
VISION FOR GROWTH AND YIELD IN ALBERTA

Prepared by
Sharon Meredith, MScF, RPF
Director, Alberta Forest Growth Organization



CONTENTS

Introduction.....	1
Current and Future Challenges	2
Funds	2
Qualified Staff	2
Models	2
Data.....	3
policy.....	3
Future Challenges	3
Strengths	5
Tenure	5
Relationships and Collaboration	5
Models and Data.....	5
Knowledge and Experience	6
Opportunities	7
Collaboration with Tree Improvement Alberta	7
Climate Change	7
Model Development.....	7
Policy.....	7
Vision and Strategies.....	8
Appendix 1: Growth and Yield Gap analysis and Research Priorities	1
Appendix 2: Workshop Participants.....	1

INTRODUCTION

The Alberta Forest Growth Organization (AFGO) was formed in 2008 by a consortium of forest industry companies and was initially funded by Forest Resource Improvement Association of Alberta (FRIAA) Open Funds. Its mandate is to expedite and co-ordinate the development of a recognized, secure and well-funded forest growth and yield sector in Alberta that operates effectively and efficiently to address emerging issues in all of Alberta's natural resource management sectors that require growth and yield knowledge and expertise for solutions.

The initial FRIAA proposal included completion of a *Provincial Growth and Yield Needs and Opportunities Assessment*. This was originally intended to follow the Carbon Conference and focus on issues identified through the conference and include all of Alberta's resource management sectors. However, the conference did not identify high priority issues, and attempts to engage other resource management sectors were unsuccessful. The needs and opportunities assessment was redefined to address the growth and yield needs of the forest industry and was accomplished in two parts.

The first part was a gap analysis of existing and desired growth and yield research, which was developed at a workshop on August 14, 2013 (Appendix 1). This "Vision for Growth and Yield in Alberta" is the second part and addresses the long-term, strategic considerations not included in the gap analysis.

A workshop was held on April 16, 2014 to discuss current the current status of growth and yield in Alberta and the desired future state. The 16 participants (Appendix 2) were knowledgeable forest managers, researchers and growth and yield practitioners. They were asked to respond to a series of questions about growth and yield in the province, including current and future challenges, strengths and opportunities, and, finally, a vision and strategies for addressing these. The following document summarizes the discussions and conclusions of the participants.

CURRENT AND FUTURE CHALLENGES

There was consensus among the participants that the greatest challenges facing growth and yield practitioners in Alberta are a lack of funding and a lack of both qualified growth and yield analysts and field staff. Both of these challenges have impacts on a number of aspects of the sector, as discussed in the following sections.

FUNDS

Funds contributed to growth and yield programs tend to be limited if the return for the investment is not in the near future but rather long-term. This is especially the case where the benefits are not clearly communicated or not communicated in terms of financial or annual allowable cut (AAC) benefits. As a result, the current level of funding does not permit the desired long-term programs and data collection considered necessary by participants.

Emerging technologies, including LiDAR and other remote sensing, have the potential to provide long-term cost savings by decreasing the amount of field data collection required. This would also address the lack of qualified field staff. However, without funding to develop methods of applying the new technology, new methodologies will not advance.

QUALIFIED STAFF

In part due to funding limitations, there are few people in industry committed to work in growth and yield. For most it is done “off the corner of their desk” in addition to other responsibilities. This may be partially responsible for the difficulty in establishing and maintaining quality growth and yield programs in industry for individual companies. Part-time growth and yield staff may lack the forward thinking to plan beyond short term projects. This is exacerbated by the lack of continuity in many growth and yield programs where much of the work is done by consultants and consequently the knowledge and expertise resides outside of the company.

Few students are entering forestry programs and many who do are not interested in working in growth and yield. Students with strong analytical abilities may not consider forestry as a career option. The strong labour market results in many qualified people, both with field and analytical skills, leaving forestry for other resource sectors with more attractive compensations.

A high proportion of forest industry growth and yield practitioners are nearing retirement and there is poor succession planning and little to no mentoring taking place. The limitations due to lack of qualified people can be expected to increase if nothing is done to mitigate loss of expertise through retirement and lack of planning for knowledge transfer.

MODELS

Forest management in Alberta is relying increasingly on use of growth models. The Growth and Yield Projection System (GYPSY) is already an integral part the Reforestation Standards of Alberta. As the proportion of landbase occupied by post-harvest stands increases, there is increasing need to use both GYPSY and Mixedwood Growth Model (MGM) for yield curve development. However, there are known limitations to both models. One of the most pressing of these is the lack of

confidence in their ability to represent managed stand growth because of the small amount of data from post-harvest stands that have been used in model development. Also, their capability to model multi-species and multi-aged stands and intensive plantations needs to be improved.

The models are expected to be the cornerstone of growth and yield, and, as such, effort needs to be devoted to the enhancement and validation of both MGM and GYPSY. These efforts are limited by funds and qualified personnel. Only one or two analysts are involved with the development of each of the models, which limits the speed at which advancement can occur.

One of the highest priority needs identified was defensible yield curves for Detailed Forest management Plans (DFMPs), and reliable models will be essential for meeting this need.

DATA

Lack of coordinated planning across the industry has led to gaps in data. Natural subregions and ecosites that are relatively rare tend to be under-represented. The tendency to focus sampling on the timber harvesting landbase means that marginally productive stands are not often seen in PSP data. It is also not clear if existing data adequately captures silviculture treatment effects, especially since treatment regimes change over time.

Historically there has been no consistency in what data is collected on permanent sample plots, making compiling data from different sources onerous and time consuming. Quality of the data is also not consistent due to differences in standards and quality control programs.

On-the-ground data collection is becoming increasingly costly with decreasing availability of qualified field personnel. Industry is placed in competition with each other to access field services.

POLICY

Existing policy limits the ability to share data across Forest Management Agreement Area (FMA) boundaries. Innovation and exploring new ideas are not encouraged due to the difficulty or perceived difficulty in having new approaches accepted by government for use in DFMPs.

Policy may also limit long-term funding. If a return on investment for growth and yield work is apparent, companies may be more likely to finance it.

FUTURE CHALLENGES

Participants agreed that challenges faced in five to ten years will be similar to those faced today. Current emerging issues such as the shrinking landbase and planning uncertainty due to the Land Use Framework will become even more important and may require changes in policy to address.

Similarly, assessing impacts of climate change is beginning to be considered important, but is expected to be a higher priority in the future. Growth and yield will be able to address changes in tree growth, but not concerns like extreme weather events and changes in pest behavior as a result of climate change. Building climate change into growth models may need to be considered.

Use of new technology, such as LiDAR, for data collection is still considered research and foresters can be slow to adopt new technology. It is important that the potential of the technology is understood along with the possible consequences of adopting it. Adequate technology transfer will be needed to broaden use by practitioners.

STRENGTHS

Although many challenges were identified, participants agreed that growth and yield work in Alberta has many obvious strengths.

RELATIONSHIPS AND COLLABORATION

Collaboration is important to successful growth and yield work in Alberta. Industry and government work well together, which can facilitate meaningful and productive policy change. Companies also work well with each other, as evidenced by the number of growth and yield associations and their current projects.

The growth and yield associations continue to look for new ways to collaborate and increase efficiency, demonstrated by the decision of the four growth and yield associations to amalgamate to form one new association.

MODELS AND DATA

The two growth models developed in Alberta are transparent and validated. Each has a team advising on priorities for model improvement: the GYPSY Advisory Committee and the MGM Steering Committee.

The availability of LiDAR data for the entire province is of great benefit to growth and yield work.

The Provincial Growth and Yield Initiative (PGYI) will support development of the GYPSY and MGM models by providing a dataset that covers the range of natural subregions and stand types in the Province in a consistent format. PGYI marks a new era of data sharing and collaboration, as all FMA-holders in the province are participating.

The Province has a wealth of data including some of the best lodgepole pine data in the world. This data resides primarily in the PSP data of two companies and the Foothills Growth and Yield Association's Regenerated Lodgepole Pine Trial.

There are several other long-term growth and yield studies underway in the province, including the WESBOGY (Western Boreal Growth and Yield Association) Long-Term Study, and the Mixwedwood Management Association (MWMA) Dynamic Aspen Density Experiment (DADE) and Strip Cut Understory Protection Permanent Sample Plots (SCUP).

TENURE

In Alberta, the tenure system allows companies to make more investments in forest management than in regions with shorter term tenures or tenures that are not area based. All FMA holders in Alberta are also required to have growth and yield programs. As a result, Alberta companies have high numbers of PSPs and there is a large amount of data available relative to many other jurisdictions.

KNOWLEDGE AND EXPERIENCE

The knowledgeable professionals working in the province are a strength that must be capitalized on before it is lost through retirements and other departures from the industry.

OPPORTUNITIES

COLLABORATION WITH TREE IMPROVEMENT ALBERTA

Frequently discussed are opportunities for increased collaboration between growth and yield and tree improvement. Better quantification of yield gain from improved stock is needed to justify the expense of tree improvement programs and to correctly assess the impact of deployment on long-term fibre supply. To fully realize this policy change around genetic gain is also needed.

CLIMATE CHANGE

Another area that needs attention is climate change and its impact on tree growth. The Tree Improvement Alberta adaptation project investigates where species can be expected to grow under climate change, but anticipated yields are not adequately addressed.

MODEL DEVELOPMENT

The growth models need more data from multi species stands to accurately reflect their development. Additionally, data on treatment response for understory protection, thinning and weeding are lacking. These treatment responses will become increasingly important as competition for landbase increases and Mountain Pine Beetle attack impacts mid-term timber supply.

POLICY

Some changes in forest management practices are limited by policy. The Alberta government traditionally has a low tolerance for risk, which has resulted in conservative policy and slow changes to policy. This limits advancement in forest management practices, such as data sharing across FMA boundaries, realizing benefits of genetic gain, and other innovations. Changes need to be made to the planning standard, which industry participants feel is outdated and restricting.

VISION AND STRATEGIES

The vision for growth and yield in Alberta is an environment where there is increased collaboration between growth and yield practitioners, modellers and regulators as well as between researchers and practitioners. This will lead to research addressing high priority needs for industry, the results of which can be implemented in forest management planning in a timely manner. Although more work needs to be done to develop a comprehensive plan for achieving this vision, workshop participants agreed that the following are necessary components:

- Collect data required to improve existing models, secure long-term funding for development and carry out model development work.
- Develop best practices for:
 - The use of MGM and GYPSY
 - PSP establishment and measurement
 - The use of data from PSPs, RSA and other sources
 - DFMP development to help streamline the approval process
- Develop long-term, stable funding. Avenues to explore include an approach similar to the Forest Resource Improvement Program and sale of carbon credits to the energy sector.
- Work with the University of Alberta to:
 - Develop a research program that meets industry needs.
 - Address needs for training at all levels including graduate and undergraduate students, and technology transfer.
- Continue with the plans for association restructuring to increase efficiencies and reduce redundancies. The new association will coordinate initiation of new research and ensure best use of limited funds.
- Continue to pursue relationships with other resource management sectors, since multiple land use and reclamation practices have the potential to impact the forest industry.
- Pursue changes to policy necessary to allow innovations in forest management and to remove barriers to effective use of data and tools. Higher levels of management in forestry industry may need to become involved in a purposeful dialogue with government to effect the desired changes.

APPENDIX 1: GROWTH AND YIELD GAP ANALYSIS AND RESEARCH PRIORITIES

Growth Modelling

	Activity/Question	Project(s)	Group	Status
1.	Growth Model Development	Development and validation of MGM Development and validation of GYPSY	U of A ESRD	Ongoing Ongoing
2.	Volume Loss Factor development	Development for MGM	U of A	Ongoing
3.	Pine regeneration modelling	FRIPSY (Foothills Regeneration Integrated Planning System)	FGYA	Working version of model complete and being reviewed by FGYA members
4.	Variability of net “competitive” effects of aspen on white spruce	Proposed project - Comeau.	WESBOGY	Under development
5.	Volume Loss, Natural Regeneration and Stand Horizontal Structure	Proposal being developed	WESBOGY	
6.	Mortality curves for young aspen (juvenile aspen stand dynamics)	Utilize WESBOGY LTS data	WESBOGY	Underway (Comeau and Bokalo)
7.	Projecting future yield and stand structure from young stand condition (characterizing future condition from performance survey data)	Sask Environment funding project by Kirk Johnson, Phil Comeau and Mike Bokalo	WESBOGY	Underway. Completion expected by December 2013
8.	Density management diagrams for aspen, white spruce and mixedwoods	Valentin Reyes-Hernandez (PhD student) and Phil Comeau	WESBOGY	Nearing completion (core paper published)
9.	Improve understanding of factors influencing conifer natural regeneration – and model it.	FRIPSY (pine focus)	FGYA	See 3. above
10.	Better understanding and modeling of natural regeneration of spruce, aspen, pine	None		
11.	Linking site (eg wet areas mapping; edatope) to productivity	High precision prediction of site index and future yield by use of wet areas mapping and full feature LiDAR	WESBOGY	Gabriel Oltean (M.Sc), Phil Comeau and Mike Bokalo – work being done at Judy Creek and at WESBOGY LTS sites. Field work initiated April 2013.
12.	Determining appropriate site index (growth curves) for forest modeling	See 11		

	Activity/Question	Project(s)	Group	Status
13.	Model growth of stands after natural disturbance and harvest	None		
14.	Modeling young stand response to establishment and tending.	FRIPSY (pine focus) Phil Comeau modelling project (spruce focus)	FGYA U of A	Underway Underway
15.	Collect data across the provincial range of natural subregions and cover types in natural and post-harvest stands for use in growth model development.	Provincial Growth and Yield Initiative	AFGO	Underway
16.	Aspen break-up modelling			
17.	Accurate modelling of changing seral stages throughout succession			
18.	Modeling partial harvest and dynamics of structured stands, understory projection, aspen- pine interactions, pine- black spruce mixes	2013 Weyerhaeuser Open Funds Proposal-- Comeau	U of A	Ongoing.
19.	Quantifying and modeling treatment effects			
20.	Distance dependent models			
21.	Support for validation and documentation, best practices documentation, etc.			
22.	Incorporation of climate into MGM.			
23.	Development of regeneration models for use in MGM.			
24.	Tools for estimating site index that would work where good top height trees are not available.			

Silviculture Treatment and Growth

	Activity/Question	Project(s)	Group	Status
25.	Silvicultural prescriptions to maintain mixedwood stands – radial herbicide treatment and thinning	Judy Creek	WESBOGY and CFS	10 th year measurement completed in 2012. Thinning completed 2012. Ongoing
26.	Influence of ecosite and treatment on lodgepole pine regeneration	Regenerated Lodgepole Pine Trials	FGYA	102 installations established between 2000 and 2001. On going
27.	Effect of density management on lodgepole pine	Historic Lodgepole Pine Trials	FGYA, ESRD and CFS	Various trials. On going
28.	What is the most economic method for producing a DC forest	None		
29.	Growth and yield implications of retention prescriptions	None		
30.	Growth and yield implications of harvesting to natural boundaries rather than rectangular blocks	None		
31.	Are there yield advantages to cutblock size when harvesting mixedwood blocks? What are the economic implications?	None		
32.	Effects of timing and radius of cutting on spruce growth and aspen resprouting	Effects of radius and timing of radial brushing treatments on aspen suckering and spruce growth - Field experiments near LacLaBiche and Judy Creek – Phil Comeau	U of A	Established in 2002 (Judy Creek), 2007 (Lac La Biche)
33.	Evaluation of banding as an alternative for establishing mixedwood stands	Comparison of banding (15 m bands treated with herbicide (vision and arsenal), arsenal spot treatment, radius brushing, and thinning – Phil Comeau	MWMA	Initiated in 2006. 4 sites included in the study (established in different years)
34.	Site preparation effects on early growth of white spruce	Included in #14 (Comeau) – Analysis to be based on available PSP and Performance Survey Data	WESBOGY	Underway
35.	Spruce growth in response to thinning aspen to different densities	Dynamic Aspen Density Experiment	MWMA	11 existing installations established between 2007 and 2009.
36.	Spruce growth in response to thinning aspen to different densities	WESBOGY Long Term Study	WESBOGY	First installations established in 1990 and thinned in 1995. (2 replicate blocks at each of 11 locations)

	Activity/Question	Project(s)	Group	Status
37.	Stand development after strip cut understory protection harvest	Strip Cut Understory Protection (SCUP) Project	MWMA	5 installations established in 2005 and 13 established in 2007.
38.	Develop methods to integrate tree improvement into growth and yield estimates/models	Planned PhD project funded under chair in Tree Improvement	UofA	Start in 2015
39.	Design realized gain trial system to monitor deployment impacts	None		
40.	Establish realized gain trials for selected programs	None		
41.	White spruce release after understory protection	None		
42.	Stand dynamics after partial harvest and effect of larger spruce on regenerating aspen	None		
43.	Site Index for white spruce understory after release	None		
44.	Black spruce productivity under different management practices and climate change	None		
45.	Incidental spruce replacement options--putting spruce on deciduous sites	None		
46.	Stand break up regardless of species	None		
47.	Natural ingress over time in natural and managed stands			
48.	Managed forests-response to treatments			
49.	Bench marking study of 15-20 year old mixedwood stands and how they grow after fire compared to after harvest			

Other

	Subject	Project(s)	Group	Status
50.	Explore the effects of drought on aspen and spruce mortality	Analysis of WESBOGY Long Term Study Data and climate data (Ted Hogg, Mike Bokalo, Phil Comeau)	CFS and WESBOGY	
51.	Effects of aspen density on aspen and spruce wood quality	Could be addressed by collecting supplemental data at WESBOGY LTS, Judy Creek, DADE and other studies	WESBOGY	Proposal under development for supplemental crown and branch measurements on WESBOGY LTS sites.
52.	Economics of mixedwood management options	None		
53.	Economic and yield implications of permanent gaps in forest stands and implications of efforts to regenerate gaps	None		
54.	Understanding of stand dynamics in permafrost areas	None		
55.	Carbon storage and cycling in single species and mixedwood stands.	Claudia Rivera-Rios PhD project underway.	WESBOGY	Field work completed in 2012 at Judy Creek. Data analysis and further sampling underway.
56.	Biodiversity effects of silviculture practices on boreal mixedwood sites.	None. (Identified by Saskatchewan Environment.)		
57.	Effects of stand density and composition on key stem and crown characteristics for aspen and white spruce – links to wood quality	Derek Sattler (PhD) and Phil Comeau FORVALUENET project. Work focussed on Mature Spruce and Mixedwood Stands	U of A	Field work completed, data analysis is underway. 1 paper submitted for publication in CJFR.
58.	Lodgepole pine stand development after attack by mountain pine beetle	Regeneration in a Mountain Pine Beetle Environment	FGYA and FRI	Completed 5 years of measurements. Seeking funding for 3 more.
59.	Effect of density management on lodgepole pine wood quality	Historic Research Trials	FGYA and CFS	On going
60.	Impact of temperature change on lodgepole pine regeneration	Dempster and Hamann paper in progress.	FGYA	Ongoing.
61.	Effects of nutrition and density management of lodgepole pine growth	Enhanced Management of Lodgepole Pine	FGYA and UofA	Complete. Plots under protection and could be re-measured.
62.	Site index for advanced growth to include in RSA MAI projections	None		

	Subject	Project(s)	Group	Status
63.	Technology and how it can be applied in growth and yield--can we do our business better for cheaper? LiDAR, etc.	Bokalo	U of A	On going
64.	Linking RSA and DFMP (Policy)			
65.	Offsetting existing costs for G&Y association costs by enhancing existing studies to get more value			
66.	Climate change impacts around insects and disease; how existing trials can help answer questions about climate.			
67.	Natural disturbances and their impacts			
68.	Post mountain pine beetle response in black spruce and other species.	2013 Weyerhaeuser Open Funds Proposal--Comeau	U of A	Ongoing.
69.	Practices in mixedwoods to mitigate MPB effects			
70.	Other sources of fibre as energy sources			
71.	Landscape level implications of stand-level responses to natural disturbance, treatments, climate change			
72.	Support for PGYI database management		AFGO	
73.	Land use rationalization for protected areas		Silvacom	Analysis done for some areas.

APPENDIX 2: WORKSHOP PARTICIPANTS

Darren Aitkin, Alberta Environment and Sustainable Resource Development
Greg Behuniak, Weyerhaeuser Company
Phil Comeau, University of Alberta
Traci Carter, Weyerhaeuser Company
Pat Golec, West Fraser, Edson & Hinton Woodlands
Gitte Grover, Alberta-Pacific Forest Industries
Bob Held, Sundre Forest Products
Terry Kristoff, Alberta Plywood
Vic Lieffers, University of Alberta
Kerri MacKay, Weyerhaeuser Company
Tim McCready, Millar Western Forest Products
Sharon Meredith, Alberta Forest Growth Organization
Daryl Price, Alberta Environment and Sustainable Resource Development
Colin Scott, Blue Ridge Lumber Inc.
Barb Thomas, University of Alberta
Yuging Yang, Alberta Environment and Sustainable Resource Development