Morice & Lakes IFPA

April 2002
Summary No. 8

Morice & Lakes Innovative Forest Practices Agreement

PROJECT SUMMARY

Morice & Lakes IFPA projects are exploring ways to enhance forest productivity through a better understanding of factors affecting productivity, through intensive silviculture treatments, by increasing the area of productive forest land, and by improving site productivity estimates.

Collecting Data on Operational Adjustment Factor (1) Values in Conjunction with Silviculture Surveys

Introduction

According to Section 7 of the Forest Act, every Annual Allowable Cut (AAC) determination includes a consideration of the growth rates of regenerated stands. Growth and yield models assist the chief forester in the assessment of these growth rates. TASS, the Tree and Stand Simulation model, is an individual tree, distance-dependent, crown-based model used by the Ministry of Forests. TASS "grows" trees in specific spatial stocking patterns. Information used to calibrate the model was derived from research plots measuring tree growth under ideal conditions with even spacing and without gaps. Because of perceived differences between this "ideal" stand and actual stand conditions, provision for an operational adjustment factor was incorporated in TASS and its associated interpolation program, TIPSY (Tree Interpolation Program for Stand Yields). There are two types of operational adjustment factors, (OAF), in TASS: OAF1, which addresses un-mappable stocking gaps and OAF 2, which is meant to address decay, waste and breakage and forest health concerns that are not static over the life of the stand.

This report addresses OAF1, stocking gaps due to natural areas such as swamps or rocky outcrops, non-commercial cover, slash piles, forest health losses, and windthrow not already accounted for in TASS. For timber supply review purposes, the default OAF1 value is 15%. This 15% OAF 1 value is comprised of four general types of net downs:

- OAF 1a: Non-productive areas e.g. rock outcrops, swamps;
- OAF 1b: Management effects – espacement and non-commercial cover;
- OAF 1c: Losses due to forest health factors; and
- OAF 1d: Losses due to random risk factors.

These categories are somewhat arbitrary and serve as a starting point for assessing OAF1. In general, the Timber Supply Branch of the Ministry of Forests expects that a net down due to stocking gaps of roughly 4% for each of the above factors will be used unless data can be provided to indicate otherwise.

When assessing a stand, however, the area currently unoccupied by trees cannot be assumed to be a stocking gap. There are two reasons for this. Firstly, tree crowns on the edge of a stocking gap grow into it, reducing the effect of the gap. Secondly, TASS already simulates the effects of stand density and incorporates some gaps at lower stocking levels.

FOREST RENEWAL BC

In order to appropriately identify stocking gaps during a silviculture survey, therefore, the area unoccupied by trees must be reduced by some amount to reflect crown extension into the gap and how TASS models this. One way of doing this is for the surveyor to assume that they are in a gap only when they are far enough away from any tree, such that the gap created results in a yield reduction when modeled in TASS. In a 1997 report by Laing & McCulloch, the distance at which yield starts to be affected was termed as the critical distance (CD). CD is an expression of the relationship between stocking holes in a stand and their impact on merchantable yield. Different critical distances are used for different species as indicated in Table 1 below.

Table 1. Critical distance values.

Species	Distance (m)
Lodgepole Pine (Pl)	2.7
White Spruce (Sw)	2.7
Interior Douglas-fir (Fdi)	3.6
Coastal Douglas-fir (Fdc)	3.6
Western Hemlock (Hw)	3.6
Sitka Spruce (Ss)	3.6
Western Red Cedar (Cw)	3.6

Objectives

The objective of this project was to collect data on OAF1 values in conjunction with silviculture surveys. It was believed that this important information could be obtained at little additional cost using this approach and that estimates obtained in this way could be used to adjust the TASS yield simulation. A secondary objective of the project was to test the sensitivity of the ground-based survey method to critical distance.

Methods

- Information was collected using the procedures described in *Ground Based Survey Methodology, Report 2* and in conjunction with free growing surveys funded through Forest Renewal BC. Contract surveyors collected the information in the Lakes, Morice and Bulkley Forest Districts. Data collection procedures were modified from the basic survey methodology described by Martin as follows.The ground-based method requires collecting samples at every plot within the opening. However, in this project the objective was to describe OAF value by site series and the value for individual openings was not important. No more than fifteen samples per site series were allowed in any given cutblock. The target number of samples for each site series was 100. Samples were systematically obtained at roughly every fourth silviculture survey plot.
- Mid season, surveyors realized that the sampling within the circum-mesic site series had quickly hit the target of 100 ground sampling plots per site series while many of the very-xeric to subxeric/sub hygric to subhydric sites were under-represented. The sampling plan was revised to reduce the number of samples in the circum-mesic sites and accelerate the collection of samples in the less frequently occurring site series while avoiding plot location bias.
- Distance to the first acceptable tree was measured in 0.1m increments from >2.0 m through to 3.9 m to test the sensitivity of critical distance. Calculations for this report used the 2.7 m critical distance.

The plot information was collated in an Excel spreadsheet, then sorted by site series, TSA, and licensee. The raw data on percent empty plots were converted to OAF1 values using a web-based OAF calculator produced by the MOF's Forest Practices Branch found at: http://www.for.gov.bc.ca/pScripts/hfp/oaf1/Calc.asp. The input variables applied to the calculator are percent empty plots, critical distance, total trees, planted or natural, site index and dominant species.

Results

A total of 586 plots were established across three districts in managed stands. A summary of OAF1 values by species, biogeoclimatic unit, and site series is provided at the end of this document. All plots were dominated by planted rather than naturally established trees. Of the 586 plots, there were only two site series for which the target of 100 plots was achieved: the zonal sites of SBSmc2 and SBSdk. Also, more than 100 plots were collected for both white hybrid spruce (Sx) and lodgepole pine (Pl). OAF1 values could not be determined for sub-alpine fir (Bl) or for non-commercial species such as trembling aspen (At) or black cottonwood (Act) because there is no database in TIPSY for these species. Using Sx instead of Bl may serve as a surrogate.

While there were only two site series with 100 plots or more, there were five site series with 30 plots or more. A standard deviation for the random binomial variable percent empty plots (PEP) was calculated for each of the site series. Standard deviation for the PEP values was used to determine corresponding OAF values using the MOF calculator (http://www.for.gov.bc.ca/hfp/OAF1/intro_calc.htm). Results of this analysis are shown in Table 2.

Table 2. Standard deviation for OAF values for site series with 30 or more plots.

Site Series	PEP	OAF1
SBSdk/01	0.5 – 3.3	0.0 – 0.0
SBSdk/05	4.0 – 6.8	0.4 – 2.6
SBSmc2/01	0.0 – 2.7	0.0 – 0.0
SBSmc2/05	0.0 – 1.8	0.0 – 0.0
SBSmc2/06	2.3 - 4.3	0.0 – 0.6

OAF1 values for these five site series averaged less than 1% on a weighted average basis. Overall, only 14 of the 586 plots (2.4%) had spacing gaps greater than 2.7 m critical distance. Only three of the 586 plots (0.5%) had spacing gaps between 3.6 m and 4.0 m critical distance.

Discussion and Conclusions

Although OAF1 values were consistently low, there were insufficient data to reliably draw any conclusions on the majority of site series. (However, the site series in which sufficient data were collected represents a significant proportion of the landbase—approximately 36% of the Bulkley TSA, for example.) Additionally, the geographic distribution of plots across the Morice and Lakes TSAs was narrow.

Nonetheless, it is clear from the results obtained thus far, that OAF1 values in planted stands are very unlikely to be as high as the 15% currently used as a default. More data will be required before a definitive conclusion can be reached for the range of conditions encountered in managed stands. At a project cost of less than $2000.00 for over 500 plots, this approach appears to be a very economical way of accurately determining OAF1 values in managed stands. A valuable and inexpensive database has been started. The challenge in future projects will be to locate sufficient plots in less common ecosystems in an unbiased way.

Recommendations

Given the probability that reliable OAF1 data will lead to a much lower OAF1 value, and increased timber supply, it is recommended that this project be continued so that data gaps can be filled. Data collection could be extended to include free growing surveys performed on post 1987 lands under licensee obligation as well as from post-free growing surveys. Relatively little data is required on the zonal sites, except to ensure that there is reasonably wide geographic distribution. Data acquisition should be continued until sufficient data are collected for all site series occurring in managed stands. Statistical analyses should also be performed to ensure that data are normally distributed and to ascertain whether there are significant differences between data sets such as site series, biogeoclimatic unit, and species.

References

Enhanced Forest Management Pilot Project – EFMPP; Operational Adjustment Factor 1999-2000 Final Report. Timberline Forest Inventory Consultants. Prince George, B.C.

Laing & McCulloch 1997. Methods for Estimating Type 1 Operational Adjustment Factors During Silviculture Surveys. Laing & McCulloch, Forest Management Services Ltd., Smithers. B.C.

Martin, P. 1998. OAF 1 Project: Report 2 – Ground Based Survey Method. BC Ministry of Forests; Forest Renewal.

Vassov, R. and Stearns-Smith, Steve. March 2001. Operational Adjustment Factors. Summary of Methods and Presentation of Options. Prepared for the Morice & Lakes IFPA. Olympic Resource Management, Vancouver, Canada.

Contact

For more information, contact either:

Susan Jones,
Morice Forest District
(250) 845-6294
Susan.Jones@gems4.gov.bc.ca

Larry McCulloch
Laing & McCulloch Forest Management Services Ltd.
(250) 847- 3267
larry.mcculloch@lmfms.ca

Acknowledgments

We would like to acknowledge Brad Leroux and his crew at Silvicon Services Inc. of Smithers, B.C. who applied the survey collection methodology to their silviculture surveys at short notice. We would also like to thank John Brockley of Canadian Forest Products who administrated this project through his multi-year agreements with Forest Renewal BC.

Editing and layout of this publication by Ritchie Morrison of Tetrad Consulting. Additional editing by John Young.

For More Information...

Morice & Lakes IFPA

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: jim@netbistro.com

www.moricelakes-ifpa.com