North Coast LRMP

Decision Support System: Temporal Experiments

Temporal Experiments Using the North Coast Landscape Model

DRAFT

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BRITISH COLUMBIA

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Executive Summary

North Coast Decision Support is a decision system implemented to capture environmental and resource management domain knowledge about the North Coast LRMP area and there response to different land use projections. The document "The North Coast Landscape Model" (Morgan, et al, 2002) describes the North Coast Landscape Model in detail and presents the results from the benchmark scenario. This document describes temporal experiments based on the results of environmental and forest management presentations to the LRMP table and table direction on experiments to conduct to help domain experts and the table understand the dynamics and interactions of resource management and a variety of domain accounts. The domain accounts include coarse filter biodiversity, grizzly bears (*Ursus Horbilis*), mountain goat (*Oreamnos americanus*) and marbled murrelet (*Brachyramphnus marmoratus*), and Northern Goshawk (*Accipter gentilis*). Resource management activities include timber harvesting, clear cut and variable retention and road building.

Two classes of experiments have been identified; timber harvesting land base (THLB) removals, and changes to forest management within the THLB. This document covers the second class of experiment, changes to forest management within the THLB. The timber harvesting land base removal experiments are covered in the "North Coast LRMP Decision Support: Area Removal Experiments Work Plan " (Warren, 2003).

Changes to forest management within the THLB can be captured as experiments involving extending rotation ages and those involving the application of variable retention.

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Acknowledgements

The process used in conducting the experiments for the LRMP is known as collaborative modelling. This process requires input from a large number of people. Most of those listed below are domain experts that assisted with the development of conceptual models and model interpretation. To facilitate their participation a multi-disciplined team, the NC analysis team (NC A-Team) was developed. This team has expertise in data management, spatial analysis, Environmental Risk assessment , decision support systems, Timber Supply, inventory, operational forestry, operational biology and expertise in linking domain knowledge to LRMP decision making. This team is co-ordinated and integrated with NC LRMP government technical team and the NC LRMP process. It evolved over several years with a great amount effort by all involved. It has a common vision of its purpose that promotes a positive professional environment that allows the collaborative modelling framework to succeed.

Ministry of Sustainable Resource Management

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*James Warren

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*North Coast Analysis Team members, also includes report author Don Morgan.

Audience

This report is intended for the North Coast LRMP table, Government Technical Team and Domain Experts.

1.0 Introduction

1.1 Background

North Coast Decision Support is a decision system implemented to capture environmental and resource management domain knowledge about the North Coast LRMP area and there response to different land use projections. The document "The North Coast Landscape Model" (Morgan, et al, 2002) describes the North Coast Landscape Model in detail and presents the results from the benchmark scenario. This document describes temporal experiments based on the results of environmental and forest management presentations to the LRMP table and table direction on experiments to explore the dynamics and interactions of resource management and a variety of domain accounts. The domain accounts include coarse filter biodiversity, grizzly bears (*Ursus Horbilis*), mountain goat (*Oreamnos americanus*) and marbled murrelet (*Brachyramphnus marmoratus*), and Northern Goshawk (*Accipter gentilis*).

Two classes of experiments have been identified; timber harvesting land base (THLB) removals, and changes to forest management within the THLB. This document covers the second class of experiment, changes to forest management within the THLB. The timber harvesting land base removal experiments are covered in the "North Coast LRMP Decision Support: Area Removal Experiments" (Warren, 2003).

The North Coast Landscape Model (NCLM) will be used to determine the contribution each of these areas makes to timber supply through time. The timber analysis group will do an assessment of the impact of the removals on timber indicators, and determine if the impacts are constant through time or have a short term or have a long term impact. The ERA team will do a qualitative assessment of the removals and the impact on environmental risk.

Single pass only

1.2. Modifications to the North Coast Landscape Model

Benchmark scenario was aspatial.
Spatial alingment. Effect of applying spatial rules.
Helicopter vs conventional changes.

1.3 Extended Rotation

Background rationale for doing….

1.4 Variable Retention

Background rationale for doing…

1.4.1 Landscape Level vs. Stand Level Retention

1.4.2 Permanent vs. Temporary Retention

1.4.3 Aggregated vs. Dispersed Variable Retention

Landscape level vs Aggregated and dispersed retention will leave openings that are at least 2 tree lengths wide. The interpretation of aggregated or dispersed retention will be left to the domain experts. It is assumed that management consideration in the plan can assist on when to apply aggregated or dispersed within stand retention to achieve plan objectives.

2.0 Experiment Methods

The two areas of experimentation are; extended rotation length and variable retention. The methods for each are presented.

2.1 Helicopter vs. Conventional Stands

Laura can you write this section based on your feedback?

From our March 10 meeting, we noted that VR is more likely to occur in helicopter-accessible stands of typically 60-80 ha, at a 2 km maximum distance from the ocean.
We need to clarify 'more likely' -- computers don't understand that term. So, what is the distribution of that likeliness? i.e. 100% for heli-stands to 10% for conventional stands?
Is that the correct clear cut block size range? What is the average?
What is the variable retention block size and range?
The helicopter analysis units make up 18% of the THLB (operable 15,654 ha; logged 299 ha; marginal 9,118 ha). This leads me to wonder….
Are the helicopter analysis units 100% helicopter-logged? Are some of them conventionally logged? How much (%)?
Is there only heli-logging in the helicopter analysis units?
What % of conventional stands will be harvested by helicopter? Can you identify them by analysis unit, or some other measure?
Can we assume that once there is a road in a 3rd-order watershed, that the remaining blocks will all be conventionally logged?
Can we assume that once there is a heli block in that watershed, that the rest of the blocks will be heli? i.e.. Would you go to the expense of building a road then putting in heli-blocks?
If there really is more heli-logging than what is reflected in the heli analysis units, will the assumption that a heli zone is a distance of 1 km from a mapped road (in addition to the heli-AU's 42 and 43) capture that realism? This gives an area of about 52,000 ha of THLB.

2.2 Extended Rotations

The biodiversity ERA team is making an assessment of coarse filter biodiversity recovery under different rotation lengths for BEC and analysis unit(AU) combination.

The assessment is based on the spatial base case and analysis unit biodiversity risk curves. These rotation target will be used by the NCLM and a new timber supply will be determined

based on an automated binary search, the interpretation of the timber supply analysis will be co-ordinated by Laura Bolster. A qualitative assessment of the removals and the impact on environmental risk will conducted by the ERA team.

The trade off between extended rotation and area removals will also be assessed.

2.3 Variable Retention

2.3.1 Levels of Variable Retention

The model will report blocks that have been harvested at 10, 30 or 70 per cent retention and not distinguish between aggregated or dispersed. These levels of retention are based on discussions with the coarse filter biodiversity team and they have developed biodiversity risk curves based on those amounts.

The application of different levels of retention will be determined based on visual quality zones, previous management, slope and access.

2.3.2 Modelling Variable Retention in Scenic Area Zones

The objective is to determine how much more/less timber can be harvested under Variable Retention (VR) as compared to a clear cut, in a scenic area zone.

Background:
There are four scenic area zones in the North Coast TSA:
1) Inside Passage,
2) Skeena River Corridor,
3) Portland/Work Channel, and
4) Douglas/Gribbell

The Visual Quality Objectives (VQO) vary between zones to reflect differences in visual sensitivity and management techniques. In the timber supply analysis (October, 2002), forest cover requirements were applied to the total productive forest area within each VQO area within each scenic zone and recommended landscape unit. Note that the VQO's for zones 3 and 4 were modelled as modification to reflect current management, although the recommended VQO's for these zones were partial retention. The following table identifies the forest cover requirements that were modelled in the scenic area zones:

Table 1. Forest cover requirements for visual quality objectives (VQO)

Management emphasis	Zone or group	Maximum allowable disturbance (% area)	Green-up height
Visual resources	Inside Passage (1) — preservation	1	7 m
Visual resources	Inside Passage (1) — retention	5	7 m

Visual resources	Inside Passage (1) — partial retention	15	7 m
Visual resources	Skeena River Corridor (2) — preservation	1	7 m
Visual resources	Skeena River Corridor (2) — retention	5	7 m
Visual resources	Skeena River Corridor (2) — partial retention	15	7 m
Visual resources	Portland / Work Channel (3) — modification	25	4 m
Visual resources	Douglas / Gribbell (4) — modification	25	4 m

For example, within a partial retention (PR) VQO, a maximum of 15% of the forested area within that polygon may be disturbed. Further disturbance is restricted until an adjacent area has grown at least seven metres tall.

For a given scenic area zone, some proportion of a VQO can be within the timber harvesting land base (THLB), and some proportion can be outside the THLB. For example, in a 200-ha PR VQO that has 100 ha within the THLB and 100 ha outside the THLB, disturbance would be limited to 15% of the total forested area, or 30% of the area within the THLB.

Modelling variable retention

Variable retention is a potential LRMP strategy. As such, we are trying to identify modelling rules that will enable us to estimate a range of timber supply impacts from applying VR in scenic area zones. We need to determine the maximum allowable levels of disturbance for each VQO class under given levels of variable retention. The Ministry of Forests document, '*Predicting the Visual Impacts of Retention Cutting'*, was used in conjunction with discussions between Laura Bolster (MSRM, Skeena Region), Jacques Marc (MoF, Forest Practices Branch) and Kevin Lee (MoF Coast Region) to help determine those levels.

Four levels of variable retention were to be modelled in scenic area zones, 0%, 10%, 30%, and 70%, in order to capture a range of timber supply impacts. However, due partly to the limitations of available data, it became clear that only in the case of a Partial Retention VQO under a VR level of 25%, could any gains be realized in terms of allowing an increased level of alteration to the area and still meet the VQO. Specifically, in perspective view, the maximum allowable disturbance for a Partial Retention VQO under a clearcut system is 7%. This was modelled as 15% in the plan view.

In the document, '*Predicting the Visual Impacts of Retention Cutting'* the maximum allowable disturbance for Partial Retention VQO under a VR system, leaving 25%, is 11%. From 7% to 11% is a 36% increase in alteration, but we are leaving 25% behind in order to achieve that. To consider this, we calculate the benefit instead as 36%-25% =11%, then take 11% of 15% = 1.65%. Taking into account the perspective view, we calculate the benefit as 22% of 15% = 3.3%. Therefore, the allowable maximum disturbance for a VR level of 25%, is 18.3% (see Table 2). This figure cannot be

extrapolated to other levels of VR, nor to different VQO classes. Although there may be additional circumstances under which further alteration is possible, there is no data to support this.

Table 2. Proportion of Forested Area by VQO for various levels of variable retention

	Current Practice	**VR 25%**
VQO Class	**Max Allow Disturbance**	**Max Allow Disturbance**
	%	**%**
Preservation	1	?
Retention	5	?
Partial Retention	15	18
Modification	25	25

2.2.4 Yield Assumptions Under Variable Retention

A full sunlight yield model can be applied (TIPSY). A separate project will be done to evaluate this assumption and to develop new yield curves for different levels and types of retention, the results will not be available till May.

Yield impacts

From our March 10 meeting, we agreed that the greater the retention, the greater the impact on TIPSY yield curves (i.e. the more trees you leave, the greater the shade influence on the regenerating stands).

We agreed there would be

0% impact on south-facing slopes with low (20%) retention levels (shade not an issue); and,

50% impact on north-facing slopes with 70% retention (shade is limiting growth).

This is actually quite complicated in terms of modelling, for a number of reasons. I am therefore proposing to model:

50% impact on all areas having 70% retention, and 0% impact everywhere else.

Comments?

Keep in mind that we are still continuing with another experiment that will give us a better estimate of the shade effects on the regenerating stands, through the SORTIE model (targeted to be complete by the June working group meeting)

3.0 Results

4.0 Discussion

Literature Cited

B.C. Min. of Forests. 2002. North Coast LRMP. Description of Data Inputs and Assumptions for the Timber Supply Analysis (base case) for the North Coast TSA.

Morgan, D., Daust, D. and Fall, A. 2002. North Coast Landscape Model. Internal Ministry of Sustainable Resource Management report.

Fall, A. and Fall, J. 2001. A domain-specific language for models of landscape dynamics. *Ecological Modelling* **141**(1-3): 1-18.