PREDICTING OUTCOMES

Newsletter from the Stand Tending Unit, BC Ministry of Forests, Forest Practices Branch

AUGUST, 2001

Editor's Note

This is the seventh in a series of newsletters that provide updates on the activities of the Stand Tending Unit, Forest Practices Branch, BC Ministry of Forests. Although the Stand Tending Unit is involved in many activities, this series of newsletters is focused on a single theme—predicting outcomes of stand-tending treatments.

I hope you enjoy the brief, informal articles in this newsletter. Subsequent issues will be produced periodically if time and resources permit.

If you have any comments on anything you read in this newsletter, please contact me.

Patrick Martin, Editor
Phone: (250) 356-0305
Fax: (250) 387-2136
E-mail: Pat.Martin@gems8.gov.bc.ca

Density management – views from around the world

Around the world, opinions vary on optimal stand density. Frank Barber has summarized some of these diverse opinions in a report, "A brief review of the status of literature on early stand density management, March 2001."

In this paper, Frank:

- describes density management regimes common in parts of Germany, Finland, Sweden, United States (inland empire), and British Columbia;
- traces the evolution of today's favoured density management regimes and the factors that drove the changes through time in preferred densities;
- discusses both planting and post-spacing density and some issues of timber quality and lumber recovery.

To obtain a copy of this report, contact Frank Barber at 250-387-8910 or Frank.Barber@gems6.gov.bc.ca.

Stand Tending Unit Staff

Ralph Winter
Stand Management Officer
Phone: 250-387-8906
Fax: 250-387-2136
email: Ralph.Winter@gems9.gov.bc.ca

Frank Barber
Stand Management Specialist
Phone: 250-387-8910
Fax: 250-387-2136
email: Frank.Barber@gems6.gov.bc.ca

Patrick Martin
Stand Development Specialist
Phone: 250-356-0305
Fax: 250-387-2136
email: Pat.Martin@gems8.gov.bc.ca

Brian Raymer
Silviculture Operations Specialist
Phone: 250-387-8909
Fax: 250-387-2136
email: Brian.Raymer@gems7.gov.bc.ca

Barry Snowdon
Complex Stand Specialist
Phone: 250-386-0183
Fax: 250-387-2136
email: Barry.Snowdon@gems7.gov.bc.ca

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Green Tree Retention: some growth and yield implications

On south-eastern Vancouver Island, Douglas-fir is now often planted under a partial overstorey of live trees that have been retained at harvest (Figure 1). This stand structure is chosen to meet aesthetic, biodiversity, and habitat objectives — but what are the growth and yield implications?

It is difficult to make general statements about the impact of retained trees on stand growth and yield. Impact depends on many factors including site conditions, the characteristics of the retained trees (species, amount, size, condition, dispersion, etc), the characteristics of the understorey trees (species, stocking, etc), and chance events such as windthrow. We have few experiments to demonstrate the long-term consequences of retention. We do have stand growth models that can simulate stand development with varying levels of retention, but with little data to calibrate the models for these conditions, the model predictions must be viewed cautiously.

With the preceding caveats in mind, I've used a stand growth model (ORGANON) to predict the growth and yield impacts of six retention scenarios. TASS — the Forest Service's growth model — can also handle these scenarios. Imagine a medium site Douglas-fir plantation with 1200 trees/ha that average 1.4 m tall. Now imagine this stand with none, 12/ha, 25/ha, 50/ha, 100/ha, or 200/ha overstorey, live hemlock trees dispersed evenly over the site that were retained at harvest. Figures 2-4 illustrate the yield predicted 60 years from now under these six scenarios[1]. I focus on boardfoot yield in this brief article.

Here are a few general observations:

1 Retaining live trees at harvest can alter stand growth and future yield. In the example scenarios, total boardfoot yield in 60 years is not affected by low levels of retention, but is reduced at higher levels (Figure 2).
2 Retention changes the characteristics of the future yield. In the example scenarios, with no retained trees, the future yield is 100% from the planted trees. With retention, the future harvest could include both the underplanted trees and some of the trees that were retained at harvest (Figure 2).
3 As the amount of retention increases, stand growth shifts from the planted understorey trees to the retained overstorey trees — but some potential growth is lost in the transfer. In the example scenarios, the large, older retained hemlocks are less efficient at volume production than the young, planted Douglas-fir (Figure 2).
4 The retained, overstorey trees slow the growth of the understorey trees. Figure 3 illustrates this point for the example scenarios. The future characteristics of the Douglas-fir planted under 50/ha retention are expressed as a percent of the corresponding characteristics of Douglas-fir grown without overstorey retention. The 50/ha overstorey slows

1 Predictions from ORGANON SMC version, edition 6. Fd site index: 28 m. Hw site index: 26 m. Retained Hw trees – dbh: 25-46 cm, height: 25-37 m, live crown ratio: 16-27%

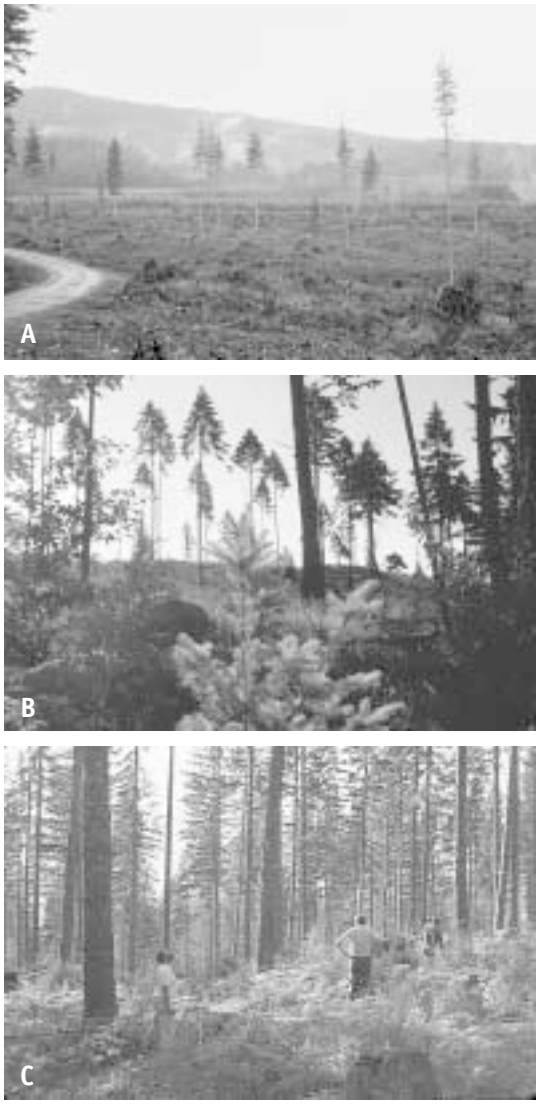

Figure 1. Three coastal blocks underplanted with Douglas-fir. A) Less than 10 retained trees/ha. B) Approx. 30 retained trees/ha. C) More than 100 retained trees/ha.

understorey diameter and height growth so that in 60 years the average boardfeet yield per understorey tree is only 62% of what it would be without the overstorey retention.

5 Moderate (and greater) levels of retention alter the future stock table — the distribution of volume yield over tree size classes. In the example scenarios, without retention the distribution of yield over tree diameter classes looks like a single "mound". With 50/ha retention, the yield appears to be concentrated in two mounds: one from the underplanted trees and one from the retained trees (Figure 4).

The simulations used in this article illustrate some limitations common to many stand growth models. First, these simulations predict survival rates for the retained trees of 98-100%. While this will occur in some cases, in other cases many trees will be lost to windthrow. Where heavy losses to windthrow are expected, the preceding general statements about the impact of retained trees must be modified accordingly. Second, no ingrowth is predicted in these simulations. However, in many cases ingrowth will accumulate — likely at greater density under the higher levels of retention.

While the impact on future yield is not the dominant consideration in the use of green tree retention, the practice can impact stand growth and future yield and these important impacts should be considered in prescription writing.

To discuss this issue further, call Pat Martin at 250-356-0305.

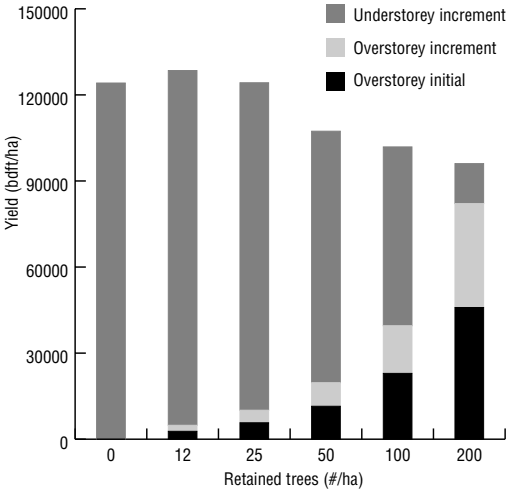

Figure 2. Yield predicted in 60 years under six scenarios ranging from no retention to retention of 200 trees/ha.

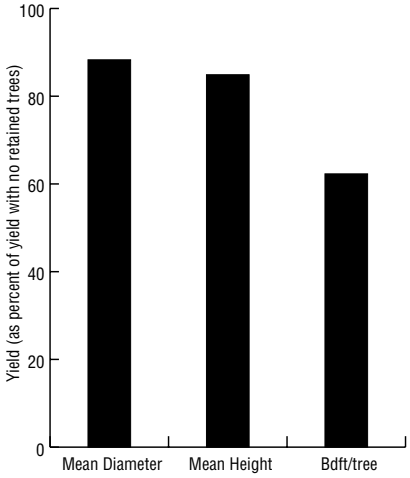

Figure 3. Yield predicted in 60 years of underplanted Douglas-fir with 50 trees/ha retained, expressed as a percent of the corresponding yield with no retained trees.

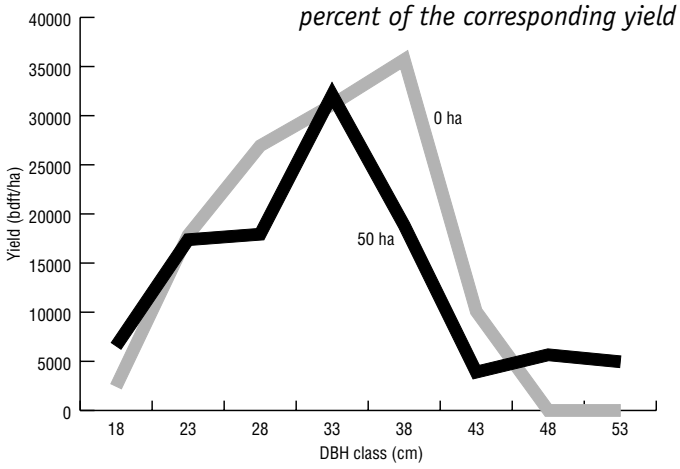

Figure 4. Predicted yield by diameter class in 60 years with 50 and with 0 retained trees/ha.

Treatments in Riparian Management Areas

The following documents have been produced to facilitate silviculture treatments in Riparian Management Areas (including Riparian Reserve Zones):

1 "Streamlining Prescriptions for Riparian Silviculture Treatments – Issues and Recommendations" – http://www.for.gov.bc.ca/hfp/pubs/standtending/riparian%20reportup.pdf
2 Riparian SMP template – http://www.for.gov.bc.ca/isb/forms/lib/FS68R.doc
3 Riparian Stand Tending schedules for Standards Agreements –
   • Schedule A – http://www.for.gov.bc.ca/isb/forms/lib/EFPsafs751ariparian.doc
   • Schedule B – http://www.for.gov.bc.ca/isb/forms/lib/EFPsafs751briparian.doc

Coming soon – Inspection procedures for monitoring treatments in riparian management areas. These inspection procedures will guide inspectors that are ensuring the accomplishments of Riparian Stand Tending and will introduce inspection procedures that are suitable for variable density spacing.

For more information on these topics, contact Brian Raymer at 250-387-8909.

Careful with that saw!

To obtain maximum benefit from juvenile spacing, spacers must leave the best trees. When spacing crews focus on achieving uniform spacing between leave trees, they will sometimes cut the tallest, healthiest, best-formed trees. TASS simulations predict that over-emphasising uniform inter-tree distance will reduce volume/ha at rotation. This issue is explored in a 1997 memo to Forest Service Region and District Managers titled "Incorrect selection of leave trees during spacing may result in potential productivity losses."

To discuss this memo, or obtain a copy, contact Frank Barber at 250-387-8910.

Guidelines for pre-commercial thinning are provided on our web site at: http://www.for.gov.bc.ca/hfp/pubs/pct/index.htm

The newly revised juvenile spacing quality inspection procedures balance the competing objectives of leaving the "best" trees while avoiding creating large gaps in the stand. To obtain a copy of the booklet Juvenile Spacing Quality Inspection, search for the FS 251 on the ministry forms web site: http://www.for.gov.bc.ca/pscripts/isb/forms/forms.asp.

To discuss spacing quality inspection, contact Brian Raymer at 250-387-8909.

On the Web

Strategic plans to guide FRBC-funded silviculture treatments (the Silviculture Strategy web site): http://www.for.gov.bc.ca/hfp/silstrat/index.htm

Silviculture Notes 1-27: providing analyses and extension on issues of site preparation, fertilization at planting, vegetation management, and growth and yield: http://www.for.gov.bc.ca/hfp/PubsSilvNotes.htm

Guidelines for collecting input data for forest growth models used in British Columbia: http://www.for.gov.bc.ca/research/gymodels/progbc/Support/G&Y%20Data%20Coll%2008Feb00.pdf