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October 13, 2004

Dear Stakeholder:

**Re: Legal establishment of Natural Disturbance Unit's and subsequent biodiversity objectives within the Prince George Timber Supply Area**

Through a joint partnership between the Prince George Timber Supply Area Forest Licensees and the Northern Interior Region of the Ministry of Sustainable Resource Management (MSRM), landscape level objectives for biodiversity management have been developed using local-level research of Natural Range of Variability (NRV) for the following elements:

- Old forest retention;
- Interior forest condition for old forest;
- Young forest patch size distribution.

To effectively implement this innovative strategy, specific implications of this research were assessed. This created a product that has balanced economic viability, social responsibility and ecological stewardship. I am therefore pleased to provide in this package, the recommended objectives for legal establishment and a background document highlighting the process involved to accomplish this task.

MSRM is currently at the public review and comment stage of this process where we value, appreciate and request your feedback regarding these biodiversity objectives. To facilitate public accessibility to detailed information regarding these objectives, MSRM will be hosting public open houses in Prince George, Vanderhoof and Fort St. James at the end of April, 2004. These open houses will be advertised in your local community newspapers. I encourage you to take the opportunity and participate at one of these events to become well informed and express your views, issues and concerns.

I thank you in advance for your interest and participation and look forward to receiving your feedback. Should you have any questions regarding this process, please do not hesitate to contact Traci Leys-Schirok or Shannon Carson at (250) 565-6135 or toll free through Enquiry BC: 1-800-663-7867.

Yours truly,

T.P. (Phil) Zacharatos, R.P.F.
Regional Director, MSRM
Northern Interior Region

# ~ Landscape Objective Working Group ~

## Prince George Timber Supply Area

## Landscape Level Biodiversity Objectives

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***Background Information and Supporting Documentation for the Process Involved in Developing the Recommended Biodiversity Objectives in the PG TSA***

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Prepared by: Ministry of Sustainable Resource Management

Northern Interior Region, Prince George

April 2004
(revised December 2005)

## EXECUTIVE SUMMARY

Landscape level planning for biodiversity in the Prince George Timber Supply Area has progressed to incorporate new government direction, local level research and the current state of the landscape. As the mountain pine beetle epidemic has resulted in an increase to the Allowable Annual Cut, it is necessary to balance economic requirements with ecological values. Additionally, to facilitate the release of the Forest and Range Practices Act, the Ministry of Sustainable Resource Management must establish legal objectives for specific biodiversity elements to guide resource management activities.

To accomplish this, the process was completed in a cooperative and inclusive approach with all vested stakeholders to ensure: 1) specific needs of biodiversity conservation are adequately being considered; 2) efficiencies between government and industry are coordinated and complimented; 3) the development of balanced objectives that provide ecological and economic certainty, and; 4) mutually beneficial outcomes that link to other initiatives, such as Sustainable Forest Management Plans, forest certification and LRMP implementation.

The information presented in this background document provides an overview of the process involved in developing landscape level biodiversity objectives that incorporate an ecosystem-based management approach for the following:

1. Old Forest Retention and Natural Forest Areas;
2. Interior Forest Condition for Old Forest, and;
3. Young Forest patch size distribution.

Information with respect to the analysis, assumptions, risks/uncertainties and results developed by the Landscape Objectives Working Group for the recommended objectives are highlighted and briefly explained.

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**APPENDICES:**

# Recommended Objectives for Landscape Level Biodiversity Conservation in the Prince George Timber Supply Area

Summary of the Prince George TSA Landscape Objectives Working Group Process
~ March 2004 ~

## A New Direction for Landscape Level Biodiversity

Management of natural resources is on a paradigm of constant change. There is an expectation that land managers must adapt as the knowledge of ecological relationships improves, resource information becomes more sophisticated and the inclusion of stakeholders in the decision making process in required.

To address this challenge, landscape level planning in the Prince George Forest Region has evolved to incorporate new government direction, local - level research and streamlined processes that promote partnerships. This new approach aims to support long term sustainability by providing socio-economic certainty, while maintaining ecological integrity through the conservation of specific biodiversity values. Past assumptions upon which biodiversity management was based on, have been revised to incorporate updated research into the policy framework.

It is the mandate of the Ministry of Sustainable Resource Management (MSRM) to deliver clear and measurable objectives that address priority values, provide certainty on the landbase and stimulate economic development. With the paradigm of forest management shifting to a results based philosophy, it will be the responsibility of the timber licensees to exercise professional judgement and front-end planning to successfully achieve these biodiversity objectives. This cultural shift will require coordination, flexibility and adaptiveness to address the uncertainties and complexities of successful implementation.

In 1995, the Biodiversity Guidebook incorporated the concept of Natural Disturbance Types (NDT's) to guide biodiversity management through the process of Landscape Unit Planning. This provincial level guidance was a required and needed "step towards responsible stewardship", but had its limitations and conceptual

challenges as it was being implemented in the Prince George Timber Supply Area[1] (PG TSA. The Biodiversity Guidebook states:

*"As scientific understanding and social values change over time, so the scientific and value-based choices presented in this document will be revisited"*

Since the release of the Biodiversity Guidebook, local-level research substantiating natural disturbance dynamics as an ecological foundation for forest management in the Prince George Region has been made available. With the current government mandate embracing alternative approaches to resource management, the PG TSA Landscape Objective Working Group (LOWG) sought to strengthen the relationship between policy decisions, scientific research and industry needs with the use of a defensible, ecologically-based platform; the Natural Range of Variability (NRV). The goal behind utilising the NRV concept is to encourage the characteristics inherent in natural disturbance patterns as a tool in forest management to maintain biodiversity, habitat diversity and ecosystem processes.

The Northern Interior Region of MSRM commenced in a collaborative planning process with the PG TSA timber licensees to build certainty around future forest conditions. Biodiversity management in the PG TSA will focus on the elements most at risk from resource management activities. These elements include; 1) the retention of old forest; 2) maintenance of interior forest conditions, and; 3) patch size distribution for harvesting.

It is important to note that the planning for these values was accomplished through a coarse filtered approach[2], where old growth stands are identified by age, species composition, ecosystem characteristics and a percent that could naturally occur on the landscape.

**Lastly, it must be recognised that the process undertaken for the Prince George TSA biodiversity objectives were developed from a combination of research findings, professional judgement and absolute need to provide certainty for continued forest harvesting while implementing ecosystem based management concepts.**

[1] The Prince George Timber Supply Area is a three district TSA that incorporates the Prince George, Vanderhoof and Fort St. James Districts

[2] A coarse filtered approach to biodiversity management involves maintaining a diversity of ecosystem characteristics and functions across the landscape, at a large scale. The intent is to meet the habitat requirements for most species.

## The Landscape Objectives Working Group (LOWG)

The Landscape Objectives Working Group (LOWG) was brought together in September 2002 and is a committee consisting of the PG TSA timber licensees, the Ministry of Forests Regional Ecologist and representatives from the Northern Interior Region of MSRM. The goal of this group is to develop recommended objectives for landscape level biodiversity conservation using science-based research of Natural Range of Variability. The LOWG membership included resource planning and analysis professionals from both industry and MSRM, with provincial support from various government agencies and consulting expertise.

The role of LOWG was to:

- Develop and maintain a working relationship that provides the foundation for successful implementation.
- Encourage ownership and responsibility of the product through the development of a flexible, adaptable and continuously improving process.
- Collectively assess how the local-level research of NRV will be applied and implemented with minimal impact on the timber supply.
- Identify resource analysis gaps and required products.
- Share technical and operational expertise regarding biodiversity management.
- Provide input on developing biodiversity objectives that link to sustainable forest management planning and Land and Resource Management Plan (LRMP) implementation.

## Why Support the Development of Biodiversity Objectives?

***MSRM Business Drivers:***

MSRM embraced the opportunity to incorporate innovative, local-level research into the process of developing biodiversity objectives. The key incentives for MSRM include:

- The need to complete the landscape level planning process that was initiated by the Ministry of Forests in 1996 (i.e. Landscape Unit Planning).
- To implement and realize LRMP direction and expectations.
- Direction from the Forest Practices Board to provide immediate biological conservation at the landscape level.

- Opportunity to work in partnership with industry to integrate technical information, and leverage resources.
- Clarify objectives as required by the Forest and Range Practices Act (FRPA).

***PG TSA Timber Licensees Business Drivers:***

Legal objectives may be formulated in such a way that they can be directly transferred into Sustainable Forest Management Plans (SFMP's). It is advantageous for licensees to directly participate in the development of biodiversity objectives for the following reasons:

- Determination of an acceptable timber supply impact resulting from the incorporation of the NRV research.
- Utilise the opportunity to ensure that industry needs are accounted for and considered in biodiversity planning.
- Assist in meeting LRMP implementation responsibilities and requirements.
- Ensure there is an effective link between biodiversity objectives and tactical strategies used to achieve sustainable forest management goals.
- Continue to build and foster working relationships with government agencies and industry.
- Embraces the idea of incorporating science-based information in biodiversity management.

## THE APPLICATION OF NATURAL RANGE OF VARIABILITY RESEARCH

One of the most important goals of managing forests in an ecologically sustainable way is through the conservation of biological diversity (Hilbert 2003; Lindenmayer et al., 2002; Fahrig, 2001; Angelstam 1997). Natural disturbance events play a critical role in forested ecosystems, as they create the patterns, shapes, sizes and structure evident at various scales over time. A widely accepted concept embraced by many ecologists, conservation biologists and resource managers that ecological integrity is dependant on forest management strategies that are more characteristic of natural disturbance patterns and regimes[3]. Delong and others (1998) state:

[3] There is a large body of literature available that substantiates the theory of managing the landscape based on the natural disturbance processes or the natural range of varability. Some of this literature includes Grumbine, 1994; Bunnell, 1995, 1991; Bergeron, et a., 1999; Brussard 1998; DeLong, 1998; Angelstam, 1998, 1997; Landres, et al., 1999; Swentnam et al., 1999; Lindenmayer and Franklin, 2002; Lindenmayer 2004, 2002, 1999; Purdon, 2003; Wong et al., 2003.

*" The underlying assumptions is that the biota of a forest are adapted to the range of conditions created by natural disturbances and thus should be less impacted by forest management if the resulting patterns resemble those of natural disturbances. Hence, understanding how the forested landscape was affected by natural disturbance is needed to develop alternative management systems that closely approximate the effects of natural disturbance."*

The LOWG process was unique because it presented the opportunity to enhance biodiversity management in combination with the release of *"Natural Disturbance Units of the Prince George Forest Region: Guidance for Sustainable Forest Management" (DeLong 2002).* The research was originally conducted by Craig Delong (Ministry of Forests, Regional Ecologist) in 1998, and became the foundation for the development of the recommended landscape level biodiversity objectives in the PG TSA. This scientifically-based information describes what the ecological potential or "Natural Range of Variability" is on the landscape, without the influence of economic or social values. Generally speaking, it provides ecological benchmarks for various forest ages and patch size distribution in broad disturbance units. MSRM endorses this approach as the best information available for the preparation of operational or landscape level plans.[4]

One of the fundamental contributions of Delong's work was the identification of Natural Disturbance Units (NDU's) for the entire Prince George Forest Region (Figure 1). These units consist of large geographic areas delineated on similar topography, climate, disturbance dynamics, stand development and success ional patterns.

[4] In a letter dated April 29, 2002 and addressed to all District Managers in the Prince George Forest Region, the Natural Range of Variability information was formally endorsed and supported by the Regional Managers of the Ministry of Sustainable Resource Management and the Ministry of Forests, as the best information available.

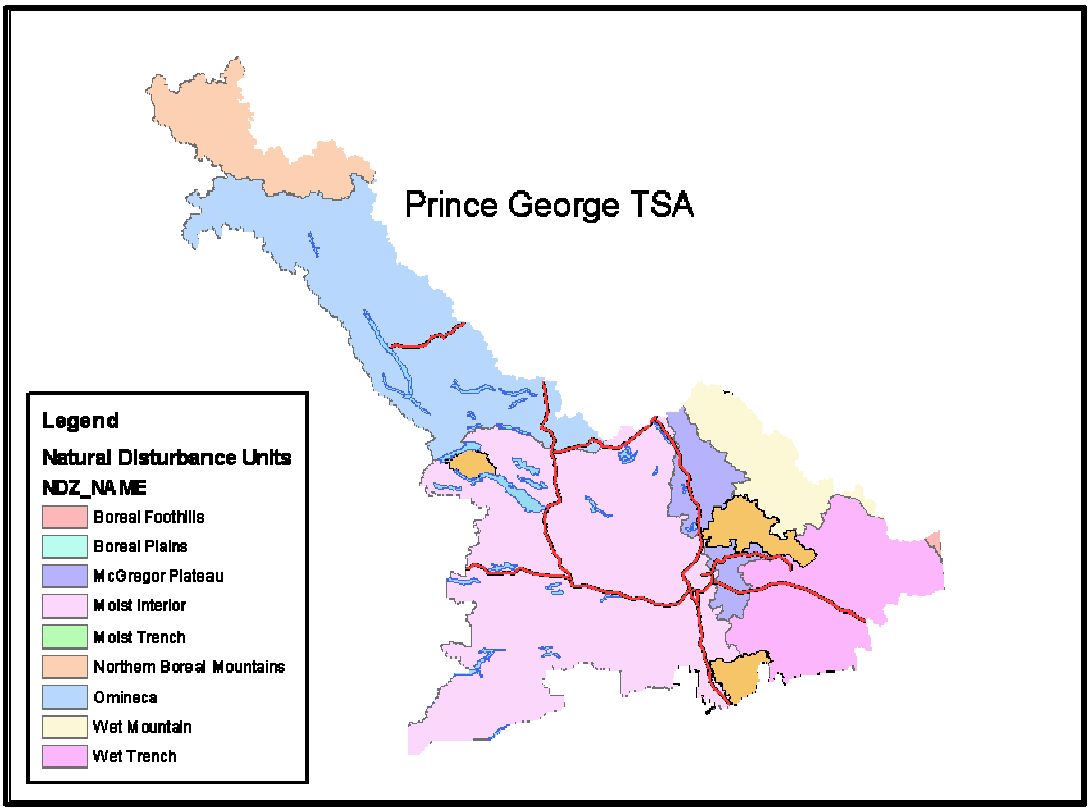



Figure 1: Natural Disturbance Units in the Prince George Timber Supply Area

## ***Peer Review of the LOWG Biodiversity Approach ~ is it acceptable?***

On November 26th, 2003, MSRM hosted a forum where the LOWG process was formally presented to academia and resource management professionals (in government and industry), fluent in the principles of biodiversity management and landscape ecology. The goal of the session was to:

- Receive input and discuss the issues and concerns regarding the process that was undertaken to incorporate the NRV research into the framework for biodiversity objectives.

- To engage in debate and discussion around key questions, including:
  - What are possible risks and uncertainties in the LOWG analysis?
  - Are we likely to maintain ecosystem function with the proposed objectives based on the NRV research?

- What are the benefits and costs of LOWG vs. the provincial direction of the Biodiversity Guidebook?
- Are there any additional sources of information and research that should be considered?
- What are the future priorities for biodiversity?

Through the identification of strengthens and weakness in the research and process, the information gained from the session was used by the LOWG committee to revise process assumptions and rationales.

### Priority Landscape Level Biodiversity Objectives ~ What are they?

The priority landscape level biodiversity objectives identified by LOWG are based on a review of business priorities, risks to ecosystem integrity and the key elements of the NRV research. Respectively, the development of the following objectives was pursued:

- Old forest retention;
- Interior forest condition for old forest, and;
- Young forest patch size distribution (cutblock size)

Old forest retention, interior forest condition and young patch size distribution are a package deal. All three of these objectives were designed to be holistic and complimentary in achieving future forest conditions beneficial to biodiversity conservation. Additionally, the move to results based forest management has accentuated the need for baseline information regarding these key elements to support legal obligations and certification initiatives.

## Application of the Natural Range of Variability Research in the PG TSA ~ the LOWG process

### *Achieving a Balanced Solution ~ Identification of key risks*

There is a general agreement in the scientific literature that ecosystem integrity should have priority over other management goals (Brussard et al. 1998). Yet, the considerations of other factors must be drawn into the equation, and this ultimately results in hard choices and trade-offs. In the attempt to balance acceptable conditions and apply equal weight to all values, forest management decision must consider all the possible consequences (Figure 2).

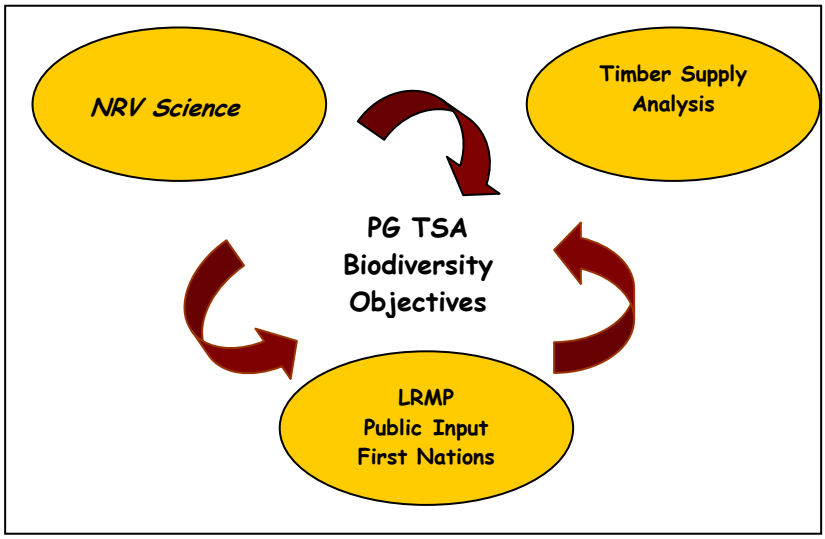



**Figure 2:** Illustrative example of how the PG TSA Biodiversity Objectives considered the economic, social and ecological values in the LOWG process.

The LOWG committee strived to achieve a balance between economic concerns and ecological integrity, as the application of the NRV research, "in its entirety", could have significant impact on the timber flow and harvesting opportunities (Figure 4). For this reason, it was necessary to identify "thresholds" or "benchmarks" to guide an acceptable level of risk to biodiversity and socio-economic values (Figure 3)[5].

[5] Note: Specific impacts to biodiversity and socio-economic values are difficult to assess given the coarse filter analysis approach employed in this process.

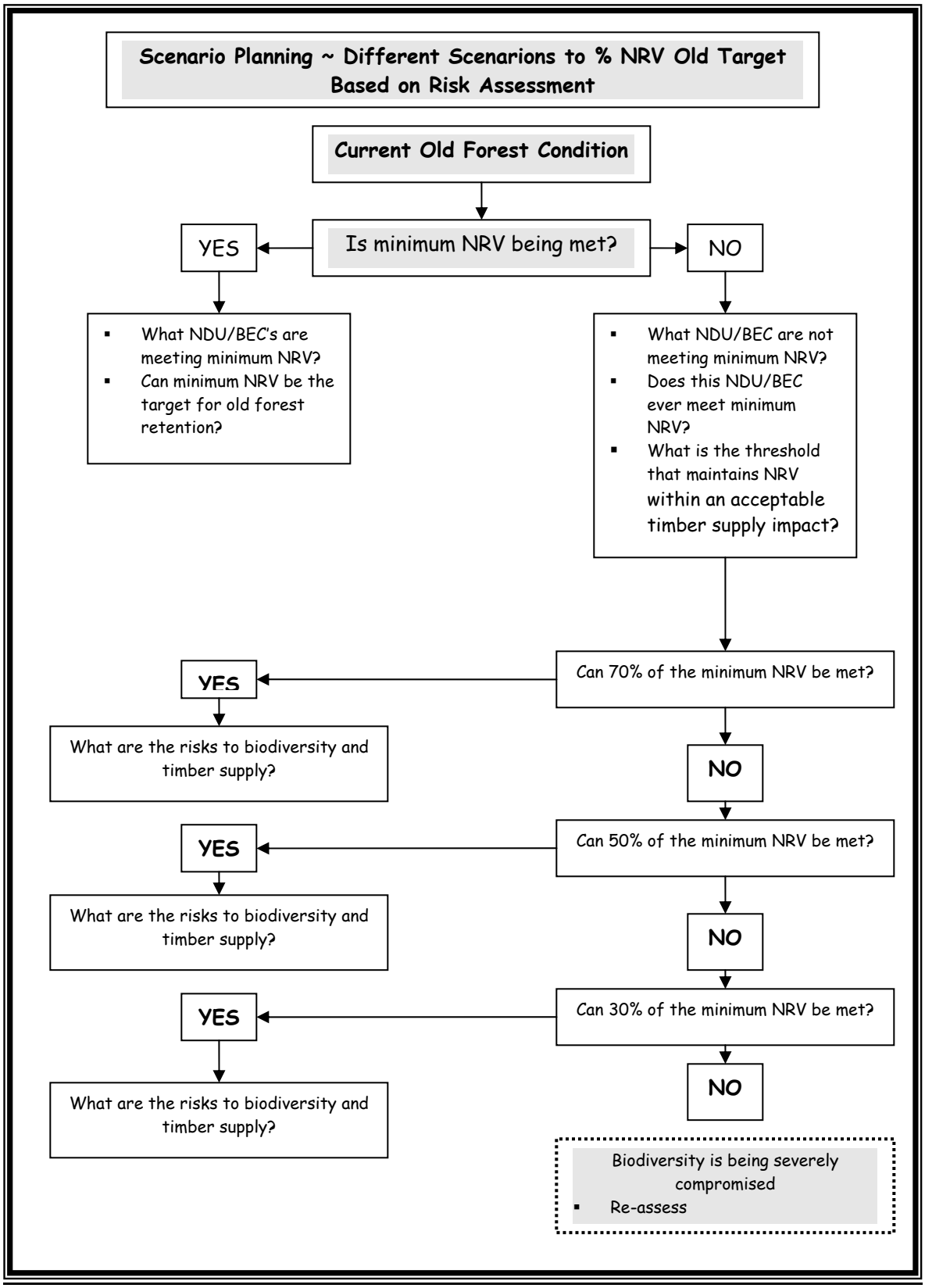



**Figure 3**: Thought process applied in developing a balance NRV target while managing the key risks based on the threshold criteria.

## Risk to Biodiversity:

The basic assumption regarding "risk to biodiversity" is that the further the old forest retention and patch size distribution is pushed away from the NRV conditions (benchmark), the higher the risk to biodiversity. Thus, if the variables (old forest, patch size) are at the same level as the benchmark, the risk to biodiversity is low. Conversely, the more the variables diverges from the benchmark, the higher the risk to biodiversity.

Risk to biodiversity was determined through comparison of the revised old forest retention levels relative to the benchmarks provided by the "unaltered" NRV ranges (Table 1).

To determine a balanced level of old forest retention, the NRV ranges identified in Table 1 are the ecological benchmarks, with the measurable thresholds of risk based on the following criteria (Holt and Utzig, 2002; Angelstam, 1997.):

- The level of risk to biodiversity is high when current old forest retention is 30% of the minimum range of NRV.
- The level of risk to biodiversity is low when current old forest retention is 70% of the minimum range of NRV.

The Natural Range of Variability research and measures of risk thresholds (as stated above) was originally presented by Water Land and Air protection (WLAP) to the Chief Forester during the 2002 Timber Supply Review II, as a means to quantify when biodiversity is at risk. It was noted at that time "***This environmental analysis uses the amount of old forest in comparison to NRV iterations as a coarse filter indicator of ecological integrity***." As most biologist and ecologists acknowledge, it is difficult to assess, demonstrate and analyze risks to biodiversity, but some form of benchmark guidance is needed. WLAP was consulted during the iterative analysis process when the minimum NRV ranges were reduced.

## Risks to Timber Supply

The application of the NRV old forest retention, "in its entirety", has far-reaching impacts on the short and long term timber supply (Figure 4). Thus, it was suggested by the LOWG committee that an acceptable level of impact to the PG TSA long term timber flow, is to be around 1.5%. This threshold is consistent with

provincial policy direction, in that the implementation of biodiversity objectives will not unduly impact timber supply and operational opportunities in the PG TSA.

## DEFINITION OF OLD FOREST ~ CAN YOUNGER STANDS PROVIDE THE DESIRED ATTRIBUTES?

Because this process is developing biodiversity objectives at a coarse filtered scale, the definition of "old forest" is based on a numeric identifier of "age".[6]. Using an age-based definition provides a simplistic approach to describing old forest through the use of forest inventory data. The general definition of "old forest" in the PG TSA is any stand greater than 140 years.

The actual age at which a forest becomes "old" in the Moist Interior Plateau NDU has been the center of debate and concern with resource managers. Strong arguments support the hypothesis that these forests may actually have the attributes of "old" in stands that are younger than 140 years, but there are gaps in the information to substantiate this. Therefore, this identified weakness facilitated a partnership between the Vanderhoof timber licensees, MSRM and the Ministry of Forests, to initiate a three phase research project in the landscapes around Vanderhoof (Moist Interior Plateau NDU) to empirically determine;

> *"What are the attributes of old forest stands, and at what age do they appear?"*

Preliminary results released in the Draft Interim Report "*Describing old growth forests in the Sub-Boreal Spruce stands of the Moist Interior Plateau Natural Disturbance Units* (MacKillop and Holt, 2003), indicate that there is no strong difference in the old forest attributes of forest stands that are 120 years and 140 years (age class 7 and 8). The assumption is, that allowing a lower age identifier provides better opportunities to capture large, intact and higher quality patches of old forest. This decision also provides the licensees with the operational flexibility to manage the mountain pine beetle situation.

[6] It is well understood by academia, researchers and resource managers that the definition of old forest is more than a function of age with many other known values associated with these ecosystems. Important old forest attributes include coarse woody debris, snags, gap dynamics, presence of large diameter trees, species composition and overall decadence (endemic disease and pathogens). The LOWG process will consider these values in the implementation and effectiveness monitoring stage.

It is important to note, that even though age is a component in the preliminary identification of old forests, there is risk that the essential biological values associated with these ecosystems may not be appropriately captured without appropriate structural assessments and spatial identification.

## *Old Growth Definition and Management ~ A Literature Review*

To assist MSRM with the LOWG planning process, a comprehensive and extensive literature review on old growth definitions and old growth management was performed. This literature review was part of a UNBC and MSRM intern partnership, where a fourth year university student was tasked to accomplish the following objectives (Hibert, 2003):

- Examination of the various methods that have been used to define old growth stands.
- Review the identified importance of old growth management/conservation.
- Examine the various proposed approaches to old growth management and planning.
- Draw conclusions and recommendations based on the information reviewed.

Based on the information presented in the literature review, it is highly recommended that licensees consider the following values when prioritizing areas for retention (attributes can be identified in existing resource inventories like ecosystem mapping and forest cover):

i) Representation of the variety and distribution of naturally occurring tree species and ecosystems (i.e. retention of deciduous stands)
ii) Maintenance or enhancement of landscape connectivity with and between old forest areas
iii) Maintenance of rare ecosystems and sites
iv) High value habitat areas
v) High quality old growth attributes including (but not limited to):
   - Veteran trees
   - Complex canopy composition and vertical height
   - High productivity sites
   - Plant and species diversity
   - Large coarse woody debris

## ANALYSIS FOR NATURAL RANGE OF VARIABILITY OLD FOREST RETENTION

It was critical that the NRV research be assessed against the modelling assumptions used to set the Allowable Annual Cut in the Timber Supply Review process[7], to provide a foundation for confident comparison. To determine what old forest conditions could actually be maintained under the current timber harvest management regimes, the following questions were explored through timber supply analysis:

1. What is the current "state of the landbase" with respect to old forest condition as compared to the NRV research?
2. What is the timber supply impact from implementing the recommended NRV old forest retention in its "entirety"?
3. What is an acceptable level of deviation from the NRV ranges for old forest retention that balances ecological integrity and economic factors?

To accomplish this task, a series of timber supply analyses and scenario were completed to benchmark the current state of the forest and provide a product that allowed assessment of all feasible NRV options. There were four key analyses conducted to provide answers to the questions stated above. These analyses were:

1. Establishment of the NDU **"base case"**, as per the methodology of the 2002 Timber Supply Review analysis. To reflect current management practices, updated resource inventories and analysis information were incorporated.[8]

2. Determination of the "**timber supply impact"** by constraining the old forest as per the minimum, mean and maximum NRV recommendations in Table 1. Refer to Figure 4 for the timber supply impacts of this analysis.

[7] The Timber Supply Review is a process that reviews the amount of timber forecasted to be available for harvesting over a specific time period. The review to the timber supply occurs every five years and examines the impacts of current forest management practises and the economic, social and ecological conditions in a specific area (i.e. PG TSA). Based on the information provided in the timber supply review, the Chief Forester determines a sustainable Allowable Annual Cut (AAC). The AAC determination for the PG TSA was in January 2002, where the PG TSA received a 3,000,000 m3 uplift.

[8] The updated management assumptions and resource inventory information that was included in the revised NDU timber supply base case includes the 3,000,000m3/yr AAC uplift, MPB unsalvageable losses (Beetle II Addendum Report), deciduous partition cut, updated forest harvesting to August 2002, PG TSA Consolidated Forest Development Plan, disturbance cycling of the non-contributing landbase, 2002 BEC coverage and the Vanderhoof Caribou Management Plan.

3. Spatial and graphical representation of the "**current state of the landscape for old forest**" which was assessed and measured against the recommended NRV (Table 1) to provide a sense of risk to biodiversity.

4. Completion of **"13 alternative scenarios"** to test the various timber supply impacts from altering or deviating the minimum NRV old forest retention levels in specific NDU and biogeoclimatic zone combinations. The iterative process gradually reduced timber supply constraints, taking into consideration risk to biodiversity (and acceptable thresholds), ecological characteristics, natural patterns from similar landscapes, and timber harvesting history. This process was completed under the advisement and expert opinion of Craig Delong. Refer to Appendix 7 for a detailed list of all the scenarios and analysis completed.

**Table 1: Natural Range of Variability Old Forest Retention as recommended in the Natural Disturbance Unit Science (DeLong 2002)**

| Forest District | Natural Disturbance Units (NDU's) | Recommended % Natural Range of Variability (NRV) for Old Forest Retention (>140 yrs) |
|---|---|---|
| Vanderhoof | Moist Interior - Plateau | 17-33 |
| | Moist Interior - Mtn | 41-61 |
| Prince George | Wet Trench - Valley | 76-84 |
| | Wet Trench - Mtn | 80-88 |
| | Moist Interior - Plateau | 17-33 |
| | Moist Interior - Mtn | 41-61 |
| | McGregor Plateau | 43-61 |
| | Wet Mountain | 84-89 |
| Fort St. James | Moist Interior - Mtn | 41-61 |
| | Moist Interior - Plateau | 17-33 |
| | Omineca - Valley | 23-40 |
| | Omineca – Mtn. | 58-69 |
| | Northern Boreal Mountain | 37-60 |

## *Natural Disturbance Unit and Biogeoclimatic Zones Analysis Units*

NDU's are very large ecological units (e.g. Vanderhoof Forest District is one NDU), and there was considerable concern about the representation and distribution of the old forest retention across each NDU. To alleviate this concern, Biogeoclimatic Zones (BEC's)[9] were added into the timber supply analysis. This resulted in old forest retention requirements for specific NDU and BEC combinations. In some

[9] Biogeoclimatic Zones is a provincial process where large geographic areas with similar macroclimates, vegetation and site factors are classified into ecological units. Each zone is named after one or more of the dominant climax tree species, with geographic and climate modifiers . BC has 14 BEC zones.

cases, certain NDU/BEC combinations were significantly small analysis units (less than 5000 ha). Under the guidance and recommendation of Craig DeLong, these BEC's were joined (merged) to other units based on similar ecological and geographic characteristics. Merged NDU/BEC units became one unit where the old forest retention requirement will apply.

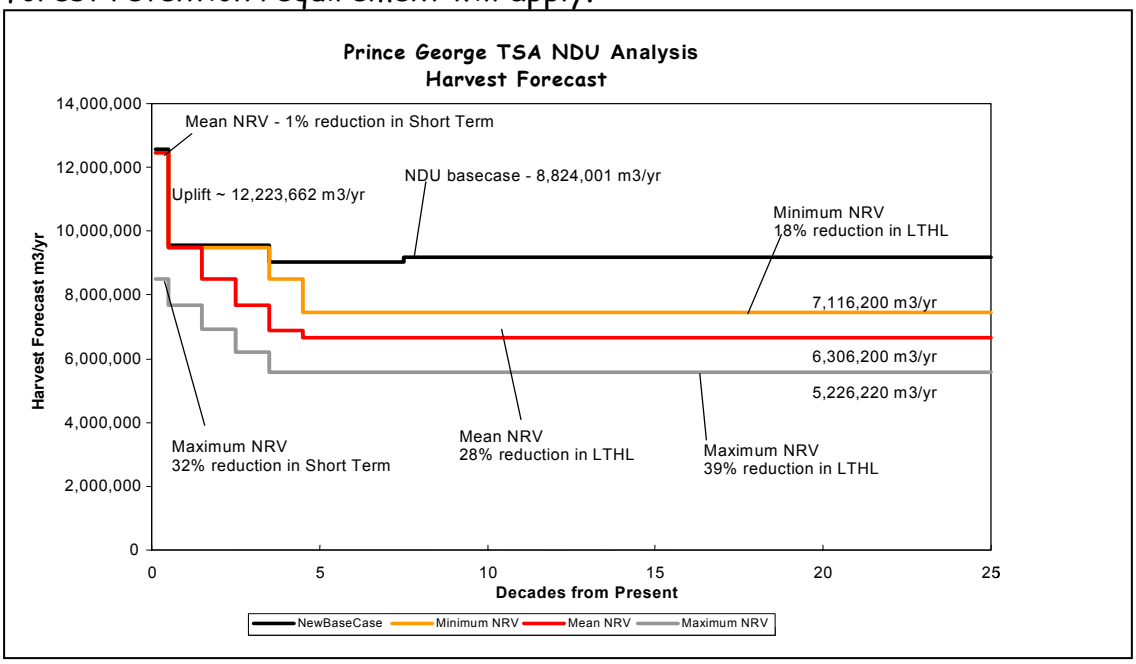



**Figure 4: NDU Base Case illustrating the timber supply impacts of the minimum, mean and maximum NRV old growth retention targets applied in its entirety**

## *What was the Balanced Solution For Old Forest Retention?*

The LOWG committee determined by consensus, that Scenario 13 provided the best case example of a balance between ecological integrity for NRV and sustained timber supply (Figure 5). Therefore, the "*Draft Order Establishing Biodiversity Objectives in the PG TSA, March 18, 2004"* are the recommended old forest retention targets based on the results of Scenario 13.

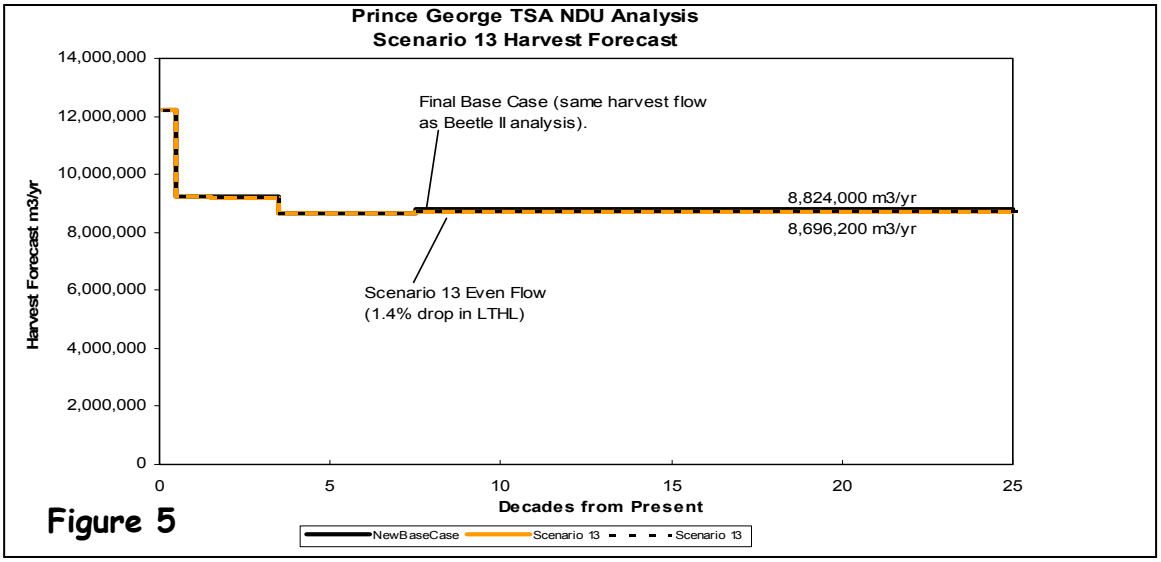



**Figure 5**

**Table 2:** Results of the altered NRV for old forest retention (Scenario 13) compared to the benchmark NRV outlined in Table 1.

| Forest District | Scenario 13 Old Forest Target as compared to the minimum NRV benchmark | Comments |
|---|---|---|
| Vanderhoof | • 4 NDU/BEC are 70% of the minimum NRV<br>• 3 NDU/BEC are 100% of minimum NRV | Total of 7 NDU/BEC analysis units ~ each with an old forest retention target |
| Prince George | • 6 NDU/BEC are at minimum NRV<br>• 9 NDU/BEC's are at 70% of the minimum NRV<br>• 7 NDU/BEC's are at 60% of the minimum NRV | Total of 25 NDU/BEC analysis units ~ each with an old forest target<br><br>***Those NDU/BEC's that are 60% below the minimum NRV were deemed acceptable limits based on similar ecological characteristics of adjacent NDU/BEC's with naturally lower NRV ranges. This decision was made under the professional guidance, direction and knowledge of Craig Delong. **** |
| Fort St. James | • 7 NDU/BEC are 100% of minimum NRV<br>• 10 NDU/BEC's are at 70% of the minimum NRV | Total of 17 NDU/BEC analysis units |

It is important to note that those NDU/BEC units in the Prince George District that are at 60% of the minimum NRV were assessed critically based on the following economic and ecological factors:

- Past harvesting activity that has reduced the total amount of old forest available.
- How operational activity would be constrained/impacted with higher percentages of N
- NRV targets.
- The ecological characteristics of the landscape were similar to adjacent NDU's that had naturally lower NRV ranges.

Table 3 illustrates how the NRV targets compare to the current provincial policy direction of the Provincial Old Growth Order (June 2004) recently released to supplement the Forest and Range Practices Act (FRPA)

**Table 3**: Simplistic Comparison of the Provincial Old Growth Order and the March 2004 Draft Order for Biodiversity Objectives in the PG TSA (NDU and NRV research)

| Current Provincial Policy ~ Old Growth Order | | | Landscape Biodiversity Objectives for Old Forest Retention in the PG TSA | | |
|---|---|---|---|---|---|
| **Biogeoclimatic Zone** | **Age of Old Forest** | **Percent Old Forest Retention Range** | **Biogeoclimatic Zone** | **Age of Old Forest** | **Percent Old Forest Retention Range** |
| BWBS | > 140 yrs | 11-16 | BWBS | > 120 yrs | 16 |
| ESSF | > 250 yrs | 9-28 | ESSF | > 140 yrs | 29-84 |
| ICH | > 250 yrs | 9-19 | ICH | > 140 yrs | 23-53 |
| SBPS | > 140 yrs | 7-10 | SBPS | > 120 yrs | 17 |
| SBS | > 140 & 250 yrs | 9-16 | SBS | > 120 and 140 yrs | 12-50 |

## *Mountain Pine Beetle and Old Forest Retention ~ what were the options?*

The implementation of biodiversity management in the Mountain Pine Beetle (MPB) impacted landscapes (i.e. Moist Interior Plateau NDU), required careful thought and consideration due to the values at risk. The current MPB outbreak is a natural event that requires a different perspective on maximizing the benefits to biodiversity under the consideration of economic and operational reality. In light of the situation, the underlying principles of biodiversity management do not fundamentally change.

The main issue focused around how to incorporate the reality of the current landscape condition (dead standing timber) with the goal of capturing some sort of "live old forest" representation;

Research and literature has substantiated the ecological importance of maintaining beetle-killed stands with a range of natural mortality in some sort of unmanaged state. Over time, these stands provide a natural representation of success ional pathways, habitat characteristics and structural attributes (snags and coarse woody debris) that are unique to a stand after a major disturbance event like the MPB (Stadt 2001, Stadt et. al, 2002, Lidenmayer, et al., 2004). Biodiversity values are affected by both the dynamics of the MPB and the management activities employed to control it. Forest development planning must consider the role that

MPB killed stands play in ecological processes, and the management of biodiversity must be mindful of the impact to timber supply.
The timber supply analysis for the LOWG process made a reasonable attempt to consider the current MPB infestation and build in variances to allow for the inclusion of these stands in the old forest retention target. The operational reality is that there will be significant areas of MPB killed stands that will not be salvaged or re-habilitated; it seems intuitive that these areas contribute to biodiversity management. Thus, the LOWG committee agreed that these stands will need to contribute, in some manner, to the old forest retention objective. As a result, the remedial measures for the old forest target in the Moist Interior Plateau NDU are as follows:

- Portions of MPB killed stands will be able to contribute to the old forest retention objective as Natural Forest Areas (NFA's).
- Licensees will be required to retain "live old" non-pine species based on the results of a prorated analysis of species availability.

Refer to the Implementation Strategy in the "*Draft Order Establishing Landscape Level Biodiversity Objectives for the PG TSA, March 18th, 2004*" for the direction provided to licensees on how to achieve these requirements.

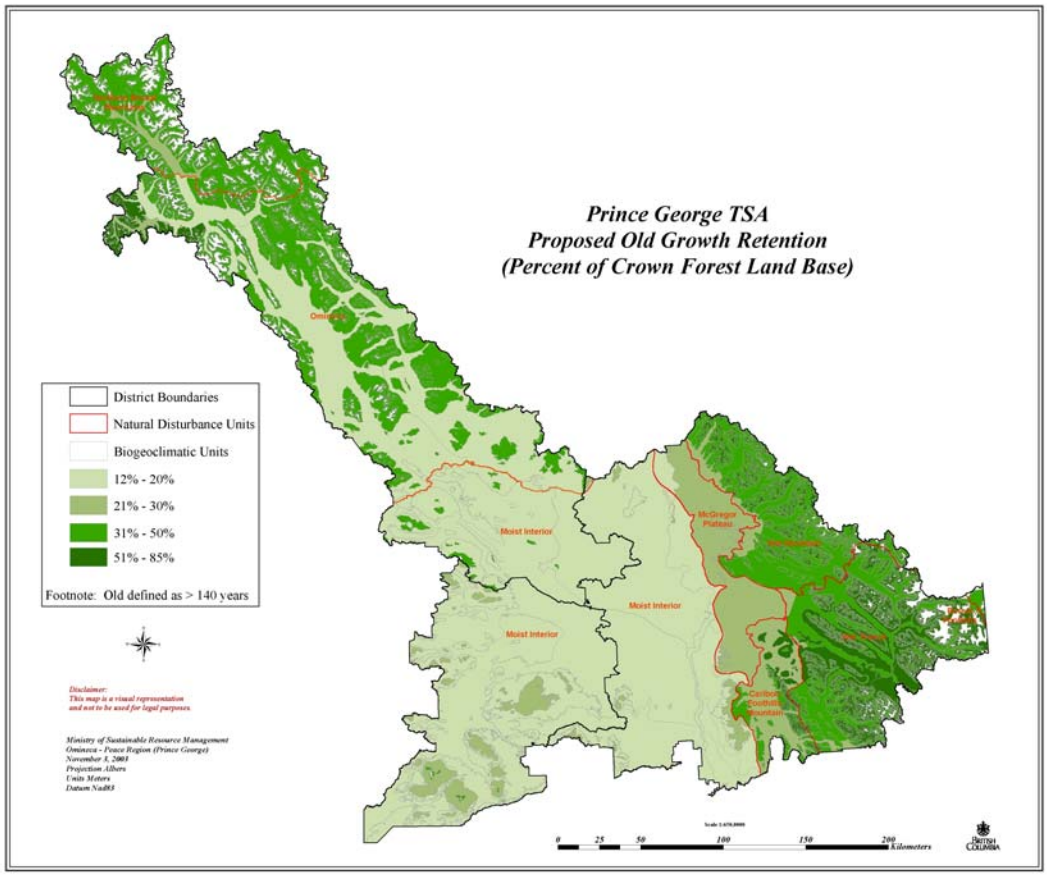



**Figure 6:** How the recommended old forest retention percentage (from Scenario 13) is distributed across the PG TSA. Darker areas represent 51-81% old forest retention requirement. Conversely, lighter areas are 12-20% old forest retention requirement.

## BASE ASSUMPTIONS FOR RESOURCE ANALYSIS OF INTERIOR FOREST CONDITION AND YOUNG PATCH SIZE DISTRIBUTION

To determine the current and planned patch size distribution within the PG TSA, it was critical that all the harvesting that has occurred and is planned was accounted for in the base line analysis. Therefore, to effectively evaluate the landscape regarding patch size and interior forest condition, three key elements were required:

1. Updated harvesting information;
2. Consolidated forest development plan for future cutblocks
3. The definition of what constitutes a "patch" for younger forests.

Through shared resources, the LOWG committee was able to update the disturbance layer of past harvesting activity to March 2004, using 2002 Landsat

Imagery and GIS capabilities. Additionally, all of the PG TSA licensees harvesting plans for the next 5 years were collected and consolidated into one resource coverage to assist baseline analysis (i.e. Forest Development Plans). Lastly, under the advisement of ecological and GIS expertise, the LOWG committee defined a young forest patch as a disturbance that is less than 20 years old.

## INTERIOR FOREST CONDITION ~ WHY ARE WE MANAGING FOR IT?

Interior forest condition is the stable environment inside a large, intact patch of forest that provides the microclimate conditions that a wide variety of flora and fauna have adapted to. When these large patches are dissected and fragmented due to disturbance, an edge effect is created (abrupt boundary between different ecosystems). The Biodiversity Guidebook (1995) defined forest fragmentation as:

*"The process of transforming large contiguous patches of forest into smaller patches surrounded by disturbed areas. This can be naturally occurring (i.e. wind throw) or human induced (forest harvesting practices)".*

Forest fragmentation can have an impact on biodiversity values by increasing the amount of edge that can have adverse effects on species that are dependant on interior forest conditions. Without due attention to the quality and spatial distribution of older forests on the landscape, large intact patches are at higher risk to forest fragmentation from timber harvesting and road construction (Lakes Expert Panel, 2002; Cariboo-Chilcotin Biodiversity Strategy Committee, 2001; Delong 1999). In the short-term, aggregated forest harvesting techniques is an approach that can be used to reduce the level of current fragmentation and active road networks. Aggregated cutblocks do not represent a change to the amount of forest that is harvested, but is a re-distribution of small, scattered cutblocks into one large harvesting unit (Klenner, 2000; DeLong 2001). The risks associated with edges and road systems can be reduced across the landscape (Figure 7).

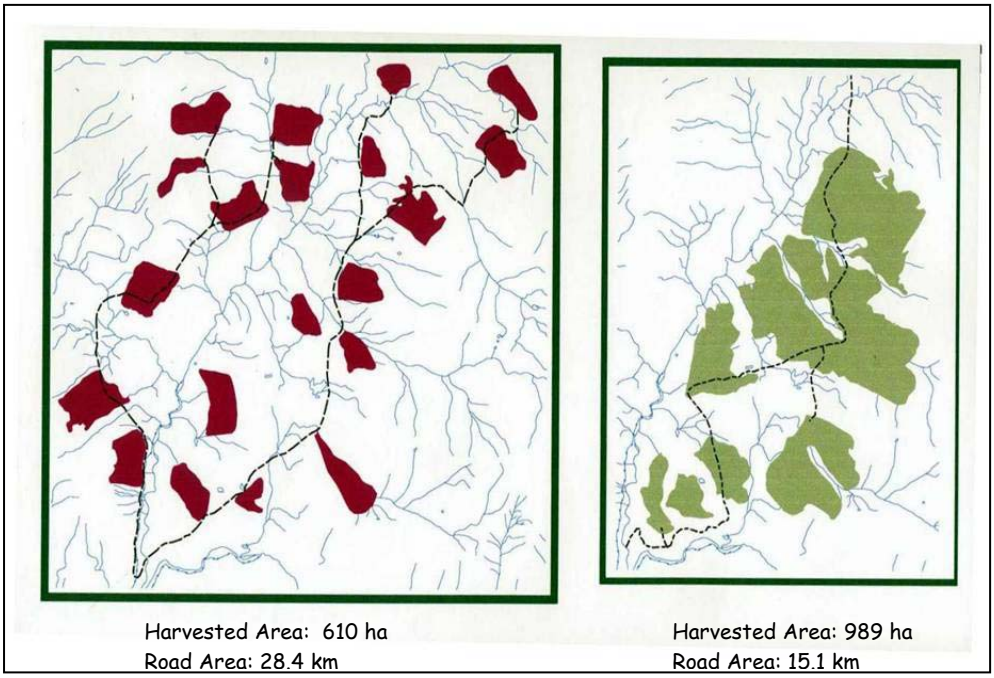



**Figure 7**: Comparative example between the net area disturbed from roads based on two different harvesting patterns (DeLong 2002).

## *Interior Forest Condition Objectives*

The goal behind the interior forest condition objective is to provide certainty for the following:

1. Maintenance of quality old forest that is valuable to biodiversity
2. Maintenance of existing large patches of old forest with interior forest condition;
3. Reducing the probability of further forest fragmentation from future harvesting activities.

The principles and concepts of interior forest condition play an important role in stands the have been attacked by mountain pine beetle. Therefore the analysis for interior forest condition and subsequent objectives apply to any Natural Forest Area that could be used in the Moist Interior Plateau NDU.

The objective for interior forest condition will be applied to each NDU/BEC combination.

## *Analysis for Old Forest Interior Condition:*

The analysis completed for interior forest condition incorporated feasibility based on the current landscape condition, operational reality, and recommendations from the Biodiversity Guidebook (1995).

There were two types of analyses completed for interior forest condition in each NDU/BEC combination:

1. Assessment of the current landscape condition by spatially identifying interior forest condition patches in existing old forest.
    - Using the resource information collected for the base case old forest retention analysis, the spatial distribution of old interior forest condition was evaluated, quantified and reported.
    - Spatial representation of interior forest was completed through an internal buffering exercise (200 m buffer) on all forest polygons > 120 years (Figure 8).

2. Determination of the timber supply implications of maintaining interior forest condition targets:
    - Due to the dynamic nature of this objective, and the expense to adequately model the effects, a very simplistic analysis approach was applied to provide a general indication if interior forest condition targets will have an immediate impact on the timber supply.
    - Interior forest conditions for three separate scenarios, minimum targets, balanced targets and maximum targets based on fixed percentages of 10, 25 and 40, were modelled
    - The results of the analysis indicated that there was no short term impact to the timber supply from any applied scenario.

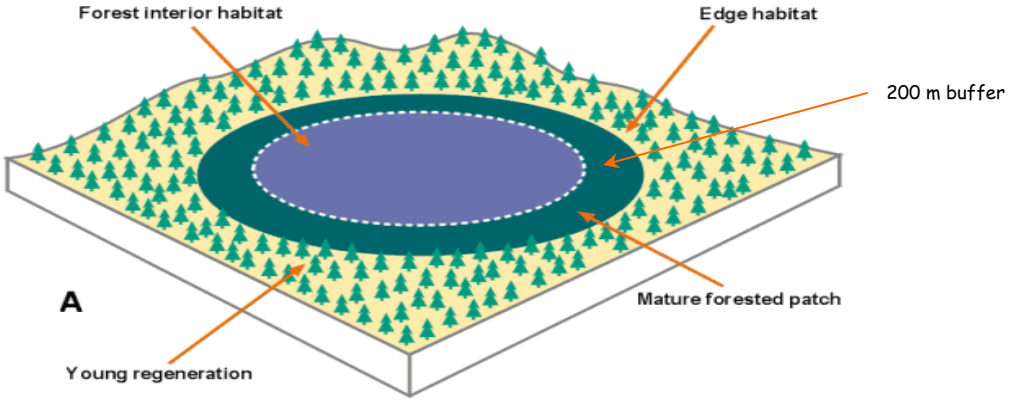



**Figure 8:** An example of the buffering exercise used to determine the current state of interior forest condition in old forest (>120 years).

## *Buffering Criteria for the Calculation of Interior Old Forest – Revised Methodology (July 2005):*

The methodology used for calculating old interior forest, during the development of the Landscape Biodiversity Objectives for the Prince George Timber Supply Area, was to exclude 200 metre buffer in the old forests that are adjacent to age classes less than 140 years (or 120 years in some mBEC units) and other disturbances. Through discussion with Forest Licensees, BC Timber Sales and the Provincial government (as represented through the Landscape Objective Working Group) it was discussed and agreed that it is appropriate to revise this methodology.

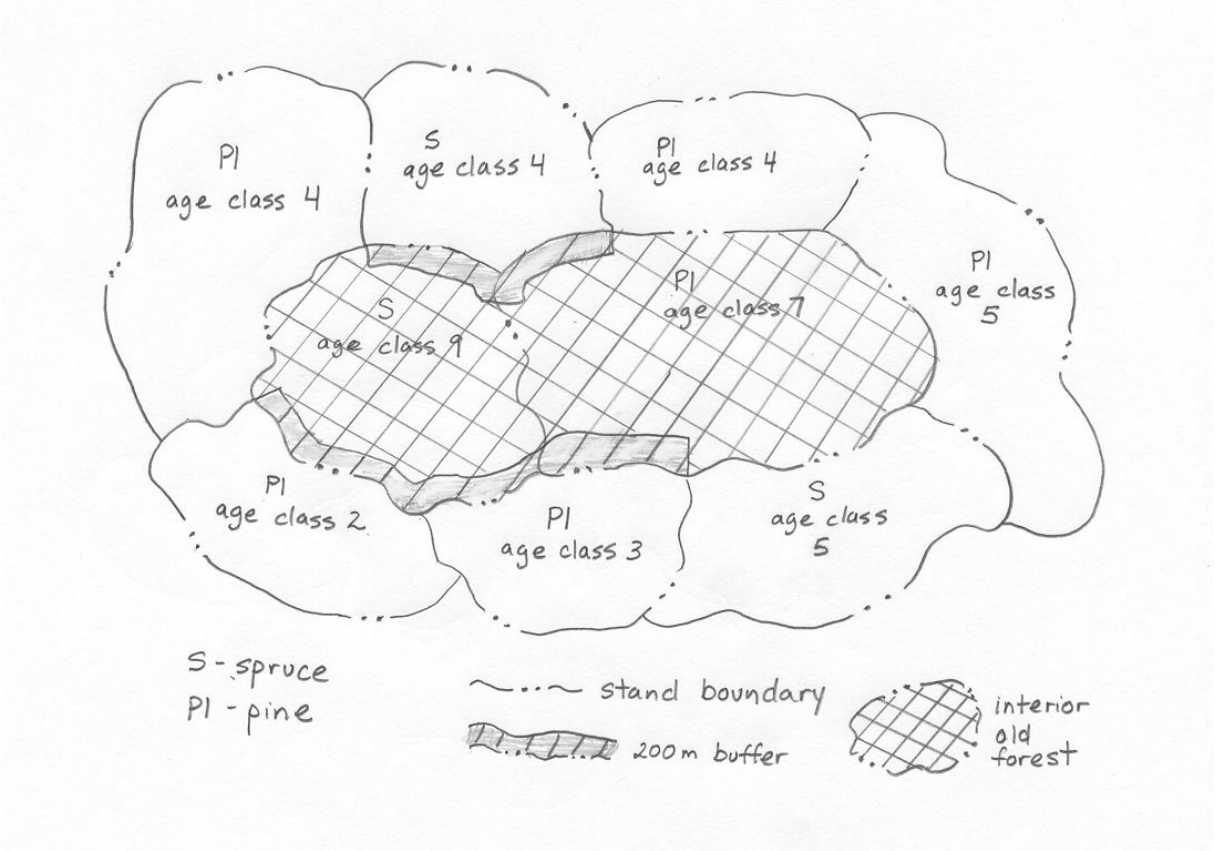
The revisions documented below were agree to at the June 22, 2005 Landscape Objective Working Group meeting.

In the Implementation Policy which accompanies the *Order Establishing Landscape Biodiversity Objectives for the Prince George Timber Supply Area* – October 20, 2004, the following definitions now apply:

***"Old Interior Forest"*** means an area of 'old forest' or natural forest area', which is buffered from younger age classes or disturbances. The revised methodology (June 22, 2005) for this objective uses the indicated buffered distance, as per the table below dependant on the age class and leading species in the adjacent stands:

| | Adjacent Age Class | Buffer Distance |
|---|---|---|
| pine and deciduous - leading stands | Not Satisfactorily Restocked (NSR) and 1-3 | 200 metres |
| | 4-9 | 0 metres (as long as area is >200 m wide) |
| all other species - leading stands | NSR and 1-4 | 200 metres |
| | 5-9 | 0 metres (as long as area is >200 m wide) |

**Figure 9:** Interior old forest buffering example in unit where old forest is >120 years old (e.g. Moist Interior – plateau sub-unit – SBS dw3)




2. A buffer of 200 metres extending from the edge of the old forest into the old forest, is excluded to calculating the amount of old interior forest for:

- transportation corridors attributed to all primary access roads (e.g. Forest Service Roads),
- pipelines,
- railways, and
- hydro transmission corridors.

No buffering is required to calculate the amount of old interior forest for transportation corridors attributed to secondary and tertiary roads.

## YOUNG PATCH SIZE DISTRIBUTION ~ HOW IT CONTRIBUTES TO BIODIVERSITY

Patch size (cutblock size) in combination with old forest retention represents the patterns of the landscape historically influenced by disturbance regimes and are critical components that shape the future forest condition. As previously mentioned, it is widely accepted among forest ecologists and the research community, that forested patches and openings (cutblocks) should reflect the variability in size, shape and patterns that are established through natural process. To achieve this outcome, proactive planning and management decisions must accommodate this theory with an appropriate balance between large openings and large, intact forested patches over time. (Figure 9).

Photo 1: Courtesy of Dr. Ken Parker (consultant)

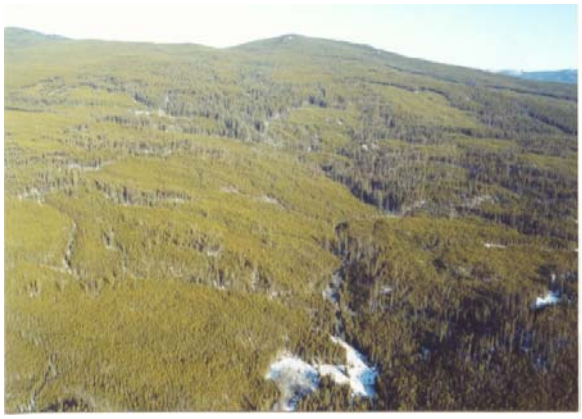


Photo 2: Courtesy Nathan Voth (MoF, Vanderhoof)

**Figure 10:** *Case example of how front-end planning for large cutblocks (Photo 1) can emulate the characteristics of natural disturbance patterns (Photo 2).*

Patch size assessment is a planning tool that evaluates whether the distribution of patch sizes on a landscape is maintaining biodiversity (reducing the risk), trending toward natural conditions or representative of fragmentation the landscape. Patch size distribution, with respect to younger age classes, is a way to reduce fragmented landscapes and focus harvesting patterns more favourable to the recommended NRV (Table 4).

**Table 4: Patch size distribution as recommended by 2002 Natural Range of Variability.**

| | Percent Patch Size Distribution | | | |
|---|---|---|---|---|
| **Natural Disturbance Unit** | **<50 ha** | **51 – 100 ha** | **101 -1000 ha** | **>1000 ha** |
| McGregor Plateau | 10 | 5 | 45 | 40 |
| Moist Interior - Mtn | 20 | 10 | 30 | 40 |
| Moist Interior - Plateau | 5 | 5 | 20 | 70 |
| Northern Boreal Mtn | 5 | 5 | 30 | 60 |
| Omineca - Mtn | 10 | 10 | 30 | 40 |
| Omineca – Valley | 5 | 5 | 30 | 60 |
| Wet Mtn | 20 | 10 | 60 | 10 |
| Wet Trench – Mtn | 20 | 10 | 60 | 10 |
| Wet Trench – Valley | 20 | 10 | 60 | 10 |

## *Young Patch Size Distribution Analysis*

There were three time periods of which the baseline analysis created spatial representation of patches (openings) 0-20 years in age:

- Existing openings between 1982 – 2002
- Existing openings between 1987 – 2002 aged 5 years
- Planned openings up to 2007 from the Consolidated Forest Development

The methodology outlined below in Table 5 was the buffering exercise used in creating and assessing current patch size distribution on the landscape. The measurement/methodology of patch size distribution is a difficult issue and has yet to be satisfactorily resolved. By implementing this standardized methodology consistently over time, the comparative assessment will be more meaningful for monitoring purposes. It is possible that as more information and research becomes available, this methodology may be modified.

**Table 5**: Buffering exercise applied to specific polygons to create patches

| Patch Size Category | Buffering Distance required to separate patches |
|---|---|
| <50 ha | 150 m |
| 51 – 100 ha | 200 m |
| 101 – 500 ha | 400 m |

| | |
|---|---|
| 501 – 1000 ha | 600 m |
| >1,001 ha | 800 m |

Using the results from the patch size distribution analysis or "current landscape condition", the spatial distribution of patches less than 20 years old was evaluated and reported on by NDU and BEC. Figure 10 is an example of the results from this assessment.

As it may not feasible to achieve the patch size distribution due to many operational realities, the objective is written to provide a range of harvested areas (sizes) that will **trend toward** the patch size distribution outlined in Table 4. The unit of management for this objective is the Natural Disturbance Subunit within each Forest District. It is the intent that within a Forest Stewardship Plan (or Forest Development Plan) the Licensee will indicate how the patch size distribution is trending toward the desired percentages within their operating area. The percentages in Table 4 were not altered in a scenario based analysis (like the old forest NRV process), but are used in its "entirety" as recommended by Delong 2002 research.

**Analysis Steps for Patch Size**

1. **Identify all patches < 50 ha with and buffer by 75 m.**
    a. If any of these patches touches another patch that also has a 75 m buffer then they must be within 150 m. Merge these patches and de-buffer by 75 m.
    b. Assess all patch sizes in hectares. Identify all patches <50 ha and remove from further analysis.
2. **Identify all remaining patches >50 ha and buffer by 100 m.**
    a. Any patches touching must be within 200m. Merge and de-buffer.
    b. Identify all patches <100 ha and remove from further analysis.
3. **Identify all remaining patches >100 ha and buffer 200 m.**
    a. Any patches touching must be within 400m. Merge and de-buffer.
    b. Identify all patches <500 ha and remove from further analysis.
4. **Identify all remaining patches >500 ha and buffer by 300 m.**
    a. Any patches touching must be within 600m. Merge and de-buffer.
    b. Identify all patches <1000 ha and remove from further analysis.
5. **Identify all remaining patches >1000 ha and buffer by 400 m.**
    a. Any patches touching must be within 800m. Merge and de-buffer.
6. **Bring all of the coverage's created in steps 1-5 back into one coverage. Some of the smaller patches may now reside within the perimeter of the larger patches.**

**Figure 11:** Standard analysis process used in the LOWG GIS exercise to spatially identify young patches in each NDU/BEC combination

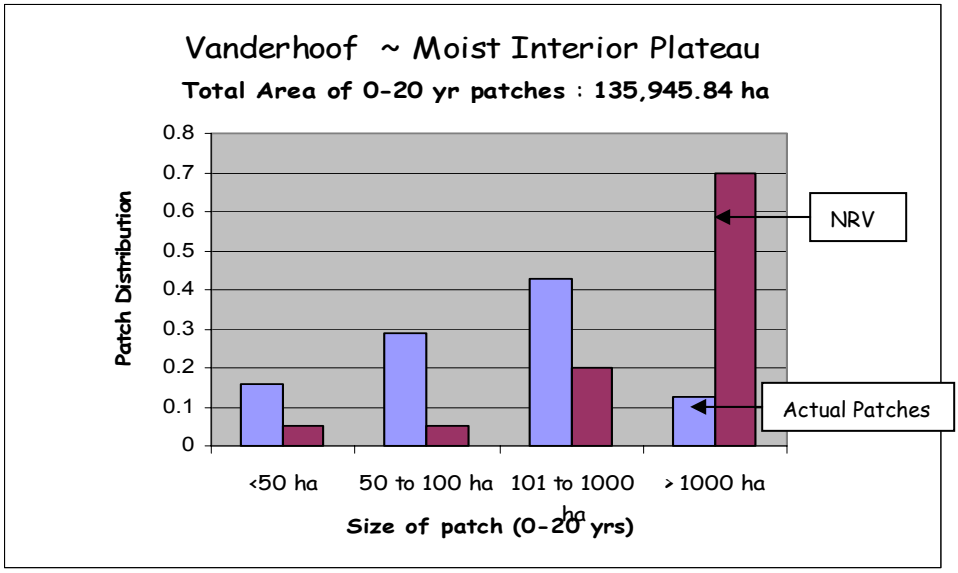



**Figure 12:** Current Patch Size distribution of openings (0-20 years old) in the Moist Interior Plateau NDU.

## LICENSEE ASPATIAL APPORTIONMENT STRATEGY ~ HOW LANDSCAPE LEVEL BIODIVERSITY OBJECTIVES WILL BE IMPLEMENTED

Two new ideas were considered with respect to the PG TSA and establishing landscape level biodiversity objectives. First, the area that the objectives would apply to would be "Natural Disturbance Units" (NDU's) and their sub-units. Second, to compliment the idea of results-based, the objectives are set aspatially.

Unlike, spatial Old Growth Management Areas (OGMA's) that do not move over time, the aspatial approach, specifically for old forest retention, facilitates flexibility and professional judgment in determining how the licensees will meet the old forest objective. This means representative old forests may move and change over time provided the licensees are accountable in meeting their obligation. By drafting the objectives in an aspatial context, more time, effort and coordination is required by licensees. Additionally, the timber supply

impacts are allocated in proportion to the size of a licensee's harvesting rights.

Licensees will consider parts of the Crown Forest Landbase that do not contribute to the timber supply (i.e., parks and protected areas) and areas constrained by other objectives (i.e., riparian) to help meet the objectives.

The "Licensee Aspatial Apportionment Strategy" specifically addresses how the objective for old forest will be divided between licensees in a NDU/BEC unit. If a licensee cannot meet the old forest retention objective within their area of responsibility, then two options exist:

1) A licensee can "borrow" old forests from a similar unit where a surplus exists.

2) If no surplus exists, a licensee will develop a recruitment strategy immediately.

Licensee consolidation and collaboration will play a key role in meeting all of the objectives, especially in regards to the young patch size and interior forest condition. To meet the young patch size requirements, licensees will require close coordination to promote operational feasibility (i.e. where opening are close together and at neighbouring operating area boundaries). Likewise, to meet the interior forest condition requirements, licensees will need to jointly participate in looking for opportunities to create or maintain large, old patches.

This is a challenging task that will require a sound and strong commitment between the PG TSA timber licensees for successful implementation. Therefore, to govern this commitment, a Memorandum of Understanding (MoU) between licensees has been drafted. This agreement is intended to outline the details of the apportionment strategy, the collaboration process involved and identify coordinated analysis requirements. This MoU will be signed by all the timber licensees involved.

**Table 6:** List of Licensees Involved in Apportionment Strategy and MoU.

| | |
|---|---|
| • Aleza Lake Research Forest<br>• Apollo Forest Products Ltd.<br>• B.C. Timber Sales<br>• Canfor<br>• Carrier Lumber Ltd.<br>• L & M Lumber Ltd.<br>• Lakeland Mills Ltd. | • Non – Replaceable Forest Licensee.<br>• Slocan Forest Products Ltd.<br>• Stuart Lake Lumber Ltd.<br>• Takla Track and Timber Ltd.<br>• The Pas Lumber Company Ltd.<br>• U.N.B.C. Research Forest<br>• Weldwood<br>• West Fraser |

## UNCERTAINTIES AND RISKS WITH THE LOWG PROCESS

As with most applications and processes that diverges from traditional provincial policy, there are risks and uncertainties that need to be identified and addressed. From the start of this process, the LOWG committee continuously tracked questions, issues, information gaps, resource analysis needs and concerns that are critical to successful implementation and continued progression. The LOWG was faced with an enormous task of balancing all values while incorporating ecosystem based research in an environment of constant change. Therefore, this project was approached in a two phase perspective, where:

**Phase 1**~ establishes the NRV research as a working tool for old forest retention and patch size distribution.
**Phase 2** ~ the priority risks and uncertainties based on the results of implementation and monitoring will be addressed in the future.

Some of the immediate uncertainties and risks that the LOWG committee has identified thus far includes:

***Ecological:***

- Quality and integrity of the old forest that is being maintained ~ are these stands functional and representative of old forest values at the stand level?
- Strictly using the age-based criteria to identify old stands may not identify the most biologically important areas of older forests.

- In the absence of spatially identifying Old Growth Management Areas, what values are actually being maintained on the landscape ~ are these aspatial areas of acceptable quality and value for old forest?
- Appropriate balance between live old forest and "Natural Forest Areas" ~ are the values of old forest appropriately maintained?
- Quantification of the values being conserved in Natural Forest Areas ~ what are we really managing for?
- For some ecosystems, the current broad based descriptor of age (> 140 yrs) may be inadequate in capturing and representing the valuable characteristics associated with ecosystems that are extremely long-lived (i.e. antique forests in the Cedar - Hemlock stands, higher elevation forests).
- The possibility of improving the NRV old forest target and interior forest condition targets to higher levels for biodiversity maintenance (especially in areas that are below the thresholds).
- Probability that the mean range of the NRV can be utilised for old forest retention ~ is there an opportunity for improvement while still managing economic concerns?
- Forecasting and projecting into the future does not meet the immediate goal of managing for biodiversity now ~ what are the forgone risks and how can they be quantified?
- The need to consider the "range of flexibility" in the NRV thresholds ~ the narrower the range, the less flexibility for biodiversity divergence.
- How to appropriately consider and manage for rare ecosystems and other biodiversity elements (i.e. connectivity) without spatially locating areas of old forest retention.
- Effectiveness monitoring and adaptive management ~ how will this proceed and who will be involved?

***Economic:***

- How do we manage the timber supply impact of conserving non-pine species that will be the future timber supply for licensees due to the MPB epidemic?
- Determination of the cumulative effects of all three legal objectives in combination of the economic impacts from the MPB.
- Analysis methodology applied to patch size objective and interior forest condition ~ are there better methodologies available?
- Base information and assumptions in the timber supply analysis that can be more reflective of current management realities to improve confidence with

the resultant information (i.e. site index adjustment, forest cover inventory, adjustment to volume gains in managed stands).
- What are the operational impacts of redistribution of harvesting in order to address imposed constraints?

***Social:***

- Demonstrated ability of a continuous working relationship among licensees ~ effectiveness of meeting biodiversity objectives in a coordinated and cooperative manner.
- Identification of social concerns and implications regarding recommended patch size (cutblocks) ~ the need to fully identify, integrate and manage public perceptions.
- Ensure that the socially accepted LRMP direction has been incorporated ~ how do we improve upon public confidence that LRMP direction is adequately considered.
- Incorporation of new tenures (i.e. Non-Replaceable Forest Licensees, small scale salvage) into the PG TSA licensees monitoring (apportionment) strategy.

## PUBLIC REVIEW PROCESS ~ WHY WE NEED INPUT

It is the commitment of MSRM to ensure that the general public, stakeholders and First Nations have the opportunity to provide input and comments towards the recommended objectives. The successful establishment of balanced and effective objectives relies heavily on the knowledgeable and well-informed public, as they are the best source of local information and experience regarding the landscapes surrounding their communities.

A formal 60 day public review and comment phase was initiated by MSRM in March, 2004 to invite comments and feedback, including:

- What is your opinion of the objectives (good or bad, pro's and cons)?
- Will they achieve the needs and desire of the community?
- How will these objectives affect you?
- Are there supporting documents required?

It is important to note that any comments received by MSRM will be taken seriously in the final decision making process. All comments received will be

reviewed and rationalized on how it was considered (agree with comment; disagree with comment or outside scope and mandate of LOWG process). A final document that outlines all comments received will be part of the rational package presented to the Regional Director and available for distribution to interested parties.

MSRM will be hosting a series of Public Open Houses to facilitate the exchange of information between the LOWG participants and people interested in the recommended objectives. Refer to Appendix 4 for an outline of the public communication, review and participation phase.

## First Nations Consultation

It was critical that the advice and knowledge of the First Nations in the PG TSA was part of the biodiversity landscape level objective process. To address this need, MSRM initiated consultation in February 2004 and is taking every opportunity to continuously meet with interested First Nations.

To receive additional information specific to First Nations consultation for this process, please contact the Northern Interior Region of MSRM in Prince George:

## Decision Making Process ~ who will be signing off these landscape level biodiversity objectives?

Following the Public Review and Comment phase, several key scenarios will be presented to the Regional Director of the Northern Interior Region of MSRM,[10] the delegated decision maker for any resulting legal objectives[11]. Options will be presented to address significant issues raised by the Regional Director. Each option will be supported by analysis information as well description of issues and concerns raised through the public review and comment process.

Once the Regional Director is satisfied that all values have been balanced and considered in the recommended scenarios (objectives) presented, objectives will become legal through Section 4 of the Forest Practices Code Act or the Land Act.

[10] However, as Scenario 13 represents a collective agreement with the LOWG participants, it is most likely the option that will be presented as the recommended objectives.
[11] The legal establishment of the biodiversity objectives does not require Cabinet Approval like the Higher Level Plan designation of Land and Resource Management Plans (LRMP's).

Forest licensees will then be required to adequately address the legal objectives in Forest Development Plan or Forest Stewardship Plan submissions.

## ADAPTIVE MANAGEMENT FRAMEWORK

Since the inception of this process, the LOWG committee supports a continuous improvement and adaptive management approach that provides the flexibility to incorporate new information, address risk and uncertainties, incorporate better knowledge/understanding and apply lessons learned.

Adaptive management is defined as (BC Ministry of Forests, 2002):

> *"A systematic, rigorous approach for learning from our actions, improving management and accommodating change."*

Figure 11 is an illustration of how monitoring and reporting can be used to strengthen the LOWG process under the principles of adaptive management. Discussions are currently underway as to future role of the LOWG in monitoring implementation of the objectives and the determination of how exactly the adaptive management framework will proceed.

The recommended legal objectives are accompanied by implementation policy to aid in interpreting the intent of the objectives. Currently the implementation approach will rely heavily on professional reliance and the collaborative planning of licensees to achieve the aspatial objectives over the large analysis units. However, it is recognised that cases may arise where spatially explicit Old Growth Management Areas are deemed necessary to provide ecological certainty of the old forest values being retained.

The LOWG committee believes that the result of this process is a "step in the right direction" towards a balanced approach for biodiversity. As with any pioneering initiative, retrospective observations can always identify how things could have been differently and perhaps better. The monitoring and evaluation should focus on improving upon the positive outcomes and constructively recognizing the problems that can be rectified. The LOWG committee was faced with setting goals and priorities (what is that we wanted to achieve), confronting the issues of practical (and realistic) tactical plans for implementation and determining how to

monitor for effectiveness of the desired outcomes. These are all essential components to adaptive management.

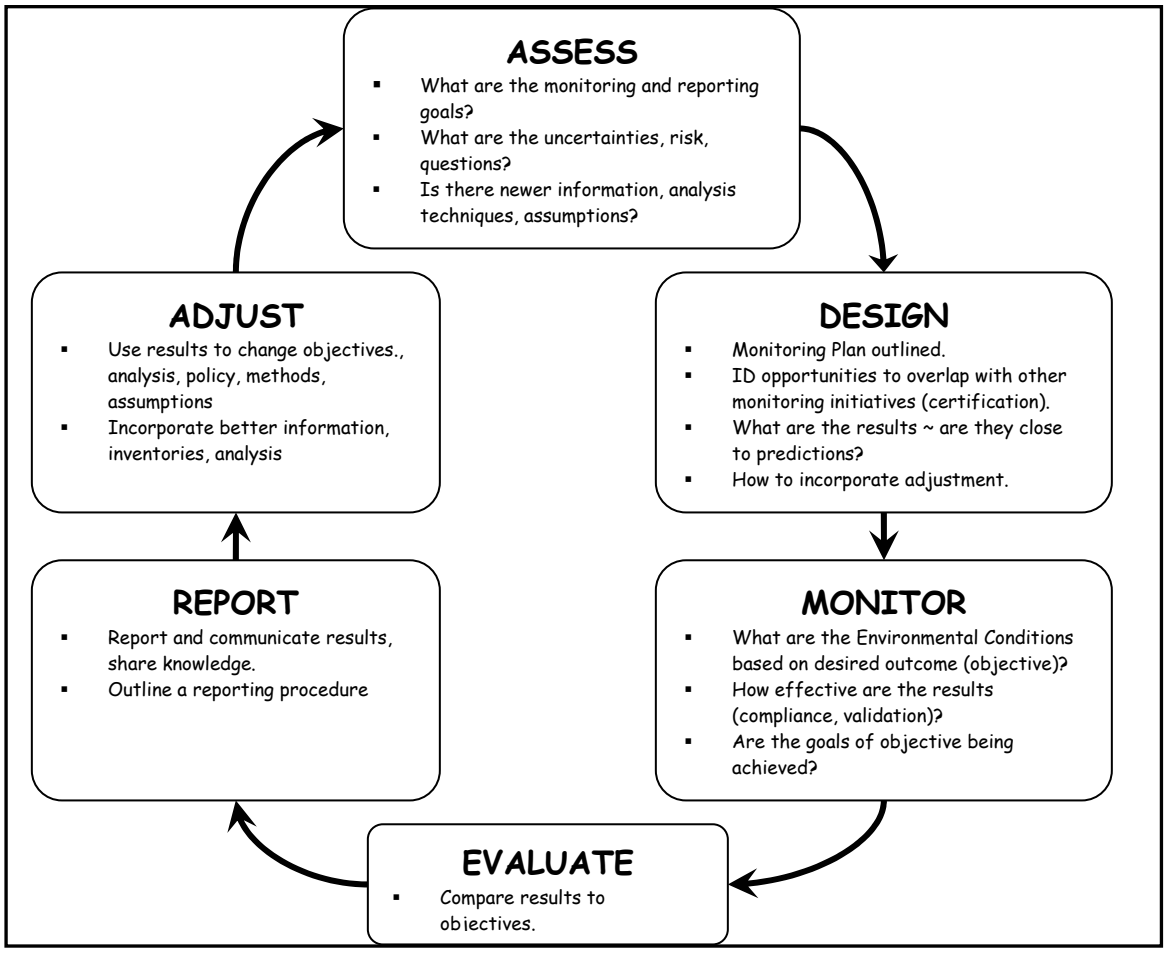



**Figure 13:** Example of how the Adaptive Management Process can be applied to monitoring and implementation of the LOWG objectives (adapted and revised from ESSA Technologies Ltd. Victoria)

## ACKNOWLEDGMENTS

It is with great pleasure and tremendous thanks that the following people are recognized for their hard work, dedication and invaluable expertise. This process has been a success because of the commitment from these individuals:

- **Craig DeLong** ~ MoF Regional Ecologist, Northern Interior Region
- **Craig Robinson** ~ Timber Supply Analyst, Forsite Consultant Ltd
- **Rob Schutz** ~ Industrial Forestry Services Ltd.
- **Frank Spears** ~ MSRM GIS Analyst
- **Diane Roberge** ~ MSRM GIS Operator
- **Sean Barry** ~ MSRM GIS Analyst
- **Doug Beckett** ~ MoF Regional Timber Supply Analyst, Northern Interior Region
- **Chris Rithie** ~ WLAP Habitat Section Head, Omineca-Peace Region
- **Rhonda Thibeault ~** MSRM Land and Resource Analyst
- **Jaime Hilbert** ~ UNBC Intern

If there are any questions, concerns or need for additional information, please do not hesitate to contact Traci Leys-Schirok, Land Use Planner, Northern Interior Region, MSRM.

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## LITERATURE CITED


Angelstam, P. 1997. Landscape analysis as a tool for the scientific management of biodiversity. Ecological Bulletin. Vol. 46: 140-170.

Angelstam, P.K. 1988. Maintaining and restoring biodiversity in European Boreal Forests by developing natural disturbance regimes. Journal of Vegetation Science. Vol. 9: 593-602.

Attiwil, P.M. 1994. The disturbance of forest ecosystems: the ecological basis for conservation management. Forest Ecology Management. Vol 63: 247-300.

Bergeron, Y., B. Harvey, A. Leduc, and S. Gauthier. 1999. Forest management guidelines based on natural disturbance dynamics; stand and forest-level consideration. Forestry Chronicles. Vol. 75(1): 49-54.

British Columbia Ministry of Forests. 1995. Forest Practices Code of British Columbia: Biodiversity Guidebook. Queens Printer. Victoria, B.C.

Brussard, P. 1998. Ecosystem management: what is it really? Landscape and Urban Planning. Vol. 40: 9-20.

Bunnell, F.L. 1995. Forest-dwelling vertebrate faunas and natural fire regimes in British Columbia. Conservation Biology. Vol. 9: 636-644.

Bunnell, F.L., L.L. Kremsater, and E. Wind. 1991, Managing to sustain vertebrate richness in forest of the Pacific Northwest: relationships within stands. Environ. Rev. Vol. 7: 97-146.

Cariboo-Chilcotin Biodiversity Strategy Committee. 2001. Description of the Biodiversity Committee Approach for Patch Size Assessments in the Cariboo Forest Region. Unpublished Report.

DeLong. S.C. 1998. Natural Disturbance Rate and Patch Size Distribution of Forest in Northern British Columbia: Implications for Forest Management. Northwest Science. Vol. 72, Special Issue: 35-48.

DeLong. S.C. 1999. Natural Disturbance Block Design Workbook. Ministry of Forests, Prince George, B.C. Unpublished report.

DeLong, S.C. 2002. Natural Disturbance Units of the Prince George Forest Region: Guidance for Sustainable Forest Management. Ministry of Forests, Prince George, BC. Unpublished Report.

Fahrig, L. 2001. How much habitat is enough? Biological Conservation. Vol. 100: 65-74.

Forest Practices board. 204. Implementation of biodiversity Measures under the Forest Practices code; Implication for the Transition to the Forest and Range Practices Act. Special Report. Report can found at: www.fpb.gov.bc.ca.

Franklin, J.F. 1989. Towards a new forestry. Am. For. November/December: 37 – 44.

Franklin, J. and Forman R.T.T. 1987. Creating landscape patterns by forest cutting: Ecological consequences and principles. Landscape Ecology. Vol 1(1): 1-18.

Grumbine, R. E. 1994. What is Ecosystem Management? Conservation Biology. Vol. 8(1): 27-38.

Hilbert, J. 2003. Old-Growth Definitions and Management: A Literature Review for the Ministry of Sustainable Resource Management, Northern Interior Region and the University of Northern British Columbia. Unpublished Report.

Holt, R.F. and Utzig, G. 2002. Indicators, Thresholds and Risks; Links to a Habitat Supply Modeling Strategy and Environmental Risk Analysis in BC. A Discussion Paper prepared for the B.C. Habitat Modeling Steering Committee. Unpublished Report.

Klenner, W. 1996. Rationale and Procedures for the Development of Aggregated Cutblock Units within the Kamloops LRMP. Ministry of Forests, Kamloops Region. Unpublished Draft Report.

MacKillop, D. and R.F. Holt. 2003. Describing old-growth forests in Sub-Boreal stands of the Moist Interior Plateau Natural Disturbance Unit. Draft Interim

Report prepared for the Vanderhoof IFPA and Northern Interior Region MSRM. Unpublished Report.

Landres, P.B., P. Morgan, and F.J. Swanson. 1999. Overview of the use of natural variability concepts in managing ecological systems. Ecological Applications. Vol. 9(4): 1179-1188.

Lindenmayer, D.B. and Franklin, J.F. 2002. Conserving Forest Biodiversity. A comprehensive multi-scaled approach. Island Press.

Lindenmayer, D.B., C.R. Margules, and D.B. Botkin. 1999. Indicators of Biodiversity for Ecologically Sustainable Forest Management. Conservation Biology. Vol 14(1): 941 – 950.

Lindenmayer, D.B., D.R. Foster, J.F. Franklin, M.L Hunter, R.F. Noss, F.A. Schmiegelow, D. Perry. 2004. Salvage Harvesting Policies After Natural Disturbances. Science. Vol. 303: 1303-1304.

Purdon, M. 2003. The nature of ecosystem management: postmodernism and plurality in the sustainable management of the boreal forest. Environmental Science & Policy. Vol. 6: 377-388.

Robinson, Craig. 2004. Landscape Objective Working Group, Prince George TSA: Natural Disturbance Unit Analysis. Forsite Consultants Ltd. Salmon Arm. Unpublished Report.

Stadt, J. 2001. The Ecological Role of Beetle-Killed Trees: A review of salvage impacts. Ministry of Water, Land and Air Protection, Skeena Region. Unpublished Report.

Stadt, J. Landscape Unit Planning Principles in the Lakes Forest district: Does the Mountain Pine Beetle Change Things? Summary of expert panel contributions. Ministry of Sustainable Resource Management, Skeena Region. Unpublished Report.

Swetnam, T.C, Allen and J. Betancourt. 1999. Applied historical ecology: using the past to manage for the future. Ecological Applications. Vol 9: 1189-1206.

Wong, C. B. Dorner, and H. Sandmann. 2003. Estimating Historical Variability of Natural Disturbances in British Columbia. Land Management Handbook 53.

## APPENDIX 1:

GUIDING PRINCIPLES that governed the Landscape Objective Working Group Terms of Reference (from MSRM provincial guiding principles for sustainability.)

***"To appropriately find the balance between environmental, economic and social objectives, the following principles are supported by the Working Group;"***

- **Accountability**: Setting performance-based standards and indicators and implementing mechanisms for compliance, auditing and reporting on progress towards sustainable resource management.
- **Certainty**: Making timely and clear resource management decisions within a predictable and understandable regulatory framework.
- **Competitiveness**: Ensuring that British Columbia remains internationally competitive by removing barriers to investment and promoting open trade.
- **Continual improvement**: Learning from the past and looking for new and improved approaches to resource management.
- **Efficiency**: Maximizing the net benefits arising from the allocation, development and use of natural resources.
- **Innovation**: Encouraging innovative approaches, technologies and skills to ensure the sustainability of natural resources.
- **Integration**: Ensuring that resource management decisions integrate economic, environmental and social considerations for the benefit of present and future generations.
- **Science-based decision-making**: Making justifiable decisions informed by science-based information and risk assessment.
- **Shared responsibility**: Encouraging co-operation among First Nations; federal, provincial and local governments; industry and non-governmental organizations in developing and implementing resource management policies.
- **Transparency**: Establishing open and understandable decision-making processes including consulting with key interests prior to making decisions.

## APPENDIX 2:

***Landscape Objective Working Group Members:***

- Heather Cullen ~ Chair of LOWG (Team Leader, MSRM)
- Darryl Bokvist ~ Planning Forester, Slocan – Plateau Divsion
- David Jewesson ~ Planning Forester, The Pas Lumber
- Judy Vasily ~ GIS Manager, Canfor
- Annette Constabel ~ Planning Forester, Canfor
- Bernard Tobin ~ Planning Forester, Carrier Lumber
- Cecil Gray ~ Planning Forester, Lakeland Mills
- Stuart Sinclair ~ Planning Forester, L&M Lumber
- Jennifer Lecuyer ~ Planning Forester, Fraser Lake Sawmills (West Fraser)
- Shannon Carson ~ Land Use PLanner, MSRM
- Traci Leys-Schirok ~ Land Use PLanner, MSRM
- Frank Spears ~ GIS Analyst, MSRM
- Leonne MacDonald ~ Planning Forester, BC Timber Sales (Stuart-Nechako)
- Jim Reid ~ Planning Forester, BC Timber Sales (Prince George)
- Sharon Dow ~ Planning Forester, BC Timber Sales (Prince George)
- John Degagne ~ Non-Replaceable Forest Licenses Representative, MoF, Vanderhoof

# APPENDIX 3

List of Participants at the November 26th, 2003 Biodiversity Information Session Peer Review

| | Name | Affiliation | Expertise |
|---|---|---|---|
| 1. | Darwyn Coxson | UNBC | Ecology Specialist |
| 2. | Yves Bergeron | UNBC | Ecology Specialist |
| 3. | John Pousette | UNBC | Resource Analysis |
| 4. | Gilbert Proulx | Consultant | Wildlife Biologist |
| 5. | Susan Stevenson | Consultant | Lichen Specialist |
| 6. | Megan Messenger | MSRM | Land Use Specialist |
| 7. | Liz Williams | MSRM | Ecosystem Conservation Specialist |
| 8. | Doug Steventon | MoF | Wildlife Habitat Biologist |
| 9. | Craig Robinson | Consultant | Resource Analyst |
| 10. | Dave Jewesson | The Pas Lumber Co | Planning Forester |
| 11. | Annette Constabel | Canfor | Planning Forester |
| 12. | Daryl Bokvist | Slocan | Planning Forester |
| 13. | Jennifer Pollard | MSRM | GIS Analyst |
| 14. | Phil Burton | Natural Resources Canada | Landscape Ecology Specialist |
| 15. | Cecil Gray | Lakeland Mills | Planning Forester |
| 16. | Al Wiensczyk | FORREX | Extension |
| 17. | Marvin George | | First Nations |
| 18. | Ryan Bichon | McLeod Lake | First Nations |
| 19. | Keinan Cardy | McLeod Lake | First Nations |
| 20. | Jennifer Lecuyer | West Fraser | Forest Planner |
| 21. | Stuart Parker | West Fraser | Forest Planner |
| 22. | Craig DeLong | MOF | Regional Ecologist |
| 23. | Heather Cullen | MSRM | Planner |
| 24. | Dan Adamson | MSRM | Planner |
| 25. | Traci Leys-Schirok | MSRM | Planner |
| 26. | Jaime Hilbert | MSRM | UNBC Interm |
| 27. | Alex Ostapiuk | MSRM | First Nation Specialist |
| 28. | Mark Imus | MSRM | IAMC Manager |
| 29. | Shannon Carson | MSRM | |
| 30. | Robin Hoffos | MSRM | Section Head Planning Specialists |
| 31. | Bob Brade | WLAP | Wildlife Stewardship |
| 32. | Dale Seip | MOF | Regional Wildlife Biologist |
| 33. | Bruce Middleton | BC Timber Sales | Planning Forester |
| 34. | Sam Campese | MOF | Operations Manager |
| 35. | Steve Dodds | BC Timber Sales | Planning Forester |

# Appendix 4 ~ Public Review and Comment Process

## APPENDIX 5:OLD FOREST RETENTION TABLES (BASED ON SCENARIO 13 RESULTS)

### Vanderhoof Old Forest District Requirements

| Unit Label | Natural Disturbance Unit (NDU) | Biogeoclimatic Units (BECs) | % Old Forest Retention of CFLB* | **Total Area of CFLB to be Retained (ha) |
|---|---|---|---|---|
| D1 | Moist Interior - Mountain | ESSF mv1, ESSF mvp1, ESSF xv1 | 29 | 40,423 |
| D2 | Moist Interior - Plateau | SPBS mc | 17 | 7,841 |
| D3 | Moist Interior - Plateau | SBS dk | 17 | 28,124 |
| D4 | Moist Interior - Plateau | SBS dw2 | 12 | 5,476 |
| D5 | Moist Interior - Plateau | SBS dw3 | 17 | 36,092 |
| D6 | Moist Interior - Plateau | SBS mc2, MS xv | 12 | 28,306 |
| D7 | Moist Interior - Plateau | SBS mc3 | 12 | 25,037 |
| **TOTAL** | | | | **171,299** |

****Crown Forested Landbase** (CFLB) is defined as all land that is not privately owned or in some form of private tenure (i.e woodlots, Tree Fram Licenses (TFL's)) or non-commercial or non-productive (i.e alpine). CFLB is not a static number and is subject to change over time.

## Fort St. James Old Forest Requirements

| Unit Label | Natural Disturbance Unit (NDU) | Merged Biogeoclimatic Units (BECs) | % Old Forest Retention of CFLB* | **Total Area of Old Forest to be retained (ha) |
|---|---|---|---|---|
| E1 | Moist Interior Mountain | ESSF mv1, ESSF mvp1, ESSF mv3 | 41 | 9,353 |
| E2 | Moist Interior Plateau | SBS dk | 17 | 4,648 |
| E3 | Moist Interior Plateau | SBS mc2 | 17 | 11,279 |
| E4 | Moist Interior Plateau | SBS mk1, SBS wk3, | 12 | 20,832 |
| E5 | Moist Interior - Plateau | SBS dw3 | 12 | 25,803 |
| E6 | Northern Boreal Mountains | ESSF wvp, ESSF mcp, ESSF mc, ESSF wv | 37 | 49,611 |
| E7 | Northern Boreal Mountains | SWB mks, SWB mk | 37 | 13,924 |
| E8 | Northern Boreal Mountains | SBS mc 2 | 26 | 9,105 |
| E9 | Omineca - Mountain | ESSF wvp, ESSF wv, ESSF mcp | 58 | 15,911 |
| E10 | Omineca - Mountain | SWB mks, SWB mk, ESSF mc | 41 | 32,456 |
| E11 | Omineca - Mountain | ESSF mvp3, ESSF mv3 | 41 | 180,559 |
| E12 | Omineca – Valley (low elevation) | SBS dk, SBS dw3 | 16 | 1,556 |
| E13 | Omineca – Valley (low elevation) | ICH mc1 | 23 | 2,797 |
| E14 | Omineca – Valley (low elevation) | BWBS dk1 | 16 | 10,111 |
| E15 | Omineca – Valley (low elevation) | SBS mc2 | 16 | 15,906 |
| E16 | Omineca – Valley (low elevation) | SBS mk1 | 16 | 40,048 |
| E17 | Omineca – Valley (low elevation) | SBS wk3 | 16 | 55,220 |
| **TOTAL** | | | | 499,119 |

****Crown Forested Landbase** (CFLB) is defined as all land that is not privately owned or in some form of private tenure (i.e woodlots, Tree Fram Licenses (TFL's)) or non-commercial or non-productive (i.e alpine). CFLB is not a static number and is subject to change over time.

## Prince George District Old Forest Requirements

| Unit Label | Natural Disturbance Unit (NDU) | Merged Biogeoclimatic Units (BECs) | % Old Forest Retention of CFLB* | Total Area of Old Forest to be retained (ha) |
|---|---|---|---|---|
| A1 | Boreal Foothills - Mountain | ESSF wcp3, ESSF wc3, ESSF mvp2, ESSF mv2 | *33* | *2,392* |
| A2 | McGregor Plateau | EESF wc3, ESSF wk2, ESSF wk1 | 26 | 2,581 |
| A3 | McGregor Plateau | SBS mk1, SBS mh | 18 | 12,649 |
| A4 | McGregor Plateau | SBS wk 1, SBS vk | 26 | 55,912 |
| A5 | Moist Interior - Mountain, Omineca - Mountain | ESSF wk2, ESSF mv3, ESSF mv1, ESSF mv3 | 29 | 3,430 |
| A6 | Moist Interior - Mountain | ESSF wk1 | 29 | 4,726 |
| A7 | Moist Interior - Plateau | SBS mh | 17 | 1,010 |
| A8 | Moist Interior - Plateau | SBS mc3, SBS mc2 | 12 | 1,078 |
| A9 | Moist Interior - Plateau | SBS mw | 12 | 3,958 |
| A10 | Moist Interior - Plateau | SBS wk1 | 17 | 6,539 |
| A11 | Moist Interior - Plateau | SBS dw2, SBS dw1 | 12 | 15,254 |
| A12 | Moist Interior - Plateau | SBS dw3 | 12 | 21,249 |
| A13 | Moist Interior - Plateau, Omineca - Mountain | SBS mk1 | 12 | 43,845 |
| A14 | Wet Mountain | ESSF mvp2, ESSF wcp3, ESSF mv2, ESSF wk2 | 50 | 76,733 |
| A15 | Wet Mountain | ESSF wc3 | 84 | 23,487 |
| A16 | Wet Mountain | SBS wk1 | 26 | 8,747 |
| A17 | Wet Mountain | SBS vk | 50 | 56,760 |
| A18 | Wet Trench – Mtn. | ESSF wcp3 | 80 | 27,453 |
| A19 | Wet Trench - Mountain | ESSF wcp3, ESSF mm1, ESSF mmp1, ESSF mvp2, ESSF mv2, ESSF wk2 | 48 | 31,091 |
| A20 | Wet Trench – Mtn. | ESSF wc3 | 80 | 78,589 |
| A21 | Wet Trench – Mtn. | ESSF wk1 | 48 | 54,370 |
| A22 | Wet Trench - Valley | ICH wk3 | 53 | 14,249 |
| A23 | Wet Trench - Valley | ICH vk2 | 53 | 76,598 |
| A24 | Wet Trench - Valley | SBS wk1, SBS mw, SBS mk1 | 30 | 38,574 |
| A25 | Wet Trench - Valley | SBS vk | 46 | 69,029 |
| **TOTAL** | | | | **730,303** |

# APPENDIX 6: Interior Forest Condition Area Targets

## Vanderhoof Forest District Interior Forest Retention Requirements

| Unit Label | Natural Disturbance Unit (NDU) | Merged Biogeoclimatic Units (BECs) | Minimum % Interior Forest of Old Forest Retention | Area of Interior Forest Retention (ha) |
|---|---|---|---|---|
| D1 | Moist Interior - Mountain | ESSF mv1, ESSF mvp1, ESSF xv1 | 40 % | 16,373 ha |
| D2 | Moist Interior - Plateau | SPBS mc | 25 % | 1,960 ha |
| D3 | Moist Interior - Plateau | SBS dk | 10 % | 2812 ha |
| D4 | Moist Interior - Plateau | SBS dw2 | 25 % | 1369 ha |
| D5 | Moist Interior - Plateau | SBS dw3 | 10 % | 3609 ha |
| D6 | Moist Interior - Plateau | SBS mc2, MS xv | 25 % | 7076 ha |
| D7 | Moist Interior - Plateau | SBS mc3 | 25 % | 6259 ha |

## Fort St. James District Interior Forest Retention Requirements

| Unit Label | Natural Disturbance Unit (NDU) | Biogeoclimatic Units (BECs) | Minimum % Interior Forest of Old Forest Retention | Area of Interior Forest Retention (ha) |
|---|---|---|---|---|
| E1 | Moist Interior Mountain | ESSF mv1, ESSF mvp1, ESSF mv3 | 40 % | 3741 ha |
| E2 | Moist Interior Plateau | SBS dk | 10 % | 465 ha |
| E3 | Moist Interior Plateau | SBS mc2 | 10 % | 1128 ha |
| E4 | Moist Interior Plateau | SBS mk1, SBS wk3, | 25 % | 5208 ha |
| E5 | Moist Interior - Plateau | SBS dw3 | 25 % | 6451 ha |
| E6 | Northern Boreal Mountains | ESSF wvp, ESSF mcp, ESSF mc, ESSF wv | 40 % | 19,844 ha |
| E7 | Northern Boreal Mountains | SWB mks, SWB mk | 40 % | 5570 ha |
| E8 | Northern Boreal Mountains | SBS mc 2 | 25 % | 2276 ha |
| E9 | Omineca - Mountain | ESSF wvp, ESSF wv, ESSF mcp | 40 % | 6364 ha |
| E10 | Omineca - Mountain | SWB mks, SWB mk, ESSF mc | 40 % | 12,982 ha |
| E11 | Omineca - Mountain | ESSF mvp3, ESSF mv3 | 40 % | 72,224 ha |
| E12 | Omineca - Valley | SBS dk, SBS dw3 | 25 % | 389 ha |
| E13 | Omineca - Valley | ICH mc1 | 40 % | 1119 ha |
| E14 | Omineca - Valley | BWBS dk1 | 25 % | 2528 ha |
| E15 | Omineca - Valley | SBS mc2 | 25 % | 3977 ha |
| E16 | Omineca - Valley | SBS mk1 | 25 % | 10,012 ha |
| E17 | Omineca - Valley | SBS wk3 | 25 % | 13,805 ha |

## Prince George Forest District Interior Forest Retention Requirements

| Unit Label | Natural Disturbance Unit (NDU) | Biogeoclimatic Units (BECs) | Minimum % Interior Forest of Old Forest Retention | Area of Interior Forest Retention (ha) |
|---|---|---|---|---|
| A1 | Boreal Foothills - Mountain | ESSF wcp3, ESSF wc3, ESSF mvp2, ESSF mv2 | 40 % | 667 ha |
| A2 | McGregor Plateau | EESF wc3, ESSF wk2, ESSF wk1 | 40 % | 1033 ha |
| A3 | McGregor Plateau | SBS mk1, SBS mh | 25 % | 3162 ha |
| A4 | McGregor Plateau | SBS wk 1, SBS vk | 10 % | 5591 ha |
| A5 | Moist Interior - Mountain, Omineca - Mountain | ESSF wk2, ESSF mv3, ESSF mv1, ESSF mv3 | 40 % | 1372 ha |
| A6 | Moist Interior - Mountain | ESSF wk1 | 40 % | 1890 ha |
| A7 | Moist Interior - Plateau | SBS mh | 10 % | 101 ha |
| A8 | Moist Interior - Plateau | SBS mc3, SBS mc2 | 25 % | 270 ha |
| A9 | Moist Interior - Plateau | SBS mw | 10 % | 561 ha |
| A10 | Moist Interior - Plateau | SBS wk1 | 25 % | 1635 ha |
| A11 | Moist Interior - Plateau | SBS dw2, SBS dw1 | 25 % | 3813 ha |
| A12 | Moist Interior - Plateau | SBS dw3 | 10 % | 3010 ha |
| A13 | Moist Interior - Plateau, Omineca - Mountain | SBS mk1 | 25 % | 10,961 ha |
| A14 | Wet Mountain | ESSF mvp2, ESSF wcp3, ESSF mv2, ESSF wk2 | 40 % | 30,693 ha |
| A15 | Wet Mountain | ESSF wc3 | 40 % | tbc |
| A16 | Wet Mountain | SBS wk1 | 25 % | 2187 ha |
| A17 | Wet Mountain | SBS vk | 25 % | 14,190 ha |
| A18 | Wet Trench – Mountain | ESSF wcp3 | 40 % | tbc |
| A19 | Wet Trench - Mountain | ESSF wcp3, ESSF mm1, ESSF mmp1, ESSF mvp2, ESSF mv2, ESSF wk2 | 40 % | 12,436 ha |
| A20 | Wet Trench - Mountain | ESSF wc3 | 40 % | 31,436 ha |
| A21 | Wet Trench - Mountain | ESSF wk1 | 40 % | 21,748 ha |
| A22 | Wet Trench - Valley | ICH wk3 | 40 % | tbc |
| A23 | Wet Trench - Valley | ICH vk2 | 40 % | 30,639 ha |
| A24 | Wet Trench - Valley | SBS wk1, SBS mw, SBS mk1 | 10 % | 3857 ha |
| A25 | Wet Trench - Valley | SBS vk | 25 % | 19,884 ha |

# APPENIDX 7

## Summary of Scenarios and Iterations to the Natural Range of Variability (old growth retention levels) in each Natural Disturbance Unit for PG TSA

| Scenario | Analysis Units | Analysis questions and assumptions | Biodiversity impacts (current state of old forest as compared to NRV %) | Timber Supply Impacts:<br>• Short term(0 to 70 yrs)<br>• Long term (100 to 250 yrs) |
|---|---|---|---|---|
| **1 ~ No administrative boundaries** | NDU subunit:<br>• no district boundaries<br>• no BEC's | **What is the current state of the old forest in NDU's only?**<br>• Modelling assumptions consistent with TSR II (as per biodiversity guidebook for old forest retention) | 4 NDU's below minimum NRV | No timber supply impacts<br>• 0%<br>• 0% |
| **2 ~ Current state of old forest in each BEC and NDU** | NDU subunit with BEC zones:<br>• no district boundaries | **What is the current state of old forest in NDU's and BEC?**<br>• Modelling assumptions consistent with TSR II (as per biodiversity guidebook for old forest retention) | 11 NDU/BEC combinations below minimum NRV | No timber supply impacts<br>• 0%<br>• 0% |
| **3 ~ Current state of old forests in specific watersheds** | NDU subunits with BEC zones and Landscape Unit's (LU's) in the Wet Mtn and Wet Trench only<br>• no district boundaries | **What is the current state of old forest in certain NDU's, BEC's and LU combinations?**<br>• Modelling assumptions consistent with TSR II (as per biodiversity guidebook for old forest retention) | Most NDU/LU/BEC combination in the Wet Mtn and Wet Trench NDU's do not meet minimum NRV in short term, but does in the long term | No timber supply impacts<br>• 0%<br>• 0% |
| **4 ~ Timber Supply Impact of minimum NRV with no ecological or administrative boundaries** | NDU subunit:<br>• no district boundaries<br>• no BEC's | **What is the timber supply impact by applying the minimum NRV in all NDU's?**<br>• TSR II biodiversity guidebook assumptions for old forest retention are replaced with minimum NRV | 1 NDU does not meet minimum NRV until 120 yrs | Significant timber supply impacts in the long term:<br>• 1% immediate reduction<br>• 17% long term reductions |

| Scenario | Analysis Units | Analysis questions and assumptions | Biodiversity impacts (current state of old forest as compared to NRV %) | Timber Supply Impacts:<br>• Short term(0 to 70 yrs)<br>• Long term (100 to 250 yrs) |
|---|---|---|---|---|
| **5 ~ Iteration to the % retention of the old NRV** | NDU subunit with BEC zones and district boundaries | **What is the timber supply impact if the minimum NRV in certain/specific high risk areas is reduced and minimum NRV is maintained everywhere else?**<br>• TSR II biodiversity guidebook assumptions for old forest retention are replaced with minimum NRV | 1 NDU/BEC does not meet minimum NRV until 120 years | Timber supply impacts:<br>• 1% immediate reduction<br>• 9% long term reductions |
| **6 ~ Ecological Emphasis for NRV** | NDU subunit with BEC zones and district boundaries | **What is the timber supply impact if high risk areas are modelled to 70% of the NRV, with minimum NRV maintained everywhere else (low risk areas)?**<br>• TSR II biodiversity guidebook assumptions for old forest retention are replaced with minimum NRV | Some short term problems but eventually all NDU/BEC units meet NRV target | Timber supply impacts in long term:<br>• 0%<br>• 4% |
| **7 ~ Timber Harvesting Emphasis, maximum reduction to % NRV retention** | NDU subunit with BEC zones and district boundaries | **What is the timber supply impact if high risk areas are modelled to 30% of the NRV, with minimum NRV maintained everywhere else (low risk areas)?**<br>• TSR II biodiversity guidebook assumptions for old forest retention are replaced with minimum NRV | This results in some NDU/BEC units below the old forest constraints identified in the Biodiversity Guidebook | There is no timber supply impact:<br>• additional harvesting opportunity (1%) is provided in short term |
| | | | | |

| Scenario | Analysis Units | Analysis questions and assumptions | Biodiversity impacts (current state of old forest as compared to NRV %) | Timber Supply Impacts:<br>• Short term(0 to 70 yrs)<br>• Long term (100 to 250 yrs) |
|---|---|---|---|---|
| | | | | |
| **8 ~ Current state of old growth forest with merged BEC's** | NDU subunits, with specific BEC zones merged (lumped), and district boundaries | **What is the current state of the old forest in merged NDU's and BEC zones (benchmark)?**<br>• Modelling assumptions consistent with TSR II (as per biodiversity guidebook for old forest retention)<br>• Some changes to the Crown Forested Landbase (removal of Tree Farm Licenses and Treaty 8 lands) | 4 NDU's below minimum NRV | No timber supply impacts<br>• 0%<br>• 0% |
| **9~ Iteration to the % retention of the old NRV in merged BEC's** | NDU subunits, with specific BEC zones merged (lumped), and district boundaries | **What is the timber supply impact if high and moderate risk areas are modelled to 70%, 60% and 42% of the NRV, with minimum NRV maintained everywhere else (low risk areas)?** | All NDU/BEC units meet revised NRV target | There is no timber supply impact until:<br>• year 40 with a 0.5% decrease<br>• year 70 a 3.7% decrease |
| **10 ~Iteration to the % retention of the old NRV in merged BEC's** | NDU subunits, with specific BEC zones merged (lumped), and district boundaries | **What is the timber supply impact if high, moderate and low risk areas are modelled to 70%, 60% and 42% of the NRV, with minimum NRV maintained everywhere else (low risk areas)?**<br>• TSR II biodiversity guidebook assumptions for old forest retention are replaced with minimum NRV | All NDU/BEC units meet revised NRV target | Same timber supply implications as Scenario 9 |

| Scenario | Analysis Units | Analysis questions and assumptions | Biodiversity impacts (current state of old forest as compared to NRV %) | Timber Supply Impacts:<br>• Short term(0 to 70 yrs)<br>• Long term (100 to 250 yrs) |
|---|---|---|---|---|
| | | | | |
| **11 ~ Iteration to the % retention of the old NRV in merged BEC's** | NDU subunits, with specific BEC zones merged (lumped), and district boundaries | **What is the timber supply impact if high and moderate risk areas are modelled to 70%, 60%, 50% and 42% of the NRV, with minimum NRV maintained everywhere else (low risk areas)?**<br>• TSR II biodiversity guidebook assumptions for old forest retention are replaced with minimum NRV | All NDU/BEC units meet revised NRV target | Minor timber supply impact in long term:<br>• 0%<br>• 1% |
| **12 ~ Provincial Old Growth Requirements as per the Forest Range and Practices Act (FRPA)** | Landscape Units in each district | **What is the timber supply impact of implementing assigned Biodiversity Emphasis for each Landscape Unit?**<br>• Modelling assumptions consistent with TSR II (as per biodiversity guidebook for old forest retention) | Not applicable | No timber supply impacts:<br>• 0%<br>• 0% |
| **13 ~ Balanced Option** | NDU subunits, with specific BEC zones merged (lumped), and district boundaries | **What is the timber supply impact if high and moderate risk areas are modelled to 70% and 60%, of the NRV, with minimum NRV maintained everywhere else (low risk areas)?**<br>TSR II biodiversity guidebook assumptions for old forest retention are replaced with minimum NRV | All NDU/BEC units meet revised NRV target | No immediate timber supply impacts:<br>• 0%<br>• 1.4% decrease at year 70 |

- High risk areas are defined as those NDU/BEC variants that do not meet minimum NRV over time
- Low risk areas are defined as those NDU/BEC variants that always meet minimum NRV.

## Appendix 9 -Old Growth Targets and Current Landbase Condition for each NDU/NDU sub-unit/merged Bec

| *Vanderhoof District* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LumpedNDU | BEC | Total Gross Area (all Ages) | Gross Area (ha) > 140 yrs | Total CFLB for all Ages | Old Growth Target (%) | Old Growth Target (ha) | Amount of Old Met in NC (ha) | Amount of Old Growth Target required from THLB (ha) | Recruitment Required (ha) | Total CFLB Available between 120 and 140 yrs | Total THLB >. 140 Yrs (ha) | Total NCLB >. 140 Yrs (ha) | Total CFLB > 140 yrs (ha) | Total THLB between 120 and 139 yrs | Total NCLB between 120 and 139 yrs |
| D1 Moist Interior - Mountain ESSFmv 1 | ESSFmv 1 | 148,583 | 64,658 | 139,411 | 28.7% | 40,011 | 21,065 | 18,945 | - | 18,027 | 41,433 | 21,065 | 62,499 | 13,434 | 4,592 |
| D1 Moist Interior - Mountain ESSFmv 1 | ESSFmvp1 | 3,134 | 1,094 | 360 | 28.7% | 103 | 103 | - | - | - | 21 | 241 | 262 | - | - |
| D1 Moist Interior - Mountain ESSFmv 1 | ESSFxv 1 | 1,397 | 1,218 | 1,394 | 28.7% | 400 | 400 | - | - | 115 | 708 | 508 | 1,216 | 108 | 7 |
| D2 Moist Interior - Plateau SBPSmc | SBPSmc | 55,858 | 13,838 | 46,128 | 17.0% | 7,842 | 7,842 | - | - | 6,027 | 4,641 | 8,710 | 13,350 | 1,987 | 4,040 |
| D3 Moist Interior - Plateau SBS dk | SBS dk | 281,571 | 36,262 | 165,506 | 17.0% | 28,136 | 9,257 | 18,879 | 9,622 | 33,853 | 23,667 | 9,257 | 32,924 | 24,419 | 9,434 |
| D4 Moist Interior - Plateau SBS dw 2 | SBS dw 2 | 55,229 | 6,091 | 45,638 | 11.9% | 5,431 | 2,118 | 3,313 | 1,195 | 10,767 | 3,137 | 2,118 | 5,256 | 7,369 | 3,398 |
| D5 Moist Interior - Plateau SBS dw 3 | SBS dw 3 | 341,941 | 29,044 | 212,343 | 17.0% | 36,098 | 6,283 | 29,815 | 23,532 | 47,635 | 19,647 | 6,283 | 25,930 | 37,435 | 10,200 |
| D6 Moist Interior - Plateau SBS mc 2 | MS xv | 3,824 | 2,554 | 3,806 | 11.9% | 453 | 361 | 92 | - | 250 | 2,186 | 361 | 2,548 | 200 | 50 |
| D6 Moist Interior - Plateau SBS mc 2 | SBS mc 2 | 245,940 | 55,749 | 232,097 | 11.9% | 27,619 | 11,424 | 16,196 | 4,772 | 46,130 | 43,086 | 11,424 | 54,510 | 35,539 | 10,591 |
| D7 Moist Interior - Plateau SBS mc 3 | SBS mc 3 | 238,602 | 56,377 | 208,665 | 11.9% | 24,831 | 12,995 | 11,836 | - | 26,975 | 38,624 | 12,995 | 51,619 | 20,931 | 6,045 |
| | | | | | | | | | | | | | | | |
| **TOTAL** | | **1,376,077** | **266,883** | **1,055,347** | | **170,925** | **71,849** | **99,076** | **39,120** | **189,779** | **177,151** | **72,962** | **250,113** | **141,422** | **48,357** |

## Appendix 9 -Old Growth Targets and Current Landbase Condition for each NDU/NDU sub-unit/merged Bec

| *Ft St James District* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LumpedNDU | BEC | Total Gross Area (all Ages) | Gross Area (ha) > 140 yrs | Total CFLB for all Ages | Old Growth Target (%) | Old Growth Target (ha) | Amount of Old Met in NC (ha) | Amount of Old Growth Target required from THLB (ha) | Recruitment Required (ha) | Total CFLB Available between 120 and 140 yrs | Total THLB >. 140 Yrs (ha) | Total NCLB >. 140 Yrs (ha) | Total CFLB > 140 yrs (ha) | Total THLB between 120 and 139 yrs | Total NCLB between 120 and 139 yrs |
| E1 Moist Interior - Mountain ESSFmv 1 | ESSFmv 1 | 21,187 | 8,872 | 20,244 | 41.0% | 8,300 | 5,020 | 3,280 | - | 4,094 | 3,747 | 5,020 | 8,767 | 2,129 | 1,965 |
| E1 Moist Interior - Mountain ESSFmv 1 | ESSFmv 3 | 2,796 | 611 | 2,527 | 41.0% | 1,036 | 122 | 914 | 793 | 802 | 430 | 122 | 552 | 442 | 360 |
| E1 Moist Interior - Mountain ESSFmv 1 | ESSFmvp1 | 333 | 85 | 43 | 41.0% | 18 | 13 | 4 | - | 30 | - | 13 | 13 | 26 | 4 |
| E10 Omineca - Mountain ESSFmc | ESSFmc | 118,097 | 71,948 | 71,457 | 40.6% | 29,012 | 29,012 | - | - | 2,489 | 26,436 | 35,152 | 61,588 | 821 | 1,668 |
| E10 Omineca - Mountain ESSFmc | SWB mk | 9,473 | 5,408 | 7,704 | 40.6% | 3,128 | 3,075 | 53 | - | 636 | 1,947 | 3,075 | 5,022 | 202 | 435 |
| E10 Omineca - Mountain ESSFmc | SWB mks | 6,173 | 941 | 687 | 41.0% | 282 | 282 | - | - | 1 | 23 | 434 | 458 | - | 1 |
| E11 Omineca - Mountain ESSFmv 3 | ESSFmv 3 | 534,409 | 320,223 | 435,259 | 40.6% | 176,715 | 121,374 | 55,341 | - | 28,050 | 175,158 | 121,374 | 296,531 | 16,291 | 11,759 |
| E11 Omineca - Mountain ESSFmv 3 | ESSFmvp3 | 102,526 | 11,805 | 5,134 | 40.6% | 2,084 | 2,084 | - | - | 209 | 990 | 3,511 | 4,501 | 25 | 184 |
| E12 Omineca - Valley SBS dk | SBS dk | 6,271 | 1,068 | 4,862 | 16.1% | 783 | 410 | 373 | - | 1,894 | 593 | 410 | 1,003 | 1,233 | 661 |
| E12 Omineca - Valley SBS dk | SBS dw 3 | 6,547 | 2,737 | 4,862 | 16.1% | 783 | 309 | 474 | 165 | 31 | 2,106 | 309 | 2,415 | 14 | 17 |
| E13 Omineca - Valley ICH mc 1 | ICH mc 1 | 14,992 | 11,186 | 12,161 | 23.0% | 2,797 | 2,797 | - | - | 219 | 6,066 | 5,020 | 11,086 | 64 | 155 |
| E14 Omineca - Valley BWBSdk 1 | BWBSdk 1 | 68,670 | 32,090 | 63,193 | 16.1% | 10,174 | 5,637 | 4,537 | - | 10,463 | 25,552 | 5,637 | 31,189 | 8,346 | 2,117 |
| E15 Omineca - Valley SBS mc 2 | SBS mc 2 | 111,156 | 66,279 | 99,414 | 16.1% | 16,006 | 16,006 | - | - | 9,586 | 39,443 | 26,305 | 65,748 | 5,767 | 3,819 |
| E16 Omineca - Valley SBS mk 1 | SBS mk 1 | 297,960 | 68,689 | 250,301 | 16.1% | 40,299 | 11,162 | 29,136 | 17,974 | 26,330 | 53,928 | 11,162 | 65,090 | 21,157 | 5,173 |
| E17 Omineca - Valley SBS wk 3 | SBS wk 3 | 392,422 | 145,985 | 345,136 | 16.1% | 55,567 | 23,556 | 32,011 | 8,456 | 54,032 | 115,448 | 23,556 | 139,004 | 42,447 | 11,585 |
| E2 Moist Interior - Plateau SBS dk | SBS dk | 37,656 | 6,161 | 27,465 | 17.0% | 4,669 | 2,088 | 2,581 | 494 | 9,103 | 3,450 | 2,088 | 5,538 | 4,264 | 4,839 |
| E3 Moist Interior - Plateau SBS mc 2 | SBS mc 2 | 73,816 | 22,996 | 66,432 | 17.0% | 11,293 | 8,233 | 3,060 | - | 10,633 | 14,095 | 8,233 | 22,328 | 6,548 | 4,085 |
| E4 Moist Interior - Plateau SBS mk 1 | SBS mk 1 | 202,967 | 34,236 | 170,739 | 11.9% | 20,318 | 3,966 | 16,352 | 12,385 | 30,924 | 28,136 | 3,966 | 32,102 | 26,392 | 4,533 |
| E4 Moist Interior - Plateau SBS mk 1 | SBS wk 3 | 3,772 | 408 | 2,832 | 11.9% | 337 | 44 | 293 | 250 | 754 | 157 | 44 | 201 | 650 | 104 |
| E4 Moist Interior - Plateau SBS mk 1 | SBS wk 3a | 36 | 20 | 26 | 11.9% | 3 | 3 | - | - | 3 | - | 10 | 10 | - | 3 |
| E5 Moist Interior - Plateau SBS dw 3 | SBS dw 3 | 292,551 | 50,249 | 215,088 | 11.9% | 25,595 | 10,378 | 15,218 | 4,840 | 63,358 | 32,066 | 10,378 | 42,444 | 44,080 | 19,279 |
| E6 Northern Boreal Mountains ESSFmc | ESSFmc | 249,515 | 159,208 | 128,585 | 37.0% | 47,577 | 47,577 | - | - | 1,705 | 40,877 | 74,492 | 115,369 | 860 | 845 |
| E6 Northern Boreal Mountains ESSFmc | ESSFmcp | 78,107 | 3,227 | 623 | 37.0% | 231 | 231 | - | - | 4 | 54 | 558 | 612 | - | 4 |
| E6 Northern Boreal Mountains ESSFmc | ESSFwv | 7,982 | 5,070 | 1,390 | 37.0% | 514 | 514 | - | - | - | 569 | 807 | 1,376 | - | - |
| E7 Northern Boreal Mountains SWB mk | SWB mk | 53,711 | 32,744 | 35,561 | 37.0% | 13,158 | 13,158 | - | - | 2,903 | 10,750 | 17,835 | 28,585 | 1,051 | 1,851 |
| E7 Northern Boreal Mountains SWB mk | SWB mks | 26,240 | 4,623 | 2,072 | 37.0% | 767 | 767 | - | - | 247 | 269 | 1,402 | 1,671 | 12 | 234 |
| E8 Northern Boreal Mountains SBS mc 2 | SBS mc 2 | 41,254 | 28,732 | 35,019 | 25.9% | 9,070 | 8,357 | 713 | - | 97 | 19,867 | 8,357 | 28,224 | 55 | 42 |
| E9 Omineca - Mountain ESSFwv | ESSFmcp | 28,282 | 668 | 154 | 58.0% | 89 | 89 | - | - | 12 | 24 | 105 | 129 | - | 12 |
| E9 Omineca - Mountain ESSFwv | ESSFwv | 52,385 | 31,077 | 27,413 | 58.0% | 15,900 | 15,900 | - | - | 252 | 8,966 | 17,067 | 26,034 | 48 | 204 |
| E9 Omineca - Mountain ESSFwv | ESSFwvp | 9,360 | 90 | 20 | 58.0% | 12 | 12 | - | - | - | 0 | 20 | 20 | - | - |
| | | | | | | | | | | | | | | | |
| **TOTAL** | | **2,850,646** | **1,127,434** | **2,036,404** | | **496,514** | **332,172** | **164,342** | **45,355** | **258,861** | **611,148** | **386,462** | **997,609** | **182,923** | **75,937** |

## Appendix 9 -Old Growth Targets and Current Landbase Condition for each NDU/NDU sub-unit/merged Bec

| Prince George District | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LumpedNDU | BEC | Total Gross Area (all Ages) | Gross Area (ha) > 140 yrs | Total CFLB for all Ages | Old Growth Target (%) | Old Growth Target (ha) | Amount of Old Met in NC (ha) | Amount of Old Growth Target required from THLB (ha) | Recruitment Required (ha) | Total CFLB Available between 120 and 140 yrs | Total THLB >. 140 Yrs (ha) | Total NCLB >. 140 Yrs (ha) | Total CFLB > 140 yrs (ha) | Total THLB between 120 and 139 yrs | Total NCLB between 120 and 139 yrs |
| A1 Boreal Foothills - Mountain ESSFmv 2 | ESSFmv 2 | 7,052 | 2,946 | 5,614 | 33.0% | 1,853 | 1,853 | - | - | 732 | - | 2,946 | 2,946 | - | 732 |
| A1 Boreal Foothills - Mountain ESSFmv 2 | ESSFmvp2 | 1,396 | 608 | 1,092 | 33.0% | 360 | 360 | - | - | 21 | - | 447 | 447 | - | 21 |
| A1 Boreal Foothills - Mountain ESSFmv 2 | ESSFwc 3 | 710 | 460 | 478 | 33.0% | 158 | 158 | - | - | - | - | 460 | 460 | - | - |
| A1 Boreal Foothills - Mountain ESSFmv 2 | ESSFwcp3 | 108 | 94 | 65 | 33.0% | 22 | 22 | - | - | - | - | 65 | 65 | - | - |
| A10 Moist Interior - Plateau SBS wk 1 | SBS wk 1 | 55,166 | 17,909 | 38,442 | 17.0% | 6,535 | 3,113 | 3,422 | 310 | 1,750 | 10,727 | 3,113 | 13,840 | 1,249 | 501 |
| A11 Moist Interior - Plateau SBS dw 2 | SBS dw 1 | 30,156 | 369 | 6,666 | 11.9% | 793 | 93 | 700 | 607 | 501 | 63 | 93 | 156 | 260 | 241 |
| A11 Moist Interior - Plateau SBS dw 2 | SBS dw 2 | 140,303 | 28,754 | 120,270 | 11.9% | 14,312 | 5,512 | 8,801 | 3,289 | 25,518 | 20,827 | 5,512 | 26,338 | 20,769 | 4,749 |
| A12 Moist Interior - Plateau SBS dw 3 | SBS dw 3 | 275,186 | 23,013 | 176,969 | 11.9% | 21,059 | 6,936 | 14,123 | 7,187 | 32,266 | 12,716 | 6,936 | 19,652 | 18,266 | 14,000 |
| A13 Omineca - Valley SBS mk 1 | SBS mk 1 | 515,636 | 94,536 | 365,342 | 11.9% | 43,476 | 22,362 | 21,114 | - | 36,489 | 66,019 | 22,362 | 88,381 | 22,215 | 14,274 |
| A14 Wet Mountain ESSFwk 2 | ESSFmv 2 | 1,458 | 933 | 855 | 50.0% | 427 | 427 | - | - | - | - | 809 | 809 | - | - |
| A14 Wet Mountain ESSFwk 2 | ESSFmvp2 | 420 | 46 | 26 | 50.0% | 13 | 2 | 12 | 10 | 2 | - | 2 | 2 | - | 2 |
| A14 Wet Mountain ESSFwk 2 | ESSFwcp3 | 42,018 | 605 | 76 | 50.0% | 38 | 38 | - | - | 3 | - | 60 | 60 | - | 3 |
| A14 Wet Mountain ESSFwk 2 | ESSFwk 2 | 191,240 | 139,293 | 152,611 | 50.0% | 76,306 | 76,306 | - | - | 4,155 | 17,817 | 113,926 | 131,743 | 433 | 3,722 |
| A15 Wet Mountain ESSFwc 3 | ESSFwc 3 | 87,858 | 36,020 | 27,961 | 84.0% | 23,488 | 23,488 | - | - | 1,404 | 81 | 24,219 | 24,299 | 4 | 1,401 |
| A16 Wet Mountain SBS wk 1 | SBS wk 1 | 40,388 | 14,232 | 33,535 | 26.0% | 8,719 | 5,419 | 3,300 | - | 2,111 | 8,420 | 5,419 | 13,840 | 1,395 | 716 |
| A17 Wet Mountain SBS vk | SBS vk | 137,089 | 87,259 | 113,514 | 50.0% | 56,757 | 41,506 | 15,251 | - | 3,666 | 40,380 | 41,506 | 81,886 | 1,572 | 2,095 |
| A18 Wet Trench - Mountain Eswcp | ESSFwcp3 | 153,963 | 50,147 | 34,316 | 80.0% | 27,453 | 27,453 | - | - | 492 | 1,404 | 30,638 | 32,042 | 24 | 468 |
| A19 Wet Trench - Mountain ESSFwk 2 | ESSFmm 1 | 1,891 | 1,689 | 1,664 | 48.0% | 799 | 799 | - | - | - | 2 | 1,631 | 1,633 | - | - |
| A19 Wet Trench - Mountain ESSFwk 2 | ESSFmmp1 | 1,829 | 1,117 | 818 | 48.0% | 393 | 393 | - | - | - | - | 794 | 794 | - | - |
| A19 Wet Trench - Mountain ESSFwk 2 | ESSFmv 2 | 3,535 | 2,657 | 2,758 | 48.0% | 1,324 | 1,324 | - | - | 63 | - | 2,628 | 2,628 | - | 63 |

| Prince George District | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LumpedNDU | BEC | Total Gross Area (all Ages) | Gross Area (ha) > 140 yrs | Total CFLB for all Ages | Old Growth Target (%) | Old Growth Target (ha) | Amount of Old Met in NC (ha) | Amount of Old Growth Target required from THLB (ha) | Recruitment Required (ha) | Total CFLB Available between 120 and 140 yrs | Total THLB >. 140 Yrs (ha) | Total NCLB >. 140 Yrs (ha) | Total CFLB > 140 yrs (ha) | Total THLB between 120 and 139 yrs | Total NCLB between 120 and 139 yrs |
| A19 Wet Trench - Mountain ESSFwk 2 | ESSFmvp2 | 829 | 434 | 359 | 48.0% | 172 | 172 | - | - | - | - | 354 | 354 | - | - |
| A19 Wet Trench - Mountain ESSFwk 2 | ESSFwk 2 | 79,772 | 53,171 | 59,173 | 48.0% | 28,403 | 28,403 | - | - | 823 | 12,920 | 37,002 | 49,921 | 272 | 551 |
| A2 McGregor Plateau ESSFwk 2 | ESSFwc 3 | 43 | 28 | 28 | 26.0% | 7 | 7 | - | - | - | - | 28 | 28 | - | - |
| A2 McGregor Plateau ESSFwk 2 | ESSFwk 1 | 340 | 103 | 327 | 26.0% | 85 | 47 | 38 | - | - | 56 | 47 | 102 | - | - |
| A2 McGregor Plateau ESSFwk 2 | ESSFwk 2 | 15,867 | 5,110 | 9,928 | 26.0% | 2,581 | 1,782 | 799 | - | 816 | 3,299 | 1,782 | 5,081 | 669 | 146 |
| A20 Wet Trench - Mountain ESSFwc 3 | ESSFwc 3 | 139,939 | 99,925 | 98,187 | 80.0% | 78,550 | 78,486 | 64 | - | 777 | 10,798 | 78,486 | 89,283 | 187 | 590 |
| A21 Wet Trench - Mountain ESSFwk 1 | ESSFwk 1 | 118,786 | 68,478 | 112,950 | 48.0% | 54,216 | 36,554 | 17,662 | - | 2,579 | 31,355 | 36,554 | 67,909 | 1,462 | 1,117 |
| A22 Wet Trench - Valley ICH wk 3 | ICH wk 3 | 29,620 | 19,418 | 26,780 | 53.0% | 14,193 | 6,534 | 7,659 | 1,125 | 1,071 | 12,301 | 6,534 | 18,835 | 791 | 280 |
| A23 Wet Trench - Valley ICH vk 2 | ICH vk 2 | 158,262 | 96,613 | 144,146 | 53.0% | 76,397 | 52,237 | 24,160 | - | 4,158 | 42,277 | 52,237 | 94,515 | 2,177 | 1,980 |
| A24 Wet Trench - Valley SBS wk 1 | SBS mk 1 | 693 | 115 | 648 | 30.0% | 194 | 36 | 159 | 123 | 183 | 78 | 36 | 114 | 159 | 24 |
| A24 Wet Trench - Valley SBS wk 1 | SBS wk 1 | 148,953 | 42,108 | 127,872 | 30.0% | 38,362 | 11,085 | 27,276 | 16,191 | 3,971 | 29,611 | 11,085 | 40,696 | 2,964 | 1,008 |
| A25 Wet Trench - Valley SBS vk | SBS vk | 188,851 | 77,990 | 149,884 | 45.6% | 68,347 | 36,434 | 31,913 | - | 4,375 | 37,071 | 36,434 | 73,505 | 1,974 | 2,401 |
| A3 McGregor Plateau SBS mk 1 | SBS mh | 1,075 | 104 | 177 | 18.1% | 32 | 32 | 0 | - | 35 | - | 32 | 32 | - | 35 |
| A3 McGregor Plateau SBS mk 1 | SBS mk 1 | 90,877 | 26,071 | 70,254 | 18.1% | 12,688 | 4,877 | 7,810 | 2,933 | 4,057 | 19,511 | 4,877 | 24,388 | 2,584 | 1,473 |
| A4 McGregor Plateau SBS wk 1 | SBS vk | 503 | 235 | 356 | 26.0% | 93 | 45 | 48 | 3 | 29 | 183 | 45 | 228 | 16 | 13 |
| A4 McGregor Plateau SBS wk 1 | SBS wk 1 | 281,519 | 74,105 | 215,003 | 26.0% | 55,901 | 17,772 | 38,129 | 20,357 | 10,526 | 49,712 | 17,772 | 67,484 | 8,053 | 2,473 |
| A5 Omineca - Mountain ESSFmv 3 | ESSFmv 1 | 7,757 | 4,178 | 7,501 | 28.7% | 2,153 | 484 | 1,669 | 1,185 | 1,210 | 3,665 | 484 | 4,149 | 1,049 | 161 |
| A5 Omineca - Mountain ESSFmv 3 | ESSFmv 3 | 5,501 | 1,795 | 4,325 | 28.7% | 1,241 | 365 | 876 | 511 | 585 | 1,419 | 365 | 1,784 | 375 | 209 |
| A5 Omineca - Mountain ESSFmv 3 | ESSFwk 2 | 987 | 10 | 471 | 28.7% | 135 | 3 | 132 | 128 | - | 6 | 3 | 10 | - | - |
| A6 Moist Interior - Mountain ESSFwk 1 | ESSFwk 1 | 16,922 | 8,534 | 16,163 | 28.7% | 4,639 | 2,152 | 2,487 | 336 | 1,747 | 6,317 | 2,152 | 8,469 | 986 | 761 |
| A7 Moist Interior - Plateau SBS mh | SBS mh | 22,065 | 1,271 | 5,940 | 17.0% | 1,010 | 767 | 243 | - | 823 | 221 | 767 | 988 | 87 | 736 |

| Prince George District | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LumpedNDU | BEC | Total Gross Area (all Ages) | Gross Area (ha) > 140 yrs | Total CFLB for all Ages | Old Growth Target (%) | Old Growth Target (ha) | Amount of Old Met in NC (ha) | Amount of Old Growth Target required from THLB (ha) | Recruitment Required (ha) | Total CFLB Available between 120 and 140 yrs | Total THLB >. 140 Yrs (ha) | Total NCLB >. 140 Yrs (ha) | Total CFLB > 140 yrs (ha) | Total THLB between 120 and 139 yrs | Total NCLB between 120 and 139 yrs |
| A8 Moist Interior - Plateau SBS mc 2 | SBS mc 2 | 6,719 | 2,865 | 6,542 | 11.9% | 779 | 320 | 458 | 138 | 683 | 2,521 | 320 | 2,842 | 607 | 76 |
| A8 Moist Interior - Plateau SBS mc 2 | SBS mc 3 | 2,733 | 944 | 2,443 | 11.9% | 291 | 142 | 149 | 8 | 577 | 636 | 142 | 777 | 512 | 65 |
| A9 Moist Interior - Plateau SBS mw | SBS mw | 48,850 | 4,469 | 32,986 | 11.9% | 3,925 | 776 | 3,149 | 2,373 | 3,313 | 3,369 | 776 | 4,146 | 2,691 | 622 |
| | | | | | | | | | | | | | | | |
| **TOTAL** | | **3,054,864** | **1,090,764** | **2,175,518** | | **728,678** | **497,074** | **231,604** | **56,812** | **151,513** | **445,781** | **551,878** | **997,659** | **93,802** | **57,711** |

# APPENIDX 10

## Prince George Timber Supply Area
## Landscape Biodiversity Objectives
## Reporting Protocol
## July 2005

The following reporting protocol has been discussed and agreed to by the members of the Landscape Objectives Working Group, made-up of

Forest Licensees and BC Timber Sales, as represented by:

- Canadian Forest Products Ltd. (PG and Vanderhoof Operations)
- BC Timber Sales (Vanderhoof, PG and Fort St. James)
- Carrier Lumber Ltd.
- Lakeland Mills Ltd.
- Winton Global
- Fraser Lake Sawmills
- L&M Lumber Ltd.

AND

BC Government, as represented by:

- Integrate Land Management Bureau, Northern Interior Region staff,
- Ministry of Forests and Range, Northern Interior Region's Ecologist, and Stewardship staff at the Prince George, Fort St. James and Vanderhoof forest Districts
- Ministry of Environment staff

The proposed reporting formats are indicated below. It is anticipate that these may be modified and made more explicit as the reporting protocol is implemented. The following products will be produced and provided for Summer 2005:

- map products at about 1:250,000 scale (paper copies, plot files)
- ArcInfo coverages (e.g. consolidated disturbance layer, Crown Forested Land Base, old and interior old forest layer)
- database (.mdb format and resultant similar to what is provided in Timber Supply Review database and Natural Range of Variability analysis for the Landscape Objectives Working Group database)
- tables (paper and .xls files)

The content of the above products are anticipated to contain information similar to the products produced during the LOWG development process. That is, maps would include operating areas, old growth management areas (where appropriate), areas where interior forest conditions are being met, young seral patches and recruitment areas (where appropriate). Tables would include the detailed numbers for how each of the objectives is met by each licensee and how each of the licensees roll-up to meet the objectives for the merged BEC units. The standards/methodology/assumptions used to generate each of the products will be provided.

A listing of all data sources for depletion information should be included (all replaceable forest licensees, non-replaceable forest licensees, salvage non-replaceable forest licensees contributing to the depletion data); this maybe the same as the signatories to the PG TSA Licensees / BC Timber Sales Memorandum of Understanding.

The products will be provided to Integrated Land Management Bureau who will share with other government agencies, as required. The information is considered to be public; however, the Forest Licensees will be provided opportunities to lead in sharing the information with other tenure holders, groups (Public Advisory Groups, Land and Resource Management Plan Tables, etc.) and other stakeholders.

## 1. Old Forest and Interior Old Forest:

In order to demonstrate old forest and interior old forest objectives are being achieved, the Forest Licensees and BC Timber Sales will provide to the BC Government the following information, at the times indicated in Table 1.

Table 1: Reporting for old forest and interior old forest objectives.

| Reporting out Date | reporting out items | | |
|---|---|---|---|
| | MAPS | TABLES | |
| Summer 2005 | Map of old and interior old for 2005 (all units) | Table of old and interior old for 2005 (all units) | Table of forecast of range of anticipated drawdown for 2010 of old and interior old (all units) |
| Summer 2006 | Map of old and interior old for 2006 (priority units) | Table of old and interior old for 2006 (priority units) | Table of forecast of range of anticipated drawdown for 2011 of old and interior old (priority units) |
| Summer 2007 | Map of old and interior old for 2007 (all units) | Table of old and interior old for 2007 (all units) | Table of forecast of range of anticipated drawdown for 2012 of old and interior old (priority units) |
| Summer 2008 | Map of old and interior old for 2008 (priority units) | Table of old and interior old for 2008 (priority units) | Table of forecast of range of anticipated drawdown for 2013 of old and interior old (priority units) |
| Summer 2009 | Map of old and interior old for 2009 (all units) | Table of old and interior old for 2009 (all units) | Table of forecast of range of anticipated drawdown for 2014 of old and interior old (priority units) |
| Summer 2010 | Map of old and interior old for 2010 (all units) | Table of old and interior old for 2010 (all units) | Table of forecast of range of anticipated drawdown for 2015 of old and interior old (all units) |

## 2. Young Forest Patch Size Distribution:

In order to demonstrate that the young forest patch size distribution objectives are being achieved the Forest Licensees will provide to the BC Government the following information at the times indicated in Table 2.

Table 2: Reporting for young forest patch size distribution objectives.

**Patch Size:**

| Reporting out Date | reporting out items | |
|---|---|---|
| Summer 2005 | Map of young patch size 2005 (all units) | Table of young patch size for 2005 (all units) |
| Summer 2010 | Map of young patch size for 2010 (all units) | Table of young patch size for 2010 (all units) |

A strategy will be developed by the Licensees Landscape Objective Working Group, to assist operational planners, working with the Forest Licensees and BCTS, to assess how new harvest block proposal will fit with existing young patch size distribution.

Adopted by Landscape Objectives Working Group:
This Reporting Protocol will be reviewed annually or as requested by either the Licensees / BC Timber Sales OR the BC Government.