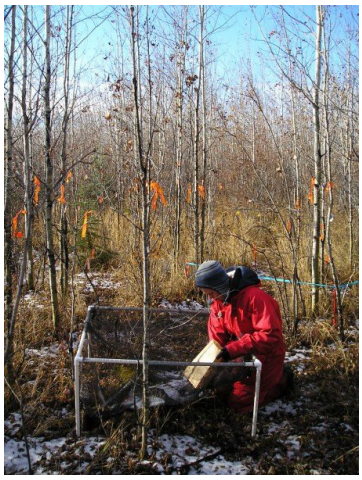
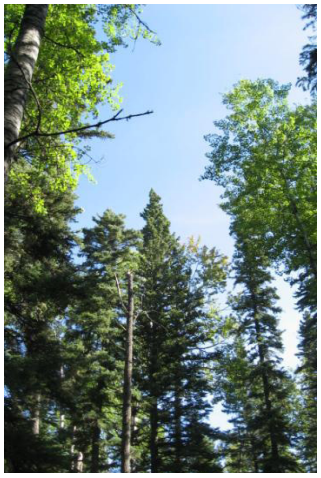
Western Boreal Growth & Yield Association





ANNUAL REPORT

April 2009

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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 during 2008 focused on development of the Mixedwood Growth Model. A new version of MGM was released in June of 2009 supported by a workshop. Many new MGM initiatives are underway and are outlined in this report.

In 2008 some studies were completed and several are continuing. All studies are designed to contribute to a better understanding of the growth and yield implications of managing mixedwood stands.

This Annual Report presents highlights of work accomplished during 2008 and briefly outlines plans for 2009.

June 2009

2008 has again been a productive year for WESBOGY and for myself.

Mike and Susan continue to make progress with cleanup, updating and maintenance of the long-term study data. Data are now clean and organized up to the current year and are housed in an accessible manner on our sharepoint site. Mike has also been demonstrating the sharepoint site to members. Sharepoint provides a fairly simple and easy way to share files and information. Our publications and potentially useful literature are also posted on the sharepoint site which is accessible to our members.

MGM2009 was completed and released in the spring of 2009. This version includes ability to model multiple strata, with effects of adjacent retained tree patches on regeneration being simulated directly. The model also now includes tree biomass and stand visualization capabilities. Mike Bokalo, Steve Titus and Ken Stadt are leading work on MGM.

The fall meeting and field trip in Slave Lake were excellent. Special thanks to the extra effort that Gary Harmata and Mike invested in making this meeting a success.

I have been actively involved in management of the ForValueNet NSERC Strategic Network during the past year. The objective of this Strategic Network created in 2008 is to develop new and integrated models to support value-added wood decision-making in Canada's boreal forests. The focus is on black spruce, white spruce, jack pine and trembling aspen. A total of 28 projects were initiated in 2008 and more are starting in 2009. Five projects will produce results directly applicable to Alberta.

I enjoyed four months in the UK during the year working on research examining application of density-size relationships in transformation of Sitka spruce and Douglas-fir stands to continuous cover. During this period Mike effectively held down the fort. In March I attended the International Forest Biosecurity Conference in New Zealand where I gave two presentations.

As always we have a busy year planned for 2009. Our spring meeting will be held in Edmonton in May and will follow an MGM workshop. Our fall meeting will be in Whitecourt and is being shortened to reduce costs. Mike will be very busy with completing the FRIAA funded Benchmark Project and with work on MGM. I will be continuing work on ongoing mixedwood management and silvicultural systems projects in Alberta and B.C. this year.

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.

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University of Alberta
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Mission Statement and Goals

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 establishment 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 development of managed stand yield projections for the major commercial tree species in the region. This will also include providing support for studies required to develop models of tree and stand response to establishment, tending and harvesting 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 appropriate 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.	Validation of MGM2009A	**Status:** Manuscript in Prep **Researchers**: Mike Bokalo, Ken Stadt, Phil Comeau
3.	Maintenance of Long Term Study Database	**Status**: Ongoing **Researchers**: Mike Bokalo, Phil Comeau, Susan Humphries
4.	Analysis of Long Term Study Data	**Status**: Ongoing **Researchers**: Mike Bokalo, Phil Comeau
5.	Climate change response on Long Term Study Sites	**Status:** Initiated in 2009 **Researchers:** Ted Hogg, Mike Bokalo, Dan MacIsaac, Phil Comeau
6.	MGM-Volume Loss Factor development	**Status**: Manuscript in Prep **Researchers**: Cosmin Tansanu (PhD). Mike Bokalo and Phil Comeau
7.	Competition dynamics in young mixedwood stands	**Status**: Initiated 2001; Completed 2009 **Researcher**: Cosmin Filipescu (PhD) and Phil Comeau;
8.	Evaluation of competition indexes using LTS data	**Status**: Underway **Researcher**: Phil Comeau
9.	Effects of herbaceous and woody vegetation control on early boreal mixedwood stand development (Judy Creek Mixedwood Regeneration Study)	**Status**: Initiated in 2002 **Researchers**: Doug Pitt, Phil Comeau, Dan MacIsaac
10.	Effects of aspen density and basal area on understory LAI and plant community diversity	**Status**: Initiated in 2006; completed 2008 **Researcher**: Sheelah Griffith (MSc), Phil Comeau
11.	Competitive effects of willow and aspen on white spruce growth in mixedwood stands	**Status**: Initiated 2006 **Researcher**: Fang Ye, Phil Comeau
12.	Stand Density Index and its relationships with productivity and understory vegetation	**Status**: Initiated 2007 **Researcher**: Valentin Reyes-Hernandes, Phil Comeau
13.	Growth and Yield Implications of White Spruce Understory Protection and Other Mixedwood Silviculture Systems	**Status:** Initiated 2007 **Researcher:** Dan MacIsaac, Ken Stadt, Mike Bokalo, Phil Comeau
14.	Benchmarking Natural (fire origin) stand regeneration.	**Status**: Initiated 2007 **Researcher**: Stefanie Gaertner, Mike Bokalo, Ken Stadt and Ellen Macdonald

Agency/Company	Current Membership
Alberta Sustainable Resource Development	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 Ministry of Environment	Since 1985
University of Alberta	Since 1985
Weyerhaeuser Company, Alberta Forestlands	Since 1985

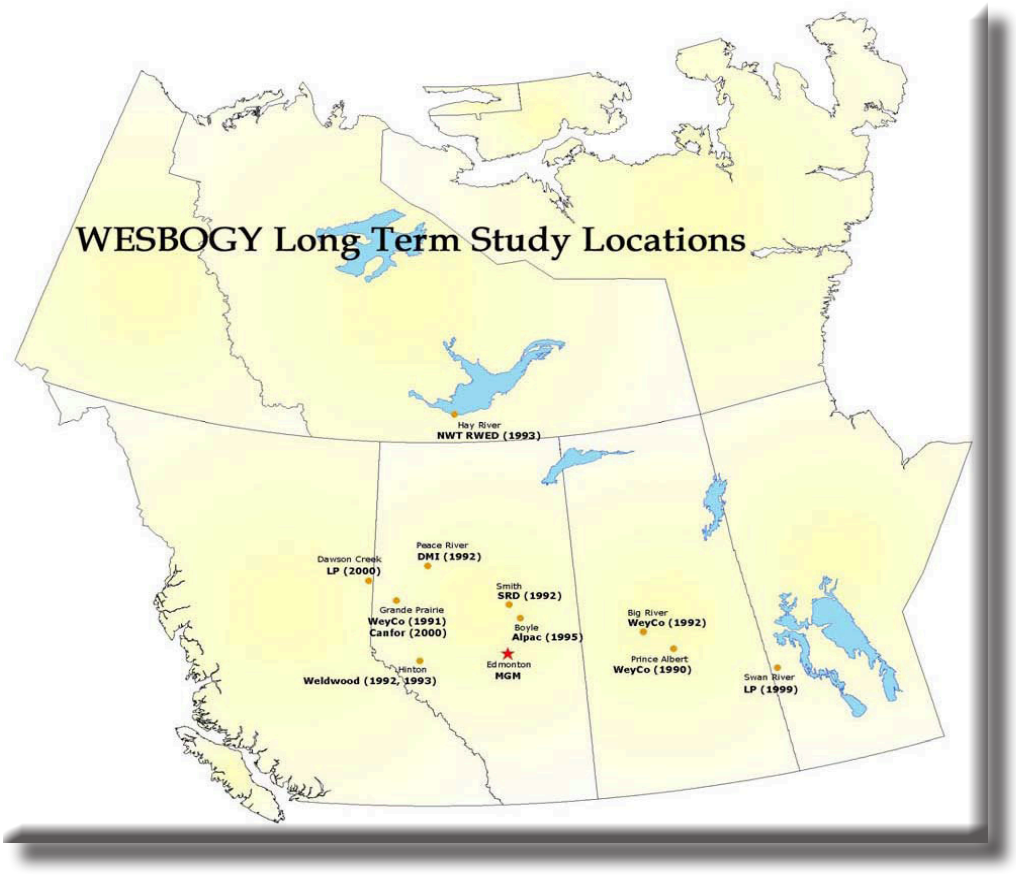
Steering Committee Members

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
2008 Comeau, Bokalo, Leblanc, Zaichkowsky, Whitmore, Morgan

History and Locations of Long Term Study Installations

Company or Agency	Agency Code	Site	Year Spruce Established	Measurements Including 2008
Alberta Sustainable Resource Development	SRD	Med	1992 2001	16 7
Alberta-Pacific Forest Industries Inc.	ALP	High Med	1994 2001	15 7
Canadian Forest Products Ltd.	CFR	High Med	2000 2001	8 7
Daishowa-Marubeni International Ltd.	DMI	High Med	1992 1992	16 16
Louisiana-Pacific Canada Ltd., Manitoba	LPC	High Med	1998 1998	10 10
Louisiana-Pacific Canada Ltd., Dawson Creek	LPD	High Med	2001 2004	8 5
Northwest Territories Resources, Wildlife and Economic Development	NWT	High Med	1993 1993	15 15
Alberta Plywood	WFR	High Med	1992 1993	14 16
Weyerhaeuser Company, Alberta Forestlands	WGP	High Med	1991 1991	17 17
Domtar Inc., Saskatchewan	WPA	High Med	1990 1990	18 18
Saskatchewan Ministry of Environment	SRM	High Med	1992 1992	16 16



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.

Database management and maintenance work continued during the past year. In 2008 measurement protocols for the long term study were expanded to include measurements to estimate top height of the aspen in the natural untreated plots (4 largest dbh trees in the full plot). In the past, aspen tree size characteristics within the untreated plots could not be compared to the treated plots because the natural plot sizes were too small to obtain top height estimates. Originally this issue would have been dealt with when the natural plots were expanded to the 5m x 5m size at year 10, however this expansion has been postponed because of the continued high densities in these plots. Top height data collection using the new protocol began in the fall of 2008. Another LTS analysis task was the determination of site indices for each plot using the new breast height age and total age equations developed by Alberta Sustainable Resource Development. Input files for MGM were developed for each plot in all LTS installations facilitating the projection of each of the long-term study plots into the future with MGM.

New to the long term study was the development of a Microsoft Sharepoint site to facilitate data handling and sharing. Each member has their own secure workspace on the sharepoint site where their data is stored and backed up. Having data posted on this shared site simplifies version control and data security. The Sharepoint site also includes metadata (history files), task lists, meeting minutes, WESBOGY publications, and selections of relevant literature (eg. Biomass; Forest Carbon). The task lists posted on the sharepoint site are agency specific, outlining clearly the upcoming scheduled tasks. In 2009 the sharepoint site will be expanded to include secure workspaces for contractors working for member agencies.

In 2009 a new project was initiated in conjunction with Ted Hogg and Dan MacIsaac from the Canadian Forest Service. The study will look at the effects of the recent drought (climate change) on growth and mortality of both the spruce and aspen on the LTS sites.

Mixedwood Growth Model (MGM) Development

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

Work on MGM during the past year has focused on the continued development of several key features within MGM and the addition of several new features. The key enhancements were the Multistrata modeling (MSS) capacity, Multistrata with adjacency, the inclusion of individual tree component biomass estimates, the addition of new provincial site equations, continued work on validation, continued enhancement of the external batch processing capabilities and the linkage to the Stand Visualization System (SVS). These enhancement were made available in the release of MGM2009A in June of 2009.

With the new release a new website and sharepoint site were activated. The website http://www.ales.ualberta.ca/rr/mgm.cfm was simplified to provide basic information on MGM and provide links to the sharepoint site which is now the download site. MGM can now be downloaded anonymously (http://www.ales.ualberta.ca/rr/mgm-anonymous-login.cfm) from the sharepoint site. The "MGM Users Workspace" (http://www.ales.ualberta.ca/rr/mgm-user-login.cfm) was set aside for registered MGM users. In the MGM Users Workspace MGM, supporting literature and a discussion group are available. In addition a workspace is available for Beta Testers, allowing power users to access and test pre-release versions of the model. The MGM Sharepoint Site is also used by the development team to provide backup of developmental information and logging and tracking of bugs and fixes.

MGM Multistrata (MSS)

Mike Bokalo, Ken Stadt and Phil Comeau

MGM is a distance independent individual tree model therefore a strata is represented by a single tree list. In many instances this is a single stand, cutblock or inventory strata. Although within stand variability exists (Figure 1), it is often represented by the average stand condition. While the average stand condition is often adequate when predicting yield, additional stratum specific information may be needed when effects of spatial variation in stand structure and composition is of interest. MGM2009A allows for a strata to be broken down into substrata. Each substrata is represented by a unique treelist and projected individually, with its contribution to the whole strata being relative to its proportion. MGM now allows for multiple "Establishment" events to exist, named through a new variable "StrataName" with its relative proportion stored in the "Weight" variable. Each substrata is projected into the future and grows and dies according to the conditions within the strata. Substrata can be acted on by any of the MGM events such "Thin" and "Harvest". The MGM multistrata models provides output for both substrata and strata. Testing of the model has demonstrated that the importance of sub-stratification varies depending on initial stand conditions.

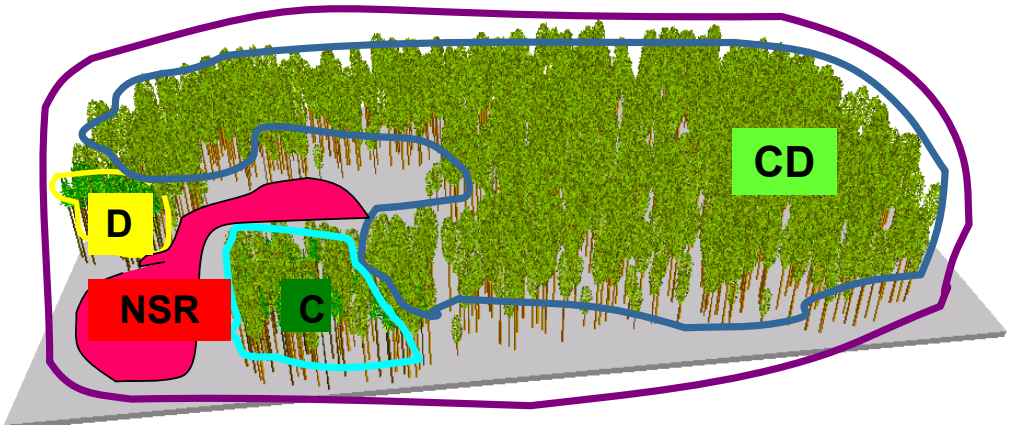


Figure 1: An example of the species composition variability that can be found within a single cutblock. Cutblocks can also vary in treatment, in productivity and size.

MGM Multistrata (MSS) with Adjacency

Dan MacIsaac, Ken Stadt, Mike Bokalo and Phil Comeau

The MGM Multistrata with adjacency model is an extension of the MSS model where each of the surrounding strata influence the growth and mortality of the substrata being projected. Figure 2 is an example of the Hotchkiss 2 pass strip shelterwood site in which the growth and mortality of each strip is dependent on the species composition, vertical and spatial structure of adjacent strata. This influence is estimated based on the amount of shade the neighbouring strata cast. The amount of shade cast is dependent on the species, height and density of the adjacent substrata. To carry out these types of projections, MGM required spatial information regarding the arrangement of the substrata. Linkages to ARCGIS and software for calculating light transmittance were incorporated into MGM. This component of model development was undertaken as part of the Canadian Forest Service Project "Growth and Yield Implications of Strip Shelterwoods and Other Mixedwood Silviculture Systems for Mixed Hardwood - White Spruce Management: Enhancement of a Strata-Based Version of the Mixedwood Growth Model", funded by the Mixedwood Management Association (MWMA).

Stand Visualization System SVS in MGM2009A

Mike Bokalo, Ken Stadt and Phil Comeau

Modeling stands with complex compositional, spatial and temporal structure with MGM2009 (MSS with or without adjacency) became very difficult to visualize and interpret. Because MGM is an individual tree model, it was natural to link MGM to the Stand Visualization System (SVS; McGaughey 2002). This enhancement permits the user to see and understand spatially and temporally how the projected stands evolve over time (Figure 2).

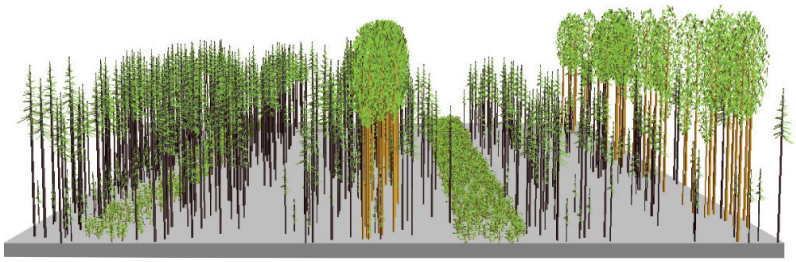


Figure 2: An example of the Hotchkiss 2-pass strip shelterwood site in which the growth and mortality of each strip is dependent on the species composition, vertical and spatial structure of adjacent strata.

Predicting Biomass in MGM2009A

Mike Bokalo, Ken Stadt and Phil Comeau

MGM2009A now predicts individual tree above ground biomass based on the "Canadian national tree aboveground biomass equations" published by Lambert et. al. in the Canadian Journal of Forest Research in 2005. These equations estimate biomass of wood (stem), bark, branches and leaves with the sum of these representing the total above ground biomass.

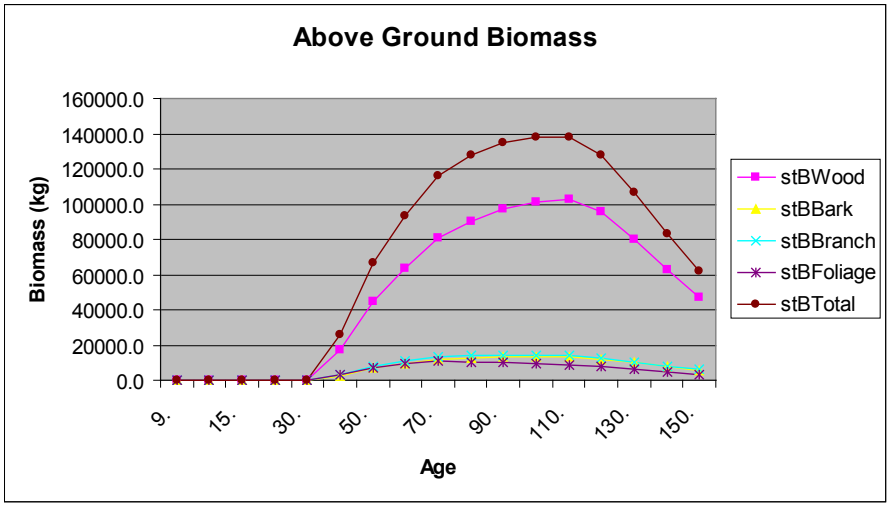


Figure 3: An example of the component (wood, bark, branch and foliage) and total biomass (kg) over time (age) from an MGM projection based on the equations published by Lamberts et al., 2005, in the Canadian Journal of Forest Research.

External Batch Processing with MGM2009A

Mike Bokalo, Ken Stadt and Phil Comeau

Current forest management planning requires that detailed sensitivity analyses be carried out to identify which of the factors are important drivers of growth, yield and mortality. These types of analyses require that many growth projections be made with different starting conditions (i.e. the tree list) and projection parameters (i.e. site index). The result is a matrix of projection outcomes which helps the user in identifying which factors are sensitive.

MGM2009A now has the capacity to run a large number (limit is Excel) of MGM projections by systematically changing the inputs, running the projection and storing the results in a file for further analyses. This external batch processing is a powerful tool for the skilled MGM user and VBA programmer. It has been extensively used with excellent success by industry, government, consultants and academics.

Summary of MGM Projection Matrix for AwSw Mixedwoods

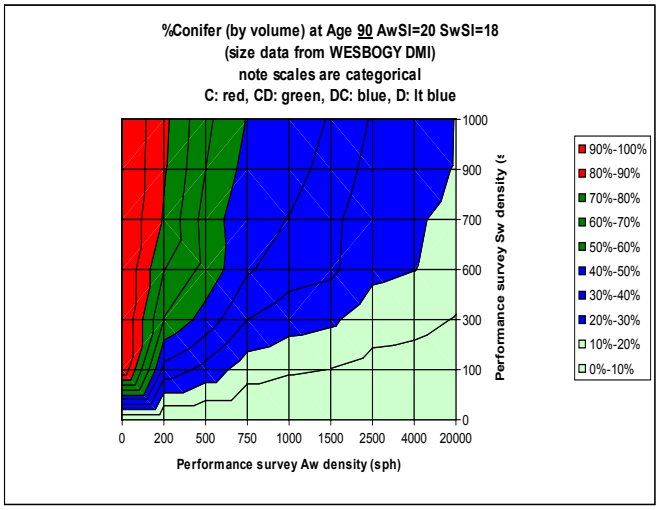
Phil Comeau, Mike Bokalo and Ken Stadt

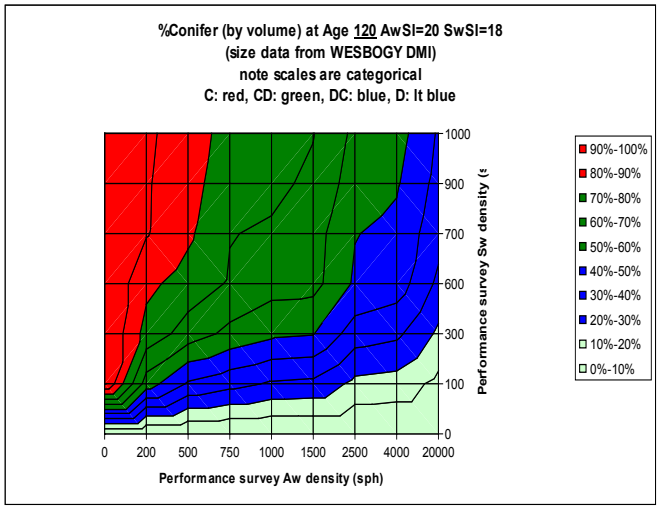
MGM 2007b was used to examine relationships between aspen and spruce densities at age 14 and predicted stand volume composition at ages 90 and 120.

Simulations completed so far use data from age 14 measurements of the DMI Medium (Hines Ck) LTS site (age 14 tree list data). For this site AW SI=20 and Sw SI=18. In addition to the treatment densities created as part of the LTS we created intermediate aspen and spruce densities by thinning plots down to lower intermediate densities (in MGM). This created 135 stands which were simulated to age 140.

Results indicate that:

- Sw volume is related to both initial aspen and spruce density
- Aw volume is related to initial aspen density (no effect of spruce)
- Results indicate that we may be able to effectively predict future stand composition from densities at performance survey age. However, this requires further testing, along with evaluation of effects of site quality and other factors.





Graduate Students Working on Projects in the Western Boreal

Sheelah Griffith (M.Sc.) – Characterization of plant community leaf area index and understory vegetation development following pre-commercial thinning in boreal mixedwood forests – Successfully defended in April of 2008.

Cosmin Filipescu (Ph.D.) - Effects of competition, site, and age on white spruce growth. – Successfully defended in April of 2009.

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 (Ph.D.) - Evaluation of competitive effects of willow and aspen on white spruce growth in western boreal mixedwood stands.

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

Francesco Cortini (Ph.D.) - Yield implications of site preparation and climate change in northern British Columbia.

Derek Sattler (Ph.D) - Effects of density, species composition, age, and tree dimensions on wood quality for aspen and white spruce in boreal mixedwoods of western Canada (FORVALUENet Project 1.2) (Project started January 2009).

Publications during 2008-2009

Comeau, P.G., C.N. Filipescu, R. Kabzems and C. DeLong. 2009. Growth of white spruce underplanted beneath spaced and unspaced aspen stands in northeastern B.C. – 10 year results. For. Ecol. Manage. 257: 1082-1094.

Cortini, F. and P.G. Comeau. 2008. Effects of red alder and paper birch competition on growth of young conifers in South-western British Columbia. For. Ecol. Manage. 256:1795-1803.

Cortini, F. and P.G. Comeau. 2008. Evaluation of competitive effects of green alder, willow and other tall shrubs in Northern Alberta. For. Ecol. Manage. 255: 82-91.

Man, C.D., P.G. Comeau, and D.Pitt. 2008. Competitive effects of woody and herbaceous vegetation in a young boreal mixedwood stand. Can. J. For. Res. 38: 1817-1828.

Effects of herbaceous and woody vegetation control on early boreal mixedwood stand development

Doug Pitt, Phil Comeau, Dan MacIsaac, Milo Mihajlovich, Michael Hoepting, and Susan Humphries

This study was initiated in 2002 to explore the use of spot treatments to enhance spruce development and increase spruce yield on mixedwood sites. The experiment examines effects of planting spruce at 5-m spacing, tending them individually with 2-m radial treatments, and leaving aspen to regenerate naturally in the intervening area between the spruce. We are also comparing the effects of controlling only the woody component against control of both woody and herbaceous vegetation for 2 and 4 years after planting. The best growth of spruce and aspen was observed following radial treatments consisting of 2 to 4 years of herbaceous and woody (i.e., complete) competition control. In these situations, spruce growth was equivalent to the same stock grown at 2.5-m spacing and provided with complete, continuous relief from competition. Removing only the woody vegetation stimulated herbaceous competition and reduced survival and growth of spruce. In contrast, control of herbaceous vegetation alone resulted in increased spruce and aspen growth over woody-only competition control. Untended plots contained the smallest spruce and aspen in the study.

Support for this study provided by the following agencies has made this research possible: Alberta Herbicide Task Force; Alberta Mixedwood Management Association; Alberta Forest Products Association; Blue Ridge Lumber (1981) Ltd.; Canadian Ecology Centre - Forestry Research Partnership; Canadian Forest Products Ltd.; Canadian Forest Service – Canadian Wood Fibre Centre (Great Lakes and Northern Forestry Centres); Dow AgroSciences Canada Inc.; Forest Protection Ltd.; Forestry Futures Trust Ontario, Enhanced Forest Productivity Science Program; Grant Forest Products Inc.; Living Legacy Trust; Louisiana-Pacific Corp.; Millar Western Forest Products Ltd.; Millson Forestry Service; Monsanto Canada Inc.; Natural Sciences and Engineering Research Council of Canada (NSERC); Ontario Ministry of Natural Resources; Spray Efficacy Research Group International (SERG-I); and University of Alberta. Ongoing support for this project is being provided by the Western Boreal Growth and Yield Association, the Canadian Forest Service, and the University of Alberta.

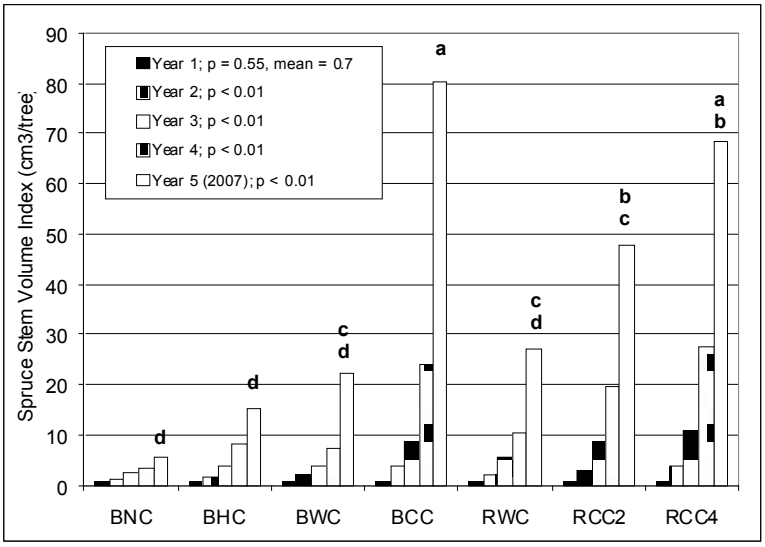


Figure 4. Stem volume index of spruce crop trees through 5 growing seasons at Judy Creek. Means with the same letter do not differ in year 5 (α=0.05, Tukey's HSD). (BNC=untreated; BHC=broadcast herbaceous control; BWC=broadcast woody control; RWC=radial woody control; RCC2=radial complete control 2 y; RCC4=radial complete control 4 y)

Benchmarking Natural Origin Stand Development

Stefanie Gaertner, Mike Bokalo, Ken Stadt and Ellen Macdonald

The objective of this study is to evaluate regeneration 10 to 20 years post-fire using the alternative regeneration standards (WAS 2008) and the previous Free-to-Grow standards (ARS 2007). This benchmark data set (density, stocking, size distributions) is being compared to post-harvest stand data sets and used to initialize growth and yield models.

Five fires from central and northern Alberta occurring in two ecological subregions were selected. The Chip Lake (1998), Virginia Hills (1998) and O'Chiese (1988) fires occurred in the Lower Foothills while the (Mariana Lakes (1995) and Mitsue (1998) fires occurred in the Central Mixedwoods. To compare the impact of different pre-fire composition on post-fire regeneration we used pre-fire regional forest inventory maps (Phase 3) to stratify stands within the fires into the following broad cover groups: pure conifer (C), conifer dominated (CD), deciduous dominated (DC) and pure deciduous (D). Only post-fire stands with no anthropogenic disturbance (eg. Salvage logging or oilfield development) were chosen. Within each stand we applied a systematic sampling design with a 30 m inter-plot distance. For each 10 m2 circular plot we recorded the tree species, measured stump height diameter and the heights of the tallest conifer and deciduous tree. Additionally, at every fourth plot, ten individuals of each species were measured for height and diameter. A total of 506 plots were sampled in 22 stands.

The results suggest that that the 10 to 20 year post-fire regeneration is dominated by deciduous species (Figure 5 and Figure 6). In pre-fire conifer dominated stands there was a higher proportion of conifer and mixedwood plots but also was a high proportion of unstocked plots (Figure 1).

This project is being funded by the Forest Resource Improvement Association of Alberta (FRIAA), the Mixedwood Management Association (MWMA) and WESBOGY.

Figure 5: Post-fire stocking of the four pre-fire strata standards. The bars represent the four strata standards used to stratify the pre-fire species composition (C pure conifer, CD conifer dominated mixedwoods, DC deciduous dominated mixedwoods and D pure deciduous). The bars show the relative proportions of the post-fire stocking types (nsr: not sufficiently restocked, c sufficiently restocked with conifer, d sufficiently restocked with deciduous and cd sufficiently restocked with both conifer and deciduous), height limits used here were 0.3m.

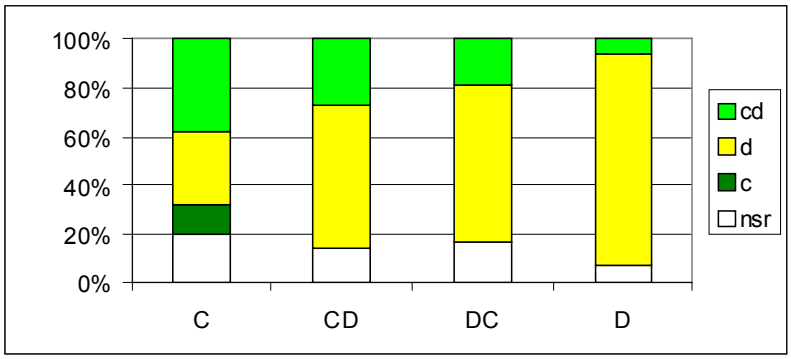
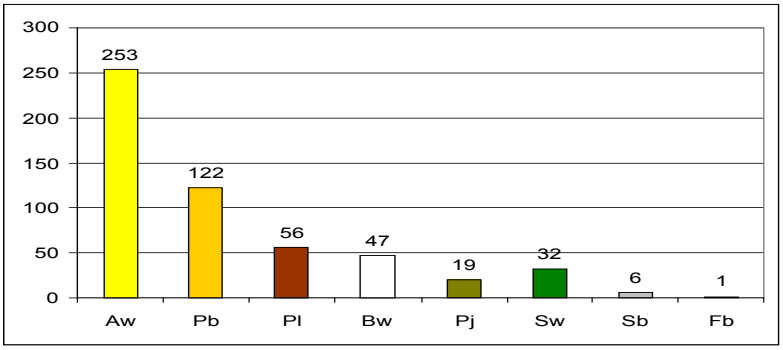


Figure 6: The potential deciduous crop trees (> 0.3m) were dominated by aspen (Aw) and balsam poplar (Pb) while the dominant potential conifer crop trees were pines (lodgepole pine (Pl) in the Lower Foothills and jack pine (Pj) in the Central Mixedwoods. White birch (Bw) is seen to be more abundant than white spruce (Sw), black spruce (Sb) and balsam fir (Fb) combined.



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 Shelterwoods 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:

- 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?
- 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?
- What are the effects of modeling adjacency on long term growth and yield?
- What are the long-term implications of this development on the overall growth and yield in these stands?
- Is this a perpetual mixedwood management regime or will this system eventually result in conifer conversion?

The project was completed with the submission of the final report and the release of the new version of MGM2009A. Work is now focused on 3 peer reviewed manuscripts.

The ForValueNet NSERC Strategic Network

Phil Comeau

This network was established in January 2008 with funding from NSERC. The objective of this Strategic Network is to develop a series of new and integrated models to support value-added decision-making in Canada's boreal forests. The network 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) of funding. Phil Comeau is chair of Science Committee for the network. Phil Comeau and Derek Sattler (Ph.D. student) will undertake a project examining relationships between stand and tree characteristics and wood quality in western boreal mixedwood stands.

Dynamics of competition in boreal mixedwood stands.

Filipescu, Cosmin Nicolaie. 2009. Ph.D. thesis in Forest Biology and Management, Dept. of Renewable Resources, Univ. of Alberta, Edmonton. [10], 120 pages; 28 cm.

Abstract

Following harvesting or fire in western boreal mixedwood stands, aspen usually regenerates more vigorously, grows more rapidly than white spruce and tends to dominate the newly regenerated forest for the first 40 to 60 years. As a result of competition, especially for light, spruce growth and survival can be significantly reduced. However, maintaining aspen in mixture with spruce is desirable for ecological, silvicultural, yield and wood quality reasons. The research in this thesis addressed a critical knowledge gap regarding competition dynamics in boreal mixedwood forests.

Long-term and large-scale field experiments of boreal forest growth and development were used in this thesis. Results indicated that competition indices are effective for predicting the availability of light in the understory of young boreal mixedwood stands of variable density. However, these indices appear less suited to predicting light in natural stands aged 20-60 years. Simple indices such as basal area provided similar predictions as more complicated stand measurements based on crown measurements. Relationships between aspen basal area and light differed significantly between geographical locations. Incorporating the distance between subject trees and competitors in the models did not improve predictions of spruce growth as a function of competition. The addition of initial spruce size significantly increased the ability of growth models to predict competition effects.

Results indicated that models relating spruce growth to competition or light differ with geographical location and stand age. It appears that the balance between competition and facilitation may shift from location to location and with stand age. This implies that changes in the occurrence and relative importance of each contributing factor adds to the variation in relationships between growth and competition.

I also tested the potential usefulness of morphological attributes of spruce in place of competition indices to predict spruce growth. Results showed that simple attributes such as height to diameter ratio had substantial promise for evaluating the vigour and current growth rates of spruce seedlings.

The impact of aspen density on frost incidence was evaluated at two WESBOGY LTS sites. It appears that aspen cover provided protection against frost, and more importantly these effects are site specific and depend on local site characteristics. Differences in frost regime between the two installations examined appear to contribute to differences in relationships between spruce growth and aspen density.

2008 WESBOGY Annual Fall Meeting

Slave Lake, Alberta
September 8th, 9th and 10th
Hosted by: Alberta Plywood
Theme: Climate Change

and,

SFMN Project Workshop: "Influence of relative density and composition on growth and understory in boreal mixed-woods"
Slave Lake, Alberta
September 11th

WESBOGY Meeting - Agenda

September 8th - Evening Ice Breaker (6:00 – 10:00)
Location: Reserved Seating in the Northwest Inn Lounge

September 9th - Location: Northwest Inn
Welcome (8:30 – 8:45)
Keynote Presentations (8:45 – 11:15)
David Sauchyn – "From Impacts to Adaptation: The Prairies Chapter of the National Assessment of Climate Change"
Han Chen - "Productivity and diversity of single- and mixed-species stands in changing environments"
David Sauchyn -"A Millennium of Climate Change in Alberta: The Record from Tree Rings"
Graduate Student Research Presentations (11:15 – 12:00)
Valentin Reyes-Hernandez and Hongan Yan

WESBOGY Research (1:00 to 3:00)
Phil Comeau and Mike Bokalo
Mixedwood Management Research
MGM 2008 - Validation

WESBOGY Business Meeting – (3:30 – 5:00)
(Note: Business Meeting Only Open to Voting Members)
Evening Dinner (6:30)
Location: TBA
Note: Not Hosted but tables will be reserved.

September 10th - Mixedwood Trials Tour
Departure to Sites (8:00 a.m.) via Trucks
Alberta Sustainable Resource Development: WESBOGY Site Visit
Jock Lees individual (radial) release experiment
Underplanting Study
Return Slave Lake 4:30 pm

September 11th - SFMN Project Workshop:
Field Day – Influence of relative density and composition on growth and understory in boreal mixedwoods

Planned WESBOGY Meetings in 2009

The 2009 Annual Spring Meeting is planned for May 21, 2009 on the U of A Campus

The 2009 Annual Fall Conference, will be in Whitecourt, Alberta. Sept 15th and 16th, 2009.

Date	Sponsor	Location
2008 Sept 8-10	Alberta Plywood	Slave Lake, AB
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 and Sharepoint Site

With the assistance of Judy Huck (U of A, Department of Renewable Resources Webmaster / Multimedia Technician) our new 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.ales.ualberta.ca/rr/wesbogy.cfm
Sharepoint Site at: https://portal.ales.ualberta.ca/wesbogy/default.aspx

WESBOGY Financial Summary For 2008-2009 (Corrected July 13, 2009)

Description	Total	Budgeted Amount	Difference
Salaries & Benefits			
1. Research Scientist (Mike Bokalo)	$78,106.22	$79,000.00	$893.78
2. Field and office tech support (Susan Humphries)	$15,696.84	$25,000.00	$9,303.16
3. Grad students (Sheelah Griffiths)	$7,732.71		
(Fang Ye)	$5,858.08		
	$13,590.79	$20,000.00	$6,409.21
Professional and Tech Services	$2,998.67	$10,000.00	$7,001.33
Supplies and Communication	$8,406.03	$8,000.00	-$406.03
Travel	$5,448.52	$15,000.00	$9,551.48
U o f A Overhead	$18,750.00	$18,750.00	$0.00
TOTAL	$156,587.86	$175,750.00	$19,162.14
Opening Balance April 1, 2008		$200,170.00	
Member Contributions		$125,000.00	
Total Expenditures 2008/2009		$156,587.86	
Balance at March 31, 2009		$168,582.14	
WESBOGY - Budget for 2009/10			
Description	**Amount**		
Salaries & Benefits			
1. Research Scientist	$82,000.00		
2. Field and office tech support (Susan (1 month for Judy Ck work, 1 month on LTS)	$16,500.00		
3. Grad students	$0.00		
Professional (Programmer/Analyst)	$10,000.00		
Travel (Wesbogy Meetings, travel & Judy Creek)	$9,000.00		
Supplies, Equipment, Communication	$5,000.00		
Overhead (15% of $125,000)	$18,750.00		
TOTAL	$141,250.00		
Projected Balance at March 31, 2010			
Opening Balance April 1, 2009 (estimated)		$168,582.14	
Member Contributions		$125,000.00	
Estimated Total Expenditures 2009/2010		$141,250.00	
Estimated Balance at March 31, 2010		$152,332.14	

Company or Agency	Contact	Email
Alberta Sustainable Resource Development	Dave Morgan (780) 422-5295 Daryl Gilday (780) 422-5257	Dave.Morgan@gov.ab.ca Daryl.Gilday@gov.ab.ca
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Western Boreal Growth & Yield Association (WESBOGY)

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www.ales.ualberta.ca/rr/wesbogy.cfm

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