SMC Quarterly News

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Dave Briggs, SMC Director

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From the Director

Norm Andersen, now retired from the Washington DNR and former chair of the Policy Committee reminded me of 1969 – what do you remember of that year? Those of you under age 40 were not even born yet! The significance of that year to forestry in the PNW region is that 1969 marked the beginning of the Regional Forest Nutrition Research Project (RFNRP) which set up suites of installations to examine the potential response to fertilization treatments. The focus was primarily on natural second growth stands and plantations of Douglas-fir and western hemlock. Over time, questions arose concerning the broader issues of intensive management including the effects of planting density, intensive site preparation, competing vegetation control, thinning and pruning and the effect of regimes on wood quality and product value as well as growth and yield. These discussions led to the formation of the SMC in 1985 and the merger of RFNRP with SMC in 1991. They also led to the development of the original SMC-ORGANON in the 1990's, the subsequent update in 2006, and the NW variant of CONIFERS young stand model in 2008. Thus we have a 40-year legacy of generating data from field installations to support these efforts.

What is as amazing as this long-term commitment is the fact that any member can receive the complete 40-year database on a CD for their use. For those who can remember 1969, imagine the sheer physical size of this database if it were on the punched computer cards of that time! As we look into the future, we see information to improve models and understanding of the effects of management regimes of growth and yield, quality and value, and other forest services continuing to come from existing installations. We also see ongoing discussions as to how we can leverage more information from them. Through our strategic

planning process we have had discussions concerning how to develop installations and collaborations to examine new issues. Examples of success include the role of genetic improvement (e.g. the GGTIV installation collaboration with NWTIC), and improving our ability to predict on which sites will Douglas-fir respond to fertilization (the paired-tree trials of CIPS at OSU and SMC). As we head into the future, the process of continuous dialogue and strategic planning must be maintained so we ensure that our research programs and supporting installations are kept on track to address critical questions.

This issue contains the following

- A summary of minutes of the SMC Fall Meeting
- An update on work completed by the 08 field crew
- A status report on the paired-tree fertilization installations
- An article by Martin Ritchie on the adaptation of the CONIFERS model for young Douglas-fir
- Abstracts of several recent publications
- Upcoming Meetings and Events

At the Fall Meeting, a number of attendees were interested in more information concerning the mountain pine beetle epidemic in BC, Louise de Montigny suggest that you visit the following web site

http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/

1. SMC Fall Policy Committee Meeting

The fall 2008 meeting was held on September 16-17 at the Little Creek Casino Resort in Kamilche, WA. with 51 participants from 19 organizations. Policy Committee Chair Louise de Montigny opened the meeting, welcomed the attendees, and noted the work since the Spring meeting by the TAC's and Strategic Planning Committee to summarize progress on the Strategic Plan and to suggest changes for consideration by the Policy Committee. This was a major focus of the afternoon portion of the meeting agenda. Dave Briggs reviewed accomplishments of 2008 to date. A few highlights:

- Cumulative funding since the SMC began in 1985 will exceed $19 million through 2009.
- Three new members (Cortex Consultants, Victoria, BC, Renewable Resources, LLC, Amherst, MA., Roseburg Resources, Dillard, OR.) joined during 2008.
- Completion of the young stand model project.

- Establishment, fertilization and instrumentation of six new Type V paired tree fertilization installations and funding from AGENDA 2020 for instrumentation ($75,000 over 3 years).
- Site characterization of the GGTIV installations planted in 2006 so we have complete site characterization and first growth measurements (after 2 growing seasons) for all 6 GGTIV installations (132 plots).
- 2 graduate students completed their theses and 8 graduate students are in residence; all funded by external grants and UW.
- The proposal to join the NSF Center for Advanced Forest Systems has been completed ($70,000 per year for 5 years) and submitted.

Budget Review: Member dues in 2008 were $606,770. Including in-kind credits and special contract income resulted in an operational budget of $616,866. Institutional Funding from the BC Ministry of Forests Research Branch was $70,652 from a competitive grant to support field work in BC. Other institutional members provided the equivalent of about $135,163 in the form of salaries of scientists, facilities, administrative support. External grants and student support funding from the University of Washington totaled $224,571 to date. The balance at the end of 2008 is likely to be on the order of $10-20,000. Dues for 2009 are projected to be $605,248. Since contract income is off-cycle in 2009 and may be very low while in-kind credits for 2008 maintenance of the GGTIV instlations will be on the order of $15,000, operational funding in 2009 is projected to be $590,731. With worst case scenario assumptions (zero balance forward from 2008, much higher travel costs, and no expense buyouts on grants) a potential deficit would be present at the end of 2009. Whether or not a deficit occurs and the magnitude is not predictable at this time. We have implemented a number of actions to reduce expenses such as web-based publication of the newsletter and other SMC publications to avoid printing and mailing costs and use of web-based conferencing to save on travel expenses.

Modeling Project Report: Dave Marshall noted recent modeling accomplishments including the update of ORGANON completed in 2006, the release of the young stand model in 2008 and the new publication "Calibration and Modification for the Pacific Northwest of the New Zealand Douglas-fir Growth Model" by Jim Flewelling and Dave Marshall (see the abstract in this issue). Strategic planning priorities that emerged from the Modeling TAC webinar on August 26 are in three areas

(1) encourage implementation of a genetic modifier in ORGANON, encourage completion of red alder analysis, collaborate with CIPS on a process model proposal, and develop a proposal for growth model evaluation.

(2) work with the wood quality TAC on wood quality modeling, explore potential for updating ORGANON wood quality module, update ORGANON with new SMC thinning and fertilization data.

(3) look for funding opportunities such as biofuel and biomass modeling and climate and weather modeling.

Nutrition Project Report: Rob Harrison reviewed the status and plans for the long term site productivity (LTSP) studies, Hood Canal, carryover, and paired tree fertilization studies. The LTSP's at Fall River, Matlock, and Mollalla are continuing to provide important information, NCASI provided $40,000 for 2008 and may provide the same for 2009, graduate students Paul Footen and Carol Schilling (both funded from UW sources) will continue work at these sites; and former PhD Brian Strahm has 2 articles published, (currently we have the abstract and linkfor only one: http://soil.scijournals.org/) and 2 in review. At Hood Canal, Cindy Flint has one article recently published, (http://www.springerlink.com/content/102971/ Vol. 35, number 3), Ben Shyrock (UW funding) is continuing sampling for his thesis, and there may be a future opportunity to shift this work from inputs into Hood Canal from fertilization of Douglas-fir stands to inputs associated with red alder. Paul Footen is wrapping up a summary of the carryover study; we will continue to measure them but there is no funding at the moment. We received $25,000/year for 3 years (one-half of what was requested) from AGENDA 2020 for the paired-tree fertilization (Type V) installations; these funds are being use to purchase instrumentation to measure precipitation and temperature on these sites. We are also placing this instrumentation into the GGTIV installations.

Wood Quality Project Report: Eini Lowell noted that the Wood Quality TAC input into the strategic planning process was summarized at the Spring meeting and at the Wood Quality TAC webinar on Aug 26. There is an opportunity to obtain wood quality data from the paired-tree (Type V) that could include wood density, terrestrial LiDAR. Eini noted that a proposal to AGENDA 2020 for wood quality research on the Type I installations was not funded; the TAC will continue to seek funding opportunities. For the NDT acoustic study, all data has been reconciled and a database is being created that will permit more comprehensive analyses and associated publications. Each of the NDT study logs had cookies from each end from which x-ray densitometer data was collected by Weyerhaeuser; this forms a great dataset for modeling wood density profiles in trees. Christine Todoroki is working with about 1200 veneer sheets from the veneer phase of the NDT study; these sheets were photographed and are being used for glass log modeling. Because of the interest in developing a wood quality model, the strategic plan includes developing a collaboration among the wood quality, modeling, and silviculture TAC's to discuss how to accomplish this.

Silviculture Project Report: Eric Turnblom reported on the status of the GGTIV installations; all now have site characterization work completed and all have the first growth measurements obtained after 2 growing seasons which was summarized during the afternoon technical session. Eric also mentioned that the 08/09 field plan will be sent soon. He summarized graduate student activity: Nick Vaughn is continuing on a PhD and is working on a "sun-tree" identification project funded by the USFS, Andrew Hill is now a post-doc and has papers in review, Kevin Ceder who is also working on a PhD is making

rapid progress on the NCASI-funded study "vegetation composition and succession in managed coastal Douglas-fir ecosystems", and a new student, Maria Petrova, is just starting on a Masters. With respect to the strategic plan, three priorities emerged from the silviculture TAC webinar on August 26.:

(1) develop criteria for retirement of installations.

(2) work with the modeling TAC on the model evaluation/validation proposal

(3) create a "LOGS" style summary report of the performance of the Type I, II, and III installations.

Strategic Planning: David Briggs reviewed the history of the strategic planning effort which began with the creation of a Strategic Planning Committee in 2004. Over the next 3 years Mission and Vision statements and a set of 6 goals were adopted and within each goal, a set of objectives, tasks and responsibilities were developed. For the strategic plan to remain current and relevant, it must be viewed as a dynamic document that will be continuously reviewed for progress and updated. Review of the plan developed over 04/07 began with TAC webinars on August 26 to report on progress and provide suggestions for changes and new activities. This information was reviewed by The Strategic Planning Committee (SPC) webinar on September 12. Dave presented the Mission, Vision, and Goals as stated in the Phase I Strategic Plan along with inputs from the TAC/SPC webinars. Some key points that emerged from the discussion were

(1) Re-wording suggestions for the Mission and Vision Statements.

(2) Further modeling evaluations and improvements including more refinements of ORGANON (genetic multiplier, additional analysis of fertilization and thinning response with new SMC data, encouraging completion of the alder growth and yield component, improving the utility of the current wood quality component of ORGANON and working toward a new wood quality model, and performing a gap analysis of existing growth and yield models.

(3) Developing "LOGS-style" summary performance reports of the Type I-III suite of installations in a forest manager friendly format.

(4) Pursue external funding for biomass/biofuel/carbon/nutrition assessments, for improved understanding how LiDAR can be used to measure and monitor forest attributes, and for establishing new UW foundation funding to support graduate students in the "production forestry arena."

These points will be used as the basis for additional webinar discussions with the objective of creating a drevised strategic plan draft for the Spring 2009 Policy Committee meeting.

Technical Session: Tom Terry presented an excellent summary of lessons learned from the Fall River, Matlock and Mollalla long-term site productivity studies. Eric Turnblom presented a summary, compiled by Keith Jayawickrama, Eric, and Terrence Ye, of the initial growth measurements, obtained after 2

growing seasons, of the GGTIV installations. Monika Moskal summarized work at the UW with terrestrial LiDAR and links that are being established with SMC installations for ground truthing. These presentations can be downloaded from the SMC website (www.standmgt.org) and provided an excellent perspective for the field tour visits to the Matlock LTSP site, the Left Court GGTIV installation, and the Rabbit Creek Type V paired-tree fertilization installation on the following day.

Summer Field Crew

The summer 08 field crew, consisting of graduate students Paul Footen, Kim Littke, and Gonzalo Thienel plus recent BS graduate Natalie Schmidt completed site characterization of the three genetic-gain/type IV (GGTIV) installations (66 plots) that were planted in 2006. We now have site characterization of all six GGTIV installations plus growth measurements after the first two growing seasons. In addition, we began purchasing and installing instruments to obtain precipitation and temperature data at each of the GGTIV installations. The summer crew also visited two Type I installations for standing tree acoustic velocity measurements and the number and size of knots in a 6 inch wide region centered on the line between the probes. We are analyzing this data to see if the density and size of knots in the region between the probes influences the acoustic velocity reading.

Status of Paired-tree Fertilization Installations (Type V)

As most of you know, the SMC began the process of selecting and installing paired-tree fertilization installations during the 07/08 field season with the goal of ultimately creating a suite of 40 installations in 15-25 year-old Douglas-fir plantations that are well distributed over the range of common parent materials. Figure 1 and the text below summarize progress to date on installations that have been accepted. Instrumentation includes placing temperature and precipitation recording devices at each installation and is being funded by the grant received from AGENDA 2020. Presently, most installations are on sedimentary or glacial parent material and relatively few on igneous parent material. Furthermore, as the color codes in Figure 1 indicate, there tends to be a north to south gradient; glacial parent materials tend to be most northerly, igneous tend to be the most southerly, with sedimentary parent materials more central. There also seems to be a gap in installations from the Cascades. Please note the gaps and weaknesses in the present coverage and contact Rob Harrison, Kim Littke, or Bob Gonyea if you have potential sites that can strengthen the study.

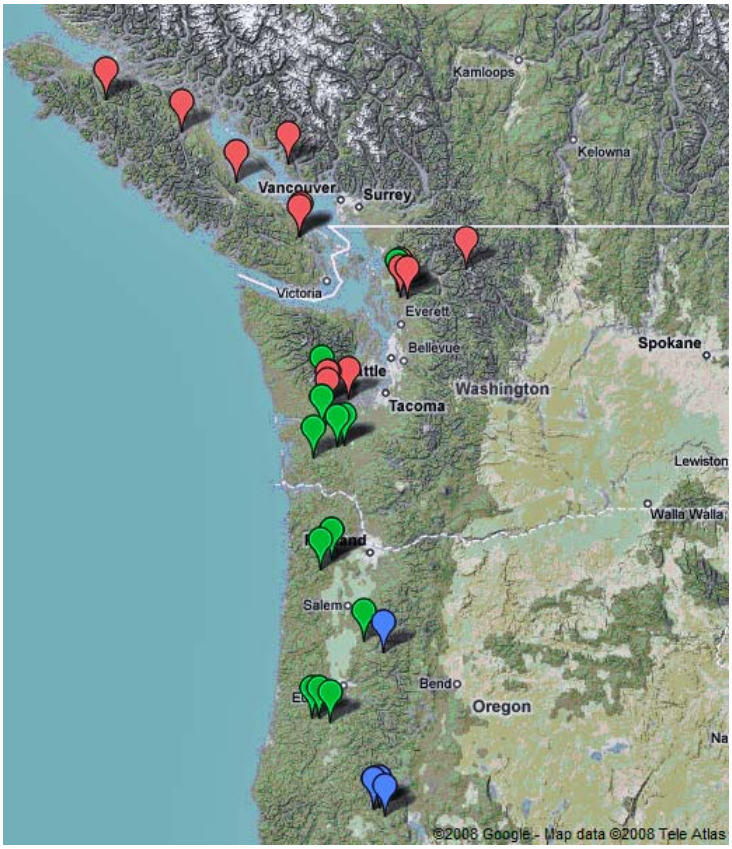


Figure 1. Current Paired Tree Site Locations throughout the Pacific Northwest. Parent material is marked by color. Red pointers are from glacial parent materials. Green pointers are from sedimentary materials. Blue pointers are from igneous parent materials. Note: pointers for some installations overlap.

Sites by Ownership (From north to south):

British Columbia Ministry of Forests: The six BC installations are Steel Creek, Upper Campbell Lake, Pender Harbour, Rosewall Creek, Copper Canyon 1, and Copper Canyon 2. These sites should be installed and instrumented in the fall of 2008. They are all on glacial parent materials.

Washington DNR: The two DNR installations are located in northwest Washington. These sites have been installed and will be instrumented in fall 2008. They are on glacial parent materials.

Pacific Denkman: Three installations have been installed, all three in northwest Washington and will be instrumented in fall 2008. They are on glacial and sedimentary parent materials.

Green Diamond Resource Co.: Three installations have been installed and instrumented this summer; all are in western Washington. Two are on glacial parent material and one is on a sedimentary parent material.

Port Blakely Tree Farms: Four installations have been installed; all are in western Washington. They have been instrumented and a soil pit has been dug and analyzed. Two are on glacial parent materials and two are on sedimentary parent materials.

Weyerhaeuser Co.: Seven installations have been installed from western Washington to northern Oregon. All have been instrumented and soil pits have been dug in four of them. All are on sedimentary parent materials.

Cascade Timber Consulting: Two installations have been installed near Albany, OR. They will be instrumented during the 08/09 field season. They are mapped as sedimentary and igneous parent materials.

Lone Rock Timber Co.: Two installations in central Oregon were installed in fall 2008. They will be instrumented during the 08/09 field season. They are mapped as having sedimentary parent materials.

Roseburg Resources: One installation has been installed in central Oregon. It will be instrumented during the 08/09 field season. The parent material on this site is sedimentary.

Plum Creek Timber Co.: Four installations in southern Oregon have been installed, instrumented, and have soil pits dug. The parent material on these sites is igneous.

CONIFERS Adaptation for the Stand Management Cooperative

Martin Ritchie, Pacific Southwest Research Station

Introduction

The project to build a new variant of the CONIFERS simulator was initiated in 2005 and essentially completed with the release of Version 4.0 of the simulator in June of 2008. The project involved fitting new growth equations for the simulator using two sources: the SMC Type III data and the RVMM modeling plots provided by Steve Radosevich at Oregon State University. The analysis was conducted by Nick Vaughn, graduate student at the University of Washington, under the supervision of Eric Turnblom (Vaughn 2007).

The new release of this simulator includes both the old (SWO) and new (SMC) variant. The SMC variant provides forecasts for Douglas-fir plantations and includes several components. These are (1) a Graphical User Interface (GUI), (2) a dynamic-linked library of functions (DLL) and (3) a HTML-based help system. In addition, Jeff Hamann has been developing the R-package version of the simulator that is currently being tested prior to final release.

Following the release of version 4.0 in June, a number of problems were detected with data error trapping in the code for both the DLL and GUI. Also, some errors were found in the original DLL tutorial distributed with the June release. A number of changes have been made to the code and these will be included in the upcoming release (version 4.1) in October 2008.

CONIFERS SMC-Variant

The SMC variant requires input of a tree list (Douglas-fir only), site index, and competing vegetation cover and height. Site index is converted from base age 50 to base age 30 (Flewelling et al. 2001). The selection of the SMC variant is made at runtime by the user either with a dropdown menu (in the GUI) or with a variable setting in the DLL application.

Among the SMC variant options are ORGANON tree lists and plot summaries. When executing the SMC variant the user also has access to options for genetic gain (Gould et al. *In press*). The genetic gain applies only to Douglas-fir in the SMC variant. It does not apply in the SWO variant.

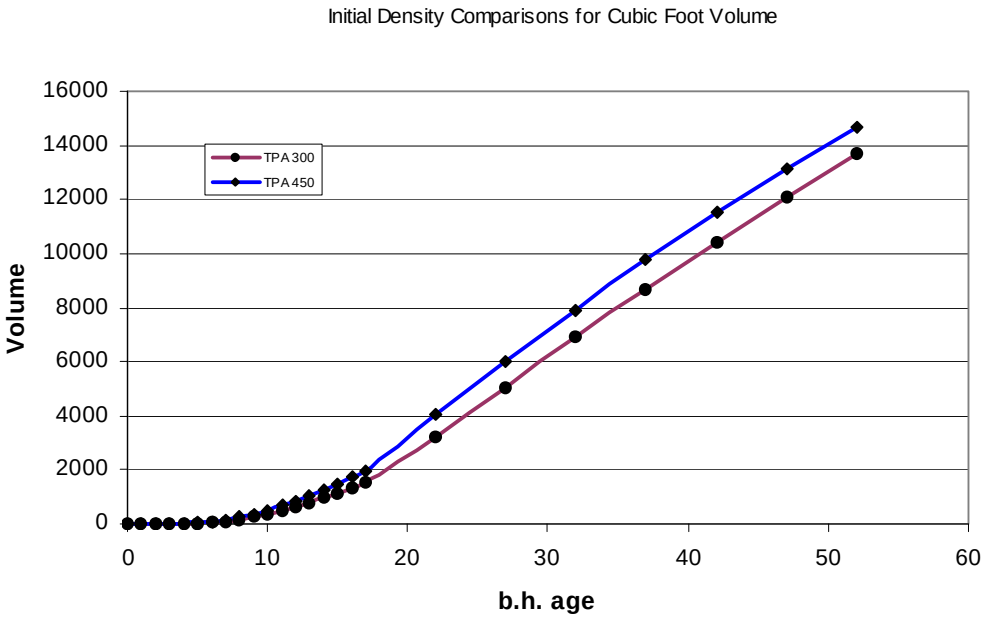
In developing models using the SMC and RVMM data, some compromises were necessary in model architecture. At this point in time, competing vegetation is grouped; we have not yet broken it out by individual species.

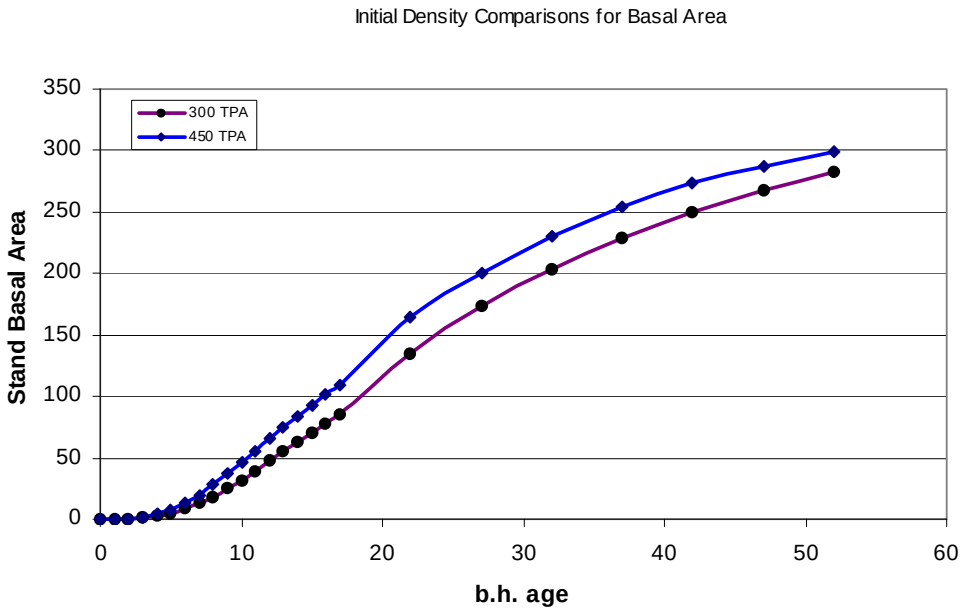
Examples

Example number 1: Comparison of initial spacing, 300 vs 450 trees per acre

In the example below we took Douglas-fir plantations at 300 and 450 trees per acre and site index (si=128, index age 50). We exported to ORGANON at breast height age 18.

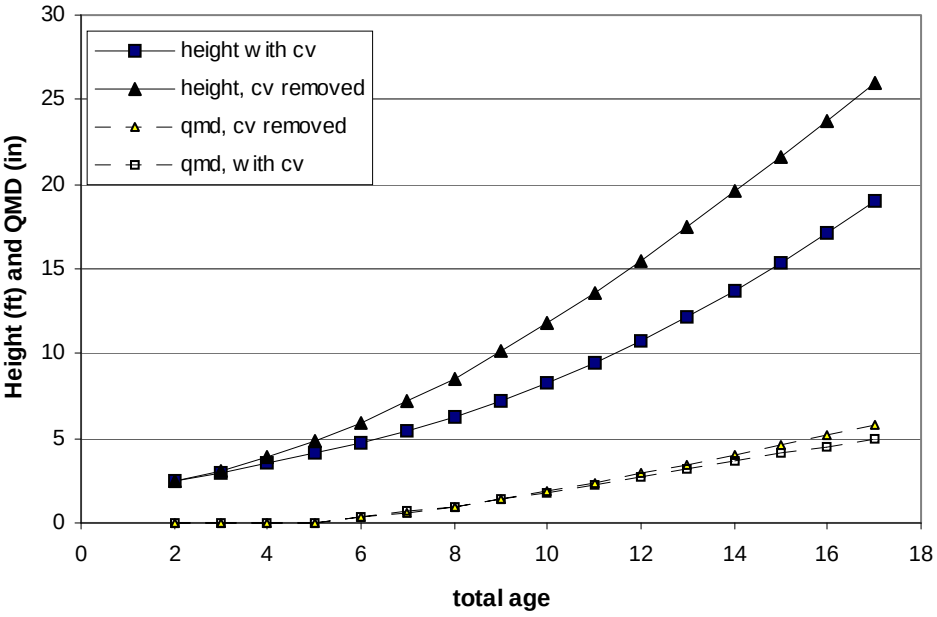
Estimates of basal area and volume over a 50 year forecast are shown in the figures below. While we observe a slight increase in growth rates at the transfer to ORGANON, part of this discontinuity is due to differences in volume estimation between the two simulators.





Example number 2: Competing Vegetation Impacts

This second example demonstrates the effects of competing vegetation in the SMC variant and shows one of the limitations we found in the current version. In this example we used a site index of 80 feet (age 50) and 350 trees per acre and 26% cover of competing vegetation (Figure below). While there is a substantial difference in height growth up to age 17 there is little difference in diameter (hence basal area and volume). This has the potential under some scenarios to produce H:D ratios that are too large. This should not be a problem with the SWO variant because the individual growth models are linked differently in the original SWO variant. However this points to one of the limitations of the data: very limited observations with significant competing vegetation.



Products

Version 4.1 will be uploaded to the web in early October, replacing version 4.0. This update will have some improved data error trapping and corrections for the tutorial distributed with the DLL.

Both the GUI and the DLL can be obtained at the CONIFERS web site:

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

The CONIFERS R-Package is complete but we have not finished required documentation. When completed we intend to submit the package to so users may install from R.

If you encounter any problems with the simulator either on installation or execution please make sure you are working with the new version (V4.1) and then contact Martin Ritchie at mritchie@fs.fed.us.

Future Development

We need better models for the dynamics of competing vegetation and the interaction between crop trees and their competitors. Limitations of the data with regard to the range of competing vegetation values and the resolution of the competing vegetation data led to some simplifications in the model architecture. Furthermore, the SMC variant currently does not have additional tree species such as western hemlock although the architecture will accommodate this addition if models are available.

Citations

Flewelling, J., R. Collier, B. Gonyea, D. Marshall, and E. Turnblom. 2001. Height-age curves for planted Douglas-fir with adjustments for density. SMC Working Paper Number 1.

Gould, P.J., R. Johnson, D.D. Marshall, and G. Johnson. In press. Estimation of genetic-gain multipliers for Douglas-fir height and diameter growth. Forest Science.

Vaughn, N. 2007. An individual-tree model to predict the annual growth of young stands of Douglas-fir (*Pseudotsuga menzesii* (Mirb) Franco) in the Pacific Northwest. M.S. Thesis, University of Washington. 91 p.

Abstracts and Publications

Calibration and modification for the Pacific Northwest of the New Zealand Douglas-fir silvicultural growth model. Flewelling, James W.; Marshall, David D. 2008 Gen. Tech. Rep. PNW-GTR-754. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

Abstract
This paper describes a growth model for young plantations of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) growing in the Pacific Northwest. The overall model has three major components. The first is a yield model for diameter and height distributions describing stands prior to pruning or precommercial thinning. The second component is an annual per-acre net increment model adapted from a recent model for Douglas-fir plantations in New Zealand; thinning and pruning are features of the model. The third component is growth equations for cohorts of individual trees; the results from this component are adjusted to match those from the second component. Fitting data are from Stand Management Cooperative experiments, with top heights generally below 75 ft. An intended use of the model is the evaluation of pruning regimes, in conjunction with the ORGANON model for growth at older ages, and TREEVAL model for clear-wood recovery and economic evaluation.

PDF verson: http://www.fs.fed.us/pnw/pubs/pnw_gtr754.pdf

A guide to LIDAR data acquisition and processing for the forests of the Pacific Northwest. Gatziolis, Demetrios; Andersen, Hans-Erik. 2008 Gen. Tech. Rep. PNW-GTR-768. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p.

Abstract
Light detection and ranging (LIDAR) is an emerging remote-sensing technology with promising potential to assist in mapping, monitoring, and assessment of forest resources. Continuous technological advancement and substantial reductions in data acquisition cost have enabled acquisition of laser data over entire states and regions. These developments have triggered an explosion of interest in LIDAR technology. Despite a growing body of peer-reviewed literature documenting the merits of LIDAR for forest assessment, management, and planning, there seems to be little information describing in detail the acquisition, quality assessment, and processing of laser data for forestry applications. This report addresses this information deficit by providing a foundational knowledge base containing answers to the most frequently asked questions.

PDF verson: http://www.fs.fed.us/pnw/pubs/pnw_gtr768.pdf

Abstracts and Publications cont.

Forest inventory-based estimation of carbon stocks and flux in California forests in 1990. Fried, Jeremy S.; Zhou, Xiaoping. 2008 Gen. Tech. Rep. PNW-GTR-750. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 25 p.

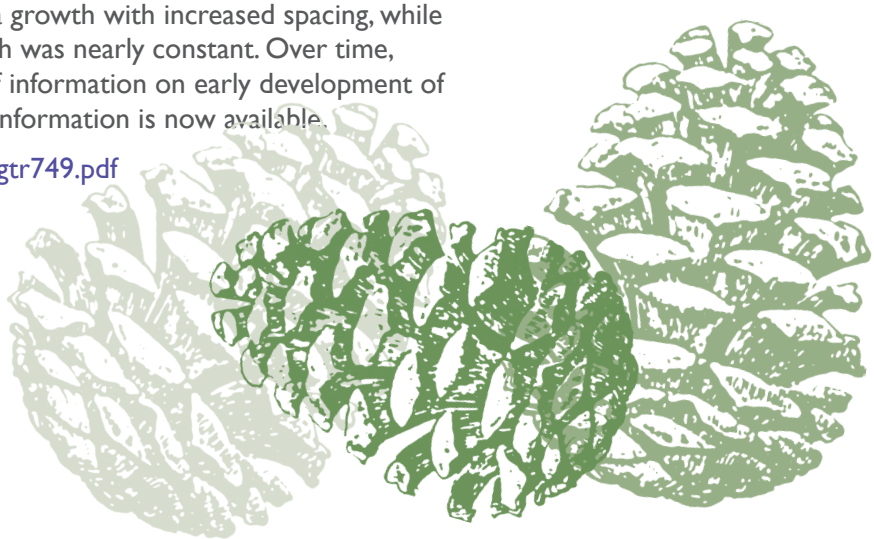
Abstract
Description: Estimates of forest carbon stores and flux for California circa 1990 were modeled from forest inventory data in support of California's legislatively mandated greenhouse gas inventory. Reliable estimates of live-tree carbon stores and flux on timberlands outside of national forests could be calculated from periodic inventory data collected in the 1980s and 1990s; however, estimation of circa 1990 flux on national forests and forests other than timberland was problematic owing to a combination of changing inventory protocols and definitions and the lack of remeasurement data on those land categories. We estimate annual carbon flux on the 7.97 million acres of timberlands outside of national forests (which account for 24 percent of California's forest area and 28 percent of its live tree aboveground biomass) at 2.9 terragrams per year.

PDF verson: http://www.fs.fed.us/pnw/pubs/pnw_gtr750.pdf

True fir spacing trials—10-year results. Curtis, Robert O. 2008 Source: Gen. Tech. Rep. PNW-GTR-749. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 36 p.

Abstract
Description: Eighteen precommercial thinning trials were established in true fir-hemlock stands in the Olympic Mountains and the west side of the Cascade Range during the period 1987 through 1994. This paper updates a previous report, with results for the first 10 years after establishment. Results are given for (1) all trees, (2) the largest 80 per acre of any species, and (3) those noble fir (Abies procera Rehd.) and Pacific silver fir (Abies amabilis Dougl. ex Forbes) included in the largest 80 per acre. Diameter growth of all species increased with increase in spacing. Height growth of Pacific silver fir decreased with increase in spacing. The largest 80 trees per acre of all species showed some increase in diameter and basal area growth with increased spacing, while height growth declined slightly and volume growth was nearly constant. Over time, these installations will provide a unique source of information on early development of managed stands of these species, for which little information is now available.

PDF verson: http://www.fs.fed.us/pnw/pubs/pnw_gtr749.pdf



Abstracts and Publications cont.

Controls on the Sorption, Desorption and Mineralization of Low-Molecular-Weight Organic Acids in Variable-Charge Soils. Strahm, Brian and Harrison, Robert. SSSAJ: Volume 72: Number 6 • November–December 2008.

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 speciû c impacts on pedogenic processes, nutrient bioavailability, and C sequestra- tion. 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 other- wise 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 equilibra- tion 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.

Mineral and Organic Matter Controls on the Sorption of Macronutrient Anions in Variable-Charge Soils. Brian D. Strahm* and Robert B. Harrison. Soil Sci Soc Am J 71:1926-1933 (2007).

Abstract

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 $NO3^{-}$, $SO42^{-}$, and $H2PO4^{-}$. 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 isot herms 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 pH = 4.0 ± 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 U.S. Pacific Northwest. For any given soil, the capacity to sorb the macronutrient anions was in the order $H2PO4^{-} > SO42^{-} > NO3^{-}$. Multiple regression analyses generally suggest that the electrostatic sorption of $NO3^{-}$ and $SO42^{-}$ is positively related to the presence of active Al fractions and negatively correlated with organic C content.

Nitrogen Leaching from Douglas-fir Forests after Urea Fertilization. Cynthia M. Flint, Rob B. Harrison, Brian D. Strahm and A. B. Adams. J Environ Qual 37:1781-1788 (2008)

Abstract

Received for publication July 12, 2007. 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-fir [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 flux 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 fluxes out of the primary rooting zone during the first year after urea application.

Vegetation competition effects on aboveground biomass and macronutrients, leaf area, and crown structure in 5-year old Douglas-fir. Kyle S. Petersen, Adrian Ares, Thomas A. Terry and Robert B. Harrison. New Forest (2008) 35-299-311.

Abstract

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 aboveground biomass and macronutrients, leaf area and crown structure in 5-year old Douglas-fir (Pseudotsuga menziessi (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-fir growing in areas with and without VC.

Upcoming Meetings and Events

November 5-9, 2008. Society of American Foresters 2008 National Convention, Forestry in a Climate of Change. Reno-Tahoe, Nevada.
http://www.safnet.org

November 12, 2008. Western Forestry and Conservation Association, Managing Climate Change Risk in Forests. Portland, OR.
http://www.westernforestry.org

November 19, 2008. 12th Annual PNW Intergrated Veg Management Conference. Portland, OR.
http://www.westernforestry.org

April 20-21, 2009. SMC's Annual Spring Meeting. Little Creek Casino Kamilche, WA.

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