

An abstract graphic composed of numerous thin, light blue lines that curve and intersect to form a complex, web-like structure. The lines are most dense in the center and become sparser towards the edges, creating a sense of depth and movement. The overall shape is roughly circular but with a pointed right side.

OPTIMIZING DECISIONS IN A COMPLEX WORLD

REMSOFT®

2009 Annual Report



Educational Institutions around the world are using Remsoft software to enhance sustainable management practices. Each institution has provided a brief abstract as to how they have implemented this technology into their program.

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College of North Atlantic

Post Modeling Analysis (PMAS) and Decision Making

This applied research project is intended to further improve decision support processes by producing a tool that will allow land managers to quickly visualize outcomes from multiple management scenarios that has varying objectives and constraints. The PMAS framework integrates results from multi-criteria analysis in a results-based structure that non-technical users can explore and modify quickly and easily. The Remsoft Spatial Planning System (Woodstock and Stanley) is used to simulate forest growth under various management scenarios. The Remsoft generated future forest descriptions are then used as inputs into other resource assessment models (i.e. carbon, wildlife habitat, visual impact) to generate data on other resource values. These assessment model outputs then form the input to the PMAS framework for integrated assessment and trade-off analysis in the resource management decision processes.

National Inventory Report on Canada's green house gas emissions and removals

Underneath a national strategy by the Canadian Forest Service, the province of Newfoundland and Labrador is required to report on an accounting of its forest carbon status. In collaboration with the Newfoundland and Labrador Department of Natural Resources, GRF used the Remsoft suite of products to test procedures to prepare provincial data used to calculate the balance of green house emissions in the province. The process is carried annually in a monitoring program to fulfill reporting obligations under the Nations Framework Convention on Climate Change (UNFCCC).

Integrated Resource Management

Each year forest technology students at College of the North Atlantic are tutored on the use of Remsoft products in the forest management field. They are exposed to the basics of forest modeling using techniques of simulation and optimization modeling, constructing landscapes, yields, actions and transitions while producing management plans for a small tract of land.

Karadeniz Technical University

Developing a DSS for ecosystem based multiple use forest management planning systems (ETÇAP) in Turkish Forestry. They have developed the concept and the framework, and are now trying to adopt a DSS for it. The project should materialize later this year.

Lanamme University of Costa Rica

Strategic long term planning for sector 1-9 of maintenance contracts

A methodology for the creation of a strategic long term plan was developed for sector 1-9 of Costa Rica. This sector has 160 km of road network. This road network is located in an urban environment with high traffic and high loads. The pavement condition has an average of PCI of 34, which means a low condition. The result of this research indicated that it is necessary to increase the budget by four times during the first four years. This is needed in order to perform reconstruction of the pavement structure, and get a better pavement condition. After the 4th year, the budget decreases and becomes more stable. The allocation of resources in pavement preservation is also applied after the 4th year.

Strategic long term planning for sector 4-2 of maintenance contracts

A strategic long term planning has been developed for sector 4-2 of Costa Rica. This sector has 280 km of road network. The objective of this research is to apply the methodology for resource allocation at the strategic level in a rural road network. The research is at its final stage and the project will be submitted in february 2010.

Pavement condition performance indexes

The objective of this research is to evaluate the applicability of a pavement condition index (PCI) in Costa Rica. This index (PCI) is composed by the Structural Adequacy Index (SAI) and the Pavement Roughness Index (PRI). For the formulation of the PCI, the SAI and PRI have a weight from 0 to 1. Remsoft is used to perform a sensitivity analysis and evaluate the impact of the weights assigned to each index on the investment plans.

Maritime College of Forest Technology

Forest Management II

Application of Remsoft software is planned in the winter term. Jeff Patch plans to work in cooperation with Thom Erdle at the University of New Brunswick. Some of the specific concepts he plans to teach more effectively are as follows:

1) What Regulates Wood and Habitat Supply from Forested Areas

Three fundamental determinants of the potential flow of values from a forested area are the size of that forested area, the choice of timing of interventions and the growth rates of component stands. Change size of area, timing of interventions, and growth of component stands and see the consequences.

2) Allowable Cut Effect (ACE)

An immediate increase in the allowable annual cut (AAC) can be made possible by silvicultural activities that increase future yields. However, the AAC benefit associated with increase silvicultural investment has limitations. What are these limitations and why do they occur? Can you afford to invest in the "best" silvicultural option for every stand when the forest level return on investment beyond ACE is delayed by decades?

3) Silviculture Choices and Impact on Wood Supply and the Landscape

How do different silvicultural investment choices impact forest structure and wood supply over time? For example, what proportion of the landscape will end up in plantations at current planting rates (is the landscape being turned into one giant plantation...not)? Why can pre-commercial thinning often be a more effective tactic than planting? (E.g. the importance of shortening time to operability can be demonstrated). How do you determine the best mix of choices?

4) Harvest Scheduling and Wood Supply

How sensitive is wood supply to choices one makes in the timing of harvesting different stand (e.g. why oldest first)?

5) Flow of Values and Size of Forested Area

At least two concepts are important here. One is that if area is set aside for one value then it will have some measurable impact on other values (e.g. one cannot set areas aside without a wood supply cost). Another concept is that dividing the landscape into smaller independent management units will reduce the potential flow of values/benefits from a forested area. Why is bigger better in the case (i.e. scheduling choices)?

6) Age Class Structure and Flow of Values

People often assume that potential wood supply is determined primarily by growth rates as expressed by yield curves. Aspects such as age class structure and being able to regulate the timing of operability can, in some cases, prove to be more important than peak yield (as expressed in m³ per hectare).

7) Planning Models are not that Mysterious

Many in the forest field reject forest level planning models (they do not understand them) or assume they are mysterious “black boxes” to be used by planning wizards who alone are capable of understanding their magic. It is important to debunk such notions and misunderstandings.

Teaching the above concepts is important for forest technologists. There is often a lack of understanding and appreciation of such concepts by technical field staff. Many students come in with preconceived notions that are difficult to debunk by using lectures alone. They see it for themselves by doing it for themselves, they learn, they accept...that is the power of experimental learning. This is not a course defined to turn students into modellers/planners etc, but it will expose them to tools used by forest planners. The learning exercises will be presented in pre-packaged modules that would allow them to tinker with decisions etc, and observe forest level consequences, and thus learn and reinforce concepts as identified above.

Mississippi State University

Advanced Forest Management and Planning

This is a graduate level course that teaches advance planning techniques. The plan is to incorporate activities and assignment using the Remsoft planning software.

North Carolina State University

FOR 734 - Advanced Forest Management Planning

This course covers the history, principles, structures and use of modern forest management planning and decision-making techniques. Emphasis is on optimization procedures and software used in forest management. In lab we are training students in the use of Remosoft's Woodstock Program.

[Assessing Optimal Management Responses to uncertainty and risk in timber production, through the integration of process based models for silvicultural, climate, and economics: Case studies comparing the Southeast U.S. and South America](#)

Comparative timber productivities and investment returns determine where global forest investments occur. This research is to assess how to deal with an uncertain future when climate, silvicultural intensity, and financial variability are taken into account. Process Based Models of forests, incorporated

into Woodstock, are the tool for integrating stochastic variables into the decision making process. This is an integration of detailed stochastic biophysical and financial analyses to build improved models of forest growth and timber investment returns, and improve understanding of how salient biological production processes and financial returns and risks affect productivity and profits in the Southeast U.S. and South America.

Oregon State University

Forest Planning Class

An introduction to Woodstock Software.

Sir Wilfred Grenfell College

Spatial Modeling of Wood Supply Analysis Versus Wildlife Habitat Objectives

Logging, farming, and infrastructural development are causing loss of biodiversity and carbon stock in boreal forest of Newfoundland. The purpose of this study is to simulate forest landscape changes under different landscape management scenarios, and concurrently apply the Marten habitat model and the CBN-CFS₃ carbon model to the projected landscapes for an integrated risk Assessment of the trade-offs that land managers are facing during the Humber River Basin development. To do so, we will first formulate tactic-level spatial forest management scenarios using Stanley based on the latest provincial Woodstock aspatial wood supply analysis for trade-off analysis between the achievable wood supply level and pine marten habitat availability under different harvest constraints (i.e., harvest size and the placement of the harvest blocks) over a 50 yr planning horizon. We will then use the outcomes of Woodstock/Stanley System to calibrate a LANDSCAPE MODEL for long-term (≥ 200 years) spatially-explicit simulations of landscape change for the entire Humber River Basin with anticipated interactions between stochastic natural disturbances and land management options. In the end, the predicted effects of landscape management options on forest dynamics, marten habitat, and forest carbon stocks will be assessed in an integrated fashion to quantify risks and uncertainty for improving decision-making in Humber River Basin Development.

Stephen F. Austin State University

FOR 411 Timber Management

FOR 411 Timber Management was not taught in 2009 as it is only offered in even-numbered years. The goal for fall 2010 is to have a dynamic yield function incorporated into Remsoft for use in their final project.

Université Laval

Aménagement Forestier II (optional undergraduate class, advanced level)

This class concentrates on the elaboration of forest management strategies through timber supply calculations. Woodstock is used as the main programming platform.

Allowable cut calculation for defined areas under different climate scenarios

A PhD student, Narayan Dhital, is preparing various timber supply scenarios of a boreal territory of 1 million ha, with different yield curves. Yield curves will be made sensitive to climate by the calibration of climate-sensitive site index and self-thinning models. These curves will be provided by another PhD student, Marie-Pierre Lapointe-Garant.

Viability analysis of timber supply calculations

Population viability analysis, a technique quite popular in conservation biology, is used to translate various sections of a Woodstock program in order to export scenarios built in Woodstock to SELES, where success rates of planned strategies are evaluated when “brought face to face” with stochastic events such as fires, insect defoliation, windthrows and forest succession.

Université de Moncton

FORS 4054 - Gestion intégrée des forêts I (Integrated Forest Management I)

Introduction au système de planification spatiale RSPS (6 exercices) :

1. Introduction à la syntaxe *Woodstock* ;
2. Introduction à la recherche dichotomique avec *Woodstock* (formulation et interprétation) ;
3. Recherche dichotomique avec *Woodstock* (formulation et interprétation) ;
4. Introduction à la programmation linéaire avec *Woodstock* (formulation et interprétation) ;
5. Programmation à buts multiples avec *Woodstock* (formulation et interprétation).
6. Introduction à *Woodstock* (configuration de la base de données spatiales, création des sections *Landscape* et *Areas*, création de cartes et de rapports).

Introduction to the RSPS spatial modeling system (6 exercises):

1. Introduction to *Woodstock* syntax;
2. Introduction to binary search with *Woodstock* (formulation and interpretation);
3. Binary search with *Woodstock* (formulation and interpretation);
4. Introduction to linear programming with *Woodstock* (formulation and interpretation);
5. Goal Programming with *Woodstock* (formulation and interpretation).
6. Introduction to *Woodstock* (configuring spatial database, building *Landscape* and *Areas* sections, generating maps and reports).

FORS 4052- Gestion intégrée des forêts II (Integrated Forest Management II)

Les étudiants planifient et réalisent un inventaire multi-ressources pour un bloc de terres publiques (superficie variant entre 400 et 1400 hectares), créent des tables de peuplement, des tables de rendement (*Staman*), et des fenêtres d'habitat pour chaque type de peuplement pour plusieurs prescriptions sylvicoles potentielles. Ils subdivisent le territoire à l'étude en zones ayant différents objectifs d'aménagement et préparent un plan d'aménagement multi-ressources pour ce territoire en utilisant le système RSPS. Plusieurs scénarios sont testés pour un horizon de planification de 80 ans, et l'évolution temporelle de plusieurs indicateurs est évaluée, y compris les volumes ligneux, et des indicateurs écologiques et financiers. Un scénario est choisi parmi ceux testés et la répartition spatiale des activités d'aménagement associées à ce scénario est effectuée par période de 5 ans, et ce pour les 25 premières années de l'horizon de planification.

Students design and carry out a multi-resource inventory for a block of Crown Land (areas have varied between 400 and 1400 hectares), produce stand tables, yield tables (*Staman*) and habitat windows for each stand type for a number of different possible silvicultural prescriptions. They subdivide the area into zones with different management objectives, and prepare a multi-resource management plan for

this area using the RSPS system. Several scenarios are tested for an 80 year planning horizon, with several indicators tracked through time, including timber volumes, ecological and financial indicators. A scenario is selected amongst those tested and management activities for this scenario are mapped out by 5-year periods for the first 25 years of the planning horizon.

Université du Québec en Abitibi-Témiscam

Contribution des débris ligneux grossiers à la rétention du carbone en forêt boréale mixte, dans un contexte d'aménagement écosystémique.

Mon projet vise à déterminer l'importance du bois mort pour la séquestration du carbone dans les forêts boréales mixtes du Québec, et à évaluer les effets des coupes sur leur dynamique. Les forêts boréales constituent une réserve importante de carbone, principalement dans les sols, où la matière organique se décompose très lentement. Le bois mort, ou débris ligneux grossiers (DLG), représente une quantité substantielle de matière organique du sol, il constitue donc un pool de carbone important. L'aménagement forestier va modifier la dynamique des DLG et va avoir un impact considérable sur le cycle du carbone. Les coupes forestières génèrent des DLG, particulièrement des arbres morts au sol, au détriment des chicots. Suite à l'exportation du bois, elles diminuent la quantité de carbone total de l'écosystème, et modifient l'allocation du carbone dans les différents réservoirs (arbres, sous-bois, sol, débris ligneux grossiers). Dans le cadre de l'aménagement écosystémique, de nouvelles approches sylvicoles sont testées ; elles sont basées sur la diversification des interventions sylvicoles, de façon à mieux reproduire les conditions créées par les perturbations naturelles. Le passage d'un aménagement équié à un aménagement laissant après coupes différentes proportions de couvert végétal pourrait avoir un impact sur le rôle de la forêt de puits de carbone. Ce projet a pour objectifs (1) d'étudier le rôle des DLG dans la rétention du carbone via la formation de molécules stables et difficilement dégradables ; (2) d'étudier les effets des différents types de coupes (partielles, totales) sur la dynamique des DLG et la répartition du carbone dans les différents réservoirs de l'écosystème ; (3) d'améliorer les simulations des flux de carbone entre l'atmosphère et la forêt à partir du modèle CBM-CFS

Effets des stratégies d'aménagement écosystémique sur le calcul de la possibilité forestière et le maintien de la mosaïque naturelle dans la sapinière à bouleau blanc de l'ouest.

La Forêt d'enseignement et de recherche du lac Duparquet (FERLD) a été établie par le gouvernement du Québec et est gérée par les Universités du Québec en Abitibi-Témiscamingue et à Montréal depuis 1995, comme une démonstration d'une approche d'aménagement forestier écosystémique (AFÉ). Basée en grande partie sur les connaissances de la dynamique naturelle et du fonctionnement des écosystèmes de la sapinière à bouleau blanc de l'ouest, l'approche d'AFÉ propose essentiellement: 1) de maintenir la structure d'âge et la composition de la mosaïque forestière naturelle à l'échelle du paysage et 2) d'intégrer la dynamique naturelle dans les pratiques sylvicoles à l'échelle du peuplement forestier. D'autres aspects touchant la gestion et la conservation du territoire ont aussi été implantées dont 1) l'inclusion d'une zone de conservation intégrale couvrant 25 % du territoire; 2) l'intégration d'une classification fine des milieux riverains, humides et aquatiques en vue de conservation des forêts de haute valeur de conservation; et 3) l'emploi de coupes partielles, variant de la coupe totale avec rétention variable jusqu'au jardinage. Bien que, conceptuellement, l'approche constitue un avancement pour l'atteinte des objectifs biophysiques de l'aménagement forestier durable, l'impact à long terme de l'ensemble de ces mesures sur le maintien de la diversité écosystémique (l'ensemble des types de peuplements et des classes d'âge de la mosaïque naturelle) et sur la possibilité ligneuse, reste à vérifier. L'objectif de ce projet est de mesurer les impacts de chacune de stratégies de l'approche d'AFÉ de la FERLD sur la disponibilité des ressources ligneuses et sur la structure de la forêt via une analyse de la possibilité forestière et de l'évolution de la mosaïque sous aménagement. L'analyse considérera

chacune des étapes menant au calcul de la possibilité forestière et fournira une documentation détaillée afin d'évaluer la pertinence des intrants utilisés lors des analyses

Intégration de fonctions et d'indicateur économique dans un modèle multiobjectif de planification forestière stratégique

Dans son livre vert, le gouvernement du Québec aborde la dimension économique en exprimant le souhait de voir doubler la valeur des produits de la forêt d'ici 20 ans. Pour plusieurs intervenants, la dimension économique constitue un des éléments cruciaux visés par le développement durable. Les coûts d'approvisionnement, les redevances, la valeur des produits et les investissements sylvicoles sont autant de variables dont les entreprises forestières et l'État doivent tenir compte afin d'assurer le maintien des bénéfices que la ressource ligneuse procure. L'intégration de la dimension économique dans la planification stratégique s'insère parfaitement dans une approche multiobjectif car elle a le potentiel de participer à l'élaboration d'un langage commun en exprimant des objectifs de natures diverses en unités monétaires. Cependant, la performance économique ne fait pas partie du calcul de possibilité, lequel est au cœur de la planification stratégique de l'aménagement forestier. Pour disposer d'un modèle de planification multiobjectif qui traite adéquatement de la dimension économique, il est nécessaire d'en définir les composantes. Tout d'abord, comment relier la croissance des bois à des indicateurs de coûts et de valeurs afin d'améliorer la performance économique d'une d'un scénario sylvicole à l'échelle du peuplement et d'une stratégie d'aménagement à l'échelle de la forêt, sachant que ces relations ne sont pas linéaires? Comment tenir compte de multiples objectifs, dont plusieurs ne sont pas reliés à l'économie de marché, tout en faisant en sorte qu'une stratégie d'aménagement, à l'échelle de la forêt, combine efficacement les scénarios sylvicoles optimaux à l'échelle des peuplements? Enfin, quel indicateur économique permet d'évaluer la durabilité économique d'une stratégie d'aménagement en regard des générations présente et futures? L'objectif général de la recherche est de développer un modèle économique qui sera intégré à la planification stratégique multiobjectif de l'aménagement forestier dans le but de maintenir ou d'accroître les bénéfices socio-économiques pour la génération actuelle et celles qui suivront. Nous aborderons la question en utilisant la richesse produite en termes de valeur sur pied des bois calculée au niveau de la société après la première transformation. Le projet de recherche se déploiera autour de trois objectifs spécifiques.

University of Alberta

FOR 431 (Integrated Forest Management)

Problem solving, decision making and planning in relation to the management of forest resources. Application of models and related tools. Public involvement and issues management will be addressed.

REN R 430 (Forest Resources Management)

Mathematical programming, decision analysis and computer simulation applied to natural resource management problems.

Sustainability of timber production and old-growth area goals (MSc project)

This project examines the joint sustainability of time production and old-growth area goals in a forest subject to a stochastic fire regime.

University of British Columbia

Large Scale Bio Energy Systems

PhD student Catalin Ristea is using Woodstock for modeling hybrid poplar plantations that provide feedstock to bioenergy plants. Genome BC research grant.

University of Canterbury

FORE 316 – Forest Management

Woodstock was used in this course to illustrate concepts of forest estate modeling.

FORE 419 – Management Case Study

Woodstock was used to evaluate alternative forest management, land acquisition and carbon forestry strategies for a 16,000 ha estate.

University of Idaho

Simulating harvest scheduling and wood supply effects on conifer seed germination rates

Can advanced silvicultural systems modify seed germination to favor particular species under different wood use and climate change scenarios? As part of his dissertation with Anthony S. Davis at the University of Idaho, Rob Keefe is using Remsoft software to study how forest management emphasizing local wood use can affect the interaction between overstory removal and the seed germination microclimate. Mr. Keefe uses a process-based soil moisture model and a new, hybrid seed germination model based on seed size and shape characteristics inferred from digital X-radiographic seed inventories to forecast how different harvesting objectives can affect relative germination rates. This work integrates hybrid forest simulation modeling with the unparalleled strength of Remsoft spatial optimization.

FORP434: Forest Tractor and Cable Systems Analysis

This is a core, senior level undergraduate forest products course at the University of Idaho. Mr. Keefe may be teaching the course during the spring semester, 2010. If so, Mr. Keefe would like to use the Remsoft SPS to demonstrate some relatively simple wood supply / optimization scenarios for a portion of the course.

University of Maine

FTY 477 Forest Management II

Integration of biophysical and socioeconomic sciences for multiple use management to achieve desired products, services, and conditions of forest lands. Application of modern analytical procedures for strategic, tactical and operational forest management planning up to the landscape level. This course utilizes a variety of software programs including the Landscape Management System and the Remsoft Spatial Planning System to expose students to techniques and tools. Together with FTY 476, satisfies the capstone requirement for the Forestry curriculum.

Predicting responses of forest landscape changes on wildlife umbrella species

Modeling past and future effects of alternative forest harvesting scenarios on vertebrate biodiversity across multiple scales on forestlands in Maine. Woodstock and Stanley are being used to project future forest conditions across a 14-township multi-owner forested landscape derived from satellite change detection dating back to the mid 1970's. Spruce budworm outbreak scenarios are also being modeled to evaluate potential impacts on management and habitat.

Landscape Planning Initiative for Northern Maine Using Area Sensitive Umbrella Species

The goal of this project is to develop, implement, and evaluate a habitat management system useful in sustainably managing the large forestlands of northern Maine. We will use data from the Nature Conservancy (180,000 acres in northern Maine) as a sample landscape in which to evaluate our models. We will be using the Remsoft Spatial Planning System to translate forest harvest planning goals and alternatives into spatially-explicit management scenarios developed around lynx and marten habitat requirements.

University of New Brunswick

FOR 2006 Management of Natural Systems

Introduces management design issues and practices for a variety of natural systems so that students can effectively work across related disciplines. Objectives: (a) quantitatively design and evaluate strategies aimed at producing a desired set of outcomes for natural systems, including forests, wildlife populations, and hydrological networks; and b) communicate technical information clearly and succinctly in written format.

FOR 3006 - Forest Management

Continuation of FOR 3005. Introduction to linear programming in forest management. Introduction to elements of resource modeling and productivity assessment (e.g. water flow) at the stand level. Analysis of the impact of alternative interventions at the operational level and their integration with strategic and tactical plans, including: financial and socioeconomic evaluation of the forest management and resulting value flows; and risk management for Insect or pathogenic attacks and wildfire. Post-implementation assessment of activities as a critical part of the management process. Prerequisite: FOR 2006, FOR 3005, or permission of instructor.

FOR 4096 – Forest Landscape Design and Management

Integrates value-flow planning with landscape planning by: 1) introducing students to the concepts and techniques used in dealing with the spatial dimensions in forest management planning; 2) introducing students to the difficulties involved with management for a complex set of demands, where resources demanded have production functions that include complex spatial and temporal relationships of inputs, many of which are unknown; and 3) exposing students to techniques available to forecast landscape patterns resulting from flow driven management planning, and to design landscape patterns based on analysis of natural dynamics. Prerequisite: FOR 3006, or permission of instructor.

FOR 4020 – Management Practicum

Practical exercise in forest landscape management, designed to provide an opportunity of integrate skills and knowledge gained throughout the program. Forest Ecosystem Management and Forest Engineering students will work on the same project to design landscape management plans at the strategic, tactical and operational levels. The practicum will be based on real forests. Through consultation with clients and/or members of the public, goals will be developed. Plans will be derived to

integrate these goals. Teams will be responsible for project management, including planning, budgeting and report preparation.

PhD Forest Management

Research goals

Objectives are 1) to quantify effects of defoliation by SBW (outbreak duration, severity) on timber supply, biomass, and carbon sequestration for susceptible stands; 2) to simulate the effects of alternative harvest scheduling, salvage and biological insecticide use scenarios on projections; and 3) to estimate harvest and carbon credits resulting from alternative forest and pest management activities.

Research methods

Insect defoliation decreases growth, increases mortality, and thereby alters stand volume over time. A modeling framework has been built to 1) use the New Brunswick stand growth model to quantify stand-level effects of defoliation and protection on volume, growth loss, and mortality; 2) incorporate time-dependant stand impact forecasts (SBWDSS methods) into a timber supply model (Woodstock) to quantify forest-level effects; and 3) use a combination of the timber supply model with insect effects and the **Carbon Budget Model** of the **Canadian Forest Sector** (CBM-CFS3, Can. For. Serv.) to determine forest-level biomass dynamics and carbon sequestration levels for alternative defoliation and pest management scenarios. Over 200 foliage-protection scenarios, including alternative combinations of efficacy, timing, and spatial extent of protection have been simulated for moderate and severe spruce budworm outbreaks beginning in 2002 on the J.D. Irving, Ltd. Black Brook District.

Summary of the outcome

Chris Hennigar has demonstrated that optimized harvest re-planning and salvage, and spatial allocation of foliage protection through Woodstock will reduce volume and carbon loss from SBW by up to 30% and minimize the area of insecticide application. His modeling reinforces 1) the fundamental importance of integrated pest-forest management and 2) the need for examination of all forest-sector carbon pools: forest (live biomass, dead-organic matter), wood product (in-use and landfill deposits), and avoided emissions from product substitution, for developing sound forest policy to reduce atmospheric CO₂ during SBW outbreaks.

Hennigar, C.R., MacLean, D.A., Porter, K.B., and Quiring, D.T. 2007. Optimized harvest planning under alternative foliage-protection scenarios to reduce volume losses to spruce budworm. *Can. J. For. Res.* 37: 1765-1769.

Hennigar, C.R., MacLean, D.A., and Quiring, D.T., Kershaw J.A. Jr. 2008. Differences in spruce budworm defoliation among balsam fir and white, red, and black spruce. *For. Sci.* (in press).

Hennigar, C.R., MacLean, D.A., Amos-Binks, L.J. 2008. A novel approach to optimize management strategies for carbon stored in both forests and wood products. (submitted to *For. Ecol. Manage.* Jan. 25th 2008).

Hennigar, C.R., MacLean, D.A. 2008. Influence of spruce budworm on carbon stored in the forest and wood products for alternative pest management scenarios in New Brunswick. (in prep.).

Economic benefits of optimized foliage protection and harvest planning to minimize losses to spruce budworm and area sprayed

Please contact partners@remsoft.com for the full abstract available in PDF form.

University of New Brunswick – Asset Management

CE5241- Introduction to Pavement Management Systems

A pavement management system encompasses a wide spectrum of activities including the planning or programming of investments, design, construction, maintenance, and the periodic evaluation of performance. The levels of management involved range from policy-related decisions for a number of projects, to practice-related detailed decisions within particular projects. The function of management at all levels involves comparing alternatives, coordinating activities, making decisions and seeing that they are implemented in an efficient and economical manner. The basic purpose of a pavement management system is to achieve the best value possible for the available public funds and to provide safe, comfortable and economic transportation. This is accomplished by comparing investment alternatives at the network and project levels, coordinating design, construction, maintenance and evaluation activities, and making efficient use of existing practices and knowledge.

This course is intended to cover the basic aspects of the system approach to pavement management; that is, the framework for good pavement design, data requirements, pavement evaluation, structural design and economic evaluation, work programming and prioritization.

Waiariki Institute of Technology

Plan Management of a Forest Estate

The aim for this Unit(paper) is to prepare a forest estate plan with reference to issues such as yield regulation, silvicultural/management regimes, forest protection, planning, scheduling and budgeting for forest operations - all of the issues a forest manager would be expected to deal with. This year we will introduce the Woodstock software tutorials to our year 3 students to show them the possibilities of running particular models with and without constraints to show the effect of these constraints on the forest wood/market supply/regime/budgets etc..

Prepare a Production Control System

This Unit(paper) will be delivered to our year 2 students and the aim is to prepare a production control system specifically for the harvesting/wood supply for a forest with a given set of customer log products. The students certainly become aware of many of the issues surrounding harvest planning/forest engineering, harvest crew scheduling, market/wood supply chains and distribution. The Woodstock tutorials will again demonstrate the possibilities for modeling certain scenarios and picking the best outcome given a set of constraints. 2011 will hopefully see us introducing a customized set of data for Woodstock so that we can run our own scenarios/constraints and therefore results.

Prepare Operational Forest Harvesting Plan

The purpose of this Unit (paper) is to focus on the operational planning of a particular harvest area with respect to the infrastructure (roads and landings) harvesting systems, environmental constraints and not the least , cost. Although the focus of the unit is operational the students need to be aware of some of the strategic/tactical constraints on any planning process and this is where we will re-introduce

Woodstock to highlight the application's use in modeling some of the likely outcomes for harvesting blocks in a forest.

Many thanks to Marion Hughes (Nelson Management Ltd) and Fred Schipper (Timberlands Ltd) for their very helpful advice and/or instructions for making a tentative start in Woodstock.