Annual Report
2003–2004

WESTERN BOREAL GROWTH AND YIELD ASSOCIATION

April 2004

CONTENTS

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 communications. 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).

Continuing work on the long-term study designed to examine the effects of manipulating aspen density on growth and yield of mixedwood stands during 2003 included cleaning and archiving of data collected through 2002, revision of the field data collection manual, and analysis of data. Work on the Mixedwood Growth Model continues, with support received from the Forest Resource Improvement Association of Alberta (FRIAA) in 2004 for major work on refining the modeling of young stands and improving representation of tending practices. In addition, a number of studies are underway that will hopefully contribute to better or more efficient tending of young mixedwood stands.

This Annual Report presents highlights of work accomplished during 2003, and briefly outlines plans for 2004.

Message from the Chair

April 2004

During the past year progress has been made on several priority projects. Substantial effort was invested in assembling data from the 22 Long-Term study (LTS) installations into a clean and complete database. We should be pleased with the excellent work that Mike Bokalo and Rongzhou Man have done in assembling this dataset. Having a complete and well organized dataset will allow us to move forward quickly with analyses that can assist in answering critical questions. Along with updating MGM with new relationships developed by our graduate students, Steve has been converting MGM to operate entirely within the framework of a Microsoft Excel workbook using Visual Basic for Applications (VBA). A new version of MGM is planned to be released in the fall of 2004. In collaboration with Gitte Grover, I organized a very interesting field tour in June of 2003, which was attended by 25 people from government (Alberta, B.C. and CFS), industry, and the U of A. A poster summarizing results from our Long-Term study was displayed at the World Forestry Congress in Quebec City in September of 2003.

During 2004 we will be using the LTS data in refinement of young stand modeling in MGM, and to examine questions relating to productivity and self-thinning of aspen, and release responses of white spruce. Funding for a 3-year project to enhance the Mixedwood Growth Model (MGM) is being provided by the Alberta Forest Resource Improvement Association and by the Mixedwood Management Association. This work is focusing on improving modeling of young mixedwood stands (using SDS, Monitoring Plot, LTS and other data), and in enhancing the modeling of mixedwood stand responses to silviculture. We are pleased to welcome Ken Stadt to the WESBOGY team to assist with this project. The MGM project, maintenance and analysis of LTS data, and selected field studies will be the primary focus of work during the forthcoming year. In addition, I look forward to continuing to build linkages with other local cooperatives interested in growth and yield, notably the Northern Interior Vegetation Management Association, the Foothills Growth and Yield Association, and the Southern Interior Growth and Yield Association.

Further information on WESBOGY projects is provided in this report. Please contact us if you would like any further information.

Phil Comeau
Chair, WESBOGY

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Mission

The purpose of the Western Boreal Growth and Yield (WESBOGY) Association is to conduct research projects that contribute to the development and dissemination of growth and yield modeling technology for both natural and regenerated stands growing in the boreal mixedwood region, primarily aspen and spruce.

Goals

1. To develop and implement a program of research in the study of growth and yield focused on problems of interest to members of the Association.
2. To increase knowledge and awareness of growth and yield relationships, as they exist in western and northern Canada.
3. 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.
4. 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 poplar, lodgepole pine, and black spruce will also be studied where sufficient data is available. 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.
5. To encourage the establishment and continued monitoring of standardized permanent sample plots (PSPs) to quantify the effects of intensive forest management practices in natural and regenerated stands, and in general to coordinate the acquisition of high priority growth and yield data;
6. To identify, evaluate, rank and address areas of research which are: of regional importance, of shared mutual interest, and most effectively approached by the Association rather than by individual efforts;
7. To facilitate the dissemination of growth and yield data through the development of appropriate procedures, standards and databases for members' use.

5-Year Objectives

The following table lists objectives identified in the 2001-2005 Agreement. It also includes links to the overall goals of the 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 10-year analysis of data. Encourage new members to participate in the long-term study	Goal #1 and #5
2. To develop growth and mortality relationships for other peripheral species 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	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 alternative matching funding from 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	Goals #2, #3, #5 and 7
8. To identify and prioritize research needs and to initiate new projects as appropriate under the direction of the Steering Committee and members.	Goals #1, #2 and #6

Membership

Agency/Company	2000	2001	2002	2003
Alberta Sustainable Resource Development	X	X	X	X
Alberta-Pacific Forest Industries Inc.	X	X	X	X
British Columbia Ministry of Forests	X	X		
Canadian Forest Products Ltd.	X	X	X	X
Daishowa-Marubeni International Ltd.	X	X	X	X
Louisiana-Pacific Canada Ltd., British Columbia	X	X	X	X
Louisiana-Pacific Canada Ltd., Manitoba	X	X	X	X
Manning Diversified Forest Industries Ltd.	X	X	X	X
Mistik Management Ltd.	X			
Northwest Territories Resources, Wildlife and Economic Development	X	X	X	X
Saskatchewan Environment and Resource Management	X	X	X	X
University of Alberta	X	X	X	X
Weldwood of Canada Ltd.	X	X	X	X
Weyerhaeuser Company, Alberta Forestlands	X	X	X	X
Weyerhaeuser Company, Saskatchewan Forestlands	X	X	X	X

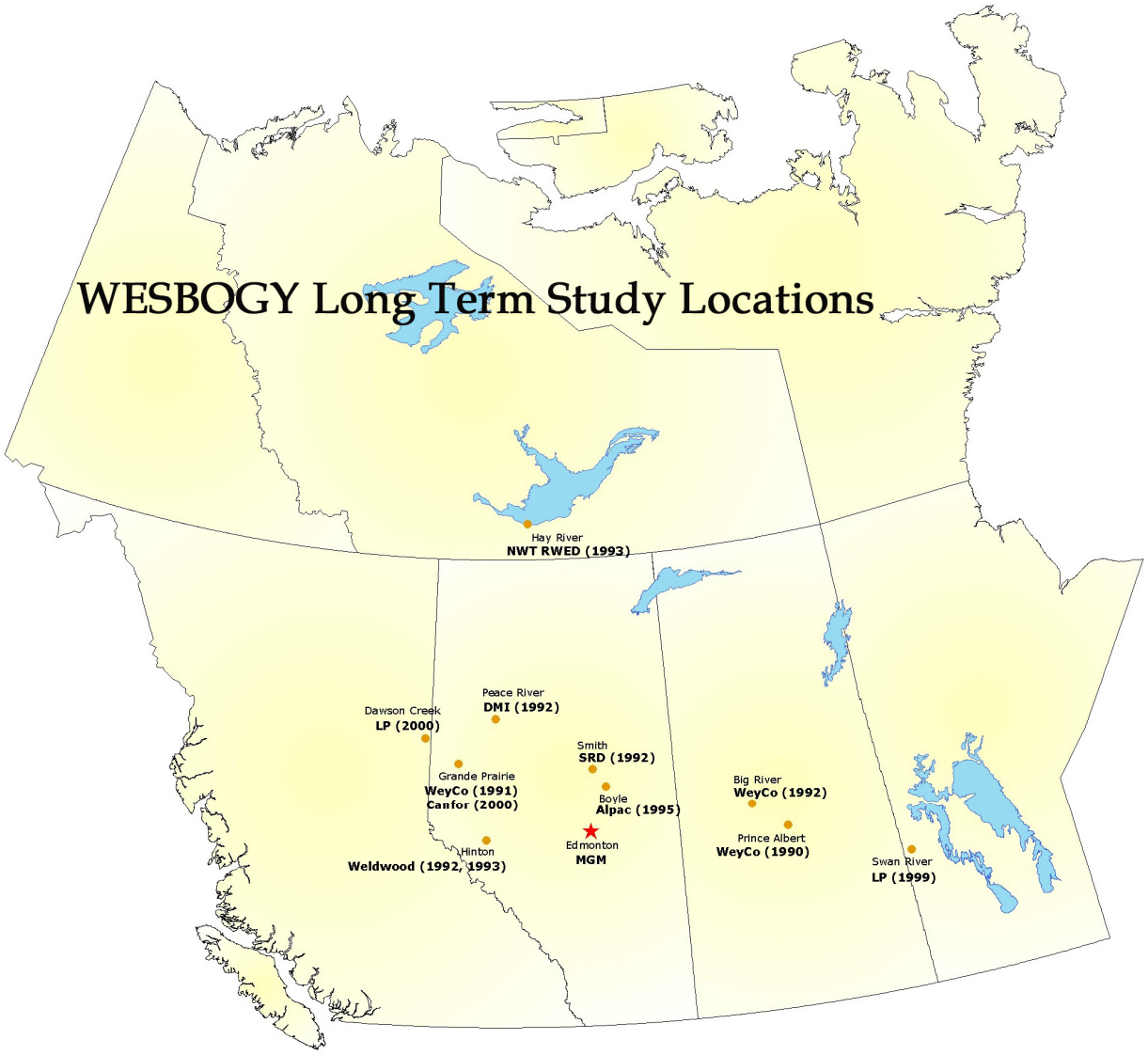
Steering Committee Members

A Steering Committee, consisting of three 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

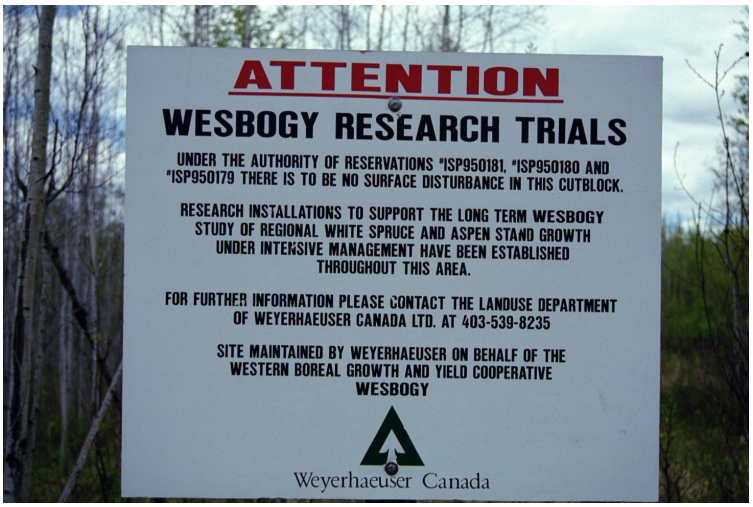
Long Term Study of Aspen/Spruce Stand Development

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.



Long Term Study Measurement Schedule

Company or Agency	Agency Code	Site	Year Established	Measure-ments incl. 2003	Contact Person
Alberta Sustainable Resource Development	AFS	Med	1992 2001	12 3	Dave Morgan (780) 422-5295 Daryl Gilday (780) 422-5257
Alberta-Pacific Forest Industries Inc.	ALP	High Med	1995 2001	8 8	Dave Cheyne (780) 525-8261
Canadian Forest Products Ltd.	CFR	High Med	2000 2001	3 2	Jill Ashley (780) 538-7793
Daishowa-Marubeni International Ltd.	DMI	High Med	1992 1992	12 12	Florance Niemi (780) 624-7048
Louisiana-Pacific Canada Ltd., Manitoba	LPC	High Med	1998 1998	6 6	Ken Broughton (204) 734-4102
Louisiana-Pacific Canada Ltd., Dawson Creek	LPD	High Med	2001 2001	3 3	Christy Nichol (250) 782-3302 ext 223
Northwest Territories Resources, Wildlife and Economic Development	NWT	High Med	1993 1993	11 11	Lisa Smith (867) 874-2009
Weldwood of Canada Ltd.	WWD	High Med	1992 1993	12 11	Sharon Meredith (780) 865-8189
Weyerhaeuser Company, Alberta Forestlands	WGP	High Med	1991 1991	13 13	Greg Behuniak (780) 539-8207
Weyerhaeuser Company, Saskatchewan Forestlands	WPA	PAHigh PAMed BRHigh BRMed	1990 1990 1992 1992	14 14 13 12	Michael Leblanc (306) 953-5154



Long-Term Study-Data Collection and Storage

Cleaning of all data collected through 2002 has been largely completed during the past year. Dr. Rongzhou Man was hired on a 60/40 split with the Mixedwood Management Association for a 1 year term. Rongzhou's focus was to first standardize the data format into Access 2000, then write an error checking routine to identify and classify the errors into 4 categories (missing data, numerical keypunch errors, illogical size relationships and flag data that was not allowed to be registered in a particular field). In cases where the needed corrections were obvious, Rongzhou made those corrections. The resulting database included 3 sets of fields: 1) a set of WESBOGY fields containing the corrected data; 2) a set of matching error fields with the error codes; and, 3) the original unedited data used for comparison purposes. A workshop was held in January of 2004 to review the data cleaning process and to return the database to each agency for review, additional corrections and finalization. Following the return of corrected datasets to the U of A, a "WESBOGY Master Database" will be created and archived. A description of the data cleaning procedures has also been included in the revised Data Collection Manual.

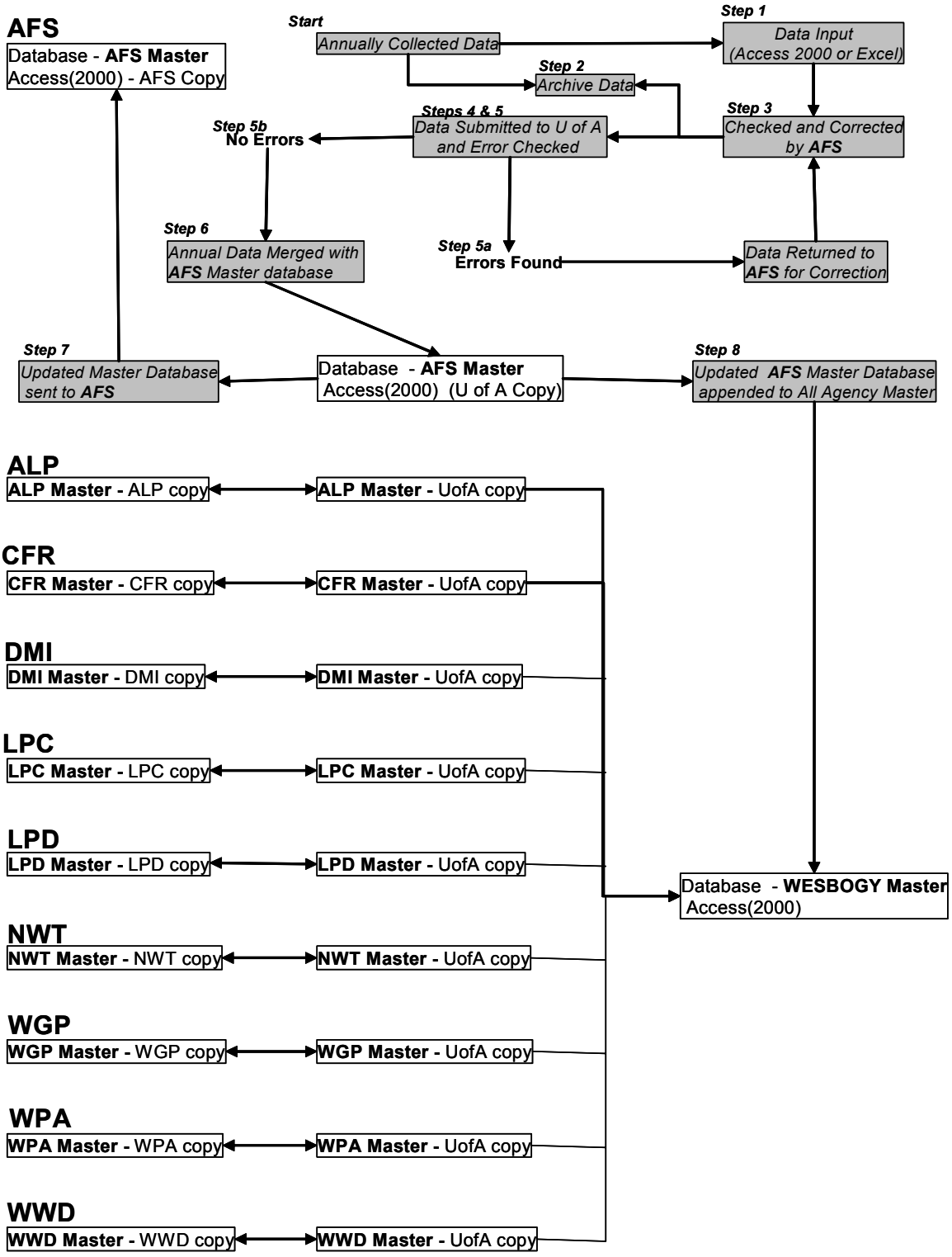
Long-Term Study-Data Handing Procedures

At the spring 2003 meeting WESBOGY members agreed that data collected in the fall of any year will be submitted to the U of A by the end of December for error checking and that data collected in the spring would need to be submitted before August of the year of collection. Following error checking, the data files will be returned to each agency for correction, and then returned to the U of A for archiving. We anticipate that errors in the data will decrease over time as both members and their data collection contractors become familiar with where major issues exist (most errors relate to entry of information and units of measurement, rather than field measurements themselves). A flow diagram for the annual data handling procedures is shown on the following page.

Long-Term Study-Review and Revision of Existing Measurement Protocols

As the Long-Term Study matures, protocols must evolve to deal with unforeseen changes. Several measurement protocols have changed. We will continue to review and revise measurement protocols as needed, while ensuring that changes are compatible with data which have already been collected. We will continue to document changes and incorporate these into the Data Collection Manual.

Data Handling Procedures Flow Diagram

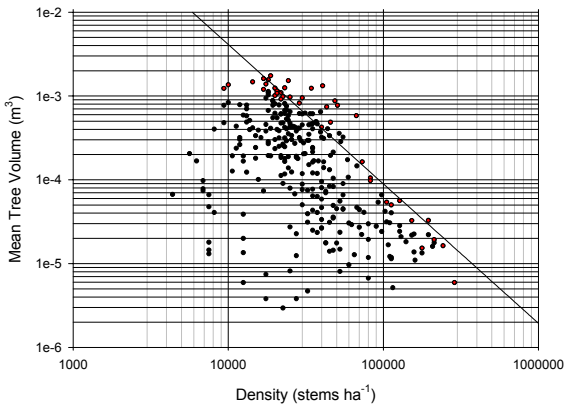


Long-Term Study-2004 Data Collection Procedures Manual

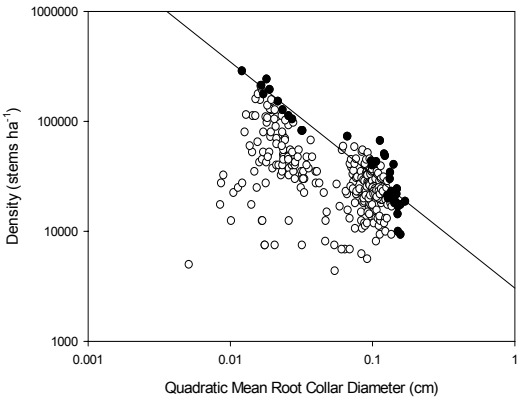
The Data Collection Manual for the long term underwent major revisions in 2003 and will be released in April 2004. The manual has been reformatted to resemble a field manual that will assist members as well as data collection contractors/consultants/field crews understand and easily implement the measurement protocols. New condition codes and protocols for new measurement issues have been added. The manual will be available for viewing and downloading on the WESBOGY website in April.

Long-Term Study-Analyses and Manuscripts

The manuscript describing initial results from the oldest Long Term Study installations required substantial revision, rewriting and refocusing and will be complete for re-submission in 2004. One major addition to the manuscript was a new analysis relating to juvenile aspen mortality. The WESBOGY data was used to fit several new maximum density functions. These functions will be used in MGM together with the existing survival probability function to overcome problems with underestimation of mortality when aspen densities are extremely high. These ceiling functions will be used to constrain densities below the maximum density-size line. Three relationships have been examined: a) the -3/2 power rule where stand density is predicted as a function of mean tree volume; b) a modified the stand density index where stand density is related to quadratic mean root collar diameter (since quadratic mean diameter cannot be measured when trees are shorter than 1.3 m); and, c) height-density relationships. The graphs shown below illustrate two of these relationships.



a) -3/2 power function for juvenile aspen fit on the upper 10th percentile of mean tree volume by density.



b) Modified stand density index function for juvenile aspen fit on the upper 10th percentile of quadratic root collar diameter by density.

Mixedwood Growth Model (MGM) Development

The development of MGM in early 2003 focused on the incorporation of new relationships developed by Buckmaster and Nunifu. Buckmaster developed new relationships for projecting height growth of understory spruce under aspen canopies. Nunifu developed new relationships for predicting height and diameter growth for spruce, aspen and pine. During the summer of 2003 the feasibility of converting MGM to operate entirely within the framework of a Microsoft Excel workbook and Visual Basic for Applications (VBA) was examined. The evaluation was successful and the conversion process was started. By the end of the summer a version with limited features (only Alberta regional features and with some special features not yet converted) was constructed and subjected to limited testing. The efficiency of VBA for making projections was comparable with the previously released version and a number of added features were available within the Excel context (e.g. more stand summary statistics). The conversion also eliminated the often troublesome program installation procedure and offered an opportunity to clean up the code and supplement the documentation. The web-based help facility was also updated as the code was revisited. A proposed completion date for the conversion was set at late 2004.

A collaborative project involving the University of Alberta Department of Renewable Resources, the Government of Alberta, the Alberta Mixedwood Management Association (MWMA) and the Western Boreal Growth and Yield Association (Alberta Members) was successful in obtaining 3 years of funding (starting in January 2004) from the Forest Resource Improvement Association of Alberta - Open Funds Initiative to further develop MGM's capabilities.

The project is designed to incorporate into MGM the flexibility and functions that are needed to model and assess growth and yield implications of current and future forest management strategies and silvicultural prescriptions in Alberta's boreal mixedwood forests. Project funding has allowed us to hire Dr. Ken Stadt as a Research Assistant Professor to handle many details of this project. The project is being directed by a Strategic Development Team whose members are: Phil Comeau, Steve Titus, Mike Bokalo, Ken Stadt, Greg Behuniak, Gitte Grover, Ken Greenway, and Willy Fast.

The project will add new functionality and capabilities to MGM through:

- Improving the representation of early tree and stand growth using newly available juvenile stand data (SDS, Monitor Plot, WESBOGY and other data) to:
  - Improve existing growth and mortality functions for trees in natural stands
  - Add the capacity to model post-harvest and treated natural stands.
- Modifying the architecture of MGM to permit incorporation of process-oriented functions and to provide flexibility for modeling a range of current and future silvicultural practices.
- Developing and enhancing the capability of MGM for predicting the response of mixedwood stands to silvicultural practices (such as: under-planting, understory scarification and seeding, juvenile spacing, harvesting with understory protection, partial cutting, herbicide treatment, and brushing) using a combination of empirical and process-oriented modeling approaches.
- Developing volume loss factors (VLF) to adjust model predictions.

Several studies are underway examining aspects of competition between aspen and white spruce. Graduate student projects include:

Janet Pritchard (M.Sc. completed July 2003) - Effects of radius of aspen removal and aspen height on light, frost incidence and growth of white spruce (NSERC and B.C. MOF funded).

Dan MacIsaac (Ph.D.) - Spatial aspects of boreal mixedwood succession and stand dynamics (NCE-SFM funded)

Cosmin Filipescu (Ph.D.) - Temporal dynamics of competition and effects of density reduction on growth of white spruce and associated microenvironmental factors (NSERC funded).

Mihai Voicu (M.Sc.) - Spatial influences of aspen on microclimate and growth of spruce seedlings along the interface between young aspen stands and young spruce plantations (NSERC and WESBOGY funded).

Cosmin Man (M.Sc.) – Effects of aspen and understory vegetation on soil moisture and growth of white spruce.

During 2003 the Alberta Mixedwood Management Association provided ongoing support for a project being conducted by Cosmin Filipescu to examine how relationships between white spruce growth and aspen competition change with stand age. In collaboration with Doug Pitt (CFS), Dan MacIsaac (CFS), and Milo Mihajlovich (IFTech) a long-term study was established near Whitecourt in 2002 to examine the effects of herbaceous vegetation control and aspen stem density on boreal mixedwood stand development. Funding for this study is being provided by a Canadian Forest Service/NSERC partnership grant and by Blue Ridge Lumber, Millar Western, Canadian Forest Products, Canadian Ecology Centre Forestry Research Partnership (Grant Forest Products), Monsanto Canada, Dow AgroSciences, Alberta Herbicide Task Force, Alberta Mixedwood Management Association, Ontario Ministry of Natural Resources (through the Spray Efficacy Research Group), and Forest Protection Limited.

Work on the radial treatment study (comparing brushing and triclopyr ester treatments, and radius of aspen removal) being conducted near Mistahae continued, with third year assessments and light measurements completed during 2003.

A small project was initiated in B.C. to determine the extent to which relationships between understory light and aspen basal area could be applied. This study will continue in 2004. During the summer of 2003 a small project was also undertaken to examine relationships between overstory and understory leaf area index at one WESBOGY installation. A short summary of preliminary results is presented below. A summary of the major findings presented in Janet Pritchard's M.Sc. thesis follows as well.

In September Phil attended the World Forestry Congress in Quebec and presented two posters:

Bokalo, M., P. Comeau, and S. Titus. 2003. Early dynamics of aspen and spruce under intensive forest management. Poster presented at 12th World Forestry Congress. Quebec, Sept. 21-28, 2003.

Comeau, P. and M. Voicu. 2003. Evaluating tending options in young boreal mixedwood stands to enhance white spruce growth. Poster presented at 12th World Forestry Congress. Quebec, Sept. 21-28, 2003.

Publications:

Biring, B.S., P.G. Comeau and P.L. Fielder. 2004. Long-term effects of vegetation control treatments for release of Engelmann spruce from a mixed-shrub community in southern British Columbia. Ann. Forest Sci. 60:681-690.

Lavery, J.M., P.G. Comeau, and C.E. Prescott. 2004. The influence of red alder patches on light, litterfall and soil nutrients in adjacent conifer stands. Can. J. For. Res. 34: 56-64.

Comeau, P.G. 2003. Estimating and managing understory light using aspen density and diameter in central and northeastern B.C. University of Alberta, Department of Renewable Resources. EFM Research Note 02/2003

Comeau, P.G. and J. Heineman. 2003. Predicting understory light microclimate from stand parameters in young paper birch (Betula papyrifera Marsh.) stands. Forest Ecol. Manage. 180: 303-315.

Comeau, P.G., J.R. Wang, and T. Letchford. 2003. Influences of paper birch competition on growth of understory white spruce and subalpine fir following spacing. Can. J. For. Res. 33: 1962-1973.

Frey, B.R., V.J. Lieffers, S.M. Landhausser, P.G. Comeau and K.J. Greenway. 2003. An analysis of sucker regeneration of trembling aspen. Can. J. For. Res. 33: 1169-1179.

The effect of opening size on light, temperature and the growth of white spruce under a trembling aspen canopy.

Janet Pritchard, M.Sc. thesis (July 2003)

Reduced light levels limit growth of white spruce beneath trembling aspen, but aspen cover provides protection from growing season radiative frosts. The creation of circular openings around individual spruce can provide more light, but reducing opening size limits the chance of radiative frost. This study examined the relationship between opening size and light and temperature levels in the center of circular gaps as well as the relationship between spruce growth and light levels in natural gaps. Gaps of different sizes were created in 9 young aspen stands located near Fort St. John, B.C. and 9 stands near Slave Lake, Alberta. Maximum height of stands studies was 7.6 m. Results indicated a strong relationship exists between post-treatment light levels and opening size after considering pre-treatment light levels (Figure 1). The relationship between opening size and growing season frost was weak, with minimum temperatures more affected by the height and density of the surrounding stand than the actual size of the openings.

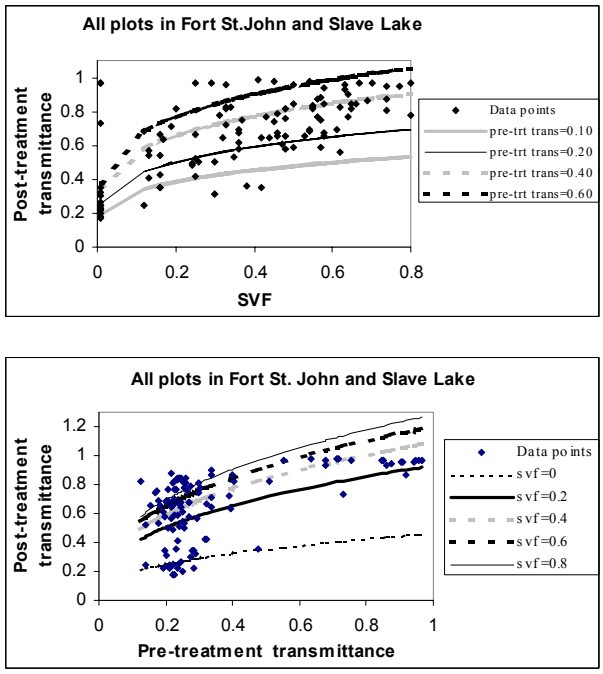


Figure 1. Transmittance (the fraction of open sky light) at 1 m above the ground in the center of circular openings is related to both the Sky View Factor (SVF) and light penetration through the untreated surrounding stand (pre-treatment transmittance). The lines are described by the equation: Ln(post-trt transmittance) = 0.299779 + 0.231178 Ln (SVF) + 0.381009 Ln (pre-trt transmittance); R^2 = 0.7354, RMSE = 0.241, n=108.

Sky view factor (SVF) is the amount of sky that can be seen when looking up, it increases with increasing opening diameter. For a circular opening, it can be calculated as: $\boldsymbol{SVF = \cos^2 (\tan^{-1}(2H/D))}$ *(where H is the forest height and D is the diameter of the circular opening).*

Aspen and understory leaf area index in young mixedwood stands.

Phil Comeau and Cosmin Man

Calamagrostis canadensis is widely recognized as a potential problem in western boreal forests due to its competitive effects on young spruce and aspen. Other studies have shown that grass and herbaceous cover and leaf area index (LAI) decline as tree layer LAI increases in maturing stands. An understanding of the effect of aspen LAI on understory vegetation development may be useful in development of strategies for reducing problems with *Calamagrostis canadensis* in young mixedwood stands.

LAI of understory vegetation and of the tree layer was measured in the 30 plots at the DMI High Site LTS installation (located near Hines Creek) in July 2003 using a LI-Cor LAI-2000 plant canopy analyzer (LI-Cor Inc., Lincoln, NB). This stand was 12 years old in 2003, with spacing completed in 1998.

Aspen and total leaf area index increased with the density of retained aspen. Five years after spacing, aspen density had a significant effect on tree and total LAI (Figure 1). However, understory LAI (predominantly *Calamagrostis canadensis*) was not significantly different between treatments. Substantial variation in understory vegetation cover was observed, reflecting effects of microsite, environmental factors, slash and soil compaction during harvesting which mask treatment effects at this time. Figure 2 indicates that a boundary line may exist, describing an upper limit to understory LAI, which declines as tree layer LAI increases beyond 1.0.

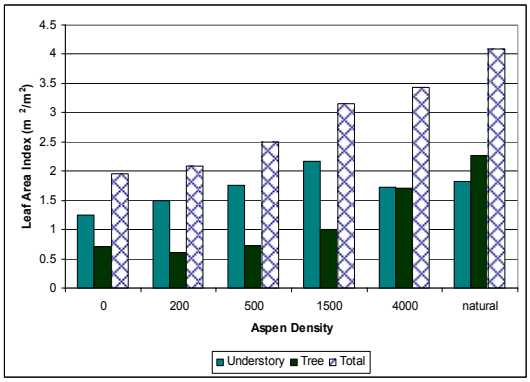


Figure 1. Mean leaf area index for understory and tree layers five years after spacing of aspen to different densities.

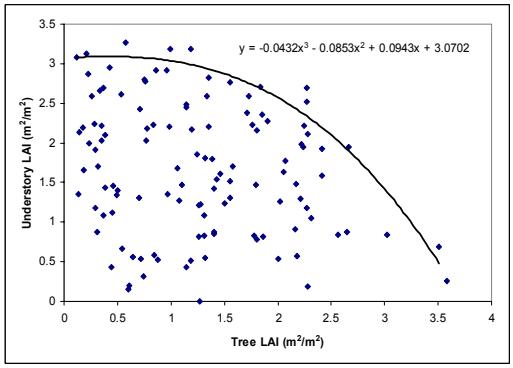


Figure 2. Relationship between understory and tree leaf area index. The curve describes a boundary line fit to the upper 10% of the datapoints in each of 7 classes of LAI.

LTS database

Cleaning and archiving of LTS data collected through 2003 will be completed. Plans for the inclusion of both spatial data and site data will be developed.

LTS Data Analysis

Continuing and extended analysis is planned in the areas of:

aspen self-thinning
improve juvenile growth and mortality models in MGM
spruce growth response and growth allocation following spacing
evaluation of relationships between spruce growth and competition and evaluation of options for estimating competition and free-to-grow status.

MGM

Work on MGM will focus on refining the modeling of early tree and stand growth using newly available juvenile stand data (SDS, Monitor Plot, WESBOGY and other data). Assembly and analysis of existing data is currently underway and will be completed during 2004.

Mike submitted a proposal to the Saskatchewan Forestry Centre (Forest Development Fund) for two years of graduate student support for a project to compare and evaluate the performance of a) MGM; b) Dendron and Flewelling Growth models; c) empirical yield curves constructed using temporary sample plot data; and d) empirical yield curves constructed using permanent sample plot data. These models have been calibrated for Saskatchewan forests using available data. The project was proposed as a quantitative analysis of model performance in terms of accuracy and precision, supporting the choice of an applicable, useful growth model for aspen and mixedwood stands in Saskatchewan. Results would highlight regional applicability and identify areas of improvement, providing an important tool for the support of sustainable forest management. Mike will be notified in April of 2004 if he was successful in obtaining support.

Successional Modeling

The association has had a long-standing interest in the development of refined tools for predicting successional pathways and rates of succession in boreal mixedwood stands. At the fall WESBOGY meeting Mike presented an outline for a proposed study and in December of 2003 he also presented the proposal to the Alberta Mixedwood Management Association. The study will rely on a combination of remeasured permanent sample plots, and stand reconstruction based on destructive sampling of matching plots. Although the methodology was generally accepted by the MWMA, there were still some concerns regarding reliance on relationships between aspen slenderness and density for estimating past densities. The MWMA provided conditional support for the project requesting a preliminary study to provide evidence of the strength of the relationships. Mike is gathering datasets that will be used to test these relationships in 2004.

Silviculture and Ecology

Work will continue on the ongoing projects described earlier in this report. In addition, a supplementary study is being established at the DMI Hines Creek LTS installation to evaluate the effects of understory vegetation and aspen on soil moisture.

WESBOGY Webpage

With the assistance of Judy Jacobs (U of A, Department of Renewable Resources Web Page Designer) our website is beginning to take on a new look. Changes include: having our own web address, a secure members area, and inclusion of both historical and current documents in readily accessible formats. The new site will have a direct link to the MGM site which will track who is downloading MGM.

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

Planned WESBOGY Meetings in 2004

The 2004 Annual Spring Meeting is planned for April 28, 2004
The 2004 Annual Fall Conference, hosted by Saskatchewan Renewable Resources, is planned for August 30 to Sept 1st in Prince Albert, Saskatchewan.

Financial Report for 2003/2004

Salaries*	$82,452
Benefits*	$20,181
Supplies and Services	$2,660
Telephone, Postage and Courier	$1,019
Travel and Meetings	$4,247
Rentalsand Leases	$425
Capital Equipment*	$8,539
Indirect Costs	$11,736
TOTAL	$131,259
Membership Dues Received	$100,000
Opening Balance April 1, 2003	$275,130
Closing Balance March 31, 2004	$243,871

Salaries and Benefits include costs for Ken Stadt's salary during February and March of 2004. These amounts will be recovered from the FRIAA grant once FRIAA funds have been received by the University of Alberta. In addition, costs for a computer purchased for the FRIAA funded MGM project will be recovered from the FRIAA grant in 2004.

Budget for 2004/2005

Expenditures	
Salary and benefits: Bokalo	$62,000
Salary and Benefits (2 months) - Data Analyst	$12,000
Graduate student support	$15,500
Supplies	$2,000
Postage/telephone	$2,000
Travel	$14,000
Meeting costs	$3,000
University indirect costs (15% of revenue)	$15,000
Total Expenditures	$125,500
Revenues	
Member Dues	$100,000
Others	$14,000
Total Revenues	$114,000
Account Balance	
Opening Balance on Account (April 1, 2004)	$243,871
Net Revenues - Expenses April 1 2004 - March 31, 2005	-$11,500
Projected Account Balance at March 31, 2005	$232,371

April 10, 2003 Spring Meeting Agenda
(Meeting held at the University of Alberta)

Completed and ongoing projects
- MGM
- Long-term study
- Competition dynamics and competition management

New Project Ideas and Priorities
Measurement of trees on natural plots
2002 Financial Statement
2003 Budget
Annual Report
Website
Fall meeting – Grande Prairie, September 9-11, 2003

September 10, 2003 Annual Meeting Program (Meeting hosted by Canadian Forest Products Ltd in Grande Prairie, Alberta)

Start	End	Speaker	Title
08:30	08:45	Phil Comeau (U of A)	Opening Remarks
08:45	09:00	Jim Stephenson (Woodlands Manager, Canfor)	Welcome
09:00	09:45	Phil Comeau (U of A)	Research Update
09:45	10:00		*COFFEE*
10:00	11:00	Daryl Price (SRD)	Managed versus Unmanaged Growth and Yield – Government Perspective
11:00	12:00	Willi Fast (ForCorp)	Managed versus Unmanaged Growth and Yield – Consultants Perspective
12:00	13:00		*LUNCH*
13:00	14:00	Peter Blake (Canfor)	Canfor Initiatives
14:00	14:30	Mike Bokalo (U of A)	Successional Modeling Project
14:30	14:45		*COFFEE*
14:45	15:30	Student Presentations (U of A)	Research Update
15:30	16:00	Mike Bokalo (U of A)	MGM development update
16:00	16:15	Patrick Ewan (Canfor)	Field Trip Overview
16:15	16:30		*BREAK*
16:30	17:30		Business Meeting
18:30			*DINNER*

History of WESBOGY Meetings

Date	Sponsor	Location
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

Thank you presentation to Steve Titus at the September 2003 annual meeting.

MGM Growth Projection Output in Tabular Form

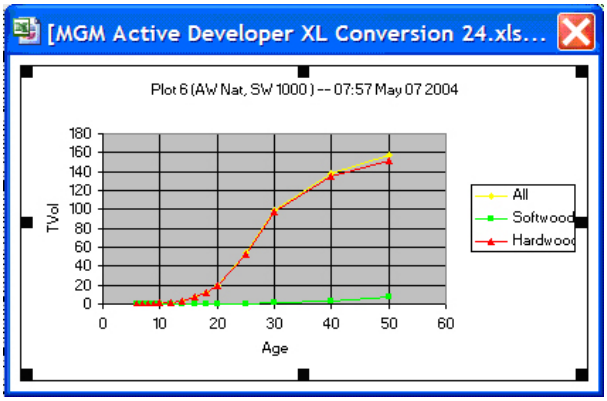
Mixedwood Growth Model - MGM Active Developer XL Conversion 24.xls

File Edit View Insert Format Tools MyTools Data Window Help Adobe PDF

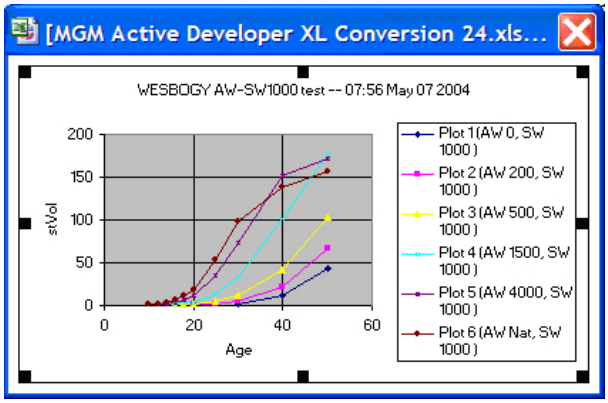
Arial 8 B I U 75%

A1

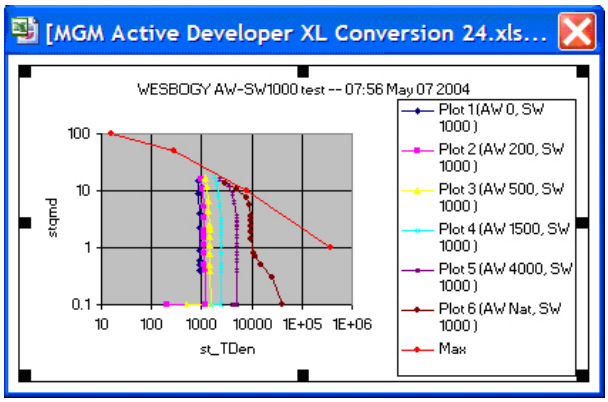
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1		Yields	Plot 6 (AW Nat, SW 1000)		07:57 May 07 2004		WESBOGY AW-SW1000 test											
2		Age	C_Den	D_Den	C_AvDbh	D_AvDbh	C_AvHt	D_AvHt	C_TBa	D_TBa	C_TVol	D_TVol	C_SIndr	D_SIndr	stQMD	StVol	stBa	stDensity
3		6	0	14000	0	0.1	0	1.8	0	0	0	0	0	18.25	0.1	0	0	14000
4		6	0	14000	0	0.1	0	1.8	0	0	0	0	0	18.25	0.1	0	0	14000
5		7	0	12300	0	0.2	0	1.9	0	0.1	0	0	0	7.81	0.3	0	0.1	12300
6		8	0	7380	0	0.5	0	2.1	0	0.2	0	0	0	4.23	0.5	0	0.2	7380
7		9	0	8663	0	0.6	0	2.1	0	0.3	0	0	0	3.44	0.7	0	0.3	8663
8		10	0	9228	0	0.8	0	2.2	0	0.5	0	1	0	2.88	0.8	1	0.5	9228
9		12	33	8895	0.5	1.3	1.6	2.8	0	1.3	0	1	3.28	2.17	1.4	1	1.3	8928
10		14	33	8999	0.9	1.9	1.9	3.5	0	2.6	0	3	2.05	1.88	1.9	3	2.6	9033
11		16	331	8997	0.3	2.4	1.5	4.2	0	4.3	0	7	4.63	1.72	2.4	7	4.3	9329
12		18	396	8997	0.7	3	1.7	4.9	0	6.6	0	12	2.51	1.63	3	12	6.7	9393
13		20	903	8997	0.7	3.6	1.8	5.7	0.1	9.5	0	19	2.48	1.56	3.5	19	9.6	9899
14		25	913	8154	2	5.9	2.7	7.1	0.3	22.5	0	53	1.35	1.21	5.7	54	22.8	9067
15		30	910	7248	3.5	7.9	3.9	8.2	0.9	36.7	1	98	1.09	1.04	7.7	99	37.6	8158
16		40	839	4017	5.7	11.3	5.3	10.2	2.2	41.7	3	135	0.93	0.91	10.7	138	43.9	4857
17		50	769	2210	7.7	14.7	6.6	12.2	3.6	39.7	7	151	0.85	0.83	13.6	157	43.3	2979
18																		
19																		



MGM Output Showing Projected Hardwood, Softwood, and Total Volume Over Time



MGM Output Showing Projected Stand Volume Over Time at Varying Aspen Stand Densities



MGM Output Showing Projected Relationships Between QMD and Stand Density at Varying Aspen Stand Densities

Western Boreal Growth and Yield Cooperative (WESBOGY)

c/o Department of Renewable Resources
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