SMC Quarterly News

Stand Management Cooperative
School of Forest Resources, University of Washington
4th Quarter 2010

www.standmgt.org

Dave Briggs, SMC Director

inside:

From the Director

Summer 2010, if you can call what we had a summer, was quite eventful. There was a lot of work by the SMC Finance Committee assessing how 2010 was developing and projecting budget scenarios for 2011-13. By laying off one staff member and having a 2-week furlough in 2009 we accrued a sufficient balance to withstand the 20% cut in 2010 dues and it looks like we may exceed the goal of a $20,000 balance at year end. After discussing the present and future, it was gratifying that the members voted to reduce the cut for 2011 to 5%. Also on the financial front, my position as holder of the Corkery Family Foundation Chair, which was to terminate In June 2010, was renewed through June 2013. The timing was perfect as it allowed us to create a package to hire a summer student field crew. In addition, we received grant supplements and new grants including one project, funded by the National Science Foundation, a collaboration of NC State, Purdue, UW, and Virginia Tech, that is a result of our membership in NSF's Center for Advanced Forest Systems.

It is also becoming more evident that The SMC will need to play a larger role in technology transfer to members. As a result, a Technology Transfer Committee was formed following the Spring meeting. The Committee solicited proposals from the TAC's and from the members with the instructions that they would primarily involve analyzing existing data, could be completed within a 2-eyar time frame by a Masters student, and would produce deliverables of importance to members. Two continuing and nine new proposals were received and presented for discussion and prioritization by the members at the fall meeting. A listing of the proposals and the final "importance" tallies is in the meeting minutes of this issue.

The “summer” was very busy for fieldwork. As noted, we had funds for a summer student field crew that did vegetation surveys on the 3 GGTIV installations planted in 2006, 3 type I installations and 1 type III installation. We have increased the number of Type V installations to 76 and are seeking others to round out the sampling matrix. We collaborated with the USFS PNW Research Station and BC Ministry of Forests Wood Fibre Centre to collect acoustic velocity (wood stiffness) and Resistograph (wood density) readings and increment cores from 4 levels of growing stock (LOGS) sites are doing a 5th side this fall, in addition we also collected the same information from one Type I installation.

From last year we have 5 PhD and 4 Masters Students who are continuing and 3 new students will be entering this fall and winter.

Future File: Please note the following meetings

- **Intensive Silvicultue of Planted Douglas-fir Forests,** Tuesday, February 15, 2011; Doubletree Hotel, Lloyd Center, Portland, Oregon. Sponsored by Center for Intensive Planted-forest Silviculture (CIPS) and the Western Forestry and Conservation Association (WFCA)
- **SMC Spring Meeting** April 19-20, 2011. Location TBA
- NSF Center for Advanced Forest Systems Meeting. June 13-16, 2011. Seattle, WA.
- **SMC Fall Meeting** September 20-21, 2011. Location TBA

New School of Forest Resources MS Student

Austin Himes

Austin Himes is a new Master of Science Student who will be working under the guidance of Rob Harrison on Type V paired tree installations using N-15 stable isotopes to track the movement of fertilizer nitrogen in the ecosystem. Austin received his Bachelor of Science degree from the University of Oregon in 2009. He was part of the University of Oregon’s Environmental Leadership Project and has worked for the Forest Service as research field technician. Austin is interested in land management and applied research for sustainable use of forest resources that support rural communities.

Stand Management Cooperative
Fall Meeting Minutes Sept 21-22, 2010

The meeting, at Oregon State University, Corvallis, OR., began at 8:30 with 45 attendees from 25 organizations. Policy Committee Chair Dave Rumker opened the meeting, welcomed the attendees and commented on the continuing importance of the SMC as a critical information source for forest land managers.

ACCOMPLISHMENTS

Dave Briggs reviewed accomplishments to date. A few highlights:

- Cumulative funding since 1985 has reached $20.1 million.
- David Briggs received continuation of the Corkery Family Foundation Chair through June 2013.
- International Forestry Consultants and Agrotain joined the SMC.
- 7 articles are in print, 2 have been accepted and 5 are in review.
- SMC has 5 PhD and 4 Masters Students in residence.

ANNOUNCEMENTS

- National Science Foundation (NSF) Center for Advanced Forest Systems annual meeting will be in Seattle in June 13-16, 2011.
- The Spring and Fall 2011 are tentatively scheduled for April 19-20 and Sept 20-21 respectively. To encourage wider participation and technology transfer, the format of the Spring meeting will have reports on continuing and completed projects in the morning of the 19th followed by a 1/2 day workshop. The business meeting will be on the morning of the 20th. D. Briggs will solicit ideas for workshop topics from the members.

STRATEGIC PLAN

A Technology Transfer Committee was formed at the Spring meeting to solicit brief descriptions of proposals for technology transfer projects from the TAC's and from members. The objective is to focus on projects for which most data was already available that could be accomplished within a 2 year time frame, likely by a Masters student, and which have high interest by member organizations. Table 1 lists the titles of 2 continuing and 9 new projects that were received. After 10-minute presentation and discussion of each project, each voting member was given a copy of the project descriptions and three red stickers worth 3, 2, and 1 points respectively. A member would place the sticker worth 3 points on the project they felt would be most valuable, the sticker worth 2 points on the project they felt would be the second most valuable, and the sticker worth 1 point on the project they felt would be third most valuable. They also combine stickers on just 1 or 2 projects if they wished. The right column of Table 1 shows the final tally. This will greatly help the SMC focus on projects that are of greatest importance to members and help with recruiting students that would best match them.

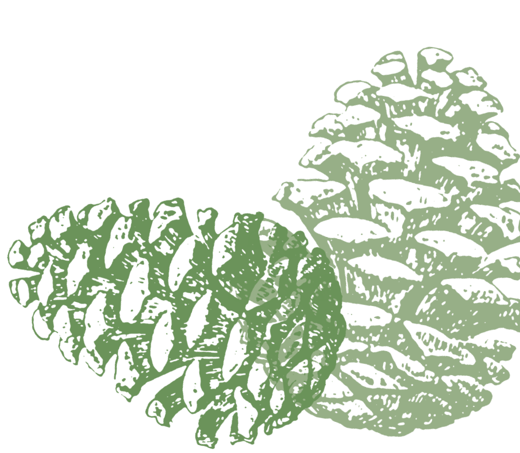
Table 1. Continuing and proposed SMC Technology Transfer Projects and total points received from voting members. See Page 33 for project descriptions.

Project Title	Point Total
Continuing: Growth and yield performance of SMC Type I, II, and III installations	**43**
Continuing: 2010 SMC Owner Survey	**17**
New: Response of wood quality parameters to stand density regime and nitrogen fertilization	**13**
New: Effect of management regimes of SMC Type I, II, and III Installations on Wood Quality: Knots	**10**
New: Development of models and software to predict changes in the young stand systems.	**10**
New: Develop methodology for relating height growth of young stands to site index and future yields	**10**
New: Evaluating site and climatic factors in a management-oriented, dynamical forest system model.	**9**
New: Canopy characterization of SMC Type V studies	**5**
New: Develop a model that predicts wood density, acoustic velocity, and modulus of elasticity longitudinally and radially in the stem from common inventory data	**3**
New: Assessing vegetation response to herbicide application in GGTIV installations	**0**
New: Development of a Wood Quality Website	**0**
New: Update Wood Quality module for inclusion in individual tree models	**0**

BUDGET

David Briggs summarized the status of the 2010 budget with actual expenses through August and projections for the balance of the year. The budget is based on the vote in 2009 for 80% of full funding (20% cut). An end of year balance of $36,580 is projected to carry into 2011. This exceeds the end of year target of $20,000 established at the Fall 2009 meeting. This balance reflects cost-cutting actions taken in mid-2009, including a 2-week shut down with no pay for SMC faculty and staff and the permanent layoff of the database programmer.

The SMC Finance Committee developed 0%, 5%, 10%, 15%, and 20% cut scenarios for 2011-13, starting with the targeted $20,000 balance from 2010 and assuming 0% and 3% inflation. It was found that the heavier cut levels led to balances that were either negative or below the $20,000 ending balance goal. It was moved (Randall Greggs) and seconded (Gene



1. *The SMC invoice Oregon Department of Forestry and Washington DNR at their the same % cut level as in 2010*
2. *The SMC invoice all others at 95% of their full 2011 dues (a 5% cut).*
3. *That the SMC 2011 budget be managed to produce an ending balance of $20,000.*
4. *That this vote is just for 2011 dues and budget management. The Finance Committee will assess the situation for 2012 as 2011 unfolds and develop a recommendation for the 2012 budget for vote at the Fall 2011 meeting.*

The motion was approved by a vote of 11 in favor and 6 opposed.

Modeling Project Report: Dave Marshall

A. Purpose

- Develop research plans, proposals for external funding, etc.
- Develop appropriate collaborations with other cooperatives.
- Develop experimental designs, field measurement protocols etc.,

B. 2010 Activities

- The Modeling Project has met many of its 5-year strategic plan goals; including the PNW-CONIFERS young stand model and updating ORGANON SMC and genetics models.
- The Modeling TAC reviewed CIPS (VMRC) young stand modeling work to build on the previous young stand model by the SMC (PNW-CONIFERS) using vegetation treatment data available from the VMR.
- The Modeling TAC participated in the ORGANON red alder planta tion model project (Hardwood Silviculture Coopera tive). The database was created through a contract with the SMC. The Modeling TAC provided requested review of model components. The modeling is complete and beta testers are needed; contact Dave Marshall if you are interested.
- The Modeling and Wood Quality TAC's are discussing wood quality modeling and the Modeling TAC is collaborating with the Silviculture: TAC on growth model evaluations. The Modeling TAC has facilitated FVS / ORGANON collaboration that will involve Erin Smith-Mateja and David Hann who will be working on folding the ORGANON model into the FVS interface. Potential funding from BLM is being explored.

C. 2011 Activity Plan

- Define the Modeling TAC role under biomass, biofuels, carbon and climate initiatives.
- Continue to encourage collaboration with other cooperatives — CIPS, VMRC, NWTIC, PNWTIRC, HSC and others.
- Seek beta testers for the ORGANON red alder model.
- Identify priority projects. One under discussion is re-evaluation of models for fertilization and thinning. Six models tested show a wide range of responses to thinning, fertilization, and their combination. No one model adhered to all of general research findings on these treatments, (G. Johnson, GMUG Growth Model Runoff II).

Nutrition Project Report: Rob Harrison

A. Carryover Study. Paul Footen (M.S. student) found small but statistically and significant differences in mean DBH and height after about the 5th year since planting, also understory differences. Paul is now completing understory/site characterization work, and has a manuscript published for the North American Forest Soils conference http://soilslab.cfr.washington.edu/publications/ and an additional paper being prepared. Funding is primarily from UW/Gessel Scholarship and sample analysis/travel paid from SMC.

B. Paired Tree Fertilization Type V Installations Study. Kim Littke has completed her PhD qualifying exam and is about 1 year from graduation;. She has submitted 2 manuscripts, one to the Soil Science Society of America Journal, and one to Forest Science. Austin Himes (M.S. student, B.S. from U. Oregon) will start Fall quarter on this project. Funding from UW/Gessel Scholarship, NSF (2 grants), and USFS Agenda 2020.

C. Fall River/Matlock/Molalla LTSPs. Received $24K in 2010-2011 from NCASI for $579K total since the project began. Warren Devine is working on biomass equations; Ghazala Yasmeen, currently a World Forestry Center fellow will enter Winter 2011 to work on LTSPs.

D. N15 Study. "Use of stable isotopes to trace the fate of applied nitrogen in forest plantations to evaluate fertilizer efficiency and ecosystem impacts." Thomas Fox, Brian Strahm, Virginia Tech; Rob Harrison, University of Washington, Jose Stape, North Carolina State University; Douglas Jacobs. Purdue University. Submitted as a Center for Advanced Forest Systems project to the National Science Foundation and funded for $195,708.

E. Deep Soils issue of Forest Science (8 papers), editors Rob Harrison, Dan Richter (Duke), Tom Fox (V Tech); highlights SMC work related to carbon in soils.

Silviculture Project Report: Eric Turnblom

A. 2010/11 field season

- Type I Installations. Well-established juvenile stands at or near a stage of stand development conducive to pre-commercial thinning (1970s cohort). Each has 7 basic spacing and thinning treatments but some also have 3 to 8 Auxiliary plots for fertilization and pruning. 22 Type I installations (135 plots total) will be visited including three installations in B.C. that will be measured by the BC Ministry of Forests. Twelve installations will receive full measurements and all but five have thinning plots near RD triggers so some may be thinned.
- Type II Installations. Plantations or natural stands at or near a stage of development receptive to commercial thinning (1950's-60s cohort). Each has a control plot and four thinning plots. Only 4 of the original 12 remain active. Three installations (15 plots) are scheduled for measurement.
- Type III Installations. Plantations planted in at six pre-specified spacings ranging from 100 to 1210 stems per acre (late 1980s to '90s cohorts). Treatments include thinning based on relative spacing in the three densest plantings and pruning in the three widest plantings. Ten Type III installations (68 plots) will be measured and one plot will be thinned.
- Genetic Gain Trial / Type IV (GGTIV) Installations. Three planted in 2005, 3 planted in 2006. The *Genetic gain trial component* has 440 stems per acre (10x10 feet spacing) with three genetic gain levels, and complete vegetation control. The *SMC Type IV component* has three spacings, 7x7, 10x10, 15x15 (200, 440, 890 stems per acre), two genetic gain levels, and two vegetation control levels The three installations (22 plots each) planted in 2005 will be measured. In lieu of covering cost of weed control, NWTIC will send crews to measure the installations planted in 2005. Basal diameters, some now reaching 6", will continue to measured as a systematic 50-tree sample until >90% of trees have surpassed breast height by plot. Complete vegetation control, an 80% bare ground specification, included spraying relevant plots at the three installations planted in 2006. Vegetation surveys were conducted by the summer field crew in summer 2010. It has been determined that no further efforts to maintain the complete vegetation control will be needed.

- TYPE V Installations. Each installation contains multiple pairs of closely matched Douglas-fir trees of which one is randomly chosen to receive 200lb./ac of fertilizer (N as urea). A new component, sponsored by the National Science Foundation will use the N15 isotope to track the fate of N through the system. 76 installations have been located; measured, paired, and fertilized since fall 2007. Twenty-eight will be re-measured and twelve (12) will receive initial measurements and be fertilized.
- Summer 2010 Field Work. Vegetation and habitat measurements were completed on the three GGTIV installations (66 plots), planted in 2006 and measured in 09/10. Vegetation and habitat measurements were completed on three Type I and one Type III installations. Stem mapping at Forks #1, #2, #3 and Brittain Creek #1, #2, #3.

B. Other projects

1. Vegetation Composition and Succession in Managed, Coastal Douglas-fir Ecosystems. Sponsored by NCASI $120,743 with the objective to develop overstory / understory relationships in young, managed Douglas-fir stands at the species level. This has been completed and presented to the NCASI Western Wildlife Committee and a project report is in final draft stage. Just received Mc-Stennis funding $6,774 to begin developing a state-space, dynamical system model that will be the basis for Kevin Ceder's Ph.D dissertation.
2. Sun-Tree Identification in Tree Lists of Multi-Strata Stands. Sponsored by the USFS with cooperation with Olympic Natural Resources / OESF $73,339. Conjecture is that top level or uppermost stratum may "drive" size / density relationships, hence stand dynamics. Graduate student Nick Vaughn developed a robust algorithm and surveys have been distributed to silviculture experts to validate algorithm estimates.
3. Logging Residues for Biomass / bio-energy. Sponsored by USFS $184,329 with cooperation from the Olympic Natural Resources Center. The focus is on the following questions for the Olympic Peninsula. How do current utilization standards affect residue amount compared with historic levels? How does harvesting system affect residue level? How does forest type affect residue level? Field data collection is underway.
4. Stand Structural differences in mixed vs. pure species stands. Currently not sponsored, cooperating with E. Zenner at Penn State to address the following questions. How does stand structure (as measured by SSI) impact stand dynamics, growth, and yield? How is cumulative stand diameter (or basal area) increment distributed spatially over the individual trees? Stemmapped 24 plots last July.

C. Strategic Plan Projects

1. <u>LOGS style performance summaries of Type I, II, and III installations</u>. Growth and yield analysis of DBH, height, tree volume, stand volume, survival (TPA), size distributions. Kevin Ceder, Jeff Comnick, and Nai Saetern are working on analyses to be followed by technical reports, workshops, and a web-based calculator tool.
2. <u>Installation retirement criteria.</u> The Silviculture TAC decided to poll land owners for their planned harvest year for each installation. Have heard back from all except for installations now on nonmember land. In the process of contacting them.
3. <u>Model Validation.</u> Co-PIs are Greg Johnson, Dave Hamlin, and David Marshal. Recent observations have shown models to exhibit different effects of thinning and fertilization. Attempts to refine, restructure, hybridize empirical models would be well informed by identification of knowledge gaps that may be causing differences in modeling treatment effects. The project has four phases. First, identify criteria and indicators for sources of high quality data in concert with meta-analysis of available literature and begin identifying existing models for validation. Second, use the criteria and indicators from phase 1 to search for data sets, obtain necessary agreements for data sharing; finalize the list of models to validate and develop a standard set of model runs. Third, perform the model runs and analyze the results. Fourth, deliver a technical report and hold a workshop for model developers, data sharing agencies, SMC cooperators, collaborators, etc. Financial support required to do this is one graduate student for 2.25 yr, computer & software, supplies and materials; total would be about $34,200.
4. <u>2010 Database is available.</u> Contact Randy Collier, rcollier@uw.edu, for a copy. We will be polling members to set a date for a database workshop.

Figure 1.—Locations of levels-of-growing-stock study installations.

5 levels of growing stock (LOGS) sites

Wood Quality Project Report: Eini Lowell

A. Effect of thinning, site quality and stand density on wood quality using non-destructive testing to develop predictive models.

- Collaborators. PNW Research Station ($30,000), Canadian Forest Service Wood Fibre Centre (include $17,400), SMC ($5000) and PFC ($7,000).
- Sample: 5 levels of growing stock (LOGS) sites, Iron Creek, Hoskins, Shawnigan Lake, Sayward, and Stampede Creek. 3 treatments (2 thinning regimes and a control); 3 plots per treatment; 15 trees per plot yields 135 sample trees/

installationfor ST-300 acoustic velocity readings. Three trees from each plot were selected from which to take increment cores and collect Resistograph measurements (total 9 trees/treatment or 27 trees per installation).

- Data collection: ST300 (longitudinal acoustic velocity) and Resistograph (bark to pith resistance profile), and increment cores for x-ray densitometry and near-infrared spectroscopy (NIRS).
- Progress: Poster presented at a Canadian Wood Fibre Centre forum with ST-300 results for 4 sites. X-ray densitometry data from Shawnigan Lake and Sayward have been received. Resistograph readings and increment cores were taken in July-August 2010 at Iron Creek, Hoskins, Shawnigan Lake, and Sayward. Cores from US sites have been sent to the Southern Research Station for x-ray densitometry and NIRS.
- Stampede Creek measurements will be done in late September. Resistograph measurements have been made on the SMC Type I installation Roaring River. Results will be presented during the field trip.

B. Strategic Plan. Wood Quality TAC developed three project proposals that were presented as part of the proposal prioritization process during the business meeting.

C. Update on the Agenda 2020 (2004) study "Non-destructive evaluation of wood quality in standing Douglas-fir trees and logs" with Co-pi's Briggs, Lowell, Turnblom, Lippke, Carter. Most of the integrated database has been completed and analyses are underway. X-ray densitometer data from ends of each 5m log received from Weyerhaeuser is being analyzed by PhD Rapeepan Kantavichai, who is looking at wood density profiles and biomass increments as affected by treatments and growing environment (climate and soil). Veneer modeling continues in cooperation with Christine Todoroki, SCION, New Zealand. Initial knot detection from veneer image work has been published. Currently looking at the effect of silvicultural treatment by modeling stiffness variation in veneer sheets (radially and vertically within the tree) and determining predictability of acoustic velocity (stiffness) based on ST-300 data from standing tree and Hitman data from merchantable bole and short logs.

D. A proposal for analyzing bear damage on SMC installations was discussed. A previous study done on Capitol Forest found a decrease in volume and value of butt logs damaged by bears to be 5-6 % less. An analysis of the animal damage recorded in the SMC database to determine losses throughout the range of SMC data could be performed to assess the stand conditions that increase damage risk and determine the overall level of loss. Investigators would be George McFadden (BLM), Eini Lowell (PNW), Connie Harrington (PNW), Dave Marshall (Weyerhaeuser) and others. No field data collection is required and it would take a 2-year Masters student ($32,000/yr, $64,000 total) to complete. The analysis could also be done by some of the cooperating PIs.

FOLLOW UP ACTIONS

1. Schedule the Spring and Fall 2011 meetings. Develop tech transfer workshop for the Spring meeting.
2. Work with TAC's to schedule TAC meetings.
3. Director Briggs indicated his plan to retire in 2013. He will work with the Policy Committee Chair to form a committee to develop a succession plan fro discussion with the UW. D. Briggs will initiate discussions with the Director of the School of Forest Resources to define issues and identify those at UW who should be included in the discussion.
4. The Finance Committee will continue to monitor the budget as it unfolds in 2011.

TECHNICAL SESSION and Field Trip

The technical session and progress report presentations listed in the agenda can be acessed via the link in the table below or by going to the SMC website (www.standmgt.org). The field trip to Roaring River, a Type I installation that has the basic 7 and all of the auziliary plots, was a great opportunity to observe and discuss performance. We also had demonstrations of the Fibre Gen ST-300 and Fakopp Treesonic tools for estimating acoustic velocity as a proxy for wood stiffness in standing trees and discussed and compared results from four levels of growing stock sties and treatment plots at Roaring River. There was also a demonstration of the Resistograph which measures resistance as a drill bit bores through a tree. This takes about the same time as taking an increment core and one has the resistance data in memory of the unit for downloading and analysis. We are taking increment cores and hope to establish a relationship to calibrate resistance (Reisitograph) to wood density (increment core). Successful calibration would pave the way fro field sampling to estimate local wood density.

SMC Field Crew member Bob Gonyea demonstrates the Resistograph which measures resistance as a drill bit bores through a tree.

STAND MANAGEMENT COOPERATIVE FALL MEETING
Oregon State University, Corvallis, OR. September 21, 2010

	AGENDA
21 Sept	**BUSINESS MEETING**
8:00	Registration, coffee & rolls
8:30	Welcome & Introductions Dave Rumker, Policy Committee Chair
8:40	2010 Accomplishment SMC Owner Survey Other Announcements Dave Briggs
8:50	The AFRI Project: Update and Plan Glenn Howe
9:10	Strategic Plan Technology Transfer Projects: Technology Transfer Committee
10:20	Strategic Plan Technology Transfer Projects, cont.
11:10	2010 Budget Status, SMC Finance Committee Dave Briggs
11:20	2011 Budget Projection and Dues Vote-(see page 6 of newsletter) Dave Briggs
	PROJECT LEADER REPORTS
12:40	Modeling Project Report David Marshall
1:00	Wood Quality Project Report Eini Lowell
1:20	Nutrition Project Report Rob Harrison
1:40	Silviculture Project Report Eric Turnblom
	TECHNICAL SESSION
2:00	"Sustaining Productivity Under Intensive Forest Management: Synthesis and Implications of Five Year Results from Two Contrasting Sites in the Pacific Northwest." Tim Harrington
2:20	"Vegetation control effects on nitrogen and carbon pools for year-5 Douglas-fir plantations on three LTSP sites differing in productivity." Warren Devine
2:40	Tom Terry's talk, which I'll present, is on a web-based BMP document sponsored by the Northwest Forest Soils Council. Scott Holub
3:20	Remote canopy characterization. Rich Grotefendt, Rob Harrison
	PROJECT PROGRESS REPORTS
3:40	Type I , II, III performance Kevin Ceder, Jeff Comnick, Nai Saetern, Eric Turnblom
4:00	The N-15 paired-tree study Kim Littke, Rob Harrison
4:20	Comparing carbon footprints of intensively managed plantations: Do your growth model and biomass equation choices matter? Nick Vaughn, Dave Briggs

The Forest Carbon Balance of Intensively Managed Douglas-fir Plantations[1]

David Briggs, Professor and Nick Vaughn, Graduate Student. School of Forest Resources, College of the Environment, University of Washington

Abstract

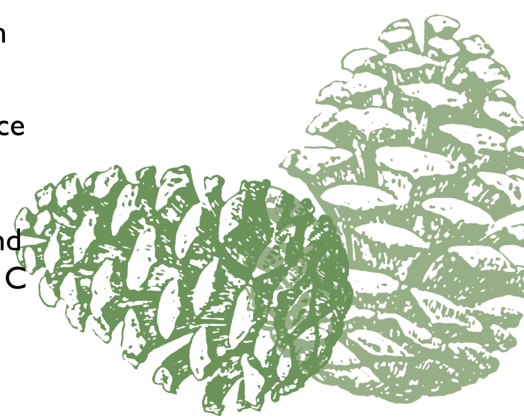
This article examines the balance between removal and storage of CO_2 in above-ground biomass and CO_2 equivalent of greenhouse gas emissions from intensively managed Douglas-fir plantations. We compared projections based on combinations of the CONIFERS, FVS, and ORGAONON growth models with either the Gholz et al or Jenkins et al biomass equations. We found large differences due to choice o growth model that are compounded by smaller but substantial differences due to the choice of biomass equation.

Introduction

Many forest landowners are examining how emerging markets for carbon credits and bio-energy would potentially fit into their investment portfolios. However, understanding and quantifying these opportunities requires a paradigm shift from inventories of stem wood volume for logs converted to traditional wood products. Since a mass of oven dry wood contains about 50% carbon and about 8600 btu/lb (20 mj/kg) of energy, the new paradigm is measurement of the dry weight of trees commonly partitionsed into above-ground biomass (AGB; stem wood, stem bark, branches, foliage) and below ground biomass (BGB; stump, roots) components.

Sonne (2005, 2006) performed life cycle analysis (LCA) of carbon dioxide and other greenhouse gases (GHG) for various Douglas-fir management regimes. GHG considered were carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). She used the FVS growth model (Dixon 2001) and the Jenkins et al. (2004) biomass equations for Douglas-fir to quantify and understand the impact of regimes on both carbon sequestration and GHG emissions. Output from growth and yield models can be obtained for each year and converted to biomass in order to portray immediate and long-term effects of management activities on carbon storage and GHG emissions.

Presently, there is little information about the sensitivity of results to the choice of growth model or biomass equation. This report presents the sensitivity of carbon storage and GHG emissions to choice of different Douglas-fir growth models and biomass equations. We show the sensitivity of annual increment and cumulative total of AGB, of CO_2 removed from the atmosphere and stored as C in the AGB, and of the CO_2 equivalent of GHG emissions to various forest management and harvesting activities.



[1] Sponsored by the National Council for Air and Stream Improvement, Inc. (NCASI)

Method

Growth Models

We used the PN variant of the model FVS (Keyser, 2008) and the SMC variant of the model ORGANON (Hann, 2005) which use a list of measured trees from a given stand as input. Each tree in the list has an associated expansion factor, which typically determines the number of trees per acre that the given tree represents. Because these models may not be appropriate for younger stands (< 15 years old) [2], we also used the young-stand model CONIFERS (Ritchie 2008) through the R-CONIFERS interface (Hamann et al., 2005), to predict growth for age 5-15 and pass the tree list at age 15 to FVS-PN and ORGANON-SMC. In a third trial, FVS-PN was allowed to predict growth from age 5 to harvest. This resulted in three growth model combinations that we examined; subscripting is used to indicate the age range when each model was used.

- FVS-PN$_{\text{5-rotation}}$
- CONIFERS$_{\text{5-15}}$ followed by FVS-PN$_{\text{15-rotation}}$
- CONIFERS$_{\text{5-15}}$ followed by ORGNON-SMC$_{\text{15-rotation}}$

Special settings for the growth models were necessary to make the model results more comparable or realistic. The FVS LOCATION code was set to the nearest National Forest. Neither ORGANON nor FVS was allowed to perform record tripling. CONIFERS does not perform record tripling by default. Herbicide effect was modeled in FVS-PN by manually increasing growth by 20% for years 5-10. Herbicide treatments were performed in CONIFERS by reducing the vegetation cover from 50 percent to 0 percent. ORGANON-SMC and FVS-NW were run with 5-year time steps. Cubic spline interpolation was used to obtain annual values.

Management Regimes

Table 1 presents information from three SMC type-III installation plots with about 350, 500 and 750 trees per acre, which were used as the basis for simulations. The data represent each stand at five years from seed, and none had prior thinning or fertilization treatments.

Table 1. SMC type-III installation plots used as the modeling basis.

Installation ID	Plot number	Actual Trees per acre	TPA Represented
915	4	387	350
932	5	517	500
919	5	720	700

Table 2 defines the activities and associated codes used in defining management regimes used in the simulations.

[2] ORGANON explicitly states that it is not applicable to data from such young stands

Table 2. Definitions, codes, and age from seed when management activites were applied.

CODE	Management	Age	Notes
HERB	Herbicide treatment	5	Generic chemicals (no HERB = 50% veg)
PCT	Pre-commercial thinning	15	Thin from below to 300 TPA
FERT	Fertilization	15	200 lb/acre N
CT	Commercial thinning	35	Thin from above to 80% of TPA at age 15
NA	No management activity	-	Stand left alone from planting to harvest

Table 3 shows 17 regimes using different combinations of management activities from Table 2 that were simulated. Site index for simulation was set to 128 feet at 50 years (King, 1966) for all stands which were simulated to age 60 from seed, at which time we assume a clearcut harvest.

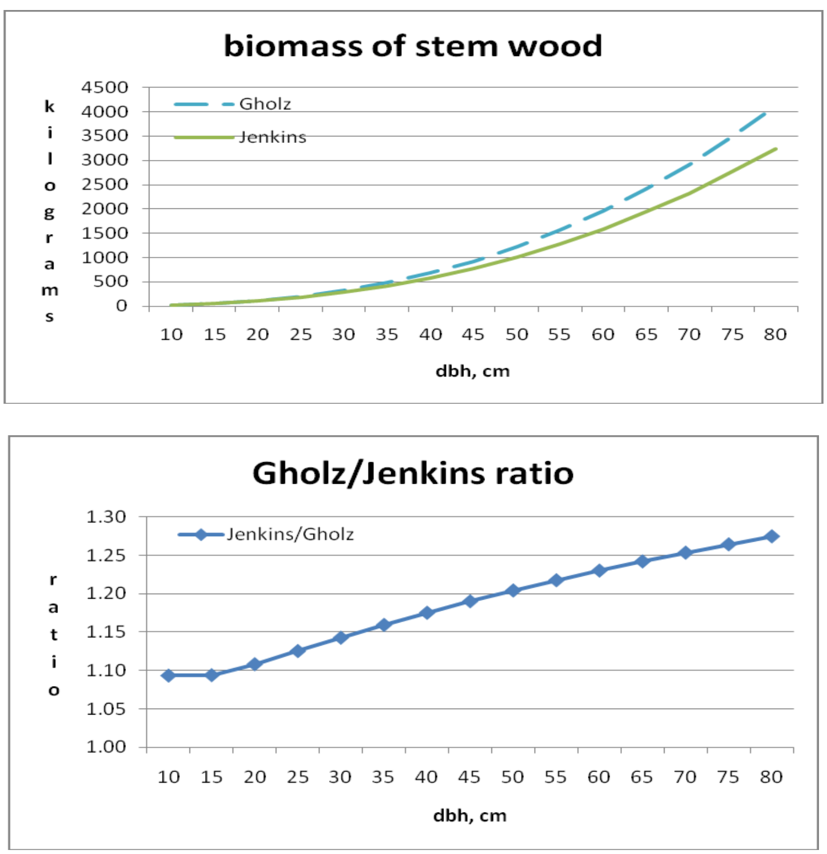
Table 3. Regime names using management activity codes from table 2.

Regime name
1. 350_CT_FERT
2. 350_NA
3. 350_PCT_CT_FERT
4. 350_PCT_CT_HERB_FERT
5. 500_CT_FERT
6. 500_CT_HERB_FERT
7. 500_NA
8. 500_PCT_CT_FERT
9. 500_PCT_CT_HERB_FERT
10. 500_PCT_CT
11. 500_PCT
12. 700_CT_FERT
13. 700_CT_HERB_FERT
14. 700_PCT_CT_FERT
15. 700_PCT_CT_HERB_FERT
16. 700_PCT_CT
17. 700_PCT

Biomass Equations

To estimate biomass from the tree list output from the growth models, one can either compute volume and convert this to biomass using an assumed wood density for the species or compute biomass directly using biomass equations for the species. We used the Gholz et al. (1979) and Jenkins et al. (2004) equations for ABG biomass for Douglas-fir. Both equations only use diameter at breast-height (dbh) to predict biomass of tree components. Figure 1a compares the predictions of stem wood biomass by these equations and Figure 1b shows the ratio of Gholz et al. to Jenkins et al. stem wood biomass predictions. Except for small dbh trees, the Gholz et al. predict higher stem wood biomass than Jenkins et al. (Figure 1a). Also, as dbh increases, the ratio of Gholz et al. to Jenkins et al. becomes larger and larger as dbh increases.

Figure 1. Comparing Douglas-fir stem wood biomass predicted by the Gholz et al (1979) and Jenkins et al. (2004) biomass equations; (a). stem wood biomass vs dbh, (b) ratio of Gholz et al. to Jenkins et al. vs dbh.



Boundary Conditions

An important aspect of LCA is to clearly define the boundary conditions which set the context for analysis and interpretation. Our simulations consider all aspects of a management regime from seedling to logs on a landing awaiting transportation. We do not consider sequestration and substitution effects associated with products obtained from thinning and final harvest logs. CORRIM has extensive research on these downstream effects (Lippke et al. 2004) and we plan to collaborate with CORRIM to integrate and combine results. We also do not consider storage and emissions from the BGB, soil, and thinning and final harvest residues that remain on the site and decompose.

CO_2 Units

The equation for photosynthesis is

$$6CO_2 + 6H_2O \quad = \quad C_6H_{12}O_6 \quad + \quad 6O_2.$$

Inserting atomic weights yields the mass balance

$$264 + 108 \quad = \quad (72+12+96) + 192$$

Scaling the mass balance to C yields

$$3.67 + 1.5 \quad = \quad 1 + 1.5 \quad + 1.07$$

Therefore 3.67 ton CO_2 is removed from the atmosphere per ton C in biomass. However a dry ton of biomass is about 50% C, so 1.835 ton CO_2 is removed from the atmosphere per dry ton of biomass.

GHG considered are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), which have 1, 23, and 296 times the warming potential of CO_2 respectively and thus can be combined into a single CO_2 equivalent scale.

Carbon Budget for Table 3 Regime 9

To illustrate the LCA carbon balance procedure this section presents detailed results for regime #9 in Table 3.It was planted with 500 2-year old seedlings per acre, had herbicide applied at age 5 from seed, a PCT (leaving the 300 largest trees/acre) and fertilization with 200lb nitrogen/acre were done at age 15 from seed. A commercial thin from above, removing the largest 20% by height, was done at age 35 from seed, and all trees are harvested at age 60 from seed.

Growth and yield of AGB and carbon Sequestration

Figure 2 shows projected AGB and total atmospheric CO_2 absorbed and stored in the AGB over age for regime #9. The $CONIFERS_{5\text{-}15}$ ➔ $ORGANON\text{-}SMC_{15\text{-}60}$ model combination was used and 5-year reports were interpolated to annual values using cubic splines. The effect of commercial thinning at age 35 is quite apparent and the subsequent slope of the curves is greater due to the accelerated growth of the residual stand.

Growth and yield of AGB and carbon Sequestration

Figure 2 shows projected AGB and total atmospheric CO_2 absorbed and stored in the AGB over age for regime #9. The CONIFERS$_{5-15}$ → ORGANON-SMC$_{15-60}$ model combination was used and 5-year reports were interpolated to annual values using cubic splines. The effect of commercial thinning at age 35 is quite apparent and the subsequent slope of the curves is greater due to the accelerated growth of the residual stand.

Figure 2. Biomass (lower, green) and CO_2 (upper, blue) sequestered by regime #9.

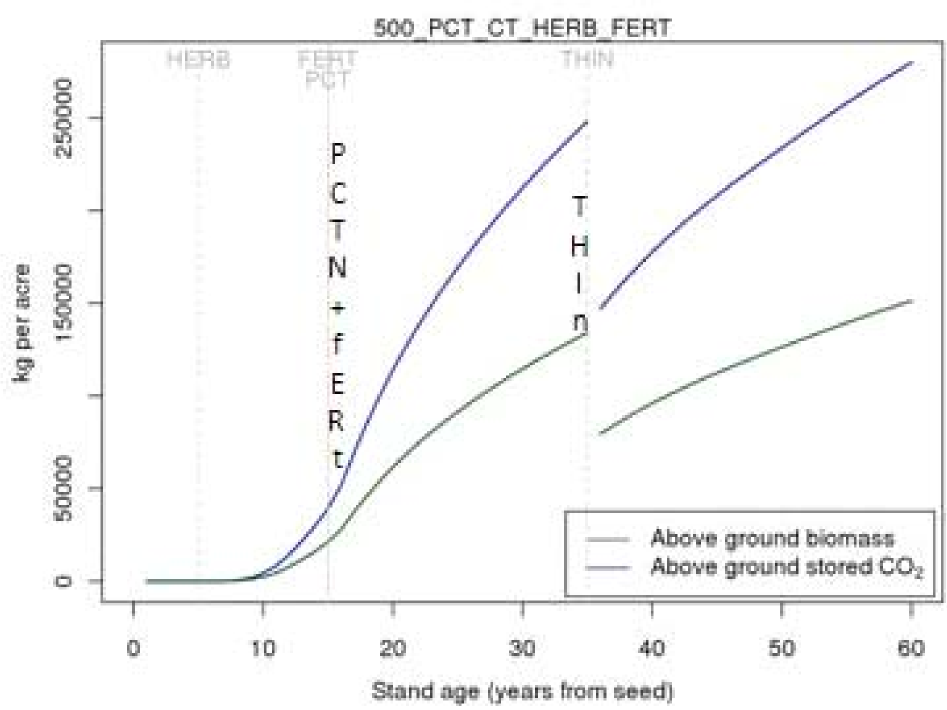


Figure 3 presents the annual increments (growth) of the AGB and CO_2 of the regime in Figure 1. The responses of the residual stand to the thinning and fertilization at age 15 and the thinning at age 35 are quite apparent.

Figure 3. Annual increment (growth) of biomass (lower, dark green bars) and CO_2 (upper, light blue bars) sequestered by regime # 9, kg/ac.

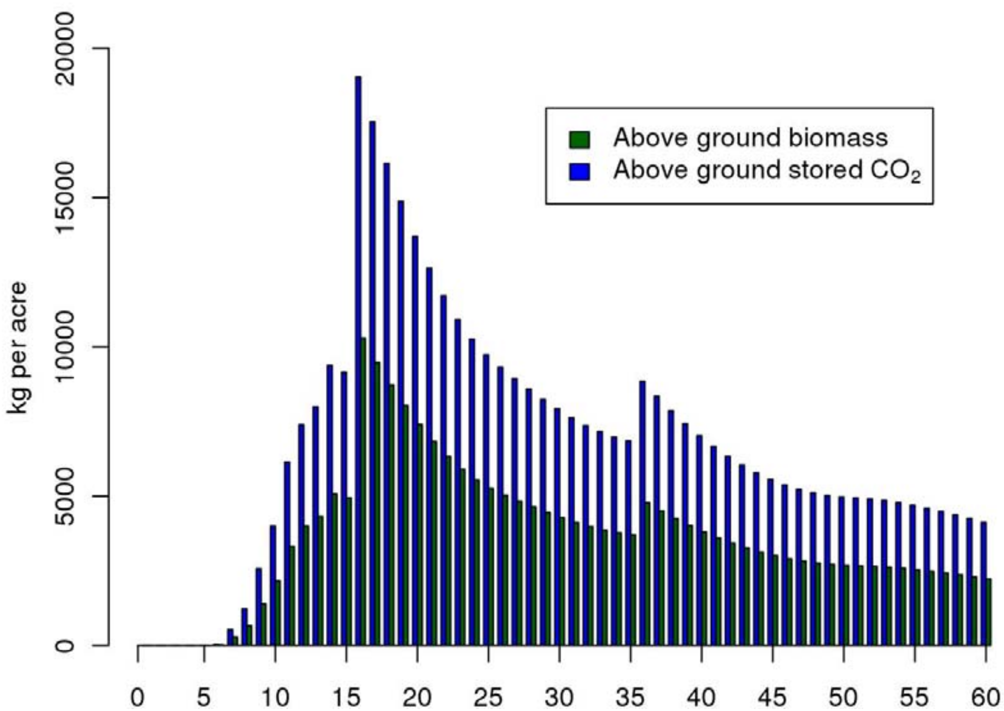
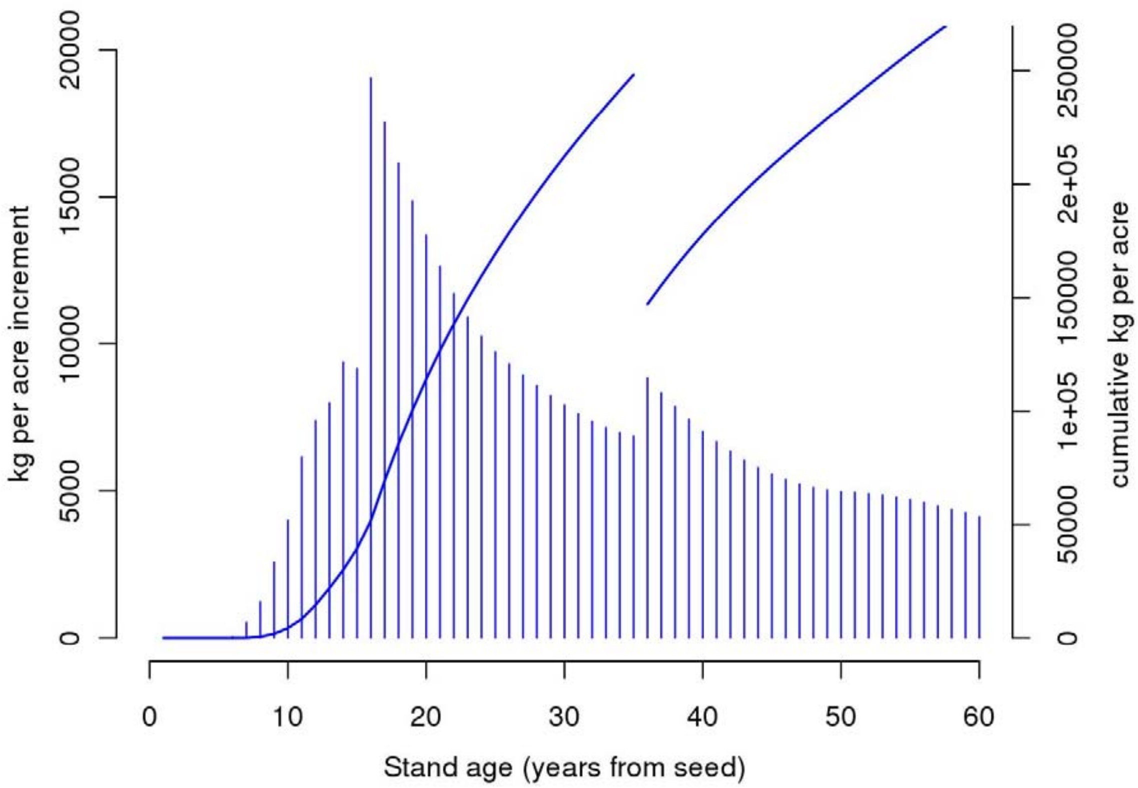


Figure 4 combines the total and incremental CO_2 sequestration curves from Figures 2-3.

Figure 4. Total yield curve (right axis scale) and annual incremental bars (left axis scale) of CO_2 stored by regime # 9.



Emissions

Figure 5 shows the emissions of each GHG and their combined CO_2 equivalent. Our convention is to show emissions from the site as negative values. Note that the emissions occur only in the year when a specific management activity was conducted. Emissions recorded for year 2 represent the nursery practices to produce the 500 seedlings, transportation to the site, and planting. Note the nitrous oxide associated with volatilization from the urea fertilizer used in year 15. New fertilizer formulations can greatly reduce this effect.

Figure 5, CO_2 equivalent annual emissions of GHG from the regime #9. kg/ac.

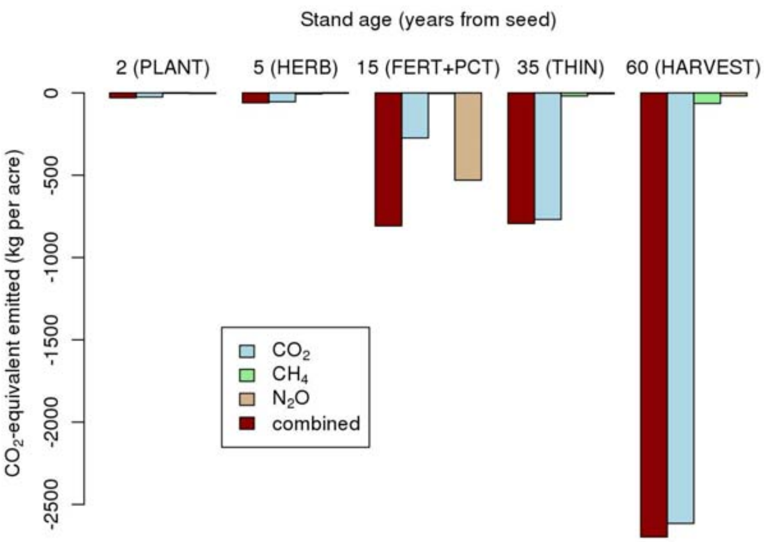


Figure 6 shows the cumulative CO_2 equivalent of GHG emissions and their combined total. Cumulative emissions follow a step function since they occur only in the specific years when management activities are performed.

Figure 6. Emissions of GHG from regime #9, kg/ac.

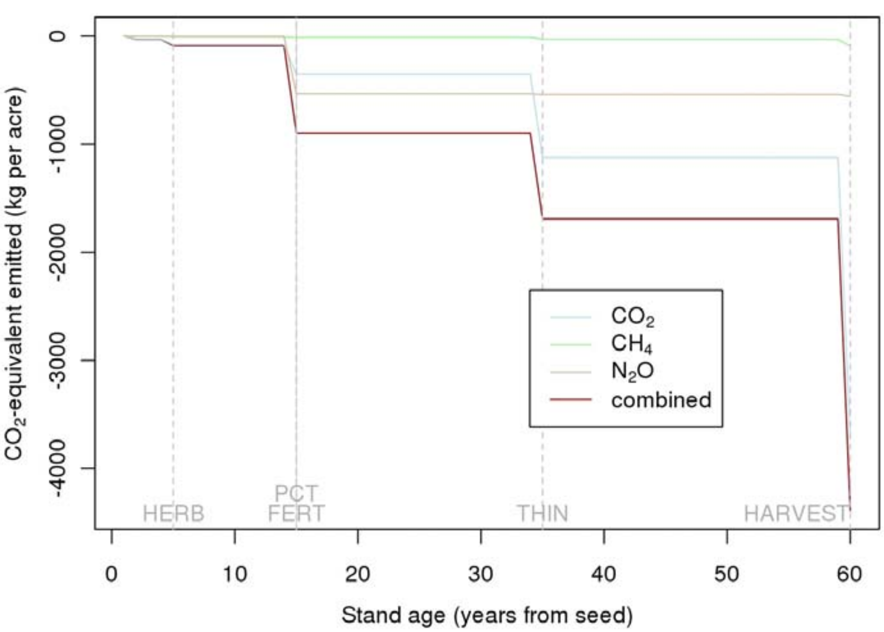
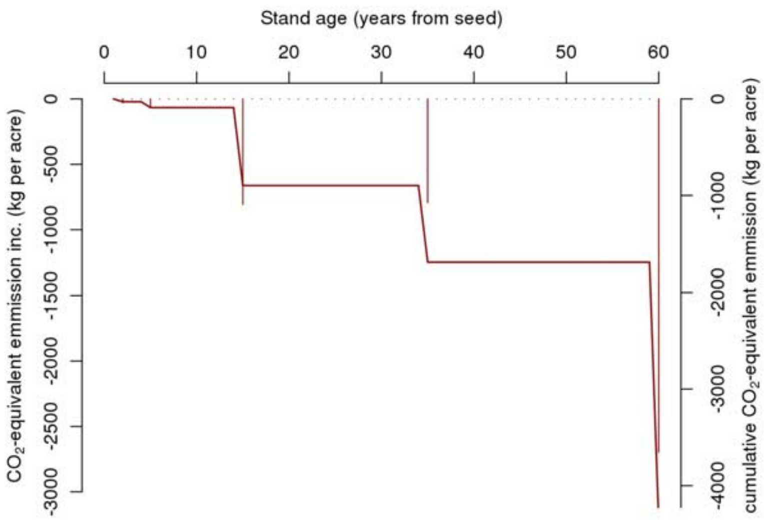


Figure 7 combines Figure 5-6 using only the combined GHG totals.

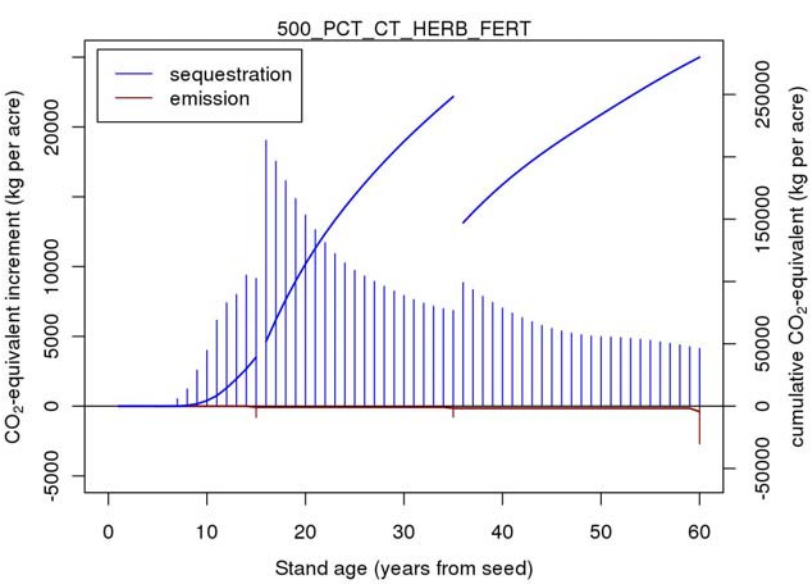
Figure 7. Total and incremental emissions from regime #9, kg/ac.



CO_2 Balance

Figure 8 combines Figures 4 and 7 to show the total and annual increment amounts of GHG emissions and sequestration. Note that the scale in Figure 4 for biomass and sequestration is much greater than the scale for GHG emissions in Figure 7. It is easy to see that the GHG emissions (negative scale) are extremely small compared to the CO_2 equivalent sequestration. The net CO_2 balance (not shown) combines the annual emissions and emissions and sums them to get the cumulative effect. Because emissions are so small the visual change from Figure 7 to the net balance is hardly noticeable.

Figure 8. CO_2 storage (positive, left axis) and emissions (negative, right axix) of regime #9, kg/ac.



Comparing alternative management regimes

In this section we compare the carbon stored by the 17 management regimes in Table 2 and answer the question "Do Choices of growth model and biomass equation matter?". Note that this section only shows the atmospheric CO_2 taken up by the ABG of the trees; the CO_2 equivalent of GHG emissions is not subtracted to yield the net CO_2 balance because the GHG emissions are so small compared to the sequestration in ABG that the effect in the figures is hardly noticeable.

Figure 9 shows growth model differences for Table 3 regime # 2. Choice of growth model has a very large effect on the results. The disparity in QMD growth appears to be a primary cause of volume and SDI differences. Differences in mortality between the models are large for the regimes with greater density, which in turn has a large effect on diameter and volume growth predictions. The green and blue lines match for first 15 years because both FVS-PN_{15-60} and ORGANON-SMC_{15-60} use $CONIFERS_{5-15}$ for early growth. The red line is based on FVS-PN_{5-60}.

Figure 9. Growth model predictions regime # 2 characteristics.

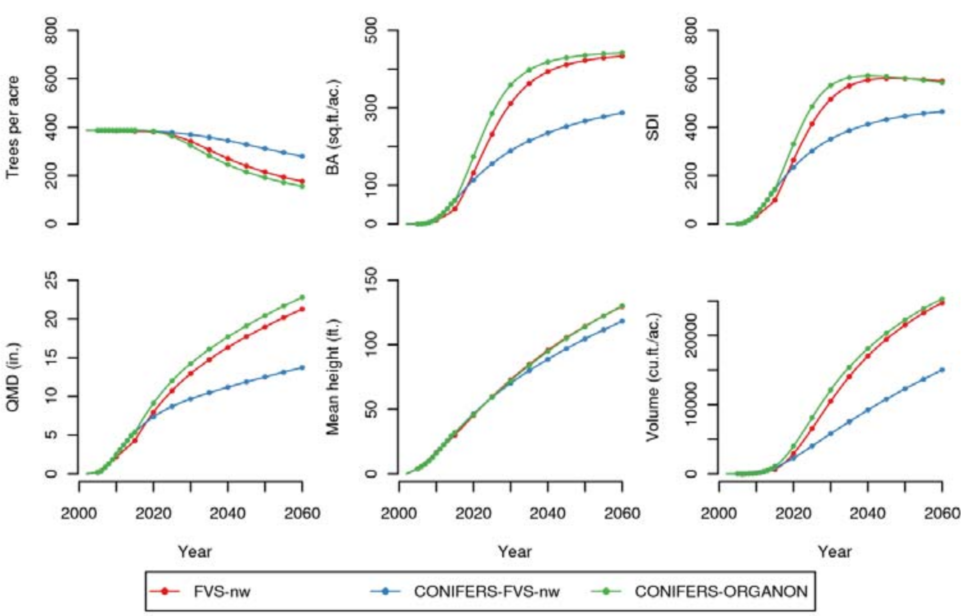


Figure 10 shows the difference in total carbon stored in ABG biomass over time for the same regime. The predictions by FVS-PN are nearly 100% larger than that for ORGANON. Figure 10 also shows the differences attributed to the choice of biomass equation which is relatively small compared to the effect of growth model choice.

Figure 10. Cumulative CO_2 storage differences between biomass equations and growth models for regime #2.

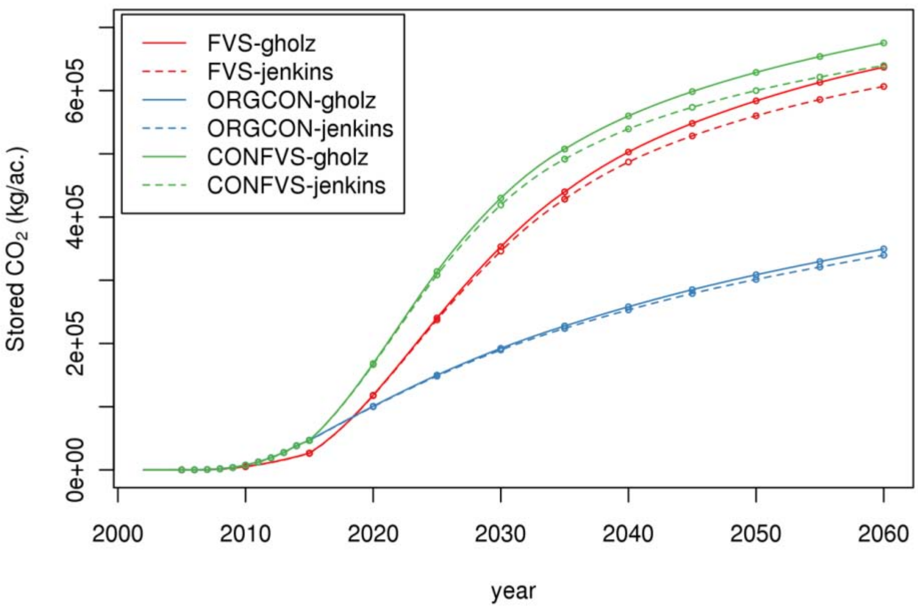
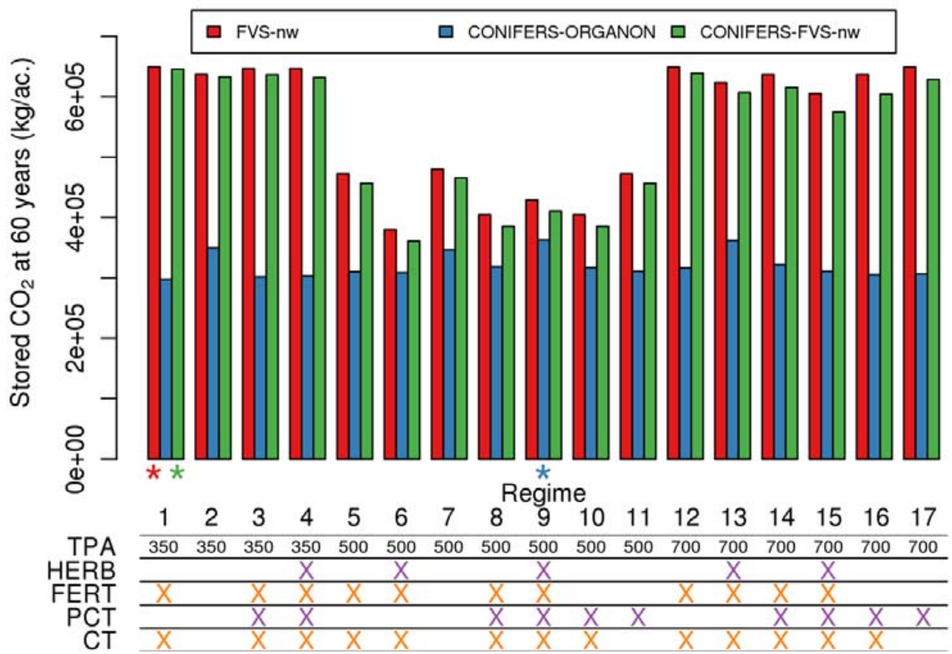


Figure 11 is a bar graph summarizing the CO_2 storage by AGB for all 17 60-year rotation regimes. Management activities of these regimes are indicated at the bottom. Of note are the differences between models as to which regime has the greatest CO_2 storage. Stars below the regime 1 and regime 6 bars indicate the regimes with largest CO_2 storage for each model. For $CONIFERS_{5-15}$ ➔ $FVS\text{-}PN_{15-60}$ and $FVS\text{-}PN_{5-60}$ regime # 1 produced the highest storage while regime #9 produced the highest storage for $CONIFERS_{5-15}$ ➔ $ORGANON\text{-}SMC_{15-60}$. It is also apparent that there are multiple regimes for each model that produce similar results suggesting that managers may have some flexibility in their choices; more research is needed in this area, as is the need to examine comparisons among regimes with different rotation ages. For example, how do 40 vs 50-year management regimes compare? To accomplish this one must "normalize". In other words, one must compare 4 cycles of 50 years to 5 cycles of 40 years so one has a common termination time. We will examine this issue in a future issue.

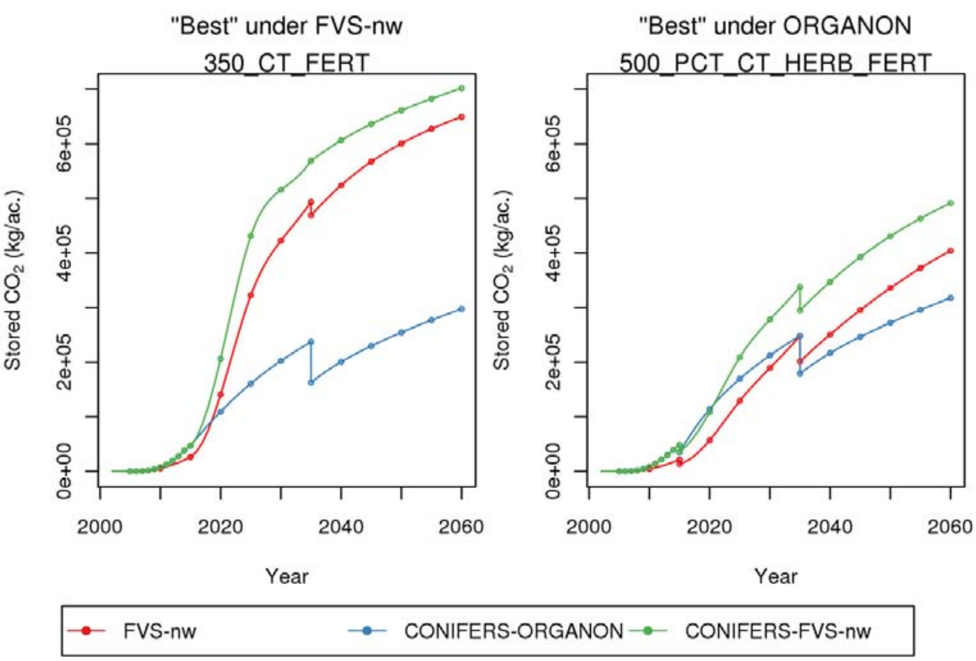
CONIFERS$_{5-15}$ → ORGANON-SMC$_{15-60}$ has the highest balance in 500 TPA regimes, while CONIFERS$_{5-15}$ → FVS-PN$_{15-60}$ and FVS-PN$_{5-60}$ produced the highest balance in 350 and 700 TPA regimes. Further research is needed to understand factors that underlie these differences between growth models.

Figure 11. CO_2 stored by AGB and GHG emissions 17 60-year-from-seed rotation regimes by model and planting density.



Regimes #1 and #9 with stars are plotted in Figure 12 to give more detail. It is interesting to note that, for the second half of the growing period of regime #9 with 500 trees/acre, the difference between ORGANON-$SMC_{15\text{-}60}$ and $FVS\text{-}PN_{5\text{-}60}$ is smaller than that between $FVS\text{-}PN_{5\text{-}60}$ and $CONIFERS_{5\text{-}15}$ ➔$FVS\text{-}PN_{15\text{-}6}$. In contrast the differences are much greater for regime # 3 with 300 trees/acre.

Figure 12. Regime #1 (left) and #9 (right) CO_2 storage.



The large differences due to choice of growth model are consistent with previous comparisons. The Growth Model Users Group performed a growth model runoff (Johnson, 2002). ORGANON-SMC and FVS-NW were found to be quite different in prediction. Marshall (2005) found similar results.

Refernces

Dixon, Gary E. comp 2002. Essential FVS: A user's guide to the Forest Vegetation Simulator. Internal Report Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Forest Management Service Center. 194 p. (last revised: March 2004).

Gholz, H.L., C.C. Grier, A.G. Campbell and A.T. Brown. 1979. Equations for estimating biomass and leaf area of plants in the Pacific Northwest. Research Paper 41. Forest Research Lab. Oregon State University, Corvallis, OR.

Hamann Jeff, Martin Ritchie, and the R Core team (2010). *rconifers: Alternative Interface to the CONIFERS Forest Growth Model.* R package version 1.0.1. Available at http://cran.case.edu/web/packages/rconifers/rconifers.pdf

Hann, David W. (2005). *Organon user's manual edition 8.0*. Oregon State Univ. College of Forestry, Corvallis, OR 129 p.

Jenkins, J.C., D.C. Chojnacky, L.S. Heath, R.A. Birdsey. 2004. Comprehensive database of diameter-based biomass regressions for North American tree species. Gen. Tech. Rep. NE 319. USDA ForestService, Northeastern Research Station. Newtown Square, PA. 45p.

Johnson, Greg (2002). Growth Model Runoff. PowerPoint presentation at Growth Model Users Group on January 22, 2002 available at http://www.growthmodel.org/ papers/modelrunoff.ppt

Keyser, Chad E., comp. (2008, revised July 29, 2010). *Pacific Northwest Coast (PN) Variant Overview – Forest Vegetation Simulator*. Internal Rep. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Forest Management Service Center. 49p.

King J. E. (1966). *Site index curves for Douglas-fir in the Pacific Northwest.* Weyerhaeuser Forestry Paper number 8. 49p.

Lippke, B., J. Wilson, J. Perez-Garcia, J. Bowyer, J. Meil. 2004. CORRIM: Life-cycle environmental performance of renewable building materials. For. Prod. J. 54(6):8-16

Marshall, David D (2005). *Modeling Douglas-fir Growth and Yield in the Pacific Northwest.* In proceedings: "Managing Stand Density: The Science Behind the Art" March 16, 2005 at the Seven Feathers Convention center, Canyonville, Oregon

Ritchie, Martin W. (2006). *User's Guide and Help System for CONIFERS: A Simulator for Young Mixed-Conifer Stands Version 3.00*. Pacific Southwest Research Station, US Forest Service, Redding, CA.

R Development Core Team. 2007. R: A language and environment for statistical computing, version 2.6.1. R Foundation for statistical Computing, Vienna.

Sonne Hall, Edie. 2005. Greenhouse Gas Emissions from Pacific Northwest Forestry Operations: Implications for Forest Management. PhD Dissertation, College of Forest Resources, University of Washington, Seattle, WA. 154pp.

Sonne, Edie (2005). *Greenhouse Gas Emissions from Forestry Operations: A Life Cycle Assessment*. Journal of Environmental Quality, 35(4):1439-1450.

Abstracts and Publications

Warren D. Devine and Timothy B. Harrington. Natural regeneration in thinned Douglas-fir stands: Belowground competition influences sapling growth and morphology. USFS PNWRS, Genetic and Silvicultural Foundations for Management.

http://www.fs.fed.us/pnw/olympia/silv/selected-studies/ftlewis/flregen.shtml

Regenerating Douglas-fir in multi-aged stands

The recent emphasis on managing Pacific Northwest Douglas-fir forests for multiple objectives, including wildlife habitat and old-forest aesthetics, has created a renewed interest in managing stands with trees of multiple age classes. While some types of commercial thinning in even-aged second-growth Douglas-fir forests can produce characteristics of uneven-aged stand structure, long-term development of multiple cohorts requires successful establishment and continued growth of conifer regeneration. It is well documented that growth and survival of Douglas-fir regeneration in the understory require at least a moderate amount of sunlight (40% or more full sun). However, belowground resources (soil water and nutrients) also are vital to success of this regeneration, and belowground competition from overstory trees and understory vegetation in multi-aged stands are not well understood. This study was designed to learn how these types of root competition affect Douglas-fir regeneration.

Van R. Kane, Robert J. McGaughey, Jonathan D. Bakker, Rolf F. Gersonde, James A. Lutz, and Jerry F. Franklin. Comparisons between field- and LiDAR-based measures of stand structural complexity. Can. J. For. Res. 40(4): 761–773 (2010). Published by NRC Research Press.

Abstract

Forest structure, as measured by the physical arrangement of trees and their crowns, is a fundamental attribute of forest ecosystems that changes as forests progress through suc;cessional stages. We examined whether LiDAR data could be used to directly assess the successional stage of forests by determining the degree to which the LiDAR data would show the same relative ranking of structural development among sites as would traditional field measurements. We sampled 94 primary and secondary sites (19–93, 223–350, and 600 years old) from three conifer forest zones in western Washington state, USA, in the field and with small-footprint, discrete return LiDAR. Seven sets of LiDAR metrics were tested to measure canopy structure. Ordinations using the of LiDAR 95th percentile height, rumple, and canopy density metrics had the strongest correlations with ordinations using two sets of field metrics (Procrustes R = 0.72 and 0.78) and a combined set of LiDAR and field metrics (Procrustes R = 0.95). These results suggest that LiDAR can accurately characterize forest successional stage where field measurements are not available. This has important implications for enabling basic and applied studies of forest structure at stand to landscape scales.

Abstracts and Publications cont.

L.E. de Montigny and G.D. Nigh. Silviculture treatments for ecosystem management in the Sayward (STEMS): establishment report for STEMS 2, Elk Bay. Forest Science Program Technical Report 049, 2009. http://www.for.gov.bc.ca/HFD/Pubs/Docs/Tr/Tr049.htm

Abstract

Knots on digital images of 51 full veneer sheets, obtained from nine peeler blocks crosscut from two 35-foot (10.7m) long logs and one 18-foot (5.5m) log from a single Douglas-fir tree, were detected using a two-phase algorithm. The algorithm was developed using one image, the Development Sheet, refined on five other images, the Training Sheets, and then applied to all remaining sheets. In phase one, global thresholding was used to segment the image through a series of morphological operations to isolate regions likely to contain knots. In phase two, adaptive thresholding was applied to grey scale and red component segmented images to improve the accuracy of the segmented knot. Overall performance, judged in terms of confusion matrix performance metrics, was better for the red component images. Red component recall (true positive) rate was 1.00, 0.99, and 0.96 for the Development, Training, and complete sets, respectively. For the grey scale images, recall rates were 0.96 for all sets. Red component accuracy was 0.76, 0.92, 0.73 (Development, Training, and complete) and those for the grey scale images were 0.71, 0.85, and 0.69, respectively. Red component precision also exceeded that of the grey scale (0.75, 0.93, 0.73 compared to 0.72, 0.88, 0.70). A greater percentage of knots (78%) segmented from red component images were correctly sized, while 16% had more pixels than required and 6% had fewer pixels. Comparative figures for the grey scale images were 57% correctly sized, 2% with more pixels, and 42% with less pixels. Based on our results, we will adopt the red component image for continuing work with digital veneer images from a sample of Douglas-fir trees selected on the basis of acoustic velocity measures. Together with acoustic measurements of the veneer sheets, we are investigating the extent that the number, size, and spatial arrangement of knots influences the average stiffness of veneer sheets, with a view to determining if a relationship exists between the average stiffness of veneer sheets in a peeler block, stiffness of the log, and stiffness of the parent tree from a range of silvicultural treatments.

Abstracts and Publications cont.

Mathieu Fortin and Josianne DeBlois. A statistical estimator to propagate height prediction errors into a general volume model. Can. J. For. Res. 40(10): 1930–1939 (2010).

Abstract
In most large-scale inventories, volume models rely on predicted heights instead of measured heights. The effect of height predictions over volume estimate uncertainty is therefore a crucial issue. In this study, we designed a statistical estimator that enables the propagation of tree height prediction errors into a general volume model. The proposed estimator relies on the assumption that both the volume model and the height–diameter model that provides the height predictions do not exhibit any lack of fit. This estimator was tested against a Monte Carlo simulation for 90 plots from three typical forest types in Quebec, Canada (hardwood, mixedwood, and softwood). The results show that the estimator provides plot volume predictions with error variances that fit those estimated using the Monte Carlo simulation. The estimator developed in this study may be useful to quickly provide the uncertainty associated with plot volume predictions in large-scale inventories.

Curtis, Robert. Effect of diameter limits and stand structure on relative density indices: A case study. Western Journal of Applied Forestry, Volume 25, Number 4, October 2010 , pp. 169-175(7).

Abstract
An understory of shade-tolerant species often develops in stands in the Douglas-fir region of western Washington and Oregon and can have a disproportionate effect on relative density indices, such as Reineke stand density index and Curtis relative density. The effects of such understories and of other departures from the even-aged condition are illustrated with selected stand data. In general, the summation methods are less influenced by departures from the even-aged condition than are the conventional calculations based on quadratic mean diameter. Recommendations are made for consistent definition of the lower diameter limit of trees to be included in such computations

Upcoming Meetings and Events

November 17, 2010, Operational Management of Swiss Needle Cast in Douglas-fir, Wellspring Conference Center, Woodburn, OR. http://www.westernforestry.org/swissneedlecast/swissneedlecast.pdf

October 27-31, 2010, Society of American Foresters National Convention, Albuquerque, New Mexico. http://www.safconvention.org/natcon10/program/onsite_program.pdf

February 15, 2011, Intensive Silvicultue of Planted Douglas-fir Forests, Doubletree Hotel, Lloyd Center, Portland, Oregon. Sponsored by Center for Intensive Planted-forest Silviculture (CIPS) and the Western Forestry and Conservation Association (WFCA).

April 19-20, 2011, SMC Spring Meeting, Location TBA.

June 13-16, 2011, NSF Center for Advanced Forest Systems Meeting, Seattle, WA. Locatation TBA.

September 20-21, 2011, SMC Fall Meeting. Location TBA

Stand Management Cooperative, School of Forest Resources
University of Washington, Box 352100 Seattle, WA 98195

STAND MANAGEMENT COOPERATIVE
Continuing Projects

Voted #1

PROJECT TITLE: **Growth and Yield Performance of SMC Type I, II, and III Installations E. Turnblom**
PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s) The objectives are (1) to summarize of how growth and yield of these suites of installations has been developing in response to the treatment regimes and (2) proved the results in Levels of Growing Stock style reports and web-based calculator form that are useful for practicing forest managers.
EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? Statistical analyses to produce equations portraying growth and yield trajectories of regimes imposed on Type I, II and III installations. Data to accomplish this is in the SMC database. No field work is needed.
EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced? A LOGS style report for each suite, accompanying summary fact sheets, and an on-line calculator tool.
BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members? Presently, other than using a growth model that has equations based on the SMC database, there are no straightforward performance summaries of management regimes that practicing managers can use. This project will fill this gap with printed summaries and a web based tool that users can use to customize summaries to their needs.
6, INVESTIGATOR(S): Who would likely conduct the study? Silviculture project leader and TAC guiding graduate student(s)
PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <= 2 years Analysis and overall performance report fit within the framework of a 2-year program for a Master of Science degree. Work began in Fall 2009 and will likely be completed by Fall 2011. Fact sheet summaries and on-line calculator development may require additional time.
PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources {both internal (i.e. SMC funds) and external (ex. grants} 3 students have been (Kevin Ceder, Nai Saetern, Kevin Zobrist) supported by a mix of UW TA, scholarship, and Corkery Family Foundation Chair funds. Will need one year of RA support ($32,000) to finish analyses and reports and develop web based calculator tool.

STAND MANAGEMENT COOPERATIVE
Continuing Projects

Voted #2

PROJECT TITLE: **2010 SMC Owner Survey** **D. Briggs, D. Maguire**
PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s) SMC has conducted 6 surveys of west-side industrial management practices and is due to conduct another for 2010. WFPA conducted a similar survey for both western and eastern Washington in 2006/07. Discussions are underway to broaden the scope to gather data on industrial and non-industrial private management practices for both eastern and western Oregon and Washington. **Objectives** (1) Form a study team of Oregon and Washington representatives to review and consolidate, east-side and west-side survey versions, (2) expand scope to include East side and nonindustrial private forest land owners, (3) create on-line surveys for easier administration and data acquisition, (4) develop a integrated database of 2010 and previous surveys, (6) analyze 2010 responses, producing reports for the east side and west side similar to previous SMC Working Papers, (7) analyze the integrated database of the 2010 and prior surveys to assess changes, trends, and directions of private sector silviculture.
EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? Survey questionnaires (east side, west side versions) will be designed and placed on the web for online data collection. Email contact lists of private forestland owners will be obtained and consolidated from extension, trade associations, and forestry cooperatives. A database of responses will be created. Analysis will consist of simple summary statistics and trend analysis.
EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced? 1. An integrated database of all surveys to support further analyses. 2. Summary reports of the 2010 survey for east side and west side regions. (WJAF?) 3. A historical trend analysis report combing data from the 2010 and prior surveys. (WJAF of JF?
BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members? Prior surveys are among the most heavily used SMC. It is useful to personnel of member organizations and by a variety of others as a benchmark and a source of information in public policy and other analyses. It is good visibility and PR.
6, INVESTIGATOR(S): Who would likely conduct the study? A Masters student with guidance from Briggs/Maguire and the study team
PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <= 2 years • Sept 10-Mar 11 ➔ develop and test on-online survey questionnaire. Design integrated database • Apr 11-Jun 11 ➔ administer questionnaire • July 11 ➔ complete integrated database (deliverable # 1) • Aug 11-Dec11 ➔ analyze 2010 responses and develop deliverable # 2 • Jan 12-June 12 ➔ analyze all surveys and develop deliverable #3
PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources {both internal (i.e. SMC funds) and external (ex. grants} • SMC Database manager 2 mo, $10,000 (in-kind) • 1 RA @ $32,000/yr x 2 yrs = $64,000 (perhaps 50% funding will be via TA, Corkery Chair, scholarship/fellowship; remaining 50% SMC and other external RA funding

STAND MANAGEMENT COOPERATIVE
Continuing Projects

Voted #3

PROJECT TITLE: Response of Wood Quality Parameters to Stand Density Regime and Nitrogen Fertilization **E. Lowell**
PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s) The proposed work involves characterizing wood quality attributes of annual layers of wood in a simulation-modeling context. Material will be destructively sampled from the double buffer on Stand Management Cooperative Type I installations to supplement existing data for the proposed modeling.
EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? The objectives of this project are: (1) To test the effect of stand density regime and nitrogen fertilization on branch size and distribution, ring width, tree and log acoustic velocity, latewood/early wood proportion, latewood and early wood density; (2) To quantify the effect of stand density regime and nitrogen fertilization on these wood quality attributes; (3) To develop dynamic predictive models for characterizing the three-dimensional gradients in wood attributes within tree boles and logs. Additional data needed include some branch and stem wood disk analysis from trees in the Type I buffer. Tree and log acoustic velocity and resistograph measurements would be helpful to establish links between these measurements and wood quality.
EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced? (1) predictive models for wood quality attributes in response to silvicultural treatments; (2) a report documenting both response of wood quality attributes to silvicultural regime and models for predicting this response; (3) an ACCESS database of wood quality attributes from trees grown under various SMC silvicultural regimes; and (4) a "post-processor" to summarize and synthesize data from the ORGANON wood quality output file.
BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members? A conceptual framework and computer model for simulating the response of wood quality parameters to intensive silvicultural practices in Douglas-fir plantations will aid SMC members in making land management decisions.
NVESTIGATOR(S): Who would likely conduct the study? Doug Maguire (CIPS-OSU), Barb Lachenbruch (OSU), Eini Lowell (PNW), Dave Marshall (Weyerhaeuser), David Hann (OSU), Dave Briggs (SMC-UW), Eric Turnblom (SMC-UW)
PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <= 2 years Data collection, analysis and modeling fit within the framework of a 2-year program for a Master of Science degree.
PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources both internal (i.e. SMC funds) and external (ex. Grants) One graduate student or faculty research assistant could complete this work. The project would require $32,000/year for 2 years = $64,000 total In kind personnel (Doug Maguire (CIPS) 10%, Doug Mainwaring (CIPS) 5% , Eini Lowell 10%, Barb Lachenbruch 5%, SMC field crew assistance, and SMC Type I installation owners)

Tied for #4

PROJECT TITLE: Effect of Management Regimes of SMC Type I, II, and III Installations on Wood Quality: Knots **D. Briggs**
PROJECT DESCRIPTION: Fahey et al (1991) found that the largest limb average diameter (LLAD) log quality index is a good predictor of the grade mix of lumber or veneer. Briggs et al. (2005) and Briggs & Ingaramo (2007) and found good relationships between LLAD and the diameter of the largest limb in the breast-height region (DLLBH). Briggs et al.(2008, 2010 accepted) related DLLBH to tree, stand, and treatment variables These publications used a single measurement of DLLBH on 9 Type I Installations that have 3 pairs of matched thinning and thinning with fertilization plots. SMC Type I and III have had 40 trees measured for DLLBH every 4 years since 1998.. **Objectives** (1) To use the repeatedly collected DLLBH data to develop dynamic models to predict how DLLBH is affected by time (age), tree, stand, and treatment variables. (2) To extend the modeling to additional Type I installations and to Type III installations. (3) To provide the results in a report, fact sheets, and web-based calculator allowing a manger to trace the effect of a regime along the value chain from tree to product. Explore opportunities to integrate with SMC-ORGANON.
EXPERIMENTAL PLAN: Statistical analyses to produce equations portraying how DLLBH, develops over time as affected by tree, stand, and treatment variables. Repeated measurements of DLLBH on the SMC installations have been taken since 1998 and provide the basis for developing dynamic models of DLLBH under the various treatment regimes. Data to accomplish this is already in the SMC database. Some supplemental field work may be needed to expand the dataset for relating DLLBH and LLAD.
EXPECTED DELIVERABLE(S): • A report on model(s) to predict how DLLBH responds over time (tree age) to the treatment regimes, • Expansion of data and models for predicting LLAD from DLLBH. • Link the DLLBH response model, LLAD_DLLBH model, and Fahey et al recovery equations as a online calculator tool and develop linkage to SMC ORGANON.
BENEFITS TO SMC MEMBERS: The repeated measurement of DLLBH on the SMC Installations has been ongoing for 12 years. The only analysis to date used one set of DLLBH measurements on the 9 Type I installations that include fertilized plots. DLLBH data collection in Type I installations in 1998. By then most branches in the BH region were dead. Many Type III installations had the base of the live crown below BH which provides the opportunity to examine the dynamics from live to dead status type III isntallationsNo work has been done on other installations or using the repeated measurements to model the change dynamics of DLLBH. The models developed will give managers a better idea of how their management regimes affect quality at the tree, butt log, and product level. These products will allow a manger to assess the effect of management regimes on tree, log, and product quality and use process capability analysis to assess the degree of conformance of stands to a user defined log quality specification
6, INVESTIGATOR(S): Graduate student guided by Wood Quality, Silviculture and Modeling TAC
PROJECT TIMELINE & DELIVERY DATES: Analysis and report on the models for predicting DLLBH as a function of time, tree, stand, and treatment variables and linkage to the Fahey et al study fits within the framework of a 2-year program for a Master of Science degree. Development of web-based calculator tools and growth model linkage would be follow-up steps.
PROJECT BUDGET & SOURCES OF FUNDING: MS student at $32.000/year for 2 years or $64,000 total.

STAND MANAGEMENT COOPERATIVE
Continuing Projects

Tied for #4

PROJECT TITLE: Development of Models and Software to Predict Changes in the Young Stand Systems. E. Turnblom
PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s) Our objectives are: (1) to expand our work on a set of dynamic understory vegetation cover models for young stands to include trees allowing a model of the entire young forest system; (2) examine interaction between trees and vegetation and support 2-way feedback between trees and vegetation; (3) include models of mean understory vegetation height to allow calculation of vegetation biomass; and (4) develop software to allow easy use of the models by forest managers and analysts.
EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? Data needed are in the SMC database so no field work is needed. Statistical analyses and optimization will be used to parameterize the set of dynamic models. A framework is in place from our current work that will provide the starting point for analysis and model parameterization.
EXPECTED DELIVERABLE(S): (what products, models, tools are needed by users of the results?) Deliverables will include: (1) a report detailing the resulting models; (2) manuscript(s) for journal submission; and (3) modeling software with documentation.
POTENTIAL SMC MEMBER BENEFITS: (how will the deliverables help SMC members?) With increased interest in sustainable forest management, including biodiversity and wildlife habitat, results from this will leverage the ongoing data collection efforts to provide managers with tools to explain the effect of forest management on young stands and the benefits being provided for biodiversity and habitat. A dynamic modeling framework brings a modeling paradigm used in other complicated biological systems to young stands modeling to provide information about the development of young stands when all the vegetation groups are modeled together as a system. Including the models in software will give forest managers and planners an easy to use tool to predict growth and change in young forests and explain results of proposed management.
INVESTIGATOR(S): (identify who might comprise the study team) PhD student Kevin Ceder supervised by Eric Turnblom Dave Briggs, Dave Marshall
PROJECT TIMELINE WITH MILESTONES: (preferably projects should be completed in 2 years or less) Analysis, model formulation and parameterization, software development and reporting will be completed in 1.5 years. The system of dynamic models will be completed at the end of the first year followed by software development and documentation and reporting during the last six months.
PROJECT BUDGET & SOURCES OF FUNDING (identify total funding resources both internal (i.e. SMC funds) and external (ex. grants) Total funding for the 1.5 years is $45,000. Current funding includes $6,733 from McIntire-Stennis (2010-11) and builds from $120,743 of funding from NCASI Western Wildlife Program (2006-2010).

STAND MANAGEMENT COOPERATIVE
Continuing Projects

Tied for #4

1. PROJECT TITLE: Develop Methodology for Relating Height growth of Young Stands to Site Index and Future Yields. Sean Garber
2. **PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s)** There is a need to estimate site index for younger stands where current site index equations are in appropriate and predict yield in younger stands (e.g., for making tree selections in progeny). The objectives of this study would be to relate early stand height and height growth to stand site index and future (rotation) yields.
3. EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? Related via regression yields later in rotation and inferred site index to height and height growth at early ages (~10 to 15 years old total age) of all or any subset of dominant trees. Data from the Type I and III's are available (could possibly use RFNRP Phase II and III data as well). No data collection required.
4. **EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced?** Equations describing yield and site index from early stand height and height growth variables. Methodology for using equations in tree selection (e.g., in progeny trials at ages 10 to 15) and predicting site index.
5. BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members? Predicting of site quality in young stands. Aid in tree improvement selection process.
6, INVESTIGATOR(S): Who would likely conduct the study? Graduate student, Silviculture and Modeling TAC input.
6. PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <=2 years Data assemble in one quarter, analysis completed in one quarter, and final models and example use presented at SMC meeting and SMC technical report.
7. **PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources {both internal (i.e. SMC funds) and external (ex. grants}** Two quarters of graduate student support. = $16,000

Voted #5

PROJECT TITLE: Evaluating Site and Climatic Factors in a Management-Oriented, Dynamical Forest System Model. **E. Turnblom**

PROJECT DESCRIPTION: (define the project, why it is important to members, objective(s)

This project seeks better understanding of the mechanisms behind site productivity and how it drives forest growth and stand dynamics. During the development of the SMC *TreeLab* whole-stand model for young Douglas-fir forests (Pittman and Turnblom 2003), it was found that *site index* was marginally significant in making stand dynamics predictions after accounting for certain stand and tree allometries (e.g., relationships between height, DBH, and basal area) already built into the model framework. Few resources were available at that time to explore other site productivity drivers. The objective of this study is to explore the sensitivity of a dynamical forest system model to other site parameters such as weather and climate variables (e.g., precipitation, temperature), soil parameters (e.g., effective rooting depth, depth of A horizon, texture), their interactions (e.g., moisture holding capacity, drought indexes), and other Hydro-Geomorphic attributes.

EXPERIMENTAL PLAN: (what field work (if any), data, and analyses are required to meet objectives) Available databases (SMC, NRCS, PRISM, WRCC, etc.) will be used extensively, so no field work is anticipated. The SMC data used to fit the *TreeLab* model (Silviculture Project Type I, II, and RFNRP Phase II, III installations) will be revisited for this project. Standard model sensitivity analysis procedures will be used to identify potential site characteristics that account for variation beyond what site index seemed capable of explaining. When candidate site characteristics are identified, further statistical analyses focusing on optimization will be used to identify and parameterize an expanded set of dynamic models contained in the *TreeLab* framework.

EXPECTED DELIVERABLE(S): (what products, models, tools are needed by users of the results?) Deliverables include 1) reports and publications to disseminate the relevant findings, 2) updated *TreeLab* dynamical model equations, and 3) upgraded *TreeLab* software, downloadable from the SMC website.

POTENTIAL SMC MEMBER BENEFITS: (how will the deliverables help SMC members?)

Deliverables will provide increased understanding of the total growing environment in terms of weather, climate, and productivity. An upgraded *TreeLab* model will provide better ability to predict Douglas-fir plantation growth and yield at the stand level, providing insight into potentially fruitful pathways for research aimed at closing the knowledge gaps regarding these important relationships.

INVESTIGATOR(S): (identify who might comprise the study team)

Silviculture, Nutrition Project Leaders Turnblom, Harrison, Director Briggs, graduate student.

PROJECT TIMELINE WITH MILESTONES: (preferably projects should be completed in 2 years or less) Total project duration is 1.5 years. First quarter: query, download, clean and format data for analyses. Second quarter: explore relationships between alternate site characteristics and *TreeLab* model predictions through sensitivity analysis, report progress. Third quarter: begin identifying (re-optimizing) *TreeLab* parameters to fold in new site characterization measures; may involve adding new dynamical equations to the model. Fourth quarter: finalize model identification; begin upgrading software, report progress. Fifth quarter finalize software upgrades, software testing, begin writing reports. Sixth quarter: finish report writing, publish.

PROJECT BUDGET & SOURCES OF FUNDING: (identify total funding resources both internal (i.e. SMC funds) and external (ex. grants)

$60,000 required. TA-ships would cover $20,000. SMC would provide $40,000.

STAND MANAGEMENT COOPERATIVE
Continuing Projects

Voted #6

PROJECT TITLE: **Canopy Characterization of SMC Type V studies** **R. Harrison**
PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s) The objectives are (1) to test high-resolution aerial photography, combined with new software, as a means of characterizing paired-tree and neighbor tree crown attributes and their responses to fertilization.
EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? We would use the methods and software of Dr. Rich Grotefendt, which includes very high-resolution stereo photography as a means to characterize tree crowns. Data for the SMC Type V studies is not available, so field work would be required.
EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced? If successful, this pilot study should allow us a path to adding some crown characterization data and neighbor-tree locations to our current study.
BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members? Crown response should be a precursor to stem response, and we aren't currently studying it in our work. This should strengthen our ability to understand responses to N fertilization coupled with the other factors already being measured.
6, INVESTIGATOR(S): Who would likely conduct the study? Nutrition, Silviculture and Wood quality project leaders, Dr. Rich Grotefendt, and two graduate students to be supported from other funding.
PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <= 2 years Initial photo data could potentially be acquired within months of funding. Analysis and interpretation will take more time.
PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources {both internal (i.e. SMC funds) and external (ex. grants} Approximately $16,000 would be required to run a pilot study. Additional funding to be determined would be required for Dr. Grotefendt's time to process data and train students in the use of equipment and further interpretations.

STAND MANAGEMENT COOPERATIVE
Continuing Projects

Voted #7

1. PROJECT TITLE: Develop a Model that Predicts Wood Density, Acoustic Velocity, and Modulus of Elasticity Longitudinally and Radially in the Stem from Common Inventory Data Sean Garber

2. **PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s)** The purpose of the study will be to build models to predict wood density and acoustic velocity which can be combined to predict MOE at any point in the stem from variables collected during inventory. The objectives will be (1) refit wood density models with additional data from Type II's and (2) build equation that described MOE throughout stem from Type II data.

3. EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? Wood density models have been produced but will benefit from a refit using data from the X-ray densitometry data from the Type II's. Use Type II data (others if available) to fit stem acoustic/MOE equations. No field work required.

4. **EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced?** Equations describing wood density, acoustic velocity, and MOE at any point in the stem. Methodology for using equations in existing merchandizes and growth models.

5. BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members? Have models that can be used with inventory software and merchandiser for predicting wood density and stiffness.

6, INVESTIGATOR(S): Who would likely conduct the study? Graduate student, Wood Quality TAC input.

6. PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <=2 years Data assemble in one quarter, analysis completed in two quarters, and final models presented and example program built in one quarter.

7. **PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources {both internal (i.e. SMC funds) and external (ex. grants}** Four quarters of graduate student support.($32,000)

STAND MANAGEMENT COOPERATIVE
New Projects

0 Votes

PROJECT TITLE:
Assessing Vegetation Response to Herbicide Application in GGTIV Installation E. Turnblom

PROJECT DESCRIPTION:
(define the project, why it is important to members, objective(s)

Control of competing vegetation with herbicides is a common practice to minimize its interference with trees giving trees maximal growing space. Vegetation community composition and timing of herbicide application may impact the level of vegetation control. The GGTIV installations were designed with vegetation control (herbicide application or not) with repeat measurements of competing vegetation. While reducing competing vegetation may increase tree growth there are impacts on habitat and biodiversity. Understanding these impacts will help managers assess and explain how vegetation control in young stand impacts sustainable forest management.

EXPERIMENTAL PLAN:
(what field work (if any), data, and analyses are required to meet objectives

Herbicide application information and vegetation cover data have been collected on the GGTIV installations and provide much of the needed data. No data were collected prior to harvest of the previous stand. To understand what the vegetation community prior to harvest was data will be collected in neighboring stands that have not been harvested. From these data assessments of vegetation control effectiveness (reduction in cover with herbicide application relative to no application) and if different vegetation species have different responses to the herbicide applications.

EXPECTED DELIVERABLE(S):
(what products, models, tools are needed by users of the results?)

A report summarizing the effectiveness of vegetation control in young stands and associated fact sheets will be produced.

POTENTIAL SMC MEMBER BENEFITS:
(how will the deliverables help SMC members?)

Vegetation control reduces understory vegetation in young stands but the full array of actual impacts may not be known. Our results will help explain what the impacts of vegetation control are on biodiversity and habitat in young stands and the impacts on sustainable forest management.

INVESTIGATOR(S):
(identify who might comprise the study team)

PhD student Kevin Ceder supervised by Eric Turnblom and Dave Briggs.

PROJECT TIMELINE WITH MILESTONES:
(preferably projects should be completed in 2 years or less)

Collecting vegetation data from neighboring stands will take no more than two weeks during the summer with the analysis and reporting being completed within six months.

PROJECT BUDGET & SOURCES OF FUNDING
(identify total funding resources both internal (i.e. SMC funds) and external (ex. grants)

Two quarters of PhD support, some travel: $20,000

STAND MANAGEMENT COOPERATIVE
Continuing Projects

0 Votes

PROJECT TITLE:
Development of a Wood Quality Website **E. Lowell**

PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s)
A website on all things Douglas-fir wood quality will be designed. It will have a technical focus but written so that a broader audience would find it useful.

EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed?
This project would involve compilation and summarization of existing, available information. No field work is required.

EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced?
An easily accessible and user-friendly website is the final product. Technical information and links to available publications will be provided.

BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members?
This site will be readily available to SMC members and also contain links to SMC related materials. It could possibly interest prospective SMC members.

INVESTIGATOR(S): Who would likely conduct the study?
Barb Lachenbruch, Oregon State University, would serve as the advisor to a student seeking a Master's Degree in Wood Science.

PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <= 2 years
Project would be completed two years from the time an MS candidate starts program.

PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources {both internal (i.e. SMC funds) and external (ex. grants}
2 years at $32,000 per year in support of a Master's student (total=$64,000).

STAND MANAGEMENT COOPERATIVE
Continuing Projects

0 Votes

PROJECT TITLE: **Update Wood Quality Module for Inclusion in Individual Tree Models** **E. Lowell**
PROJECT DESCRIPTION: Briefly describe/define the project and state the objective(s) There is a need to take the current algorithms and make them more robust and easier to access from individual tree models such as ORGANON. Newer branch models can also be incorporated.
EXPERIMENTAL PLAN: What analysis approach will be needed to achieve each objective? Is the data readily available? Is field work needed? Data to accomplish this is in the SMC database. No field work is needed.
EXPECTED DELIVERABLE(S): What results, products, models, tools etc. will be produced? There is the potential to build a more realistic tree and develop a new WQ DLL that is easier to access. This would also provide a road map for future development of models as other wood quality data are collected and relationships built (e.g. acoustic testing).
BENEFITS TO SMC MEMBERS: How will the deliverables benefit SMC members? Updating WQ Module to build algorithms for dynamic sort would be of interest to industry members. It would be useful to develop the capability to produce an Excel or Access file instead.
INVESTIGATOR(S): Who would likely conduct the study? Modeling, silviculture and wood quality TACs would guide graduate student.
PROJECT TIMELINE & DELIVERY DATES: Note interest is in projects that can be completed in <= 2 years Analysis and overall performance report fit within the framework of a 2-year program for a Master of Science degree.
PROJECT BUDGET & SOURCES OF FUNDING: Identify budget and possible funding sources {both internal (i.e. SMC funds) and external (ex. grants} One graduate student could complete this work.2 years at $32,000/yr = $64,000