Silviculture x genotype interactions. Are there additional measurements that should be made? Look at morphology – branches, both number and angle. General feeling was that a limitation from a genetics perspective is the small number of families included (10).

LOGS

Forest Service has ended its measurement cycles on three plots. OSU is maintaining two (Stampede Creek and Hoskins). At this time, there are no plans to harvest these sites. The question was raised are there base fundamental issues to be learned from them? In the heavily thinned plots there are few trees. A wide range of growth rates and densities exist. These plots do not look like industrially managed stands. Core work might be useful in looking at chronosequence of tree conditions. Not a high priority for WQ TAC at this time. Could possibly be useful in the future. Encourage FS to leave tags on trees for a few more years or paint (or GPS?) the sample trees for permanent reference purposes.

Al Mitchell commented that he has been hearing from the product and marketing side that while they know there are differences among species, they know little about variation within species especially from one stand to the next. Questions regard what attributes vary a lot and which ones don't. The LOGS installations provide a tremendous latitudinal gradient as well as a stand density gradient and range of site qualities. These installations could be used to provide wood quality data on how site and stand characteristics modify fiber attributes from a processing, rather than silvicultural, viewpoint.

Miscellaneous

A report on Canada's FPInnovations (formed by a merger of three national research organizations) was given by Jim Goudie.

BC Ministries research is continuing its in-depth look at single species. Next up is cedar.

Dave Briggs is participating in NCASI gap assessment. He's bringing up the question of why the U.S. doesn't have

technical capabilities to assess wood quality that are available in other countries and whose services are very expensive to obtain.

Type III installations can provide research material in the future.

What WQ traits are needed in engineered/composite wood products?

If you could design an installation that would focus on wood quality, what would it look like? Be more proactive and design the experiments. Look at Vegetation Management and Swiss Needle Cast coops.

Action Items

Strategic Plan:

- Goal 1 - Objective A: MS student to look at pairings
 - Objective C: protocol for Type III and IV early stage of development
- Goal 2 – potential for upgrade of WQ module in ORGANON (Maguire, Marshall, Lowell)
- Goal 4: Website on DF wood quality (Lowell and Lachenbruch)
 - Workshops on wood quality (Howe, Marshall, SMC meetings?)
- Goal 6: develop proposal for website (Lachenbruch and Lowell)

Type I: develop proposal for AGENDA 2020 (Lachenbruch et al.)

LOGS: Speak with Connie Harrington and Al Mitchell (Lowell)

Partners: FPInnovations (Briggs)

FPL (Lowell)

Type VI (wood quality) Installations (silviculture TAC already has type V in the works!):

For all TAC members to take into consideration and provide ideas/thoughts

Next TAC meeting will include a “Design a Wood Quality Installation”

STAND MANAGEMENT COOPERATIVE STAFF

University of Washington, Seattle:	Dave Briggs, SMC Director Randy Collier, Senior Computer Specialist Bob Gonyea, Field Coordinator Rob Harrison, Nutrition Project Leader Bert Hasselberg, Field Technician John Haukaas, Research Consultant Megan O'Shea, Administrative Specialist Eric Turnblom, Silviculture Project Leader William Bizak, Hourly field assistant Brian Straham, Post-Doctorial Research
B.C. Ministry of Forests, Victoria:	Lisa Meyer, B.C. Field Coordinator Louise de Montigny, B.C. Research Forester
PNW Research Station, Portland:	Eini Lowell, Wood Quality Project Leader
Weyerhaeuser Company	Dave Marshall, Modeling Project Leader,
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