Western Boreal Growth & Yield Association ANNUAL REPORT



April 2008

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Executive Summary and Highlights

The Western Boreal Growth and Yield Association first met in the mid 1980's as an informal group of agencies involved in forest growth, yield, inventory and planning in western Canada. The association works to: encourage member agencies to work in a coordinated fashion to improve the efficiency of their research and development efforts; facilitate data sharing; and, provides a forum for communication. We are focused on development and dissemination of growth and yield modeling technology and information for both natural and regenerated stands in the western boreal mixedwood region, primarily aspen and spruce.

Current membership in the association includes seven forest companies and three provincial/territorial governments (Alberta, Saskatchewan and the Northwest Territories).

The association coordinates work on a long-term study which is designed to examine the effects of manipulating aspen density on growth and yield of mixedwood stands. Work 2007 has focused on preparing detailes summaries of data for each installation.

In 2007 some studies were completed and some new studies were initiated. All studies are designed to contribute to a better understanding of the growth and yield implications of managing mixedwood stands.

Work on the Mixedwood Growth Model continued with a new version released in June of 2007 supported by a workshop. Many new MGM initiatives are underway and are outlined in this report.

This Annual Report presents highlights of work accomplished during 2007 and briefly outlines plans for 2008.



April 2008

2007 has again been a banner year for WESBOGY.

Mike and Susan continue to make progress with cleanup, updating and maintenance of the long-term study data. Summaries of data from each company have been prepared and sent to each member company and the data continue to be used in MGM development and validation. In the spring of 2007 a new release of MGM was completed and final validation is underway, with publication of results planned for the fall of 2008. Mike Bokalo, Steve Titus and Ken Stadt are leading work on MGM.

The fall meeting in Lac La Biche and the field trip to Fort McMurray were excellent. Special thanks to the extra effort that Dave Cheyne and Mike invested in making this meeting the success that it was. (Even the movies were "interest-ing").

Work on a number of student projects is progressing well. You will find information on some of the research that Sheelah Griffith, Valentin Reyes-Hernandez, Hongan Yan, and Fang Ye are doing in the report.

During the winter, NSERC approved funding of the ForValueNet Strategic Network, in which I am involved. Results from this research network should be of interest to WESBOGY members. Some additional information on the network is also provided in this report.

2008 promises to be another productive year. Research is ongoing (don't know if it is ever possible to run out of questions to try to answer). Mike will be very busy with the FRIAA funded Benchmark Project and MGM. I will be continuing research on a number of fronts in Canada and will be enjoying undertaking some research in Scotland relating to conversion of even-aged Sitka spruce stands to continuous cover forestry (funded under a Scottish Forestry Trust Fellowship).

If you require any further information on the projects that are underway or have other questions relating to WESBOGY please contact Mike Bokalo or myself.



Phil Comeau Chair, WESBOGY Dept. of Renewable Resources University of Alberta 442 Earth Sciences Bldg. Edmonton, AB T6G 2E3 Email: phil.comeau@ualberta.ca The purpose of the WESBOGY Association is to conduct research projects that contribute to the development and dissemination of growth and yield information and modeling technology for both natural and regenerated stands growing in the boreal mixedwood region, primarily aspen and spruce.

Individual projects and/or students sponsored with Association resources should make progress in achieving this mission. Sponsored projects include those supported using Association resources. Associated projects are identified with the Association but are funded by individual (or groups of) members or other sources. A business plan outlining project priorities and allocation of resources to accomplish the mission has been developed and periodically reviewed with the participation of Steering Committee members.

GOALS

To develop and implement a program of research in the study of growth and yield and stand dynamics focused on problems of interest to members of the Association. Projects will have defined goals and products, and will be completed in a timely manner.

To increase knowledge and awareness of growth and yield relationships, as they exist in western and northern Canada.

To foster communication, cooperation and exchange of information among the members as well as various agencies and groups concerned with management and development of boreal forests.

To focus on the dynamics of mixedwood stands of aspen and white spruce growing in the boreal forest. Basic relations to be studied will include establishment, ingrowth, growth, and mortality. While the major species of interest are aspen and white spruce, other species such as balsam poplar, lodgepole pine, black spruce, and jack pine will also be studied. In developing simulation models based on these relations, provision will be made for projecting stands subject to multiple interventions (treatments) through the life of the stand. Differences between Natural Subregions (Ecoregions) and site productivity will also be evaluated where there is sufficient data.

To encourage the establishment and continued monitoring of standardized permanent sample plots (PSPs) to quantify the effects of forest management practices in natural and regenerated stands, and in general to coordinate the acquisition of high priority growth and yield data.

To identify, evaluate, rank and address areas of research which are: of regional importance, of shared mutual interest, and most effectively approached cooperatively by the Association rather than by individual efforts;

To facilitate the dissemination of growth and yield data through the development of appropriate procedures, standards and databases for members' use.



The following table lists measurable objectives identified for the 2006-2011 Agreement. It also includes links to the overall goals of the WESBOGY Association.

5-Year Objectives	Related Goals
1. To maintain the WESBOGY long-term study designed to evaluate the effect of spruce and aspen density levels on the development of plantations from estab- lishment to final harvest. Maintain and update the database for the WESBOGY long-term study. Complete analysis of data. Encourage new members to participate in the long-term study.	Goal #1 and #5
2. To develop and refine growth and mortality relationships and incorporate these new relationships into the MGM growth simulator.	Goal #1 and #2
3. To expand the scope of the MGM growth simulator as a tool for the develop- ment of managed stand yield projections for the major commercial tree species in the region. This will also include providing support for studies required to de- velop models of tree and stand response to establishment, tending and harvest- ing practices.	Goal #4, #5, and #6
4. To maintain a website that will identify, evaluate and disseminate information on trends in growth and yield research;	Goal #3 and #7
5. To hold annual field and technical meetings for dissemination of information obtained from ongoing research projects as well as other speakers invited to address other relevant growth and yield issues.	Goal #3 and #7
6. To expand the scope of WESBOGY activities by recruiting new members and seeking opportunities to augment the research component by securing funding from other granting agencies.	Goal #1, #2, #3 and #6
7. To identify and summarize regional PSP database standards and protocols for data exchange and use with regional growth models.	Goal #2, #3, #5 and #7
8. To collaborate with other agencies and organizations in the development of research and acquisition of data to support a better understanding of and development of models to estimate effects of silviculture on yield.	Goal #1, #2, #3 and #4
9. To identify and prioritize research needs and to initiate new projects as appro- priate under the direction of the Steering Committee and members.	Goal #1, #2 and #6

5-Year Program (2007-2011)

- 1. To continue analysis of the WESBOGY long-term study data including:
 - Height, diameter, and density patterns for aspen in the natural plots.
 - Height and diameter growth of spruce and aspen in treated plots.
 - Mortality of spruce and aspen in treated plots.
 - Recruitment (ingress) of new trees into natural and treated plots.
 - Preparation of manuals and reports for distribution to members and for journal publication.
- 2. To continue development of MGM to improve its ability to represent stand responses to silviculture. This will include;
 - Partial cutting amount and method.
 - Site preparation.
 - Brushing and vegetation management
 - Influence of site, age and other factors on aspen-conifer interactions..
- 3. To update the WESBOGY long-term study data collection manual and the WESBOGY web site.
- 4. To seek to expand the scope of WESBOGY activities and influence.
 - To identify and approach potential new members;
 - To seek opportunities and develop proposals for potential complementary funding from other agencies.
 - To work with other groups and co-operatives and to promote WESBOGY activities in both silviculture practices and growth modeling.
- 5. To organize the WESBOGY Fall, Spring, and Steering Committee meetings each year. Prepare the meeting minutes and WESBOGY annual reports.
- 6. To develop height, diameter, and mortality functions for other species.
 - To develop relationships for poplar and black spruce using available PSP data.
 - To prepare manuals and reports for distribution to members and for journal publication.
- 7. Review, summarize, and prepare a report of regional PSP database standards and protocols for data exchange and use in regional growth models.
- 8. To review and update the list of priority and ongoing projects.
- 9. To undertake high priority research projects as recommended by the Steering Committee and approved by the members.



The following table *summarizes* current projects and their respective priorities. For a complete description of projects and proposed projects see the WESBOGY 2005 Annual report.

Current Research Projects

	Subject/Title	Status and Priority
1.	Development of MGM	Status: Ongoing Researchers: Mike Bokalo, Ken Stadt, Steve Titus, Phil Comeau
2.	Maintenance of Long Term Study Database	Status : Ongoing Researchers : Mike Bokalo, Phil Comeau, Susan Humphries
3.	Analysis of Long Term Study Data	Status : Ongoing Researchers : Mike Bokalo, Phil Comeau
4.	MGM-Volume Loss Factor development	Status : Done - Manuscript in Prep Researchers : Cosmin Tansanu (M.Sc.). Mike Bokalo and Phil Comeau
5.	Competition dynamics in young mixedwood stands	Status : Initiated 2001 Researcher : Cosmin Filipescu (PhD) and Phil Comeau;
6.	Evaluation of competition indexes using LTS data	Status: underway Researcher: Phil Comeau
7.	Evaluating the predictive performance of several growth models calibrated for Saskatchewan	Status : Done - Report to be distributed Researchers : Cosmin Tansanu (MSc), Mike Bokalo and Phil Comeau
8.	Grass and aspen competition for water	Status: Initiated 2004 Researcher: Phil Comeau
9.	Effects of aspen density and basal area on under- story LAI and plant community diversity.	Status : Initiated in 2006. Researcher : Sheelah Griffith (M.Sc.) Phil Comeau
10.	Competitive effects of willow and aspen on white spruce growth in mixedwood stands	Status : Initiated 2006 Researcher : Fang Ye, Phil Comeau
11.	Stand Density Index and its relationships with pro- ductivity and understory vegetation	Status : Initiated 2007 Researcher : Valentin Reyes-Hernandes, Phil Comeau
12.	Benchmarking Natural (fire origin) stand regenera- tion.	Status : Initiated 2007 Researcher : Stefanie Gaertner, Mike Bokalo, Ken Stadt and Ellen Macdonald

Agency/Company	Current Membership
Alberta Sustainable Resource	Since 1985
Alberta-Pacific Forest Industries Inc.	Since 1990
Alberta Plywood	Since 1985
British Columbia Ministry of Forests	1985-2003
Canadian Forest Products	Since 1985
Daishowa-Marubeni International Ltd.	Since 1990
Louisiana-Pacific Canada Ltd.,, British Columbia	Since 1997
Louisiana-Pacific Canada Ltd., Manitoba	Since 1996
Manning Diversified Forest Industries Ltd.	Since 1997
Northwest Territories Resources, Wildlife and Economic Development	Since 1985
Saskatchewan Environment and Resource Management	Since 1985
University of Alberta	Since 1985
Weyerhaeuser Company, Alberta Forestlands	Since 1985

Steering Committee Members

A Steering Committee, consisting of three or four members elected to the Committee at the Annual Fall meeting, and the Chair and the Research Scientist sets policy, develops strategic objectives and priorities, reviews work plans, adjusts annual membership assessments in light of planned activities, and deals with other items which may arise.

2000 Titus, Wang, Behuniak, Niemi, Weeks 2001 Titus, Behuniak, Niemi, Nichol, Ewan 2002 Titus, Bokalo, Comeau, Behuniak, Niemi, Nichol, Ewan 2003 Comeau, Bokalo, Titus, Behuniak, Niemi, Nichol, Ewan/Ashley 2004 Comeau, Bokalo, Titus, Behuniak, Nichol, Ashley, Whittaker 2005 Comeau, Bokalo, Titus, Behuniak, Nichol, Ashley, Whittaker 2006 Comeau, Bokalo, Behuniak, Nichol, Blue/Ashley, Whittaker/Whitmore 2007 Comeau, Bokalo, Nichol, Ashley, Whitmore, Morgan

Long Term Study of Aspen/Spruce Stand Development

Mike Bokalo, Phil Comeau and Susan Humphries

The design of the Long-Term Study involves planting white spruce seedlings in recently clearcut areas where aspen regeneration had already been established. Spruce seedlings were planted in both the plot and buffer areas. For the first 5 years, vegetation is controlled by clipping or using plastic mulch mats within a 40 to 50 cm radius of the spruce. After 5 years, both the spruce and aspen are thinned to desired treatment densities. The objectives of the thinning are to achieve desired densities but retain potential crop trees at relatively uniform spacing. The study uses a randomized block design with each agency setting up and maintaining one block, comprised of two installations. Each installation consists of two replications of a series of 15 plots.

In 2007, along with the annual collection, inputting and cleaning of tree data, the year focused on finalizing the database and providing the companies the first summary report for each of their installations. The summaries were presented at the WESBOGY fall meeting in Lac La Biche, Alberta and included both tabular and graphical summaries of density, height, and diameter for both aspen and spruce and also included the spatial diagrams of each of the plots. In September 2007, a new version of the WESBOGY long-term study experimental design, data collection and database maintenance manual was released. This release was a complete redesign of the original manual and focused on chronologically organizing the manual specifically identifying the tasks that needed to be completed relative to the measurement year of the installation. The long-term study database saw a tremendous amount of re-development which included changes to the database structure to support lookup tables and cross-linked databases. The first steps of removing the spatial data from the main tree data were taken. This was specifically done to maintain a single spatial record for each tree simplifying the database structure. The databases for the soils, vegetation, and site were incorporated into the main database structure. Another major task undertaken in 2007 was to develop a summary of the history and future schedule of activities for each installation. This includes a plan for future data collection and the acquisition of all the supplementary information required to support the study (maps, GIS shape files and site descriptions).

Analysis in 2007 focused on determining whether there are significant differences in height, diameter, height/diameter ratio and height increment between the different aspen treatment densities (0, 200 500, 1500, 4000 and natural). A mixed model ANOVA was applied to the complete dataset to account for the data structure created by the study design (defining the fixed and random factors). Some results describing the effect of aspen on spruce are presented in the table below.

Plans for 2008 include the development of the long-term study data input files for MGM for each of the installations and plots. This will facilitate the projection of each of the long-term study plots into the future in MGM. Another task that is planned is the determination of site indices for each plot using the breast height age and total age equations developed by Alberta Sustainable Resource Development. Another analysis of interest is the development of individual tree survival/ mortality equations for use in MGM. These equations would replace the existing whole stand approach to modeling mortality in MGM.

Source	df	HT	RCD	HTI	HDR
		P-value	P-value	P-value	P-value
Agency (A)	3	-	-	-	-
Installation(I)	1	0.683	0.474	0.448	0.416
Aspen Treatment Density (Aw)	5	0.706	<.0001	0.829	<.0001
Spruce Planting Density (Sw)	1	0.128	0.537	0.010	0.325
A * I	3	-	-	-	-
Replicate(A * I)	6	-	-	-	-
Aw * Sw	5	0.421	0.153	0.324	0.465
I*Aw	5	0.700	0.908	0.751	0.951
I*Sw	1	0.634	0.863	0.118	0.993
I*Aw*Sw	5	0.626	0.869	0.432	0.305
Residual Error	132	-	-	-	-
Total	167	-	-	-	-

Aspen Treatment Effect on Spruce - Mixed model ANOVA results (α =0.05) for spruce, testing differences in mean HT(m), RCD(cm), HTI(cm) and HDR ratios by treatment at year 13

Company or Agency	Agency Code	Site	Year Spruce Established	Measurements Including 2007
Alberta Sustainable Resource Development	SRD	Med	1992 2001	15 6
Alberta-Pacific Forest Industries Inc.	ALP	High Med	1994 2001	14 6
Canadian Forest Products Ltd.	CFR	High Med	2000 2001	7 6
Daishowa-Marubeni International Ltd.	DMI	High Med	1992 1992	15 15
Louisiana-Pacific Canada Ltd., Manitoba	LPC	High Med	1998 1998	9 9
Louisiana-Pacific Canada Ltd., Dawson Creek	LPD	High Med	2001 2004	7 4
Northwest Territories Resources, Wildlife and Eco- nomic Development	NWT	High Med	1993 1993	14 14
Alberta Plywood	WFR	High Med	1992 1993	13 15
Weyerhaeuser Company, Alberta Forestlands	WGP	High Med	1991 1991	16 16
Domtar Inc., Saskatchewan	WPA	High Med	1990 1990	17 17
Saskatchewan Environment and Resource Management	SRM	High Med	1992 1992	15 15



Mixedwood Growth Model (MGM) Development

Mike Bokalo, Ken Stadt, Phil Comeau, and Steve Titus

The development of MGM in 2007 continued on many fronts. In early June of 2007 a new version of MGM (MGM2007A) was released. The release was coupled with a one day user workshop that began with several presentations outlining the new enhancements followed by an afternoon of hands on tutorials. Attendance at this workshop was very high (33 registrants) and the comments from the workshop questionnaire were excellent. Following the release of MGM2007A, work focussed on testing, validating and bug fixing. The final release of the model was delayed to allow users to test and recommend changes. A concerns raised by several users was the lack of a method to batch process a several stands or crop plans. In response, an external batch processing methodology was developed, tested and distributed. Development of the multistrata version of MGM (MSS) continued through 2007. The MSS version of MGM is being developed for application in situations where stands must to be sub-stratified in order to account for spatial differences. This is a semi-spatial approach to modeling and directly addresses the proposed protocol requiring that cutblocks, when necessary, be subdivided into smaller strata . On the horizon is the MSS version of MGM with the ability to account for the effects of adjacent stands (refer to page 17 for re details). Other areas of development include linking MGM to the Stand Visualization System (see example image below) and the inclusion of functions to calculate tree and stand total biomass. The final pressing task in the development of MGM is the publishing the relationships and results of the work that has already been incorporated into MGM.



Current Graduate Students

Cosmin Tansanu, M.Sc. Successfully Defended 2007 – The role of gaps and stand fragmentation in estimating stand yields.

Cosmin Filipescu (Ph.D.) - Effects of competition, site, and age on white spruce growth.

Sheelah Griffith (M.Sc.) – Characterization of plant community leaf area index and understory vegetation development following pre-commercial thinning in boreal mixedwood forests

Valentin Reyes-Hernandez (Ph.D.) - Stand Density Index and its relationships with productivity and understory vegetation in the boreal mixedwoods in Western Canada

Fang Ye (M.Sc.) - Evaluation of competitive effects of willow and aspen on white spruce growth in western boreal mixedwood stands

Hongan Yan (M.Sc.) - The effects of competition control treatments on white spruce (*Picea glauca* [Moench] Voss) height and diameter growth.

Benchmarking Natural Origin Stand Development

Stefanie Gaertner, Mike Bokalo, Ken Stadt and Ellen Macdonald

In 2006 a project proposal to Forest Resource Improvement Association of Alberta (FRIAA) - Open Funds Initiative was approved. The project is also supported by the Mixedwood Management Association and WESBOGY. The project start date was delayed due to difficulties in recruiting a qualified student. In January of 2008 a Post Doctoral Fellow, Stefanie Gaertner was hired to lead the project. The objective of this project was to obtain benchmark data from natural (fire) origin pure and mixedwood stands and compare this to post-harvest stand data. A secondary objective was to provide a range of juvenile natural origin stand conditions (density, stocking, size distribution) to assist in initializing growth and yield models. This will allow more appropriate testing of these models against the natural origin mature data (PSPs, TSPs) which are currently used for final yield evaluation. In the spring of 2008, a full season of field measurements are planned. Fires selected for the study include the Chip Lake fire (1998), the Ochiese fire (1988), the Virginia Hills fire (1998), the Mariana Lakes fire (1995) and the Mitsue fire (1998).

The ForValueNet NSERC Strategic Network

Phil Comeau

The objective of this Strategic Network is to develop a series of new and integrated models to support value-added wood decision-making in Canada's boreal forests. The project includes five themes: 1) Stand and tree growth modelling; 2) Three-dimensional stem quality modelling; 3) Sawmilling products recovery modelling; 4) Value-added wood products recovery modelling; and finally 5) Development of integrated decision-support systems considering the information generated in the four previous themes plus silvicultural, harvesting, manufacturing and marketing costs and end-product value. The development of an integrated wood manufacturing optimization system for principal boreal forest species will enable the industry to optimize the wood products manufacturing processes based on both external stem geometry and internal wood characteristics in order to maximize the value from the individual trees. The integrated models developed from the project will support value-added silvicultural and harvesting planning to enhance forest stand value. Overall, this Strategic Network will allow the Canadian forest industry to add value along the forest-wood value chain, directly supporting the industry's strategic positioning towards achieving greater value-added wood manufacturing, enhanced forest value and competitiveness within the global market. Ten Canadian Universities and 32 academics are involved in this project. Dr. Alain Cloutier at Laval University is the Network Chair. Several individuals from Industry and from Federal and Provincial Government agencies are involved in this project which has 5 years (2008-2012). Phil Comeau is chair of Science Committee for the network and will be leading a project examining relationships between stand and tree characteristics and wood quality in mixedwood stands.

Stand Density Index and productivity in boreal mixedwoods of Western Canada

Valentin Reyes-Hernandez and Phil Comeau

Some density measures (like Reineke's Stand Density Index – SDI) are useful indicators of site occupancy and competition between component species, along with the potential impact of them on stand productivity in mixed stands. SDI is an expression used to define a maximum stand density at a given stand average size (quadratic mean diameter of 25 cm), and it is directly related to the -3/2 power law (Yoda et al, 1961).

This research is focused on three objectives: a) to analyze the influence of site occupancy and stand composition on productivity of boreal mixedwood stands, linking them to growth rates of the component species; b) to characterize structural diversity and relate it to SDI, composition and management objectives, and c) to examine understory vegetation abundance (non-timber value) and its relation to density evaluations and current stand structure/composition.

Permanent sample plot (PSP's) data from the Western Canada boreal forest is being used to develop size – density relationships equations for white spruce and aspen stands, covering a wide range of ages, stand densities, species compositions and site conditions. Additional data on light penetration and understory vegetation is being collected in selected PSP's. Sampling will be completed during the summer of 2008. Size-density relationships will be developed for pure and mixed stands using all of the data sets, while current stand structure analysis will use the most recently measured PSP's.

This research is being funded by the Sustainable Forest Management Network. Personal support for Valentin Reyes-Hernandez is being provided by a CONACYT scholarship.







Effects of Gap Size and Surrounding Trees on the Light Patterns in Western Boreal Forest

Fang Ye and Philip G. Comeau

Light patterns within gaps were examined in young aspen stands in northeastern British Columbia and Northern Alberta. Within gaps, light transmittance (diffuse noninterceptance) is highly correlated to the sky view angle.

$$SVA = \tan^{-1}\left(\frac{H-h}{R-d}\right)$$

And between two locations light patterns were significantly different as shown on Figure 1.

Branch expansion of trees into gaps also was examined in BC. The results showed that annual branch lateral growth rates averaged 15.2 cm/yr. Lateral branch size facing gaps is significantly longer than that of branches growing away from gaps (Figure 2). Height growth of edge trees was not significantly different from the general tree growth within stands.







Figure 2. Size of the branches growing into and away from gaps in relation to gap size (L, M, S). Tukey's honest test showed branch size in large gaps is larger than medium and small gaps (P<0.01).

The effects of competition control treatments on white spruce (Picea glauca [Moench] Voss) height and diameter growth.

Hongan Yan and Phil.Comeau

The Judy Creek Mixedwood study was established in 2002 to examine the effects woody only and complete control, and duration of complete control on growth of both aspen and white spruce. The study was established in a recently harvested block located at Judy Creek, near Whitecourt, Alberta (54° 22′ 48″N 115° 35′ 30″W). Spruce were planted in June of 2003 and have been measured annually.

In 2007 height and diameter growth of the 8 sampled white spruce in each plot were calculated and analyzed using analysis of variance (ANOVA). Results show that CCB, CCR2, CCR4, HCB, WCR treatments had significant influence on spruce height growth compared with NCB (control) plots (p<0.05) (Figure 1), the net height growth was 200% more in those plots than in NCB plots, but there was no significant difference between NCB and WCB plots. The highest height growth occurred in HCB plots, followed by CCR4, CCB, CCR2, WCR, WCB, and NCB. There was also a significant difference between radial treatments (CC2 CCR4 WCR) and broadcast treatments (CCB WCB HCB NCB) (p=0.0005).

Spruce annual diameter growth in NCB was significantly different from the CCB, CCR2, CCR4, WCB and WCR treatment (p<0.05), but there was no significant difference between NCB and HCB (Figure 2). The highest diameter growth occurred in CCB, followed by CCR4, CCR2, WCB, WCR, HCB and NCB. There was significant difference between radial treatments (CC2 CCR4 WCR) and broadcast treatments (CCB WCB HCB NCB) (p<0.0001).

Results continue to indicate benefits of complete and herbaceous control, compared to control of only the woody component.



Figure 1. 4-year old white spruce annual net height growth in seven different silvicultural treatments. CCB: broadcast complete control, CCR2: 2-year radial complete control, CCR4: 4-year radial complete control, HCB: broadcast complete control, NCB: broadcast no control, WCB: broadcast Woody control, WCR: radial woody control.



Figure 2. 4-year old white spruce annual net diameter growth in seven different silvicultural treatments. CCB: broadcast complete control, CCR2: 2-year radial complete control, CCR4: 4-year radial complete control, HCB: broadcast complete control, NCB: broadcast no control, WCB: Broadcast Woody control, WCR: radial woody control..

Tree and understory LAI and species richness at the Weyerhaeusser Grande Prairie LTS Site

Sheelah Griffith (M.Sc. candidate) and Phil Comeau

The effect of pre-commercial thinning (PCT) on overstory leaf area (LAI) and understory vegetation was examined ten years after the initial thinning in this young boreal mixedwood stand. PCT had a positive impact on white spruce root collar diameter and on the average diameter of retained aspen. Overstory LAI had a negative exponential relationship with overstory aspen density and results indicated that reducing the aspen density to below 1500 trees per hectare (7m2/ha) leads to a reduction in overstory LAI. The understory plant community responded to thinning with an increase in total cover and a shift in abundance towards shade intolerant species. Understory species richness was not affected by thinning and introduced species abundance did not increase in response to thinning. The small shifts in understory cover and dominance observed are consistent with the fact that most understory boreal species are adapted to disturbance.

The relationship between aspen basal area and estimate of overstory LAI using hemispherical photography (p>0.0001, r2=0.49).



The relationship between aspen basal area and total understory (p<0.0001, r2=0.17).



Growth and Yield Implications of White Spruce Understory Protection and Other Mixedwood Silviculture Systems

Dan MacIsaac, Mike Bokalo, Ken Stadt and Phil Comeau

The multi-strata modeling capacity was initially developed in MGM in a previous project "Adapting the Mixedwood Growth Model for Post-harvest Stands". The natural extension of this project was to validate the model and further develop MGM to include the effects of adjacent strata on tree growth using light as the main factor limiting growth. To continue the development a two year research project titled "Growth and Yield Implications of Strip Shelter-woods and Other Mixedwood Silviculture Systems", led by the Canadian Forest Service and funded by the Mixedwood Management Association, was initiated.

The two research objectives posed were:

- 1. Evaluate and refine the multi-strata version of the Mixedwood Growth Model using semi-spatial understory protection data.
- 2. Conduct long-term (60 year rotation-length) growth and yield modeling of strip cut understory protection and other mixedwood silviculture systems.

The Hotchkiss F3S Block was chosen as the development and test data set. The block was harvested as a two pass shelterwood and is comprised of a 5 m aspen residual interspersed with a 35 m aspen extraction corridor using two ~6m wide machine corridors, with a 5 year interval between harvest of the first and second machine corridor.

The questions that this project intends to address are:

- 1. Will the aspen and poplar regenerating along the machine corridors provide a significant proportion of volume during the second harvest? What will be the effect of aspen regeneration in the white spruce retention corridor?
- 2. What are the optimal stand conditions (in terms of spruce density and height) to target for understory protection from both productivity and management points-of-view?
- 3. What are the effects of modeling adjacency on long term growth and yield?
- 4. What are the long-term implications of this development on the overall growth and yield in these stands?
- 5. Is this a perpetual mixedwood management regime or will this system eventually result in conifer conversion?

The project completion date is early 2009 and will include a report summarizing the findings, 3 peer reviewed manuscripts, as well as a new enhanced version of the MGM Multistrata Model.



2007 WESBOGY Annual Fall Meeting Lac La Biche, Alberta September 4th, 5th and 6th

Hosted by: Alberta-Pacific Forest Industries

Theme: Oil and Gas versus Growth and Yield

Agenda

September 4th - Location: MacArthur Place – Tea Room Evening Ice Breaker (6:00 – 10:00) (Assorted Appetizers and Refreshments)

September 5th - Location: MacArthur Place (MacArthur Room) Welcome (8:30 – 8:45) Keynote Presentations (8:45-11:00) Don Pope – The Energy sector and Integrated Landscape Management on the Al-Pac FMA Area. Graduate Student Research Presentations (11:00 – 12:00) Lunch WESBOGY Research (1:00 to 2:30) Phil Comeau and Mike Bokalo – Ongoing Research

WESBOGY Business Meeting – (3:00 – 6:00) (Note: Business Meeting Only Open to Voting Members)

Evening Dinner (6:30) - Lac La Biche Inn - Not Hosted

September 6th Suncor Tour Departure to Ft. McMurray (6:00 a.m.) via Bus Coach Suncor Tour 10:00 – 3:00 Oil Sands Extraction Tour Reclamation sites Leave Suncor @ 3:00 to return to LLB Dinner (Pizza / Beverages on Bus) Arrive LLB @ approx. 8:00 pm

Planned WESBOGY Meetings in 2008

The 2008 Annual Spring Meeting is planned for April 24, 2008 on the U of A Campus

The 2008 Annual Fall Conference, will be hosted by Alberta Plywood, Slave Lake, Alberta. Sept 8th, 9th and 10th, 2008. The meeting has also been coordinated with the SFMN Workshop titled "The influence of relative density and composition on growth and understory in boreal mixedwoods" on Sept 11th.

Date	Sponsor	Location
2007 Sept 4-6	Alberta-Pacific Forest Industries	Lac La Biche, AB
2006 Aug 29-Sept 1	Louisiana Pacific Canada Ltd.	Dawson Creek, BC
2005 Aug 29 - Sept 1	Northwest Territories Resources, Wildlife and Economic Development	Hay River, NWT
2004 Aug 30 - Sept 1	Saskatchewan Environment – Forest Service	Prince Albert, SK
2003 Sept 9-11	Canadian Forest Products Ltd.	Grande Prairie, AB
2002 Sept 9-11	Louisiana-Pacific Canada Ltd.	Riding Mountain, MB
2001 Sept 9-11	Daishowa-Marubeni International Ltd.	Peace River, AB
2000 Sept 6-8	Weyerhaeuser Company, Drayton Valley	Edson, AB
1999 Sept 23-25	Weyerhaeuser Company, Prince Albert	Anglin Lake, SK
1998 Oct 7-9	Alberta-Pacific Forest Industries Ltd.	Athabasca, AB
1997 Oct 7-9	British Columbia Ministry of Forests	Dawson Creek, BC
1996 Nov 6-8	Daishowa-Marubeni International Ltd.	Peace River, AB
1995 Oct 11-13	Weldwood of Canada Ltd.	Hinton, AB
1994 Oct 12-14	Weyerhaeuser Company, Alberta Forestlands	Big River, SK
1993 Nov 4	University of Alberta	Edmonton, AB
1992 Oct 6-7	Weyerhaeuser Company, Grande Prairie	Grande Prairie, AB
1991 Oct 24-25	Weyerhaeuser Company, Prince Albert	Prince Albert, SK
1990 Nov 22	University of Alberta	Edmonton, AB
1989 Mar 15	Canadian Forest Service	Saskatoon, SK
1988 Nov 4	Canadian Forest Service	Whitecourt, AB
1998 Feb 4-5	Canadian Forest Service	HInton, AB
1987 Mar 27	Canadian Forest Service	Edmonton, AB
1986 Feb	Canadian Forest Service	Edmonton, AB
1985 Nov 15	Canadian Forest Service	Edmonton, AB
1985 Oct 24	Canadian Forest Service	Banff, AB
1985 Mar 23	Canadian Forest Service	Edmonton, AB

WESBOGY Website

With the assistance of Judy Huck (U of A, Department of Renewable Resources Webmaster / Multimedia Technician) our website is up and running. Changes include: having our own web address, a secure members area, and inclusion of both historical and current documents in readily accessible formats.

Check out our website at: http://www.wesbogy.rr.ualberta.ca/

April 1 2007-March 31, 2008

2007/2008 Expenditures			
Description		Budget	Actual
Salaries & Benefits			
	1. Research Scientist (including benefits)	\$73,500	\$76,897.67
	2. Graduate student stipend and/or independent research projects	\$20,000	\$21,742.69
	3. Field and office technical support (LTS data)	\$18,000	\$19,574.13
	4. Programmer/Analyst Support (MGM)	\$8,000	\$12,517.87
Travel, subsistence, and accommodation		\$11,000	\$16,415.31
Supplies, Equipment, Communication		\$5,000	\$10,074.60
Overhead (15% of \$125,000)		\$18,750	\$16,304.31
Total		\$154,250	\$173,526.58
Opening Balance on account April 1, 2007			\$248,697
Member contributions			\$125,000
Total Expenditures 2007/2008			\$173,527
Balance at March 31, 2008			\$200,170

2008/2009 Budget			
Description		Amount	
Salaries & Benefits		ĺ	
	1. Research Scientist (including benefits)	\$79,000	(assume \$9,000 of teaching paid by Dept.)
	2. Graduate student stipends and/or independent research projects	\$20,000	
	3. Field and office technical support (LTS data and miscellaneous measurements)	\$25,000	
	4. Programmer/Analyst Support (MGM)	\$10,000	
Travel, subsistence, and accommodation		\$15,000	
Supplies, Equipment, Communication		\$8,000	
Overhead (15% of \$125,000)		\$18,750	
Total		\$175,750	
Projected Balance at March 31, 2009			
Opening Balance on account April 1, 2008			\$200,170
Member contributions			\$125,000
Estimated Total Expenditures 2008/2009			\$175,750
Estimated Balance at March 31, 2009			\$149,420

Company or Agency	Contact	Email
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