



PROJECT SUMMARY

Developing and implementing Sustainable Forest Management Plans for both the Lakes and Morice Timber Supply Areas is the central objective of the Morice and Lakes Innovative Forest Practices Agreement. The adaptive management cycle and public involvement are both important components of this planning process.

Ecosystem
Management

Forest Productivity

Public Involvement

Adaptive
Management

Growth and Yield Curve Preparation and Delivery



Fraser Lake Sawmills

Introduction

Yield curves are used to quantify various timber and non-timber values on the land base. The Morice and Lakes Innovative Forest Practices Agreement (M&L IFPA) is relying on this information to help support the forecasting and reporting of indicators in a number of learning scenarios. Yield curves that reflect natural stand development and the performance of plantations based on Timber Supply Review (TSR2) management assumptions have been developed to support the base case scenario. Special curve sets were developed to support the forecasting of indicators under three scenarios: the forest productivity scenario, the natural disturbance scenario and the recreation scenario.

The forest productivity scenario curve sets were developed based on the Morice base case curve sets and additional forest productivity studies and data that were not incorporated in the last Timber Supply Review of the Morice Timber Supply Area (TSA).

The natural disturbance scenario curve sets were developed based on the Morice TSA base case curve sets and include additional curves to account for forest succession in different ecosystem types.

Objectives

The objectives of the activity are as follows:

- To produce a set of base case curve sets that reflect natural stand development and the performance of plantations based on Timber Supply Review forest management assumptions.
- To produce a set of forest productivity curve sets that provide an insight into the timber and non-timber resource implications of applying revised estimates of site productivity and various silvicultural regimes and treatments.
- To produce a set of natural disturbance curve sets that mimic natural forest successional pathways in order to assess the timber and non-timber resource implications of managing the land base using current knowledge of natural ecosystems.

Additional adjustments were made to yield curves to account for non-recoverable volume losses. The foundations of these adjustments are the projections of the British Columbia Mountain Pine Beetle (BCMPB) project. The basic method is to apply the BCMPB projections in reducing yield curves as precisely as possible according to a stand's age, landscape unit, and pine component class.



Methods

A variety of yield curve sets were prepared over a two year period to support scenario planning in each TSA. The processes used to prepare and deliver each set are briefly described below. Additional information on the preparation of each yield curve set is available from the IFPA website at www.moricelakes-ifpa.com.

Base Case Yield Curve Sets

The base case yield curve sets were the first curve sets to be developed. They were required for modeling the base case scenarios for each TSA. The Variable Density Yield Prediction (VDYP) model was used for estimating timber attributes in natural stands. The Table Interpolation Program for Stand Yields (BatchTIPSY) model was used for estimating timber and non-timber attributes in managed stands.

The initial phase of the base case curve sets involved updating the forest inventory data to better reflect the status of the land base as of August 31, 2001. Using the silviculture survey measurement data from ISIS (the standard Ministry of Forests reporting tool for silviculture information) and some general assumptions, the Non-Satisfactory Restocked (NSR) stands within the forest inventory were updated. This inventory update process was completed for the Lakes TSA in September 2004 to better reflect the status of the Lakes TSA landbase to April 2004.

The second phase of the base case curve sets involved the generation of a curve set for every stand. Additionally, curve sets were produced for each analysis unit, as defined in the TSR document.

Polygon specific curves (i.e. a curve for every forested polygon) and analysis unit curves (i.e. an area-weighted curve for each analysis unit) were developed. Due to the large sizes of the datasets, the datasets were grouped by the unique attributes that were required by the growth & yield models. The relationships were maintained between the unique input values and the individual forest inventory polygons. This same procedure was performed for all the yield curve sets that were developed for this project.

Forest Productivity Yield Curve Sets

The forest productivity curve sets are required for modeling the forest productivity learning scenarios in each TSA. The yield curves for the forest productivity scenario were developed based on base case curves and additional forest productivity studies and data. There were a number of issues being modeled, and many of the issues required increased resolution of the resultant file, so more data was integrated including spatially identifying areas that were planted with genetically improved stock and incorporating the spatial locations of silviculture treatments. The intention of the forest productivity curve set is to integrate various issues that would provide an insight into the growth potential of different applied silvicultural treatments or where current silvicultural knowledge was applied. The steps involved in creating these curves sets include:

1. Integration of Silvicultural Treatment Data into the GIS Resultant

The layers that were added include brushing, fertilization, genetically improved plantations, juvenile spacing, pruning, seed planning units and site preparation.

2. Developing the Main Lookup Table used for Growth & Yield Curve Generation

The forest productivity scenario used assumptions that were applied based on biogeoclimatic zone, subzone, variant and site series combinations. Therefore, the lookup table is based on the resultant overlay and incorporates all additional necessary data including the forest inventory layer, the PEM layer and all the silvicultural treatments.

3. Development of Yield Curves

Polygon specific curves (i.e. a curve for every forested polygon) were developed. The majority of the assumptions were incorporated into the main lookup table. The curves were assigned a natural, managed or a future managed status and all attributes required to produce the base line curves were included in the lookup table. Due to the large size of the datasets, each unique combination of input parameters required for the growth and yield models were grouped together for each type of curve: natural, managed and future managed. Once grouped, each curve was given a unique table number and related back to the main lookup table.

Natural Succession Yield Curve Sets

The natural disturbance curve sets are required for modeling the natural disturbance scenario. The intention of the curves is to mimic natural succession on the landbase through the use of successional pathway diagrams that describe the forest succession and the impacts of natural disturbances in different ecosystem types. Each successional pathway diagram contains the following information:

- Biogeoclimatic description (including site series)
- Leading and secondary species
- Transition times between each class (defined as the number of years required to move from one class to the next)

The steps involved in creating these curves sets include:

1. Creation of Successional Pathway Diagrams

The intention was to use the successional pathways developed during several vegetation dynamics workshops held for the Morice and Lakes IFPA. The results of these workshops were summarized in the document "Vegetation Pathway Diagrams for the Morice and Lakes Innovative Forest Practices Agreement" produced by ESSA Technologies Ltd. However, after reviewing the document and comparing the pathways to the landbases for each TSA, it was realized that the pathways were too generic in nature to use. In fact, each of the landbases contained biogeoclimatic descriptions and species codes that did not have pathways developed. Because

of this inability to use the existing document, it was decided to create new pathways, which would explicitly cover both landbases. These pathways were developed by Ardea Biological Consulting. Ardea reviewed all combinations of biogeoclimatic variant, site series, leading species, secondary species and age contained within the two landbases and developed pathways based on these criteria.

2. Assignment of Successional Pathways to each Landbase

All of the work performed for the natural disturbance yield curve development is based on work completed for the base case curves. Successional pathways were assigned to each resultant landbase using the following criteria: biogeoclimatic zone, subzone, variant, site series, leading species; secondary species, and age.

3. Creation of Successional Pathway Yield Curves

These are pathways boxes, whose combination of BEC variant, site series, species and age were found on each landbase. Note that not all of the boxes contained within a successional pathway were found on the landbase. The missing boxes tended to be primarily the early or late successional boxes. These curves were created by area weighting all the natural base case curves that fell within each of the pathway boxes on each landbase. Area weighting was done for both the natural base case inputs and outputs.

Adjustments for Mountain Pine Beetle Non-Recoverable Volume Losses

Consistent with the IFPA approach of carrying high resolution, stand specific yield-functions, these epidemic related volume loss adjustments were implemented at the highest resolution supported by the available data. Stands are allowed to increase in volume following epidemic induced losses according to rates of growth previously determined for those stands. The projected proportion of residual live pine moderates those growth rates. For strata with some pine component, the pine component is assumed to remain constant prior to epidemic loss adjustments being made. The Mountain Pine Beetle (MPB) epidemic ends when the BCMPB project's projections end in 2013. Beetle killed pine volume dead no longer than 5 years is viable for saw-logs and is added back to the yield function.

Results

The procedures outlined above resulted in the preparation of three types of curve sets. Additional documents describing the data inputs and assumptions that went into developing these curve sets are available from the Morice and Lakes IFPA. They include:

- The M&L IFPA Information Package
- Base Case Yield Curves (Morice TSA) – March 2003
- Base Case Yield Curves (Lakes TSA) – March 2003
- Forest Productivity Scenario Yield Curves (Morice TSA) – April 2004
- Ecosystem Scenario Yield Curves (Morice TSA) – April 2004
- Forest Productivity Scenario Yield Curves (Lakes TSA) – February 2005
- Ecosystem Scenario Yield Curves (Lakes TSA) – January 2005

Discussion and Conclusions

The IFPA analysis is relying heavily on these growth and yield curve sets to support the modelling of a variety of resource values under a range of alternate management strategies. Many of the innovative management practices proposed for the IFPA will be assessed based on the use of this information. This product is a good example of cooperation between IFPA participants. The end result is a series of innovative growth and yield projections that facilitate the modeling and analysis of innovative forest management practices.

Recommendations

The following recommendation stems from the development of the growth and yield curve sets:

- That the methodologies used to develop these yield curve sets be applied on other management units in the province to further enhance the current approaches to sustainable forest management.

Contacts

For more information, contact:

Dwight Crouse

Resource Analysis Department Manager, Tesera Systems Inc.

PO Box 1078, Cochrane, AB, T4C 1B1

(w) 403 932-0446, (f) 403 932-9395

Email: dwight.crouse@tesera.com

Carol Ann Crouse, RPF

Resource Analyst, Tesera Systems Inc.

PO Box 1078, Cochrane, AB, T4C 1B1

(w) 403 932-0445, (f) 403 932-9395

Email: carol.crouse@tesera.com

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For More Information...



For more information on the Morice & Lakes IFPA,
please contact:

*Jim Burbee, RPF, IFPA Manager
c/o Tweedsmuir Forest Ltd.
3003 Riverview Road
Prince George, B.C. V2K 4Y5
Tel: 250-564-1518
e-mail: venturefc@telus.net*

www.moricelakes-ifpa.com