Lakes Timber Supply Area

Sustainable Forest Management Plan

Morice & Lakes IFPA

Version 3.2
March 31, 2008

The Lakes Timber Supply Area
Sustainable Forest Management Plan

Prepared for:

Morice and Lakes Timber Supply Areas
Innovative Forest Practices Agreement

Prepared by:

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March 2008

The Board of Directors of Tweedsmuir Forest Limited and the Morice and Lakes IFPA General Manager are pleased to present the Lakes Timber Supply Area Sustainable Forest Management Plan.

Original signed by

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Foreword

Tweedsmuir Forest Ltd., a subsidiary company of licensees engaged in the **Morice and Lakes Timber Supply Areas Innovative Forest Practices Agreement** (M&L IFPA), is pleased to present *Version 3.1* of the *Sustainable Forest Management (SFM) Plan* for the Lakes Timber Supply Area (TSA).

Acknowledgements

Version 1.0 of the Lakes TSA SFM Plan completed in December 2002 represented the culmination of an enormous effort by dozens of individuals in preparation of the document. Tweedsmuir Forest Ltd. recognizes and values the substantial amount of public involvement that contributed to achieve these first steps towards a collaborative approach to SFM in the Lakes TSA. The tireless effort and personal time expended by public participants outside of formal meetings is gratefully acknowledged and sincerely appreciated.

Version 2.0 of the plan completed in 2004 required a great deal of effort and ingenuity on the part of the IFPA Technical Committee, Scenario Planning Team and the supporting consulting group led by Tesera Systems Inc. The substantial contributions of these lead groups along with, resource agency staff, employees of parent companies and others engaged in supporting committee work and subsequent tasks enabled Tweedsmuir Forest Ltd. to further develop the SFM Plan to a new level of sophistication.

Version 3.0 of the SFM plan was is the result of numerous analyses that tested the technical creativity of the IFPA Technical Committee and Tesera Systems Inc. The forecasting of SFM indicators over long time horizons was designed to better understand how values are maintained on the landscape under varied management regimes. Public participants again contributed immeasurably in refining indicator functionality for implementation, and in endorsing management targets based upon learning from the analysis work. As with previous versions, the task of working through new and evolving planning processes, information gaps and innovative analysis technologies has been a challenge for many and the perseverance shown is duly noted and is recognized as a key element of bringing the SFM Plan to this stage in its evolution.

Similarly, credit is due to the parent companies of Tweedsmuir Forest Ltd for their continued support, both strategic and financial, of the SFM Plan initiative as an essential foundation to moving strategic planning objectives into the operational arena. This version of the SFM Plan has benefited from the first cycle of performance monitoring, management review and continual improvement actions that generated numerous practical improvements. This commitment to SFM is commendable and demonstrates leadership within the forest sector.

The involvement of First Nation communities in SFM planning remains a challenge and this is recognized as a shortcoming that requires continued effort. It is an objective of the IFPA Strategic Committee to demonstrate the value of collaborative planning to First Nation communities, with the intent of increasing participation from this important segment of the greater community.

Version 3.2 SFM Plan purpose and function

The fundamental purpose of SFM Plans is to provide a management framework for developing, implementing and monitoring socially acceptable resource management plans. There are a number of strategic planning initiatives that serve specific purposes for different organizations, which while logical in their own perspectives, are collectively difficult to deliver in practice. Examples of this within the province of BC would include IFPA Forestry Plans, Land & Resource Management Plans, Forest Stewardship Plans, Forest Investment Plans, certification initiatives, and Beetle Management Plans. The purpose of the Lakes SFM Plan is to assimilate such strategic needs into a single adaptive management framework for operational planning and implementation.

The major challenge during the term of this plan will be to manage for multiple values in the face of the rapidly escalating mountain pine beetle epidemic. The most recent information and knowledge related to the current status and dynamics of this unprecedented event have been incorporated into analysis work and management strategies. The hope is that this plan enhancement will better prepare managers in all sectors to respond to the epidemic in a manner consistent with SFM values and indicator targets. Not all strategic needs will be met by this version of the Lakes SFM Plan and it will continually evolve to address the broader list.

Version 3.2 of the SFM Plan builds on the previous versions (including Version 3.1) and reflects a full year of SFM Plan implementation in the Lakes TSA.

The overarching task of establishing an Adaptive Management System for SFM in the Lakes TSA requires the persistent commitment of many stakeholders and individuals. The ongoing, systematic pursuit of SFM will require elements of modesty, patience, persistence and co-operation to ensure that we are managing the forests and associated resources to meet our local values and expectations for generations to come.

Original signed by

Jim Burbee

General Manager
Morice and Lakes Timber Supply Areas
Innovative Forest Practices Agreement

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1.0 INTRODUCTION

As society affirms a greater diversity of values toward the forest land base, there is a requirement for forest management to become more engaging and accommodating of a wider set of public interests. While traditional forest management primarily focused on a sustained forest resource for timber utilization, there is the public desire to manage the forest ecosystem toward a balance between social, ecological and economic values *(Figure 1)* while at the same time allowing future generations to enjoy the same benefits. This concept is known as **Sustainable Forest Management** (SFM), and represents the foundation by which the **Lakes Timber Supply Area** (TSA) land base will be managed.

Figure 1: Conceptual balance SFM represents

Progressing toward SFM on the Lakes TSA land base requires the strong commitment of the public, stakeholders, forest licensees, and managing agencies to embrace innovative methods and technology. In particular, these methods are being employed to obtain meaningful public input and participation (building on previously established processes) and to examine how a diversity of values can be accommodated and managed on the Lakes TSA land base. This **SFM Plan** represents a culmination of effort and dedication to actively implement SFM on the Lakes TSA land base.

1.1. Historical Context of the Lakes TSA

The area occupied by the Lakes TSA has long been utilized for it abundance of natural resources. Pre-dating contemporary society, the Carrier aboriginal peoples utilized the natural endowment of resources to sustain their traditional lifestyle that was based on fishing, hunting trapping and gathering (Anon 2000). Most indigenous settlements were situated along major waterways, land benches, riparian areas and on major trade routes between the interior and the coast (Anon. 2000).

Non-indigenous immigration into the area first started to occur early in the 19th century with Europeans introducing fur trading and agriculture. Non-indigenous settlement and development started to occur in the area with the construction of the Collins Overland Telegraph Line in the 1860's. Settlement was further stimulated by the construction of the Grand Trunk Pacific Railway which brought about the first instances of the forest industry with the requirement for timber for railway ties and bridge timbers. The making of hand hewn railway ties comprised the majority of the forest industry in this area in the early 1900s. Other than forestry, many of the settlers in the early 1900s also made their living through agriculture. With the construction of the railway, agricultural goods could be exported from the region. During these times, the main agriculture export from this area was commercial forage seed (Anon. 2000)

The post-World War II construction boom created a high demand for lumber and subsequently stimulated the investment and development of the forest industry in the Lakes area. During this time, the demand for lumber encouraged the establishment of many small portable sawmills (Anon. 2000). While small operators thrived for a short period, the complex nature of forest management and the highly integrated nature of the forest industry caused the transition toward establishing larger stationary sawmill complexes; thus, amalgamation of the local forest industry occurred by larger companies buying timber rights from small operators (Anon. 2000).

Rail access also encouraged mining development in the Lakes area. During the 1920s, the Silverfox Mine on Taltapin Lake exported ore to the smelter in Trail B.C. Other small mining operations were developed on Chikamin Mountain during the mid-1930s, and during the mid-1950s perlite was mined from the south shore of Francois Lakes.

Construction of the Kenney hydroelectric dam on the Nechako River, attracted more people to the area during the mid-1950s. The dam was primarily developed to meet the energy requirements for the Alcan Aluminum smelter located in Kitimat. While The Alcan development caused significant economic opportunities for the communities of Kitimat and Prince Rupert, very little benefit occurred in the Lakes area; however, the costs to this area were very high in terms of the displacement of aboriginal communities and the loss of valley bottom lands which were important for agriculture, forestry and wildlife (Anon. 2000).

Presently, the forest industry is the main economic driver in this area. Over the past few decades, the forest industry in the Lakes TSA has seen major changes. As mentioned above, one of the primary changes has been consolidation of small scale sawmill operations into large scale centrally located wood processing facilities. The production of lumber has also increased as a result of from substantial increases in harvest rates from the 1960s and 1970s. Furthermore, wages, benefits and working conditions have also improved in timber processing facilities (Anon. 2000).

Other sectors (i.e. public sector, tourism) have been making marked gains with regard to generating employment and economic activity. The natural abundance of lakes, rivers and scenic areas, give rise to the pursuit of a variety of recreational activities including fishing, hunting, camping, boating, snowmobiling and cross country skiing (Anon. 2000). As such, the increasing tourism sector is becoming an important opportunity to the diversification of the Lakes area.

While these emerging sectors continue to help diversify the local economy, forestry will likely remain the primary economic driver of the area particularly as the forest industry matures and develops non-traditional business opportunities (e.g. value-added processing, silviculture, consulting) (Anon. 2000). Furthermore, the Lakes TSA has been substantially impacted by the recent bark beetle epidemic that is affecting mature stands of timber across the interior of the province. Implementing strategies to mitigate the impact of the bark beetle epidemic (e.g. temporary uplift of AAC) are certain to increase the level of forest sector activity in the Lakes TSA.

With the forest sector being such a major influence on the socio-economic prosperity of the area, the vitality of the forest sector plays a key role in sustaining local communities. As a result, community leaders and the licensee representatives want to ensure that an equitable amount of investment and growth come back to the communities in the area. There is a strong need to ensure that the timber resources in the Lakes TSA will be sustained throughout time and that the forest sector will co-exist and prosper with other activities and values that occur on the Lakes TSA land base. In this respect, investments in SFM can have a significant positive impact on the economies in these relatively small communities, and a positive return on government revenues through stumpage and the corporate and personal tax base. The **Morice & Lakes Timber Supply Areas Innovative Forest Practices Agreement** (M&L IFPA) represents a strategically planned effort to accomplish this complex task.

1.2. Objectives of the SFM Plan for the Lakes TSA

The fundamental purpose of SFM Plans is to provide a management framework for developing, implementing and monitoring socially acceptable resource management plans. More specifically, the

purpose of the Lakes SFM Plan is to assimilate such strategic needs into a single adaptive management framework for operational planning and implementation.

1.2.1. THE MORICE & LAKES TIMBER SUPPLY AREA INNOVATIVE FOREST PRACTICES AGREEMENT

The provincial IFPA program was designed to enable licensees to explore new forest management ideas in an operational setting to enhance timber supplies, community stability and social and environmental values. The program was launched to advance seven goals of government:

- Develop socially acceptable forest management plans and practices,
- Conserve environmental values,
- Increase timber supply,
- Improve the knowledge base to achieve specific forest management objectives,
- Implement a results based approach to management,
- Communicate IFPA results to influence forest management, and
- Promote tenure reform.

The M&L IFPA was awarded in 1999 and is a partnership between six regional forest licensees (Babine Forest Products Company, Canadian Forest Products Ltd., Decker Lake Forest Products Ltd., Fraser Lake Sawmills, Houston Forest Products Company, and L&M Lumber Ltd.) and the BC Ministry of Forests Timber Supply Program (BCTS)[1] in both the Morice and Lakes Timber Supply Areas. The IFPA program was designed to enable licensees to explore new forest management ideas in an operational setting to enhance timber supplies, community stability and social and environmental values. The M&L IFPA goals are (M&L Strategic Committee):

- Develop socially acceptable plans and practices,
- Enhance basic drivers of timber supply,
- Maintain environmental values, and
- Implement innovative approaches, affect policy and transfer learning.

Developing and implementing SFM Plans for both the Morice & Lakes Timber Supply Areas is the central objective of the M&L IFPA. These SFM Plans are developed using innovative approaches in public involvement, forest productivity and ecosystem-based management, and are the vehicle by which achievement of IFPA goals is enabled.

[1] Formally the BC Ministry of Forests Small Business Forest Enterprise Program (SBFEP)

1.2.2. LINKAGES TO OTHER PROCESSES

Linkages have also been identified with how this SFM plan relates to other processes that have since been initiated and are being implemented within the Lakes TSA land base (see *Table 1*).

Table 1: Linkages to other processes

Processes	Relationship to SFM Plan
Lakes Land and Resources Management Plan	Coordination of objectives and indicator monitoring activities
ILMB Sustainable Resource Management Plan	Develop SRMP objectives with M&L IFPA.
Forest Certification (e.g. CSA-SFM Z809-2002, SFI)	Derive certification needs from M&L IFPA processes (e.g. PAG) and SFM Plan.
Forest Investment SFM Plans	Address needs of the FIA SFM Plan guidelines
Forest and Range Practices Act (results-based forest practices code)	Develop SFM Plan to support Forest Stewardship Plans
Beetle Management Strategies	Incorporate Beetle Management Strategies into SFM Plan
Corporate Forest Policies	Address Corporate Forest Policies

1.3. Overview of the SFM Plan for the Lakes TSA

The primary purpose of this SFM Plan is to outline the process of adaptive management that will be implemented on the Lakes TSA land base and to identify key indicators that will be managed to achieve a sustainable balance of social, economic and ecological values throughout time.

Some of the historical context for the SFM Plan has been noted earlier in this section, and Section 2.0 provides a description of the Lakes TSA with respect to the physical characteristics, current and anticipated uses, and management regimes. Section 2.0 also contains descriptions of some aspects of traditional forest management, and descriptions (in subsection 2.5) of the enhancement of forest management under the M&L IFPA SFM framework.

Implementation of the SFM Plan is described in the Section 3.0. This section describes the procedures by which the partnership will implement the SFM Plan in terms of operational implementation to support data gathering, monitoring, reporting, management adjustment and continual improvement.

Section 4.0 of the SFM Plan describes the indicators that are used to implement, monitor and evaluate SFM on the Lakes TSA. Each indicator is described on a "detailed indicator sheet" in Appendix C with respect to its rationale, relation to each SFM framework (M&L IFPA and the Canadian Council of Forest Ministers [CCFM]), current condition, indicator forecasting information, target/threshold, data required, and monitoring plans. The development, forecasting and monitoring of indicators is an integral component of the performance management and continual improvement framework for SFM.

2.0 THE DEFINED FOREST AREA OF THE LAKES TSA

2.1. The Lakes TSA land base – Area breakdown

Table 2: Area breakdown for the Lakes TSA

						Net Area Breakdown by Licensee (ha)											Net Area Breakdown by Licensee (%)										
FRPA Scenario Classification with Community Forests represented as Areas where Land Based Tenure Agreements Apply	**Gross Area (ha)**	**Net Area (ha)**	**Percent of Gross Area**	**Percent of Total Productive Area**	**Percent of Volume Based Tenure Agreement Lands**	**Babine Forest Products**	**BCTS**	**West Fraser Mills Ltd**	**NRFL**	**Woodlots**	**Caribou Migration Corridor**	**Burns Lake Community Forest**	**Cheslatta Community Forest**	**Parks and Reserves**	**Water**	**Island / Unallocated**	**Babine Forest Products**	**BCTS**	**West Fraser Mills Ltd**	**NRFL**	**Woodlots**	**Caribou Migration Corridor**	**Burns Lake Community Forest**	**Cheslatta Community Forest**	**Parks and Reserves**	**Water**	**Island / Unallocated**
Lakes TSA	**1,121,620.5**	**1,121,620.5**	**100%**			**125,054.1**	**223,297.5**	**124,517.0**	**168,607.4**	**23,517.5**	**15,162.0**	**83,435.1**	**114,744.1**	**88,007.9**	**153,540.1**	**1,738.0**	11.1%	19.9%	11.1%	15.0%	2.1%	1.4%	7.4%	10.2%	7.8%	13.7%	0.2%
Reductions to Total Land Base																										
Unclassified Lands	262.3	262.3	0%			0.0	140.0	0.0	0.0	4.7	0.0	0.0	0.0	0.0	0.0	117.6	0.0%	53.4%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	44.8%
Natural Non-Treed Non-Productive	164,132.9	164,231.2	15%			2,476.3	3,213.9	738.8	1,852.0	201.7	255.7	676.8	561.4	658.0	153,540.1	56.5	1.5%	2.0%	0.5%	1.1%	0.1%	0.2%	0.4%	0.3%	0.4%	93.5%	0.0%
Total Productive Land Base		**957,225.3**	**85%**	**100%**		**122,577.8**	**219,943.6**	**123,778.1**	**166,755.4**	**23,311.0**	**14,906.3**	**82,758.3**	**114,182.7**	**87,349.9**	**0.0**	**1,563.8**	12.8%	23.0%	12.9%	17.4%	2.4%	1.6%	8.6%	11.9%	9.1%	0.0%	0.2%
Reductions to Total Productive Landbase:																										
Deforested Lands for Agriculture and Settlement	29,443.4	29,408.9	3%	3%		204.3	19,523.4	97.6	7,187.7	278.4	15.6	1,248.6	619.4	168.9	0.0	65.0											
Deforested Lands for Timber Harvesting and Forest Management	12,107.3	10,806.8	1%	1%		1,952.3	1,974.7	1,867.1	2,403.8	206.0	9.6	677.9	1,709.2	3.9	0.0	2.2	18.1%	18.3%	17.3%	22.2%	1.9%	0.1%	6.3%	15.8%	0.0%	0.0%	0.0%
Natural Treed Non-Productive	10,842.3	10,815.6	1%	1%		1,441.4	1,849.1	938.9	2,257.9	67.0	121.4	377.0	2,663.8	1,080.5	0.0	18.7	13.3%	17.1%	8.7%	20.9%	0.6%	1.1%	3.5%	24.6%	10.0%	0.0%	0.2%
Net Productive Land Base:		**906,095.6**	**81%**	**95%**		**118,979.8**	**196,596.4**	**120,874.5**	**154,905.9**	**22,759.6**	**14,759.7**	**80,454.9**	**109,190.2**	**86,096.6**	**0.0**	**1,477.9**	13.1%	21.7%	13.3%	17.1%	2.5%	1.6%	8.9%	12.1%	9.5%	0.0%	0.2%
Lands to which Volume Based Tenure Agreements cannot be Granted	196,570.0	155,393.7	14%	16%		301.6	31,157.9	94.1	12,878.2	22,462.8	407.2	1,580.9	7.6	86,088.5	0.0	414.8	0.2%	20.1%	0.1%	8.3%	14.5%	0.3%	1.0%	0.0%	55.4%	0.0%	0.3%
Forested Area where Land Based Tenure Agreements Apply:		**750,397.0**	**67%**	**78%**	**100%**	**118,678.1**	**165,438.5**	**120,780.4**	**142,027.7**	**0.0**	**14,352.5**	**78,874.0**	**109,182.6**	**0.0**	**0.0**	**1,063.1**	15.8%	22.0%	16.1%	18.9%	0.0%	1.9%	10.5%	14.5%	0.0%	0.0%	0.1%
Reductions to Volume Based Tenure Agreement Lands:																										
Non-Commercial Cover	4,079.8	2,581.0	0%	0%	0%	654.5	723.3	464.3	247.9	0.2	0.0	463.5	23.9	0.0	0.0	3.3	25.4%	28.0%	18.0%	9.6%	0.0%	0.0%	18.0%	0.9%	0.0%	0.0%	0.1%
Non Merchantable Forest Types	71,183.2	38,963.3	3%	4%	5%	5,562.1	12,625.7	5,402.8	5,433.7	0.0	384.5	6,527.3	2,894.7	0.0	0.0	132.5	14.3%	32.4%	13.9%	13.9%	0.0%	1.0%	16.8%	7.4%	0.0%	0.0%	0.3%
Low Productivity Sites	4,421.3	4,301.4	0%	0%	1%	1,576.2	343.1	2,006.2	375.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.6%	8.0%	46.6%	8.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Environmentally Sensitive Areas	36,417.9	25,706.5	2%	3%	3%	4,864.7	4,736.8	4,976.7	4,450.1	0.0	341.8	2,068.8	4,251.7	0.0	0.0	15.8	18.9%	18.4%	19.4%	17.3%	0.0%	1.3%	8.0%	16.5%	0.0%	0.0%	0.1%
Inoperable	2,808.0	38.0	0%	0%	0%	26.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.5%	0.0%	31.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Recreation Areas (ESA Rec)	4,839.8	2,532.3	0%	0%	0%	285.6	532.2	268.5	79.3	0.0	150.9	693.3	87.1	0.0	0.0	435.4	11.3%	21.0%	10.6%	3.1%	0.0%	6.0%	27.4%	3.4%	0.0%	0.0%	17.2%
Riparian Management Areas	46,991.2	29,112.3	3%	3%	4%	4,858.8	5,680.2	3,330.5	5,555.3	0.0	1,592.2	2,323.6	5,547.0	0.0	0.0	224.8	16.7%	19.5%	11.4%	19.1%	0.0%	5.5%	8.0%	19.1%	0.0%	0.0%	0.8%
Areas Unavailable due to Economic Constraints	0.0	0.0	0%	0%	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0											
Old Growth Management Areas	61,489.2	44,148.3	4%	5%	6%	0.0	4,747.2	2,123.8	11,935.8	0.0	11,784.4	297.1	13,088.6	0.0	0.0	171.4	0.0%	10.8%	4.8%	27.0%	0.0%	26.7%	0.7%	29.6%	0.0%	0.0%	0.4%
Wildlife Tree Retention	75,582.4	28,793.3	3%	0%	0%	5,097.4	7,302.2	5,561.5	5,934.1	0.0	5.9	1,781.7	3,108.8	0.0	0.0	1.9	17.7%	25.4%	19.3%	20.6%	0.0%	0.0%	6.2%	10.8%	0.0%	0.0%	0.0%
Mountain Goat Habitat Access Management	6,601.7	2,504.8	0%	0%	0%	1,137.2	82.5	207.1	0.0	0.0	0.0	1,078.1	0.0	0.0	0.0	0.0	45.4%	3.3%	8.3%	0.0%	0.0%	0.0%	43.0%	0.0%	0.0%	0.0%	0.0%
Current Timber Harvesting Land Base:		**571,716.0**	**51%**	**60%**	**76%**	**94,615.6**	**128,665.4**	**96,427.1**	**108,015.7**	**0.0**	**92.8**	**63,640.7**	**80,180.9**	**0.0**	**0.0**	**78.0**	16.5%	22.5%	16.9%	18.9%	0.0%	0.0%	11.1%	14.0%	0.0%	0.0%	0.0%
Future Reductions:																										
Conversion to Agriculture	2,010.1	1,236.9	0%	0%	0.0	42.9	731.0	0.0	373.1	0.0	0.0	56.7	31.6	0.0	0.0	1.6	3.5%	59.1%	0.0%	30.2%	0.0%	0.0%	4.6%	2.6%	0.0%	0.0%	0.1%
Deforested Lands for Timber Harvesting and Forest Management	16,379.7	9,897.4	1%	1%	1%	1,515.1	2,664.0	1,577.1	1,571.2	0.0	2.8	1,383.8	1,176.9	0.0	0.0	6.6	15.3%	26.9%	15.9%	15.9%	0.0%	0.0%	14.0%	11.9%	0.0%	0.0%	0.1%
Future Timber Harvesting Land Base:		**560,581.8**	**50%**	**59%**	**75%**	**93,057.6**	**125,270.4**	**94,850.0**	**106,071.4**	**0.0**	**90.0**	**62,200.2**	**78,972.4**	**0.0**	**0.0**	**69.8**	16.6%	22.3%	16.9%	18.9%	0.0%	0.0%	11.1%	14.1%	0.0%	0.0%	0.0%

Notes: OGMAs are netted from the THLB in the Lakes South where they have been defined, and the means of determining wildlife tree retention amounts have changed. In Base Case it was based on the Landscape Unit Planning Guide, in the FRPA scenario we apply TSA-wide retention target of 7% (source: FPPR Section 9.1, Section 12.1 and Section 67). ILMB considers the Community Forests to be part of the Crown Forested Area. The above table is calculated so the Community Forests are not netted out of THLB.

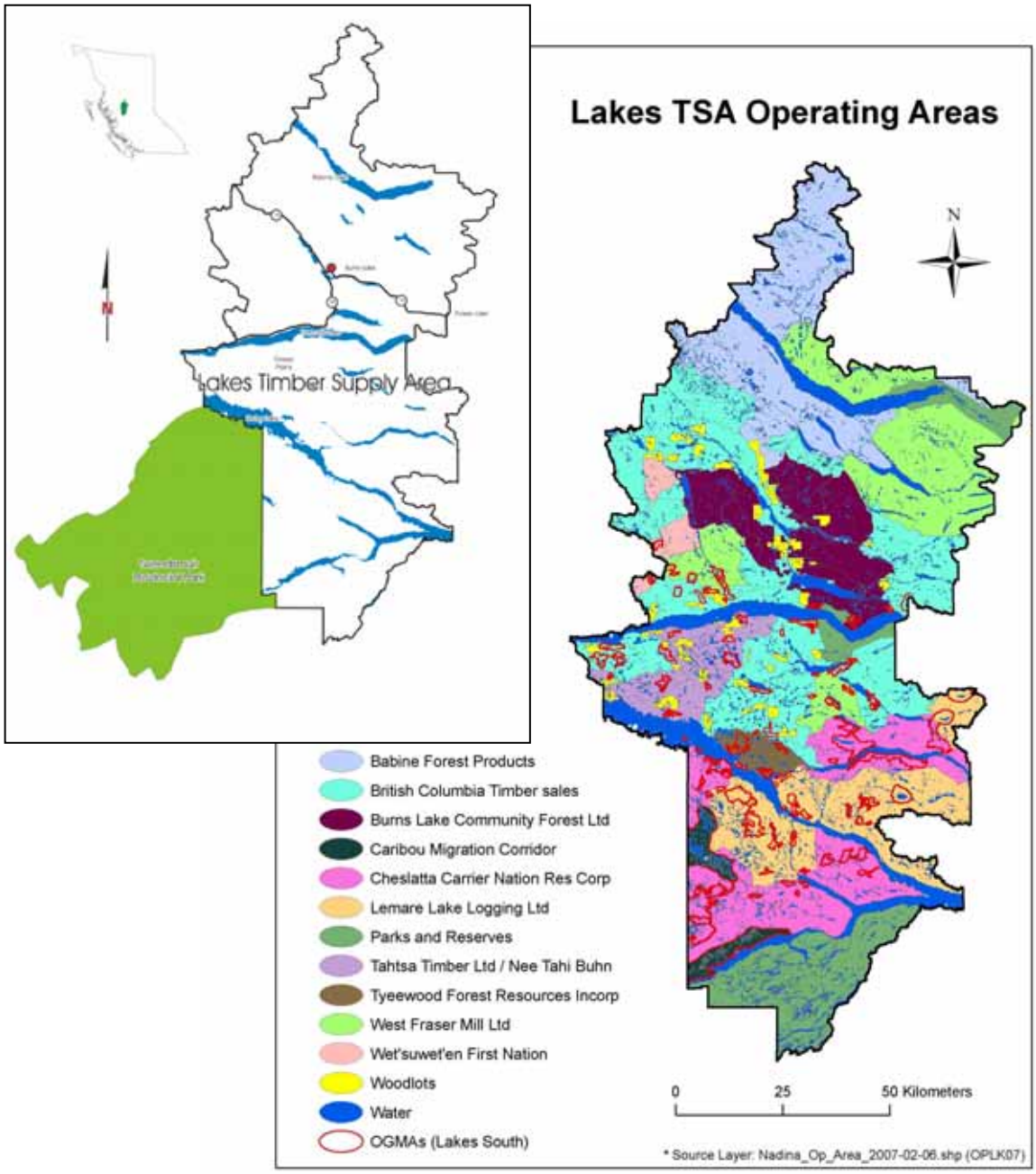


Figure 2: Map of the Lakes Timber Supply Area and the operating areas within it.

2.1.1. GEOGRAPHY AND TERRAIN

The Lakes TSA is located in central BC along the western edge of the interior plateau, and covers approximately 1.12 million hectares (see *Figure 2* and *Table 2*; also see *Appendix D* for a larger, more detailed "Key map of the Lakes TSA"). The landscape has been shaped by past glacial activity, and as a result, is characterized by gently rolling uplands, abundant wetlands and many lakes. Nearly 10% of the TSA is classified as lakes ranging in size from small kettle lakes to large linear lakes (east-west orientation) resulting from the gouging activity of glaciers (BCMOF 2001). Babine Lake, located in the north of the TSA is one of the largest freshwater natural lakes in BC. Francois Lakes and the Nechako Reservoir (Ootsa, Knewstubb and Tetachuk Lakes) are the other large lakes located in the south part of the TSA (Anon. 2000).

The climatic conditions in the Lakes TSA can be quite extreme. The winters are generally long and cold with heavy snowfall. Alternatively, the summers are generally warm and dry. The average annual precipitation is about 45 centimeters (Anon. 2000).

2.1.2. ECOSYSTEMS

Owing to its physical geography and climate, the Lakes TSA has a variety of ecosystems. As organized by the provincial Biogeoclimatic Ecosystem Classification System (BEC), the Lakes TSA has four BEC zones (summarized in *Table 3*; sources: Anon. 2000; Meidinger and Pojar 1991)

Table 3: BEC zones and descriptions of the Lakes TSA

Sub-Boreal Spruce (SBS) (85%)	The Sub-Boreal Spruce is the predominant forested zone in the interior lowland forest in the southern half of the Prince Rupert Forest Region, including the Lakes, Morice and Bulkley forest districts. The SBS occurs in valley bottoms to an elevation of approximately 1350 m, depending on local topography and climate. The climate is characterized by seasonal extremes of temperature, with severe, snowy winters and relatively warm, moist and short summers. The climate is more productive for tree growth than the true boreal forest. This subzone is subject to frequent large-scale fires (the average fire return interval is 100 years), and early seral species such as lodgepole pine and trembling aspen, are common, although the climax tree species are hybrid spruce and subalpine fir.
Sub-Boreal Pine-Spruce (SBPS) (5%)	In the Lakes TSA, these areas are located on high elevation plateaus (between 850 and 1.300 metres elevation) in the southern reaches below Tetachuck Lake. Situated south and west of the Sub-Boreal Spruce zone in the rain shadow of the Coast Mountains, these areas have a continental climate characterized by cold, dry winters and cool, dry summers. The mean annual temperature ranges from 0.3-2.7C and mean precipitation ranges from 335-580mm (of which 30-50% falls as snow). Tree species include lodgepole pine (Pinus contorta), white spruce (Picea glauca), and trembling aspen (Populus tremuloides). The types of soil found in the zone are Brunisols and Luvisols, such as Brunisolic Gray Luvisols and Orthic Dystric Brunisols. There is low timber productivity, and a low capability for agriculture in this zone.
Engelmann Spruce-Subalpine Fir (ESSF) (8%)	The ESSF has a shorter, cooler and moister growing season than adjacent low elevation zones. The zone is comprised of continuous forest at its lower and middle elevations and subalpine parkland at its upper elevations. Subalpine fir is the dominant tree species throughout the zone. Hybrid spruce and lodgepole pine are common in drier portions of the zone that have been influenced by fire (mainly above the SBS).
Alpine Tundra (AT) (1%)	The Alpine Tundra in the Lakes TSA area occurs at elevations above 2,100 metres (i.e. above the ESSF). The climate in the AT is severe. It is cold, windy and snowy, with low growing season temperatures and a very short frost-free period. Frost can occur at any time during the year. The AT is characterized by its lack of trees. Tree species do occur at lower alpine elevations in stunted or krummholz form. Alpine vegetation is dominated by shrubs, herbs, mosses, liverworts, and lichens.

2.1.3. FOREST TYPES

With regard to dominant forest types, lodgepole pine-leading forests cover the large majority of the forested land base (76%). Spruce leading stands cover about 20% and balsam- and fir-leading stands cover about 4% of the harvesting land base (BCMOF 2001). Deciduous stands also occur on the Lakes TSA.

2.1.3.1. Epidemic beetle infestations

Within the THLB on the Lakes TSA, approximately 76% of the forest is dominated by lodgepole pine in pure or mixed stands; more than two-thirds of this area is considered susceptible to mountain pine beetle attack (BCMOF 2001). The following paragraphs characterize the current situation for mountain pine beetles (and spruce beetle) on the Lakes TSA (Fenwick 2006, pers. comm.).

Mountain Pine Beetle (*Dendroctonus ponderosae*)

The area infested by mountain pine beetle has been increasing within and adjacent to the Lakes TSA over the past decade. In approximately 1995, the infestation rose to an epidemic level in Tweedsmuir Park and by 1998 epidemic conditions were evident within the southern part of the TSA. The level of epidemic infestation is on the rise. The area south of Francois Lake is now over-run with MPB (greater than 50% attacked), and the area south of Cheslatta Lake is largely grey. The epidemic is rapidly spreading to the north, with MPB populations increasing around Tchesinkut Lake, Maxan Lake, Pinkut Lake, Augier Lake, Taltapin Lake and Babine Lake (Fenwick 2006, pers. comm.). "By 2002, the outbreak had exceeded all previous records and continues to grow at epidemic levels. In April 200[5], the BCFS Research Branch reported the *Provincial Level Projection of the Current Mountain Pine Beetle Outbreak: An Overview of the Model (BCMPB) and Draft Results of Year[2] of the Project"* (BCMOF 2004, p.28). District staff report that the current level of mortality of the Lakes TSA is higher than that projected by the project, but it is interesting to note that the project predicts two peaks in annual kill: the first has already occurred in 2003, and the second is predicted to occur in 2006 in the west-central portion of the TSA (Fenwick 2006 pers. comm.)

"Effective August 1, 2001, the AAC for the Lakes TSA was increased to 2,962,000 cubic metres per year. The increase was intended to facilitate the salvage of timber damaged by the mountain pine beetle (MPB) then spreading across the TSA and also to reduce the extent of future damage" (BCMOF 2004, p 4). "Effective October 1, 2004, the new AAC for the Lakes TSA [is] 3,162,000 cubic metres, an increase of 200,000 cubic metres…The purpose of this increase is to provide the district with sufficient AAC to salvage timber killed by the current and projected MPB epidemic" (BCMOF 2004 p.5).

The uplift volume is near full disposition, utilizing non-replaceable forest licenses, BCTS AAC increase and volume transfers[2] which have been concentrated in the epidemic area. The uplift volumes are directed towards salvaging dead pine stands, as directed by the Chief Forester. As the MPB epidemic has spread throughout the entire district, harvesting focus has shifted from a leading edge strategy to a salvage strategy, that is, a harvest strategy directed towards MPB-attacked pine trees, while preserving non-pine species and non-attacked pine for harvest in the mid-term (15-40 years from now) (see *Figure 3*). (Fenwick 2006 pers. comm.)

[2] Section 18 of the Forest Act

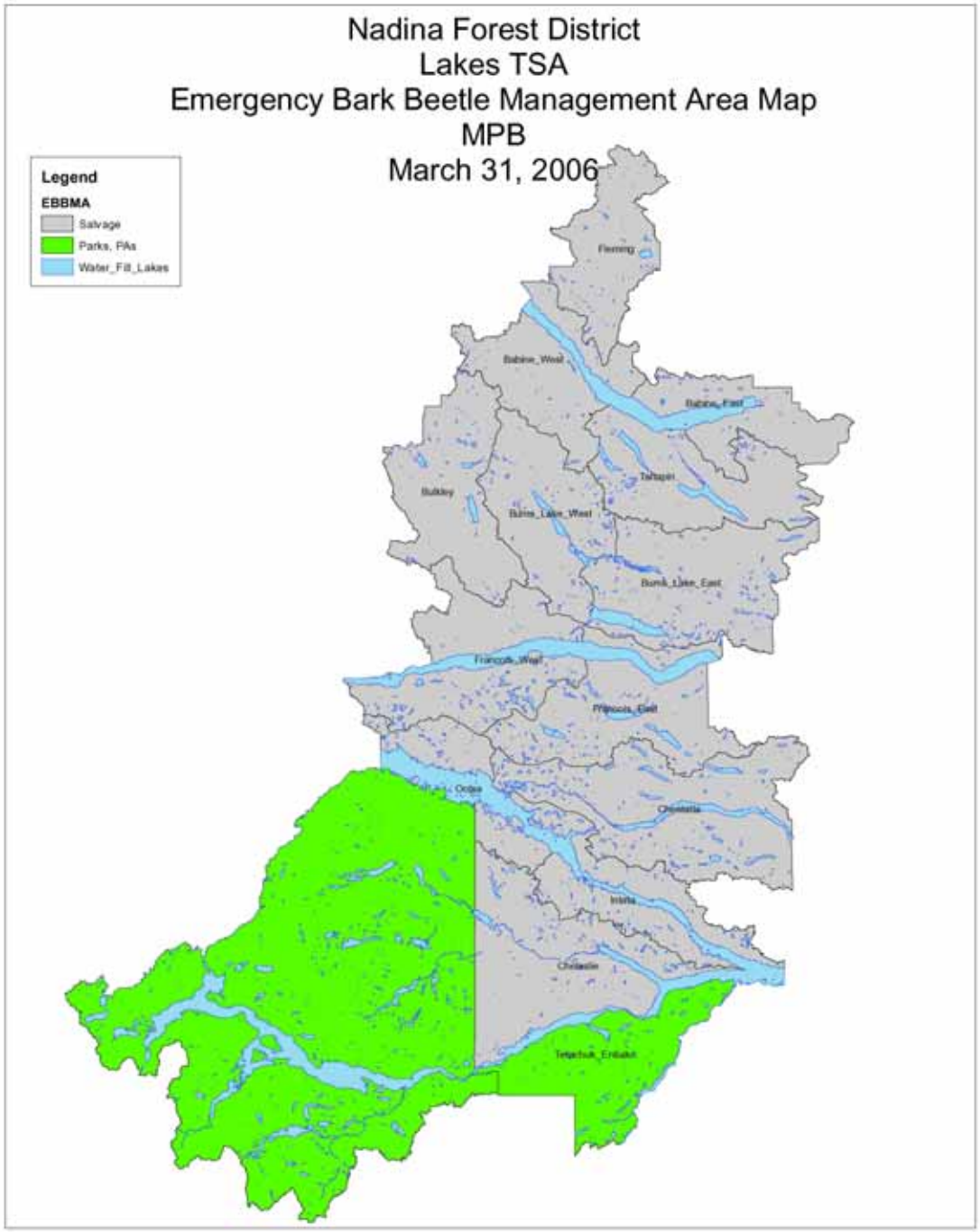


Figure 3: Lakes TSA – Emergency Bark Beetle Management Area Map

The MPB epidemic is expected to peak in 2006, and it is expected that the epidemic will continue unabated until the majority of susceptible host stands are wiped out (Eng et al. 2005, p.46). The outbreak is now so widely distributed that there is not a high probability that the province will experience a severe cold weather event of sufficient spatial extent to affect a significant proportion of the population (Eng et al. 2005, p.46). In addition to killing mature pine, the MPB is also killing young pine aged 20-60 years old. As little as 25% mortality could cause a stand to be classified as NSR (McLauchlan 2006), p. 5). Attacks to young pine will continue until the MPB outbreak collapses, and the Nadina District is one of a few districts where future losses in young pine stands is expected to be highest. As a result, unsalvaged losses may be higher than earlier predicted (McLauchlin 2006, p.3).

Spruce Beetle (*Dendroctonus rufipennis*)

The Lakes TSA first experienced a problem with spruce beetle in 1999 and the estimates were approximately 500,000 cubic meters of infested spruce. The area in the Lakes TSA that is significantly affected is in the north and central portions. Populations were expected to slightly increase, however they have stayed relatively constant and the 2002 estimate indicates a decline to about 300,000 cubic meters. The spruce beetle behavior is tied to availability of windthrow or blowdown and, as such, the Nadina Forest District staff believes current populations can be managed and further reduced through an aggressive trap tree and sanitation program.

2.1.4. WILDLIFE AND FISH

This Lakes TSA supports a wide variety of wildlife. These wildlife species are either adapted to surviving or avoiding the severe winters associated with the Lakes TSA. Common wildlife species in this area include moose, caribou, grizzly bear, mule deer, black bear and small furbearers (BCMOF 2001)

Avian species include those resident and migratory birds that can take advantage of the habitat elements afforded by the TSA (e.g. forest birds, geese, ducks, swans, grouse, woodpeckers, owls, eagles, and osprey).

The numerous lakes and watercourses within the TSA also give rise to several fish species, including sockeye salmon, pink salmon, burbot, rainbow trout, lake trout, whitefish, northern pike minnow, suckers, char, steelhead and kokanee (BCMOF 2001; Anon. 2000).

“Identified Wildlife Species” have been identified within the Lakes TSA under the Forest Practices Code of British Columbia Act. “Identified Wildlife Species” are those species and plant communities that have been approved by the Chief Forester and deputy Minister of Environment, Lands, and Parks or designate as requiring special management. The following are “Identified Wildlife Species” occurring in the Lakes TSA: bull trout, sandhill crane, northern goshawk, fisher, grizzly bear, American bittern, Trumpeter swan, and mountain goat (BCMOF 2001).

The BC Conservation Data Centre has also identified “Red” and “Blue” listed animal species within the Lakes TSA. Red listed species are extirpated, endangered, or threatened species, whereas Blue listed species are considered “vulnerable” (i.e. particularly sensitive to human activities or natural events) (BCCDC 2006). The Peregrine falcon (anatum subspecies) is the only classified Red listed species. The Blue listed species within the Lakes TSA are American bittern, bull trout, caribou (northern mountain population), dolly varden, fisher, grizzly bear, sharp-tailed grouse (*columbianus* subspecies), and wolverine (luscus subspecies) (BCCDC 2006).

2.1.5. GEOLOGY

The Lakes TSA is located on the Nechako Plateau which is the northernmost of the three plateau subdivisions of the Interior Plateau. The Nechako Plateau is an area of relatively low relief which is comprised of flat or gently dipping Tertiary lava flow which covers older volcanic and sedimentary rocks of the Takla and Hazelton Groups and intrusive rocks of the Upper Jurassic and Cretaceous age (Holland 1976). The entire Nechako Plateau was previously covered with ice and, as a result of the ice moving across the plateau, many glacial grooves and drumlin-like ridges (parallel to the direction of ice flow) cover the entire area. From Ootsa Lake, the ice moved eastward and northeastward toward the Rocky Mountains near McLeod Lake. Furthermore, ice moved southeastward along the Babine Lakes valley and then veered to the northeast. Numerous depressions left on the plateau surface after the glacial retreat are now occupied by a myriad of lakes ranging in size from small ponds to vast lakes. Eskers and dried meltwater channels are also noticeable features across the surface of the Nechako Plateau which occurred after glacial retreat (Holland 1976).

2.1.6. SOILS

Upland soils within the SBS zone are primarily from the Luvisolic, Podzolic, and Brunisolic soil orders. Podzols and Brunisolic and Orthic Gray Luvisols are the most common soils found on the abundant morainal deposits. Imperfectly to poorly drained sites in the SBS typically have Gleysols or gleyed subgroups of Luvisols, Podzols, or Brunisols. Within the ESSF, the rapid to moderately well-drained parent materials give rise to podzolic soil developments and are classified as Humo-Ferric Podzols (Meidinger et al. 1991; Coupé et al. 1991).

2.2. Socio-economic Description of the Lakes TSA

2.2.1. POPULATION

The Lakes TSA supports a population of approximately 7,700. The Village of Burns Lake is the largest centre (approximately 2,050 residents) in the TSA. A population of approximately 2000 exists in an aggregation of smaller communities on the south side of Francois Lake, which includes Southbank, Grassy Plains, Wistaria, Takysie, Cheslatta and Ootsa (Anon. 2000).

Rural settlement occurs across the Lakes TSA in agricultural communities of Palling, Colleymount and Noralee, and also along lakeshore areas of Babine, Decker, Burns, Tchesinkut, Francois, Uncha, Takysie and Ootsa Lakes (Anon. 2000).

An aboriginal population of approximately 2,500 also live within the Lakes TSA. Approximately 1,500 aboriginal people live on 58 reserves within the TSA, and the remaining 1,000 people live off reserve within the Lakes TSA (Anon. 2000).

2.2.2. ADMINISTRATION

In administrative terms, the Lakes TSA is located in the Bulkley-Nechako Regional District. Municipalities in that Regional District include Houston, Granisle, Burns Lake, Fort St. James, Fraser Lake, Smithers, Telkwa, and Vanderhoof. The Board of Directors for the Regional District includes elected representatives from all municipalities as well as elected representatives from the rural, electoral

areas. The only incorporated municipality within the Lakes TSA is the Village of Burns Lake which is represented by an elected Mayor and Council.

2.2.3. FIRST NATIONS

The Carrier peoples First Nation traditional territory exists across the Lakes TSA. The Carrier peoples include Burns Lake, Cheslatta, Nat'oot'en (Lake Babine), Nadleh Whut'en, Nee Tahi Bun, Skin Tyee, Stellat'en, Tl'azt'en, Ulkatchot'en, Wet'suwet'en, and the Yekooche. The Nat'oot'en, the Office of the Wet'suwet'en Hereditary Chiefs and the Carrier-Sekani Tribal Council are at various stages of tripartite treaty negotiations with the governments of Canada and British Columbia (Anon. 2000).

The Office of the Wet'suwet'en Hereditary Chiefs is based in Smithers and operates with a basis on the hereditary system of governance. The Carrier-Sekani Tribal Council is based out of Prince George and is an over-arching organization of elected First Nation chiefs of the Carrier-Sekani (Robinson 2002 pers. comm.).

2.2.4. EMPLOYMENT

As the Lakes TSA represents one of the most important timber supply areas in the province, most of the local employment and economic wealth of the Lakes TSA and surrounding areas is provided by the forest industry. In relative terms, forestry employs approximately 50%, followed by the public sector (30%), tourism (10%), agriculture and ranching (7%) and mining (1%). Other services make up about 12% of the employment workforce (Anon. 2000). Prior to the closing of the Bell Mine in Granisle (located outside the Lakes TSA), mining was a significant employer for area residents.

Forestry plays a significant role in supporting numerous other jobs in the area by companies and employees purchasing goods and services form local businesses. For every 100 direct forestry jobs, another 20 to 25 indirect and induced jobs are supported. In comparison, every 100 jobs in the public sector or tourism support another 18 positions, while each 100 tourism jobs support approximately 6 positions (BCMOF 2001).

2.3. Current and Anticipated Uses of the Lakes TSA land base

2.3.1. TIMBER

By maintaining a stable Allowable Annual Cut (AAC), the forest industry will continue to be the primary economic driver of the area and will contribute to the maintenance and creation of employment. *Table 4* summarizes the AAC allocations for the Lakes TSA. Since Version 1 of the SFM plan, the Lakes TSA has gone through a timber reallocation process; most of the AAC uplift volume has been allocated through NRFLs and BCTS. The focus within the Lakes TSA has now shifted to harvesting and forest health priorities, with emphasis on harvesting dead pine and preserving non-pine species and non-attacked pine for the mid-term falldown (15-40 years from now) (Fenwick 2006 pers. comm.).

While certain factors may constrain timber supply (e.g. government policy and regulatory initiatives associated with higher level plans, wildlife management strategies, insect infestations etc.), one of the purposes of the M&L IFPA is to demonstrate if, and how, these policies and regulations can be implemented without constraining timber supply, thereby maintaining/expanding harvest volume to stimulate the local economy.

Table 4: AAC Allocations for the Lakes TSA (m^3)

TENURE		REPLACEABLE	UPLIFT	TOTAL
L & M LUMBER LTD	A16821	23,084		23,084
BABINE FOREST PRODUCTS	A16823	344,951		344,951
CANFOR	A16824	53,627		53,627
BABINE TIMBER LIMITED	A16825	104,748		104,748
FRASER LAKE SAWMILLS	A16826	342,194		342,194
BCTS		384,506	330,367	714,873
WOODLOT		16,548		0
COMMUNITY FORESTS		49,918		49,918
FOREST SERVICE RESERVE		0	35,000	35,000
COMMUNITY SALVAGE LICENSE		0	25,000	25,000
TSL < 10000 (replaceable)				1,548
NRFL		142,424	1,309,633	1,467,057
TOTAL		**1,462,000**	**1,700,000**	**3,162,000**

(Source BCMOF 2006)

Though the forest industry continues to be the primary economic influence in the area, encouraging the diversity of other values and resource uses on the land base an important aspect in community stability and sustainable forest management.

2.3.2. TOURISM AND RECREATION

Within the Lakes TSA, a favourable endowment of natural terrain features (i.e. lakes, rivers, topography, etc.) and natural resources (e.g. fish, wildlife, etc.) provides for many recreational and tourism opportunities. Fishing, boating, hunting, are the major and recreational activities in this area, while emerging activities include a trend toward increasing backcountry and eco-tourism activities (e.g. wilderness travel, wildlife viewing) (Anon. 2000). Other popular activities include camping, hiking, horseback riding as well as numerous winter activities such as cross-country skiing, back country skiing, dog sledding, and snowmobiling. The highway travel corridors are also highly valued for their scenery.

The Lakes TSA contains 25 recreation sites. Also within the Lakes TSA, "Use, Recreation and Enjoyment of the Public" (UREPs) reserve areas have been designated. Any proposed land use in a UREP must be reviewed by government to reduce any conflict with recreation values.

The Lakes TSA is situated next to Tweedsmuir Provincial Park (Burns Lakes is promoted as being “The Gateway to Tweedsmuir Park”). The park offers wilderness camping, boat anchorages, tent sites and an extensive network of trails. Many tourism-related businesses in the Lakes TSA cater toward those activities undertaken in the park (e.g. canoeing, camping, guiding, fishing, hunting, hiking, wildlife watching, boating).

Over the past decade, employment in the tourism industry has grown by about 11% which accounts for approximately 9% of all sector related income on the Lakes TSA (Anon. 2000, BCMOF 2001). It is

anticipated that the tourism sector will continue to grow at a modest rate, given the abundance of tourism and recreational opportunities in the Lakes TSA (Anon. 2000).

The Lakes Forest District has conducted Recreation Opportunity Spectrum (ROS) work for the Lakes TSA, and a series of updates were completed prior to the Lakes LRMP. The ROS mapping has also undergone updates to align to new BCMOF inventory standards (Bergen, pers. comm. 2002).

The local Chamber of Commerce and Burns Lake Community Economic Development have been interested in developing local tourism opportunity studies (Bergen, pers. comm. 2002)

2.3.3. MINING

Presently, there are no operating mines within the Lakes TSA; however, just outside the boundaries of the TSA mining operations occur in rock formations that extend into the TSA area (Anon. 2000). Mineral exploration on the Lakes TSA has been limited by thick glacial deposits which cover most of the land base. There have, however, been recent discoveries of gold and silver south of Ootsa Lake and advanced exploration on molybdenum deposits in the northern portions of the Lakes TSA (Anon 2000). As new access occurs throughout the Lakes TSA (primarily resulting from timber harvesting activities), and new technology is developed for mineral exploration, it is anticipated that there will be future opportunities for increased mineral exploration and development (Anon. 2000)

2.3.4. AGRICULTURE AND RANGE

Within the Lakes TSA, cattle ranching is the primary agriculture activity. Both in the short- and long-term, growth is expected to be minimal. Short term growth is limited by poor market conditions, while climatic (i.e. short growing season) and biophysical conditions will likely limit long-term growth of this industry. While the agricultural industry is relatively small (~6% of employment on the TSA), it provides many people with full time and supplementary income and offers a source of economic diversity in the Lakes TSA (Anon. 2000, BCMOF 1995)

2.3.5. FISHING/HUNTING

The features associated with the Lakes TSA land base provides ample opportunity for hunting and fishing pursuits. Since the fishing and hunting resources are important both for recreational purposes and First Nations traditional use, these values are highly regarding on the Lakes TSA.

The lakes in the TSA contain rainbow trout, Dolly Varden, kokanee and lake char. Babine Lake and Francois Lake are important nurseries for Pacific salmon and are therefore considered a provincial resource. Other significant fisheries are found in Uncha Creek, Pinkut Creek, Sutherland River and the Bulkley River. Fishing of both migratory and non-migratory species is an important recreation and tourism feature of the region (BCMOF 1995).

The First Nations fishery exists to support First Nations indigenous food, social and ceremonial purposes. Also from a commercial fisheries standpoint, one large First Nations commercial sockeye fishing license was issued in the Lakes TSA in 1996 and it is expected that this license will continue into the future (Anon. 2000).

The recreational fishery supports both unguided (generally residents) and guided (generally non-residents) participants. The majority of participants in the recreational fishery are unguided residents of

the area; however, there is increasing participation in guided fishing opportunities as the tourism sector develops and attracts more non-residents to the area.

Hunting is also a popular activity on the Lakes TSA. Similar to fishing, a large proportion of the hunters are residents where as non-resident hunters require a guide. Hunting effort and success is influenced by factors such as game abundance, access, regulations, economic climate, and weather. As access has increased, the game populations have become more vulnerable and opportunity for licensed hunters has had to be restricted.

2.3.6. GUIDING-OUTFITTING/TRAPPING

The Lakes TSA hosts a wide variety of wildlife which supports guiding-outfitting and trapping operations.

There are 15 guide-outfitters that have territories overlapping the Lakes TSA (Anon. 2000). Moose and bear are the most common animals sought by guided hunters.

Trapping within the Lakes TSA has been a traditional activity for aboriginal residents for many years and has important cultural significance (BCMOF 1995). Trapping is also an important lifestyle choice for most non-aboriginal trappers. There are 90 licensed trappers have territories within the Lakes TSA (Anon. 2000) Species commonly trapped species are marten, beaver, weasel, squirrel, mink, and muskrat. Coyote, fisher, fox, lynx, river otter, skunk, wolf and wolverine are trapped occasionally.

2.3.7. CULTURAL/HERITAGE AND FIRST NATIONS USES

Owing to the history of the area that pre-dates contemporary society, the First Nations of the area have many long-standing traditional uses and culturally important areas.

First Nations have expressed concerns about forestry activities in areas with high cultural values. The Lakes Forest District has developed the Lakes Archaeological Resource Project (LARP), which utilizes maps and an extensive archaeological and historical database to identify cultural sites (BCMOF 2001). The LARP project considered information from First Nations, traditional use studies, archaeological impact assessments (AIA), culturally modified tree inventories, archival sources and settlers. Cultural sites dated prior to 1846 are protected under the Heritage Conservation Act.

Archaeological overview assessments (AOA) have been completed for the Lakes TSA based on the LARP information (BCMOF 2001). The AOA model uses field confirmed data, input from First Nations and other inventories to provide mapped areas of high, moderate, or low risk of finding an unknown archaeological site. The AOA map is used by major licensees, woodlot licensees and the BC Timber Sale Program (formally the SBFEP) when proposing harvesting blocks. By using the information gathered by the project, assessments, inventories and consultation, the Lakes Forest District is able to consider cultural values during operational planning activities.

The Lakes Forest District has developed DM policy regarding the management of Cultural Heritage Resources (i.e. Lakes Forest District DM Policy letters dated Sept. 2, 1999, and August 16, 2001). Furthermore, the Lakes Forest District has recently developed the “Lakes District Cultural Heritage Resource Manual (August 31, 2002)”.

Traditional use studies (TUS) have been formally completed to Resource Inventory Committee (RIC) standards for the Wet’suwet’en First Nation. Informal TUS information has been received from the Broman Lake Band, Cheslatta and Lake Babine First Nations. Typically these studies indicate areas of

importance for traditional activities such as hunting, fishing and berry-picking as well as indicating important wildlife habitat areas, trails, camping areas and cabins.

The Ministry of Forests has worked with the Wet'suwet'en to complete the "Wet'suwet'en landscape pilot project". This project was designed to cooperatively gather First Nations' land-based information and guiding principles for consideration in land use and resource management within Landscape Units and Wet'suwet'en traditional territories (BCMOF 2001).

2.3.8. NON-TIMBER FOREST PRODUCTS

Non-timber forest products (NTFPs) use on the TSA is neither documented nor inventoried; however, this use is known to occur on the TSA in varying capacities ranging from non-commercial personal use of NTFP, to small commercial operations. NTFP uses on the Lakes TSA include such activities as wild mushroom harvesting and berry picking.

2.3.9. BIOLOGICAL DIVERSITY

As noted in earlier sections of the SFM Plan, there are many elements which contribute to the biological diversity and the variety and abundance of wildlife in the Lakes TSA. The geographic location within the interior of the province influences climate factors which, in turn, have shaped the natural diversity of the flora and fauna within the various ecosystems.

The largest impact to the existing status of biological diversity is land use activity, of which forestry has the largest spatial influence. Young seral forests are created through the removal of the forest canopy by logging or naturally by forest fires. These changes to the structural habitat change the distribution and abundance of flora and wildlife species. Within the Lakes TSA, timber harvesting prevails, so there are abundant young seral forest habitats in various stages of succession.

As the forest progresses through its successional stages the abundance and diversity of flora and fauna species change. Many species can benefit from early successional shrub areas (e.g. ungulates, bears, mice, voles, avian predators and other bird species adapted to open areas). As the natural succession proceeds from early seral through to old seral, other species become more abundant as a result of being able to take advantage of changing habitat elements (e.g. structure, food, microclimate, etc.). Though many species can take advantage of some of the opportunities provided by forest in various stages of seral development, particular attention must be afforded to those species that are rare, threatened or endangered so as not to exert further pressure on already limited populations (Meidinger et al. 1991).

2.3.10. WATER

The Lakes TSA has abundant supplies of high quality surface water in rivers, streams, wetlands and lakes. Freshwater provides important habitat for fish and other aquatic creatures as well as for terrestrial animals and plant communities. Freshwater is also used by humans for drinking, recreation, industry, hydropower generation and irrigation. As land use activity can negatively affect water quality, resource management must consider all opportunities to maintain the quality and quantity of all water resources.

Industry (i.e. hydroelectric energy, wood processing and agriculture), the Village of Burns Lake, and other communities are the main users of water on the TSA (Anon. 2002).

2.4. Contemporary Forest Management Planning

Provincial forest planning in BC is based on two streams of decision-making: forest land use and forest land management. Land use plans generally define zones and specific objectives for those zones. In the Forest Practices Code of British Columbia Act and Strategic Planning Regulation, this is referred to as "higher-level planning."

Forest management plans, in contrast, define the practices needed to implement the objectives specified in higher-level plans. The Forest Practices Code of British Columbia Act and Operational Planning Regulation refer to these plans as "operational plans". Timber Supply Reviews are conducted at least once every five years, and incorporate a variety of economic, social and environmental information which is used by the Chief Forester of BC to make a determination of Allowable Annual Cut for the TSA. There are several opportunities for public review and input throughout the Timber Supply Review process (22 months duration).

In broad terms, land use objectives are fed into timber supply planning from higher level plans, while harvesting areas and rates are fed back into forest management planning.

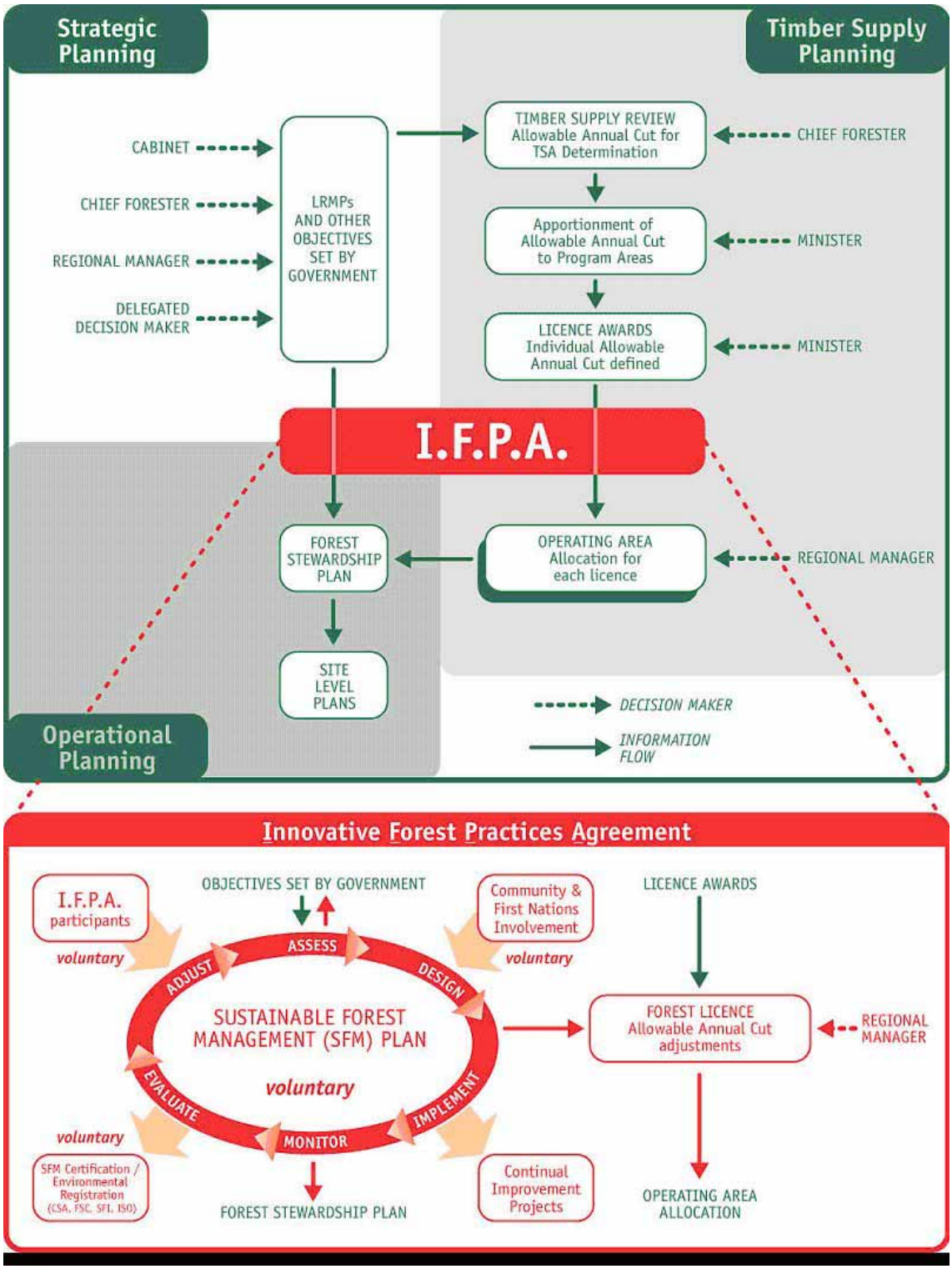


Figure 4: M&L IFPA relationship within current regulated forest planning in BC

2.5. Advanced Forest Management Planning through the M&L IFPA

Innovative Forest Practices Agreements are provincial programs that are intended to encourage new approaches to forest management. They are agreements between major forest companies and the Minister of Forests, and are mandated under the Forest Act (Part 4) through the Innovative Forest Practices Regulation (section 59.1).

Initially, the IFPA program was a product of the Jobs & Timber Accord. The Accord has now run its course, but the IFPA program remains, in the form of unique forest management programs in each of BC's forest regions. Each IFPA is voluntary, locally based, and industry-led, with its own unique focus and priorities. A core requirement of each IFPA is the development of a Forestry Plan that describes the IFPA's intent, and the activities that it will implement.

The Morice & Lakes IFPA aims to develop and implement Sustainable Forest Management (SFM) Plans for two Timber Supply Areas: the Morice TSA, near Houston, and the Lakes TSA, near Burns Lake. This plan will fulfill some of the requirements for an IFPA Forestry Plan, but will also embrace a wider scope (see *Figure 4*). The proponents of the Morice & Lakes IFPA recognize that to be sustainable and implementable, local residents will need to support the plan.

Local residents worked to identify resource management objectives that they considered important by participating in public input meetings. Objectives provided by First Nations, government, and forest companies also shaped the plan. All groups were invited to remain involved in developing the SFM Plan, and in subsequent monitoring its implementation. Forest companies and the BC Ministry of Forests Timber Sale Program are implementing the plan.

2.5.1. M&L IFPA MANAGEMENT STRUCTURE

The M&L IFPA partners developed a management structure in the formative stages of the M&L IFPA and will continue to utilize this management structure in the implementation of the IFPA (see *Figure 5*).

The M&L IFPA management duties have been split between a Strategic Committee and a Technical Committee. Furthermore, an IFPA Manager coordinates all activities and acts as a liaison with the Strategic and Technical Committees.

Tweedsmuir Forest Limited

Tweedsmuir Forest Ltd. is the subsidiary company of licensees engaged in the M&L IFPA, and is the holder of the IFPA and acts as the funding and delivery mechanism for the M&L IFPA. Tweedsmuir is a limited liability corporation formed under the *Companies Act of BC*, and is directed by a board of directors representing each of the M&L IFPA partner licensees.

M&L IFPA Strategic Committee

The role of the Strategic Committee is to oversee the implementation of the M&L IFPA. One senior member from each licensee is a voting member of this committee. The Chair is chosen by the licensee representatives. Management policies and directions have been developed by committee members. Licensee members on the Strategic Committee are at the woods manager or chief forester level. Other Strategic Committee members are drawn from the following groups:

- Ministry of Forests – District Manager and Timber Sale Program Manager
- Ministry of Sustainable Resource Management – Regional Director
- Ministry of Environment – Regional Director
- Communities – representatives from local governments (council representatives from Houston, Burns Lake & Granisle)
- First Nations representative from each TSA
- M&L IFPA Manager
- Public Advisory Group representatives.

M&L IFPA Technical Committee

The primary role of the Technical Committee is to develop and oversee the implementation of the SFM Plan. This committee proposes management strategies and commitments for approval by the Strategic Committee and addresses technical issues relating to specific activities. Furthermore, this committee determines management targets and monitors results. For the most part, each licensee provides one representative for the committee. The Technical Committee is comprised of members at the divisional forester or operations superintendent level. Technical representatives from the MOF, ILMB and MOE also sit on the Technical Committee. Additional expertise is added as required both from internal and external sources. Also, Technical Advisory Committees for Forest Productivity and Ecosystem Function act as subcommittees to the Technical Committee to provide further domain expertise in focused subject areas.

M&L IFPA Implementation Team

The implementation team works with the Technical Committee as a sub-committee to develop and maintain the SFM Plan. In particular, the team works to develop practical indicator monitoring and reporting protocols, adaptive management protocols, and operations management systems that include joint performance reviews and management intervention responses. The Team undertakes all matters in relation to the implementation of the SFM Plan and related activities as directed by M&L IFPA management entities through the IFPA Manager. Members of the implementation team also work with their own organizations to ensure that SFM Plan commitments are being met (e.g. incorporation of SFM Plan targets into operational plans, monitoring/reporting SFM Plan results). In doing so, they are also responsible for implementing corrective action as necessary (to address SFM Plan target commitments) and to seek opportunities for continual improvement in the efficiency and effectiveness of SFM Plan indicators and indicator targets.

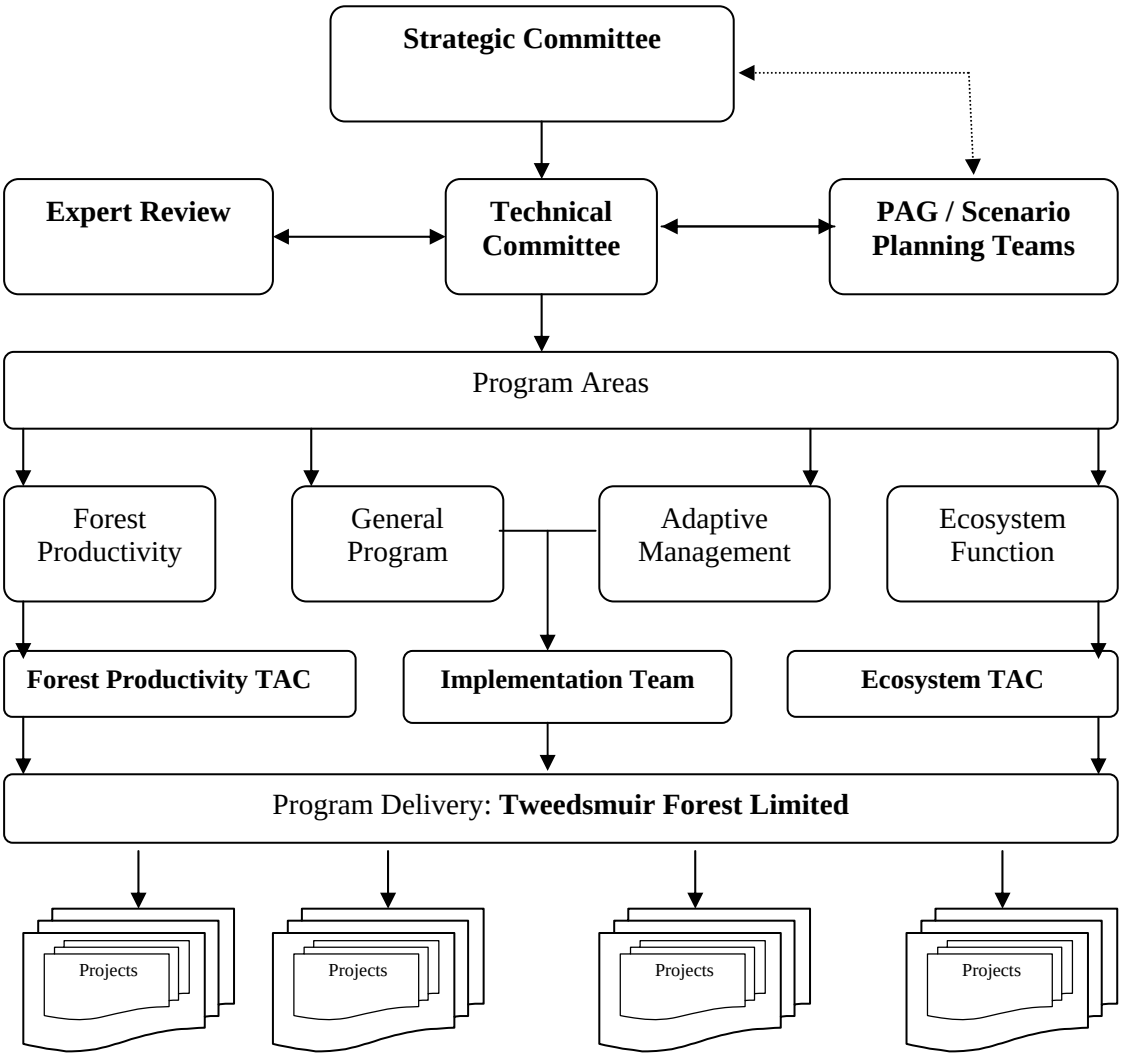
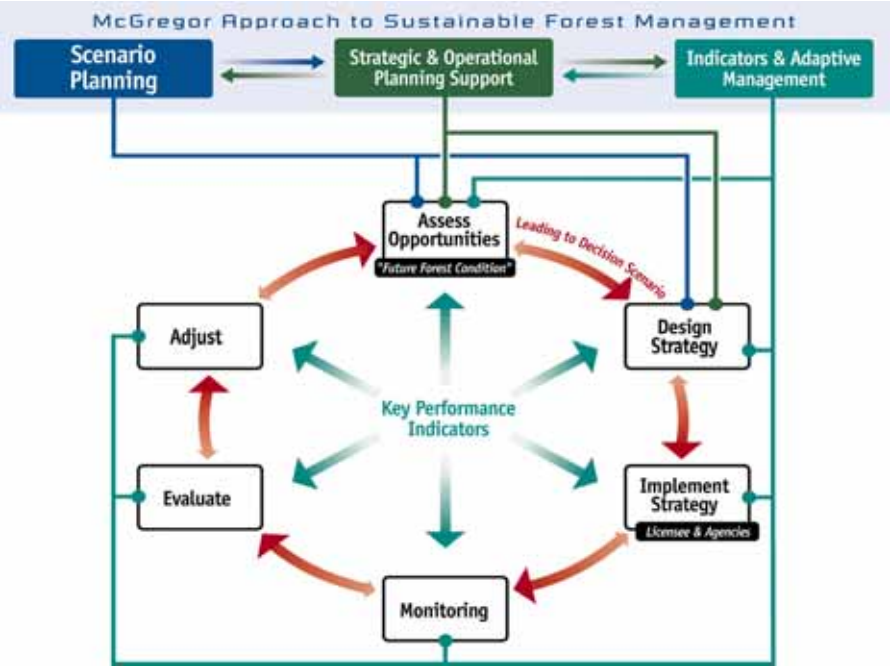


Figure 5: M&L IFPA management structure

2.5.2. THE SFM FRAMEWORK FOR THE M&L IFPA

The SFM framework used for the M&L IFPA is based on the "*McGregor Approach to Sustainable Forest Management"*. This SFM framework, originally developed by the McGregor Model Forest Association and now implemented by Tesera Systems Inc., is based on a generic adaptive management cycle (see *Figure 6*). Additional features have been added to this adaptive management framework to facilitate the development and implementation of SFM plans and systems.

Figure 6: The McGregor Approach to Sustainable Forest Management



A multi-disciplinary planning team is a vital part of the process; it uses scenario planning to develop a series of future forest scenarios (i.e. "learning scenarios) that attempt to achieve a variety of resource management objectives (based on locally expressed values). These learning scenarios represent diverse possible outcomes that reflect the diversity of values that stakeholders would like to see expressed on the forest landscape. It is at this level in the M&L IFPA where "Resources", and "Values/Issues" are identified, objectives are set for the learning scenarios and indicators are developed that enable evaluation of objectives for a specific scenario.

In the M&L IFPA, the multi-disciplinary planning teams identified the following resource categories and rationalized the vast number of identified values/issues under these categories.

- Agriculture
- Community Stability
- Landscape and Stand Biodiversity
- Minerals and Energy
- Recreation

- Timber
- Watershed and Riparian
- Wildlife

Strategic analysis of resource data (spatially and temporally) supports/enables an objective comparison of the learning scenarios and associated values. As part of this process, constraints are imposed for each learning scenario that is based on particular values that stakeholders wish to be maintained. The analysis determines if it is possible to maintain these values on the landscape throughout time. Furthermore, during the analysis it is possible to see how certain values interact, and to determine if seemingly disparate values can be compatible on the landscape. As a result of this analysis, the scenario planning team reviews the results from the learning scenario analyses, and works together to develop "decision scenarios", upon which future sustainable forest management will be based. Similar to the learning scenario process, the analysis will project and forecast indicators on the landscape into the future. As a result, indicator targets/thresholds are determined for a decision scenario which forms the basis of the SFM Plan. (Note: The current version of the SFM Plan undertakes sustainable forest management within the current policy framework. Subsequent versions of the SFM Plan will be based on the decision scenario).

"Implementation of the strategy" requires management and practices to be aligned toward meeting the objectives in the decision scenario. Each licensee and government agency involved in the M&L IFPA is responsible to implement strategy as per the decision scenario.

In order to determine if the management and practices are "on track" with the objectives and values of the decision scenario, indicator monitoring is conducted. As part of developing the SFM Plan, indicator detail sheets were prepared for each indicator, which form the basis for indicator monitoring. These sheets outline the details of the indicator with respect to associated resource values/objectives, rationale for indicator, current state of the indicator, indicator forecasting, targets/thresholds, and how the indicator will be monitored (data required, analysis procedure, responsibility of tasks, etc.). As such, these detailed indicator sheets and the indicator monitoring provide a framework for future evaluation of the SFM Plan in terms of meeting the values and objectives.

The evaluation of indicator results relative to the targets and thresholds determines if the objectives are being met and whether the values set out in the initial SFM Plan are being maintained. If deemed appropriate (i.e. through the evaluation process), certain management adjustment procedures may be required if indicator targets/thresholds are not being met. The assessment of indicator monitoring results is complex and indicators must be assessed as a whole, rather than individually. Therefore, if certain indicator targets/thresholds are not being met, a careful assessment must be done to determine causal factors and to address whether values are being maintained. Assumptions in the original analysis must be revisited and current conditions must be carefully considered.

The *McGregor Approach to SFM* is an ongoing process based on continual improvement. Therefore, the cycle continues as new understanding is gained from the indicator monitoring, or as new information becomes available, or as values change. It may warrant re-assessing opportunities through scenario planning, refining existing objectives and indicators and/or defining new objectives and indicators, undertaking monitoring, evaluating monitoring results and undertaking any applicable adjustments.

2.5.3. PUBLIC INVOLVEMENT

In order to establish an effective public involvement process, the organizers developed a hierarchy of committees and fully integrated these entities into the design and implementation structure of the M&L

IFPA. The two key public involvement committees are the Public Advisory Groups (PAG) and the Scenario Planning Teams (SPT) that operate at the TSA level (see *Figure 5*).

The PAG is comprised of members who represent a wide spectrum of values and interests within the TSA community including local business, economic development, small business, contractors, ranching/agriculture, trapping, guiding, recreation, hiking, tourism, woodlots, labour, environment, and local government. The PAG provides a local forum for input and feedback into the SFM planning framework development for the M&L IFPA and the SFM Plan.

The SPT is a working group that develops the resource management objectives, strategies, indicators and future forest scenarios necessary for the delivery of the SFM Plan. Each SPT is comprised of individuals who represent the PAG, the M&L IFPA proponents, and the resource agencies. Functionally, the bulk of the "hands-on" public involvement in the SFM planning process and the development of the SFM Plan rests with the SPT members. The public members of the SPT report out to the PAG on a periodic basis, and—through the PAG—to the community at large.

Since the start of the M&L IFPA in early 2000, well over 200 people have contributed local knowledge and expertise to the identification of resource values, management strategies and indicators. Over 100 meetings have been held within the M&L IFPA planning area to solicit community input and develop the plan. Future meetings are planned to evaluate learning scenarios and develop decision scenarios for each TSA. The decision scenario forms the basis for subsequent versions of the SFM Plan.

2.5.4. INTEGRATION OF THE M&L IFPA WITH OTHER PROCESSES

There are other processes initiated in the M&L IFPA planning area with similar requirements to an SFM Plan particularly regarding the monitoring of performance indicators. For example, a single SFM Plan uses objectives from the M&L IFPA, SFM certification, Higher Level Plans, and the LRMP processes, letting planners develop inclusive management strategies and implementation plans. As well, common performance indicators (measures) can be used to track progress in IFPAs, LRMPs, and certification.

2.5.4.1. Land and Resource Management Plan (LRMP)

An LRMP is a provincial initiative that uses public consultation to guide government in making land-use decisions. The Lakes District LRMP specifies land use zones for the Lakes TSA, along with higher-level social objectives for those zones and monitors their implementation. The M&L IFPA's SFM Plans are both strategic and tactical implementation plans that forge a link between higher-level objectives (i.e. those defined by LRMPs) and the operational plans required by the Forest Practices Code.

2.5.4.2. ILMB Sustainable Resource Management Planning

Sustainable Resource Management (SRM) Planning is the consolidated approach of the Integrated Land Management Branch (ILMB) to planning at the landscape level on provincial Crown lands. The analysis and detail of direction in SRM Planning is at the landscape level (on average 50,000 to 100,000 ha). In addition to landscape-level planning, ILMB will eventually integrate management of strategic land use plans (i.e. LRMPs) into SRM Plans to produce a single framework that will provide a more consistent, streamlined and cost-effective approach to strategic resource planning. The result will be a more comprehensive, single source of information on all approved plans that will expedite development approvals and promote economic development (MSRM 2002).

ILMB Planning has the following goals (MSRM 2002)*:*

- Replace the current confusing array of landscape-level Crown land plans with a new comprehensive, flexible and efficient model for landscape-level planning that supports sustainable economic development, ecosystem management and watershed planning.
- Implement workable, long-term partnerships that provide resources for planning and encourage ownership of the results.
- Provide a single window access and integrated delivery mechanism for new and existing (e.g., LRMPs) sources of planning, land registry and resource management information to expedite resource development approvals and stimulate sustainable resource-based economic development.

Given the close alignment and mandate of interests between the M&L IFPA and the ILMB in the Lakes TSA, it is foreseen that a number of collaborative initiatives can be undertaken to realize time and cost efficiencies and to increase the scope and effectiveness of coordinated resource management efforts within the TSA. A collaborative agreement has been reached between ILMB and the M&L IFPA since there are presently numerous opportunities for collaborative work (e.g. data sharing, public involvement, indicators). Other opportunities which arise throughout time can also be addressed using the relationship outlined in the agreement.

2.5.4.3. SFM Certification

Forest certification is recognition by a qualified, independent third party that forest management meets a predetermined set of standards. These standards are set by groups that generally follow a broad consultative process that is national or international in scope. Forest certification is driven by consumers who insist that the forest products they buy come from responsibly managed forests.

The M&L IFPA has committed to making the SFM Plan "certifiable" by aligning the M&L IFPA resources and values framework and suite of indicators to the Canadian Council of Forestry Ministers (CCFM) SFM framework. Currently, the CSA-SFM certification (CSA-SFM Z809-2002) is structured according to the CCFM – SFM framework, and the CSA-SFM system is recognized by the US Sustainable Forest Initiative (SFI) certification. The CSA – SFM framework has an optional "chain of custody" process and product label provision to track wood from source to consumer, ensuring that the product comes from a forest that follows sustainable forest management standards. The Forest Stewardship Council (FSC) is another certification system available in Canada, and has recently developed draft regional standards for British Columbia. Though the FSC has not adopted the CCFM SFM framework, there may be potential to align the M&L IFPA suite of indicators to the FSC certification framework.

2.5.4.4. Forest Investment SFM Plans

For allocation of BC Ministry of Forests "Land Based Forest Investment Program" (LBIP) funds to individual licensees, each investment schedule is founded upon an SFM Plan developed for the particular timber supply area. Starting in 2003-04, only those licensees that are signatory to an SFM Plan will be entitled to submit an LBIP funding schedule or receive funding for LBIP activities. The SFM Plans will be provided by licensees to illustrate their strategies and priorities for sustainable forest management (BCMOF 2002a).

2.5.4.5. Results-based Forest Practices Code

In the framework of the Forest and Range Practices Act of BC, licensees are required to prepare Forest Stewardship Plans (FSPs). A designated statutory decision maker (normally a District Manager) will then review the FSP and assess whether it will achieve government objectives to manage and conserve the forest resource.

The proponent license will be required to submit sufficient information or an "evidentiary base" to satisfy the District Manager that the FSP will be effective. The standard of proof required to satisfy the District Manager and the evidentiary base required to support the FSP submission will vary with the degree of risk of a negative outcome (e.g. a stronger body of evidence will be required where human safety or critical environmental objectives are at risk (BCMOF 2002b).

The M&L IFPA process and SFM Plan will provide much of the necessary analysis, information, documentation and public involvement process, to address many of the FSP requirements of the evidentiary package and satisfying the approval requirements.

2.5.4.6. Beetle Management Strategies

Under the current situation of bark beetle outbreaks throughout the Morice and Lakes TSAs, *Beetle Management Strategies* have been developed. As such, these strategies are incorporated into the M&L IFPA analysis (i.e. base case analysis and assumptions).

2.5.4.7. Licensee Corporate SFM-related Policies

Environmental and other Corporate SFM Policies

All of the licensees in the Lakes TSA have developed corporate polices directed toward SFM such as corporate mission statements, forest policies, and environmental policies (see Appendix A). As a result this SFM Plan will directly contribute toward fulfilling and evaluating some of the objectives outlined in those policies.

International Organization for Standardization (ISO)

The International Organization for Standardization (ISO) is a global federation of national standards bodies. Representatives from participating national bodies may attend technical committees and compile management standards in various subject areas. The ISO 14001 standards are intended to provide organizations with the elements of an effective environmental management system (EMS), which, in combination with other management requirements, can be used to achieve environmental and economic goals. Organizations that successfully demonstrate conformance to the requirements of the ISO 14001 standard through independent, qualified audit can achieve registration of their EMS to the standard.

Currently all of the plan proponents have ISO 14001 registration.

2.5.5. PROJECTS GUIDED BY THE M&L IFPA SFM PLAN

The projects guided by the M&L IFPA are integral to the continual improvement of the Morice TSA SFM Plan. These projects are described in *The Morice and Lakes IFPA Forestry Plan.* Project description sheets have been completed for each M&L IFPA continual improvement project. These contain such

linkages to indicators and other processes, partners, schedule of activities, funding requirements, etc. *The Morice and Lakes IFPA Forestry Plan* also includes rationale statements for undertaking continual improvement projects.

2.5.6. ANALYSIS FOR THE LAKES TSA SFM PLAN

2.5.6.1. Data acquisition and preparation

A substantial effort has been made to compile, prepare and standardize data for analysis of the learning and decision scenarios for the M&L IFPA. Of nearly 800 data coverages reviewed from strategic and operational plans, approximately 100 have been selected and compiled for use in the analysis. Of the layers selected for processing about half are static while the others are derived data layers. Static data layers are existing data inventories for different resource values and are supplied by M&L IFPA partners. Derived data layers are "value added" data layers and usually involve buffering, classifying or extracting data from static layers. Information regarding the data was also compiled for each layer (i.e. scope, source of date, custodian, vintage, scale, original format, and metadata).

The Scenario Planning Team and the Technical Committee have been involved in the review and approval of each data layer. Reviewing the data with the SPT provided the members with opportunities to understand the complexity and completeness of the M&L IFPA information base.

Data files associated with timber growth and yield, ecosystems and activities have also been collected. Even though Timber Supply Review 2 (TSR2) data are used in the analysis, these data are tracked outside of the “Scenario Planning Team” database.

Benefits of a collective data set for the M&L IFPA

There are many benefits to offset the costs and efforts extended to assemble a collective data set for TSA-wide analysis. One of the advantages is that efficiencies may be realized which may reduce costs and time while providing intrinsic benefits. The following outlines some of the benefits of a centralized data approach, in relation to some of the cost issues described above.

- Current (updated) data sets will be accessible by all IFPA partners and government agencies in a timely fashion. All data will be centrally located on a server and accessible through the Internet.
- Duplicate information will be minimized since there will be a complete inventory of the most current data.
- Data will be standardized therefore increasing accuracy and maintaining a high level of data integrity. A standardized data format will also greatly minimize data preparation time for anyone involved in analysis work.
- Data exchange paths no longer need to be tracked as data will be located in one central depository and can be downloaded when needed.
- Each IFPA Partner will continue to maintain their data custodian role. This would mean data update / maintenance costs will be distributed.
- Strategic planning data needs, such as the LRMP process, forest certification, higher level plans, operational plans and the M&L IFPA will be met through this one process.

2.5.6.2. Timber Supply Analysis

Timber Supply Analysis addresses many complex management objectives in the Lakes TSA, such as those involving forest health, extensive riparian areas, diverse wildlife, wildlife habitat requirements and visual quality objectives. In this regard, timber supply analysis first examines what exists on the landscape under the current management regime and constraints. Subsequent to examining current conditions, Timber Supply Analysis then look forward to see what is possible given certain assumptions in management as specified in defined scenarios. The application of the advanced technology of spatial timber supply analysis modelling is particularly appropriate for the M&L IFPA since both the Morice and Lakes TSAs are at a relatively early stage of development. As such, there are greater opportunities to achieve spatially related targets for age class, patch size, biodiversity and other planning objectives. Spatial analyses have been completed for individual landscape units using Tesera Systems' spatial modelling and analysis tools, and this technology is being applied to the entire M&L IFPA planning area (i.e. the Morice and Lakes TSAs).

The first use of the assembled database and the Tesera Systems' spatial analysis tools is in the preparation of the information package for SFM under the "current policy framework" for each TSA. Each information package details the extent of the timber harvesting land base, describes the management strategies that will be forecast, and provides a current status of each indicator.

The information package has been reviewed and approved by the Technical Committee prior to being employed to forecast SFM under the "current policy" framework. Subsequent versions of the SFM plan will be augmented with information and strategies derived from the decision scenario.

2.5.6.3. Multiple Resource Analysis

Multiple Resource Analysis refers to the analysis of values and objectives outside the scope of Timber Supply Analysis. Scenario planning is used to collect the wide variety of timber and non-timber values and objectives, and subsequently analytical parameters can be identified. These values and associated objectives can be modeled and tracked using indicators. Parallel to scenario planning, multiple resource analysis is used to understand the implications of various learning scenarios as well as the decision scenario. Forecasted indicator results are used to evaluate the learning scenarios, and a decision scenario has been selected for management implementation based on this analysis.

2.5.6.4. Base Case and Decision Scenarios - General Assumptions and Alternative Strategies

The mandate for the Lakes-IFPA Base Case required that data inputs and assumptions remain consistent with those implemented under TSR2, where relevant. In addition, this Base Case analysis incorporates management assumptions from the Expedited Timber Supply Review for the Lakes TSA (2004) and current non-recoverable loss projections for the mountain pine beetle through 2013 according to the BC Mountain Pine Beetle Project. Other deviations included the conversion of aspatial approximation assumptions to their spatial equivalents, and the use of better, more up-to-date inventory information if available.

The intent of the decision scenario is to fully implement the Forest and Range Practices Act while mitigating the negative effects of the current mountain pine beetle epidemic to the forest industry. The data and assumptions of the learning scenarios are implemented along with any legally required management constraints absent in the learning scenarios.

The following text and figures summarize the general strategic assumptions of the Base Case and Decision Scenarios as well as some of the alternative strategies that were incorporated. A discussion of the harvest flows achieved is also included.

2.5.6.4.1. Timber Harvesting Land Base (THLB)

Primary Assumptions: The THLB of the Base Case was lower than that of TSR2 and the Expedited TSR due to an expanded Burns Lake Community Forest and the inclusion of the Cheslatta Community Forest. The THLB used for the Decision Scenario was further decreased to allow for the inclusion of the Old Growth Management Areas defined in the Lakes South Sustainable Resource Management Plan. These OGMAs occur in the Francois East, Francois West, Cheslatta, Ootsa, Intata and Chelaslie landscape units.

Alternative Strategies: In the Decision Scenario community forests are considered lands to which volume based tenure agreements can be granted. The Cheslatta Community Forest and the Burns Lake Community Forest are included in the assessment of land base constraints. However, harvest within the community forests is separate from the TSA harvest flow.

2.5.6.4.2. Growth and Yield

Primary Assumptions for Base Case:
The assumptions underlying the Base Case yield curves are generally consistent with the assumptions of TSR2. However the stand groups were much less generalized.

Alternative Strategies for Base Case:

Significant modifications were applied to the entire existing natural inventory provided it was at least 60 years of age and contained some component of lodgepole pine. Projections for pine mortality were incorporated based on projections from the BCMPB Project through 2013. The modifications were applied by landscape unit and by pine component class and accounted for stand age relative to the start of the planning horizon. These modified curves were used in both the Base Case and the Decision Scenarios.

Primary Assumptions for Decision Scenario: In the Decision Scenario existing natural stands and existing managed stands used growth curves from the Forest Productivity Scenario. Future managed stands also used growth curves from the Forest Productivity scenario. In the Forest Productivity curves, future managed stand site indices are principally taken from SIBEC, and Old Growth Site Index (OGSI); whereas, in the Base Case they were taken from the forest cover and some site index adjustments were applied. Also, first generation genetically improved stock is incorporated in future managed stand yield curve generation.

Alternative Strategies for Decision Scenario:

- Existing natural stands susceptible to MPB attack used growth curves from the Base Case with modifications to account for non-recoverable losses as projected in the BCMPB project.
- Future managed stands used growth curves from the Forest Productivity Scenario but with an updated species mix containing higher components of spruce and less pine. The intent here was not to reduce beetle hazard, but to improve mean annual increment and thus improve recovery.

2.5.6.4.3. Recovery from MPB epidemic

Primary Assumptions: In the Base Case Scenario, beetle attacked stands not harvested before the volume falls below the merchantability threshold of 140 m^3/ha begin to regenerate on natural stand yield curves. Further, recovery of MPB depleted stands along succession pathways began at 20 years into the planning horizon. Stands were assumed to regenerate from an age of zero. The implications of this are that all residual live volume was lost and that stands were set back to an early seral stage. Due to the large scale

of the MPB epidemic and preponderance of pine, large areas of forest were "locked-down" due to early seral constraint binding. This effect contributed to the depth of the harvest trough.

Alternative Strategies: In the Decision Scenario, recovery of MPB depleted stands along succession pathways begins at an age when the volume of the recovery curve "matches" that of the depleted curve being left behind. The two curves were assumed to have matching volumes if the volume difference was less than 20 m^3/ha. Succession in the Decision Scenario begins on average 45 years into the planning horizon, and the average age of stands after succession has occurred is 60 years.

This "volume-matching" approach allowed stands to retain some older seral characteristics and all their residual live volume. This approach avoided the widespread binding of early seral constraints that occurred in the Base Case. It also advanced the recovery of depleted stands.

2.5.6.4.4. Landbase Constraints

Primary Assumptions for Decision Scenario:

- No harvesting within OGMAs (Does not apply in Base Case.)
- Increased allowable denudation in visually sensitive areas (Does not apply in Base Case.)
- Visually effective green-up in visually sensitive areas
- Seral stage requirements in LRMP defined Biological Ecosystem Networks
- Seral Stage Requirements in Landscape Units according to their LRMP Biodiversity Emphasis Option
- Stage Requirements in Caribou Migration Corridors
- Seral Stage Requirements for other specified wildlife: mountain goat, grizzly bear, moose winter range, deer winter range
- Maximum denudation and roads restrictions in backcountry lakes buffers
- Maximum denudation in other recreation areas
- Within harvest block wildlife tree retention
- Biodiversity targets – wintering range restrictions, etc.

Alternative Strategies for Decision Scenario:

- Different Wildlife Tree Retention (WTR) levels were used in the Decision Scenario than in Base Case. In the Base Case WTR targets were applied using Table A3.1 of the Landscape Unit Planning Guide. Each landscape unit and biogeoclimatic sub-zone combination has a WTP target assigned. In contrast, for the Decision Scenario the WTR reductions were 7% for all harvest blocks based on Forest Planning and Practices Regulations Section 9.1, and Section 66.1.
- Management of patch sizes is intended to reduce the level of fragmentation on the landscape. In TSR2 no patch targets were used as the analysis was conducted aspatially. No patch targets were used in the Base Case either. However, in the Decision Scenario patch targets were applied to create a desired patch size distribution given in Table 7 of the Lakes South SRMP, and seral stage definition in the Biodiversity Guidebook. As patch targets are computationally intensive to model, a selective approach was used to attempt to create the desired patch distribution. Analytical forecast indicators showed that in the Base Case the desired patch distribution was achieved over the long term in NDT3 without setting targets. Therefore no patch targets were set for NDT3 areas. In contrast, in NDT2 areas a shortage of small patches and an excess of medium and large patches was observed throughout the planning horizon. Patch targets were only set to increase the amount of area within small patches in the ESSF throughout the TSA. (Does not apply in Base Case.)
- The Decision Scenario models the use of a plan to perspective VQO depletion adjustment, which increases the allowable disturbance within visually sensitive areas particularly in low slope areas.

These adjustments are based on methods outlined in a Forest Service Bulletin from December 12th, 2003 entitled 'Modelling Visuals in TSR III'. (Does not apply in Base Case.)

- Landscape corridor targets for connectivity from Lakes South SRMP were applied in the Decision Scenario. A minimum of 70 % of the crown forested area within these landscape corridors is maintained in a mature state. In the SBS, stands are considered mature when they are at least 70 years old. And in the ESSF stands must be a minimum of 100 years to contribute to the target. In total, 95,700 hectares CFA and 60,100 hectares THLB were subject to these constraints in the Decision Scenario. (Does not apply in Base Case.)
- As mentioned in the section on THLB determination, the community forests are included in assessment areas for landbase constraints. (Does not apply in Base Case).

2.5.6.4.5. Harvest Flow

The harvest flow "policy" used in both the Base Case and the Decision Scenario was to match the current allowable annual cut of 3.13 million m^3 / yr for first five years, which was determined in the Expedited Timber Supply Review in June of 2004. After the period of the uplift the intention was to minimize the depth and duration of the MPB epidemic induced harvest trough before returning to a maximum sustainable long term harvest level evidenced by non declining THLB growing stock.

2.5.6.4.5.1. Non-recoverable Losses

Consistent with TSR standards, the values reported in the graph are all net of non-recoverable losses (NRLs). As per the data inputs and assumptions applied under the Base Case Scenario, NRLs consisted of 2,819 m^3 / yr for fire related disturbances and 18,357 m^3 / yr for wind-throw. Losses due to the mountain pine beetle epidemic were accounted for within the merchantable yield curves used in the model. The endemic beetle NRL amount of 10,800 m^3 / yr was waived for the first 30 years of the planning horizon then reinstated for the remaining time.

2.5.6.4.5.2. Harvest Flow Priorities

Primary Assumptions: Consistent with TSRII, portions of the agriculture/settlement zone were prioritized in both scenarios to promote agriculture land expansion. Additionally, stands infested by MPB or projected to be infested based on the BC Mountain Pine Beetle Project were prioritized in an attempt to maximize salvage and mitigate the impact of the MPB epidemic on harvesting activities.

In the Base Case priorities were set on a worst first basis. That is, the projected difference between the original yield curve and the epidemic adjusted yield curve in 2013 was determined. Those stand groups where this difference was greatest became highest priority stands, and there were ten such priority classes in descending order.

Alternative Strategies: The approach to harvest priorities used in the Decision Scenario can be described as "best of the worst first". That is, stands with the largest projected beetle related volume losses are high priority and within them more productive stands are higher priority. In other words, within the overall salvage priority, there is another priority which encourages conversion of higher productivity sites to managed stands first as these have the potential to provide available timber sooner.

2.5.6.4.5.3. Harvest Flow Graph

Figure 7, "IFPA Lakes TSA Base Case and Decision Scenario Harvest Flows", presents the flowed results of the IFPA Scenarios in comparison to the flow forecast obtained in the Expedited Timber Supply Review.

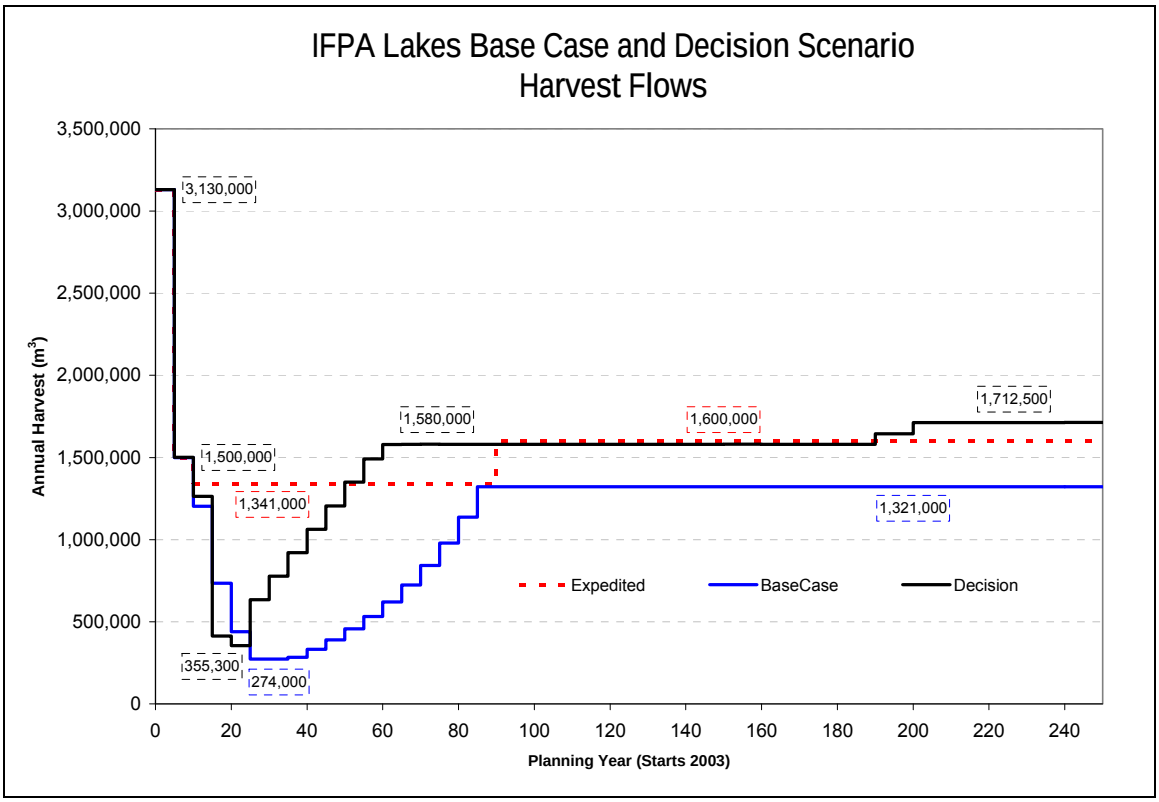


Figure 7: IFPA Lakes TSA Base Case and Decision Scenario Harvest Flows

Under the IFPA Lakes TSA Base Case and Decision Scenarios, the current AAC is maintained for 5 years after which harvest levels drop to 1.5 million m^3 / yr for five years. From that point further dramatic reductions are required which represent an MPB-induced fall down or harvest trough.

After the first ten years the Base Case harvest levels are generally lower than the Decision Scenario with the exception of periods 4 and 5 which extend from 2019 through 2028. The lowest projected harvest level in the Base Case occurs between 2029 and 2038 and is only 274,000 m^3 / yr. Recovery from this level is 55 years in duration with 16% increase in the harvest level each subsequent period. The Base Case long term harvest level of 1.321 million m^3 / yr is achieved in 2088, and is 17.5% lower than the Expedited TSR LTHL.

The harvest trough in the Decision Scenario is steeper on both sides than the Base Case trough. The lowest level, which occurs in period 5, is 355,000 m^3 / yr which is 30% higher than the lowest level in the Base Case. Recovery is more rapid and more linear with an average increase of 153,000 m^3 / yr each subsequent 5 year period; the average periodic increase in Base Case is 95,000 m^3 / yr. The recovery takes 40 years which is 15 years faster than in Base Case. Recovery to an initial LTHL in the Decision Scenario is complete in 2063, 25 years sooner than in Base Case. The initial LTHL of the Decision Scenario is 1.58 million m^3 / yr; 20% higher than the Base Case LTHL. It is also 1% lower than the LTHL of the Expedited TSR, though it is achieved 30 years sooner. The LTHL of the Decision Scenario climbs to just over 1.7 million m^3 / yr in 2103. This level is 30% higher than the LTHL of the Base Case, and 7% higher than the LTHL of the Expedited TSR.

2.5.6.4.5.4. Harvest Flow Interpretation

This section contains a brief discussion of some major influences on the shapes of the harvest flow graphs in Figure 7.

Trough is deeper in Base Case and Decision than in Expedited TSR

- The lower harvest levels obtained under the IFPA Lakes TSA Base Case and Decision Scenarios in the short and mid-term relative to the Expedited TSR are largely attributable to application of the BCMPB projections through 2013 rather than only the 2004 beetle flight as was done in the Expedited TSR.
- The current THLB in the Base Case is 32,700 hectares or 5.5% smaller than that current THLB used in TSR2. This decrease is mainly due to removal of an expanded Burns Lake Community Forest and the Cheslatta Carrier Nation Community Forest from the THLB.
- The THLB in the Decision Scenario is further reduced by the removal of OGMAs in the southern landscape units. The current THLB in the Decision Scenario is 516,300 hectares which is 73,700 hectares or 12.5% smaller than in TSR2 current THLB, 590,000 hectares.
- In the Base Case and Decision Scenarios beetle attacked stands that drop below the commercially viable threshold of 140 m^3/ha are excluded from harvest. This was not enforced in the Expedited TSR.
- In the Expedited TSR a relaxation of visual quality objectives was used in the first 20 years. The maximum allowable disturbance in significant visual retention and visual retention areas was increased to 12.6%. The maximum allowable disturbance in significant visual partial retention and visual partial retention areas was increased to 25%. This type of constraint relaxation was not implemented in the IFPA Base Case or Decision Scenario.
- Spatially explicit modeling as was applied in the Base Case and Decision Scenarios is more accurate, and can be more constraining to harvest than aspatial modeling as was used in the Expedited TSR. This is the case when assessment areas for constraints are considerably smaller than the landscape unit level as is common in these analyses.
- In the Base Case green-up adjacency constraints apply in the IRM zone after the first 20 years. This means that harvest blocks that have not reached green up height prevent harvest or "lock-down" of adjacent harvest blocks. In contrast the Expedited TSR used an aspatial approximation which requires that 67% of the IRM zone forest cover must be at least 3 metres tall at all times.

Trough is lower in Base Case than Decision Scenario

- The volume matching approach to enabling recovery of beetle depleted stands on VDYP curves used in the Decision Scenario avoids the widespread early seral binding observed in Base Case.
- Plan to perspective adjustments were applied to increase maximum denudation levels within visually sensitive areas. This applied in the Decision Scenario, but not the Base Case.
- Forest Productivity Curves were used in the Decision Scenario, but not the Base Case.

Trough is steeper going down in Decision Scenario than Base Case

- Small patch targets were applied in the ESSF throughout the TSA. This had a significant effect. These constraints also significantly constrained the LTHL in the Decision Scenario.

- It was observed that including community forests in assessment areas decreased harvest availability slightly in three periods within the trough.
- The THLB is smaller than in Base Case due to removal of OGMAs.

Trough is steeper on recovery in Decision Scenario than in Base Case

- Plan to perspective adjustments were applied to increase maximum denudation levels within visually sensitive areas.
- The volume matching approach to enabling recovery of beetle depleted stands on VDYP curves avoids widespread early seral binding observed in Base Case.
- Forest Productivity curves are used in the Decision Scenario.

LTHL is lower in Base Case than Expedited TSR

- Spatially explicit modeling is constraining of harvest; green-up adjacency requirements and assessment areas of other land base constraints.
- A long recovery term is observed for MPB decimated stands. MAI is lower, MHA is later on recovery curves than on future managed TIPSY curves.
- THLB is 5.5% smaller in Base Case.

LTHL increases late in planning horizon in Decision Scenario

- Recovery is a long-term process in these scenarios.
- The mean annual increment on the VDYP recovery curves is considerably lower than that of the future managed TIPSY curves.
- In comparison to the Base Case, recovery from the MBP epidemic is advanced by approximately 35 years by using the volume matching approach in the Decision Scenario.

3.0 IMPLEMENTATION OF THE SFM PLAN

This SFM Plan will be implemented through the M&L IFPA proponents as a collaborative effort which aligns management and practices toward the strategies identified for the various M&L IFPA and CCFM parameters identified through the public involvement process (i.e. Public Advisory Groups and Scenario Planning Teams).

The M&L IFPA proponents are collectively responsible for the implementation of the SFM Plan. Each proponent of the partnership will be responsible for ensuring that their corporate/agency management and practices contribute to meeting targets and/or thresholds for the various performance indicators which relate back to the framework of "values/issues" and "resources" for the M&L IFPA.

The Implementation Team is composed of representatives of the M&L IFPA proponents and ensures that strategies will be incorporated into operational plans for implementation within their respective organizations. Tweedsmuir Forest is responsible for ensuring that indicator monitoring is conducted and results from monitoring are compiled to evaluate performance toward achieving targets. If non-conformance is found, the implementation team will be responsible for evaluating the non-conformance and determining remedial action within organizations—or for the M&L IFPA as a whole—through Tweedsmuir Forest. Through this continual improvement process information gaps will be filled from ongoing research and any future data gaps may have to be addressed through implementing other research projects. These elements of implementation and continual improvement are described in greater detail below.

3.1. Operational Planning Links

Operational plans must be consistent with strategic objectives established in higher level plans and government objectives as defined in the Forest and Range Practices Act. The M&L IFPA transcends the boundary of legislated minimums, since it involves defining additional objectives that are provided by local communities, First Nations, agencies, and forest companies. Strategies to meet these objectives are generally incorporated into operational plans so activities will meet targets. (Refer to *Figure 4: M&L IFPA relationship within current regulated forest planning in BC*).

3.2. Monitoring

Monitoring of indicators is initiated according to the monitoring plans developed by the Implementation Team. The specifics of the monitoring activities and responsibilities for accomplishing various tasks are outlined in the "detailed indicator sheets" (see Appendix C). The unique nature of each indicator requires a distinct protocol for data collection. The quality specifications and standards used to collect certain datasets is prescribed through consultation with IFPA proponents.

3.3. SFM Reporting

Tweedsmuir Forest Ltd. will report to the public and stakeholders on the state of the forest in a clear, unambiguous manner. Action plans will outline procedures that will be implemented where outcomes are inconsistent with expectations (see "Continual Improvement" – Section 3.5). Above all, reporting must achieve credibility and encourage confidence in resource management.

SFM reporting will serve a variety of purposes ranging from operational feedback through to general public reporting. Each of these reports will differ in intent, purpose and audience.

3.3.1. INDICATOR MONITORING TECHNICAL REPORT

The "Indicator Monitoring Technical Report" provides a management summary of the "State of the Forest". Specifically, this report will show (by virtue of the indicator monitoring results) whether management practices are achieving the targets to meet resource management intent/objectives. This report will be based on systematic analyses to determine the SFM indicator values.

The format of the Technical Indicator Monitoring Report will closely resemble the "detailed indicator sheets" (presented in a later section of this SFM Plan). Where targets have not been met, references will be made to any "management adjustment action plans" which have been reviewed and approved within performance management meetings (see "Continual Improvement" – Section 3.5). The technical report will also include a brief interpretation of the indicator monitoring results, particularly as they apply to the SFM frameworks and their associated parameters.

3.3.2. PUBLIC SFM REPORT

The Public SFM Report utilizes the same information as in the Indicator Monitoring Technical Report; however, the information in the public report is summarized to demonstrate the progress toward SFM. The interpretation of the indicator monitoring results will be provided by the M&L IFPA Implementation Team. The preparation of the public report is to be done in a clear and understandable fashion. The report will utilize effective communication aids (charts, graphs, maps, etc) and will be available in various media (e.g. hardcopy, Internet-based document). Feedback mechanisms will also be incorporated into these public reports (i.e. hardcopy and Internet-based feedback forms).

3.3.3. OTHER CORPORATE/MANAGING AGENCY REPORTS

The requirements for corporate reports (i.e. public annual reports, SFM certification, shareholders reports) and agency reports, will utilize the information from the Technical Indicator Monitoring Report, and/or the Public SFM Report. Specific queries not addressed in the Technical Indicator Monitoring Report or the Public SFM Report can be accommodated through access to the results of the original indicator monitoring information.

3.4. Evaluation

Evaluation of management performance is based on the analysis of indicator monitoring data and consideration of their effectiveness in meeting resource objectives (i.e. indicator targets). Interpretation of indicator monitoring results provides the following:

- allows for subsequent decisions to be made regarding resource management strategies and practices;
- recognizes any interdependencies between indicators that can lead to improvement of indicator sets; and,
- implications that may result if management adjustment is implemented.

Figure 8 presents the sequence of steps in evaluation, review and adjustment.

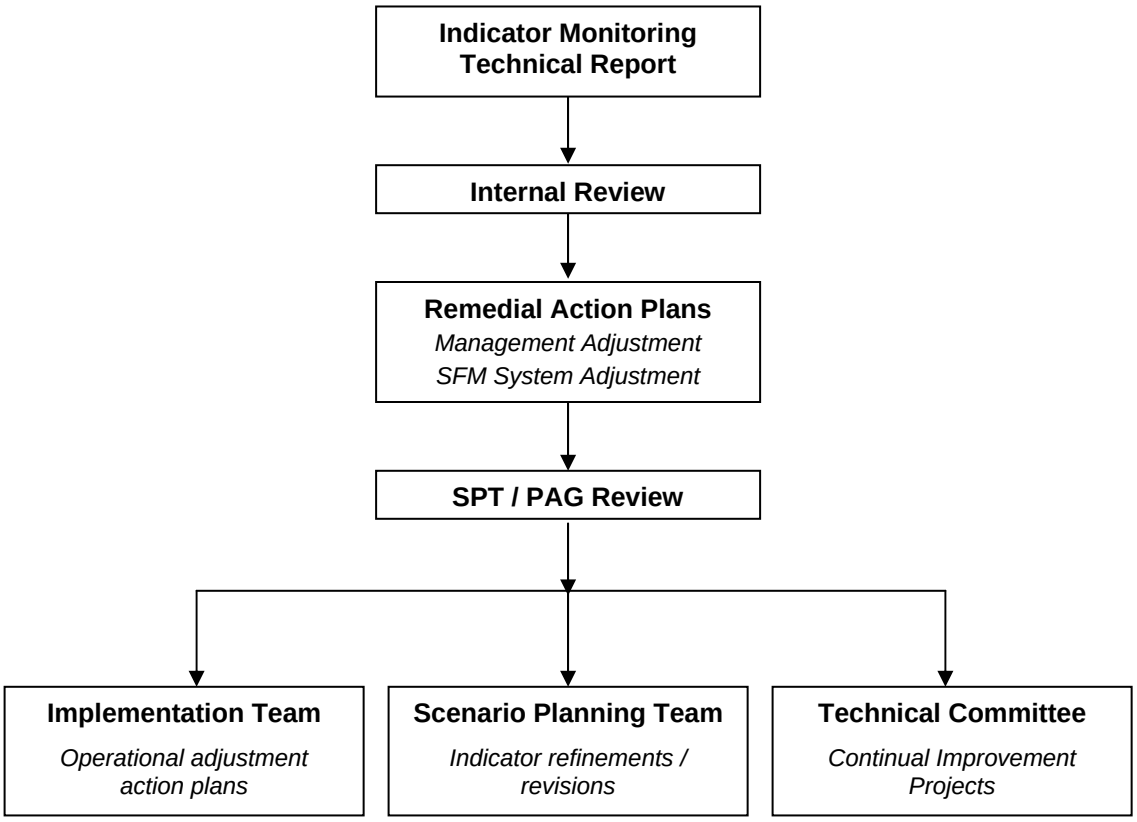


Figure 8: Process of evaluation, review, adjustment and continual improvement

3.4.1. PERFORMANCE MANAGEMENT

Performance management will utilize the Indicator Monitoring Technical Report (as described in Section 3.5) to assess the achievement of indicator targets by the IFPA proponents. If individual targets are not being met, the Indicator Monitoring Technical Report will reference the deficiencies and document plans for remedial action. Information from performance management forms the basis for determining "Management Adjustments"

Performance Management information for each indicator will contain the following elements within the Indicator Monitoring Technical Report:

- Name of indicator
- Indicator linkages (M&L-IFPA, CSA-SFM)
- Target met?
- Licensee/Operating Area
- Implications of not meeting target
- Remedial action proposed
- Time to meet target

3.4.2. INTERNAL AND PUBLIC REVIEW

Performance management measures will be completed by the Implementation Team and documented in the Indicator Monitoring Technical Report. This report will be reviewed with the Public Advisory Group during scheduled M&L IFPA performance review meetings. These meetings would normally be scheduled annually or more frequently if required and will be conducted by Tweedsmuir Forest Ltd. Indicator monitoring results will demonstrate if targets are being met by individual M&L IFPA partners. If targets are not being met due to management and/or practices, the proponents will be expected to propose remedial actions within a "Management Adjustment Action Plan" (described below). If it is determined that the non-conformance issues are related to the SFM system as a whole, continual improvement measures may have to be initiated (see Section 3.5).

The Public SFM Report and Management Adjustment Action Plans will also be presented and reviewed at Public Advisory Group meetings. These meetings would normally be scheduled annually or more frequently if required.

3.5. Continual Improvement and Adjustment

In keeping with the principles of SFM, opportunities for learning and improvement will be created. Continual improvement includes the incorporation of new information and knowledge, the identification of other information gaps, and undertaking research to address such gaps. The incorporation of new knowledge and understanding allows for better management approaches to evolve.

Continual improvement activities also include modifications to the adaptive management system as a result of what is learned from indicator monitoring. Indicator results provide a means to evaluate the achievement of objectives and to determine whether values are being maintained. This process may also reveal issues with the SFM system that requires adjustment to the SFM system in part, or as a whole.

Following the performance management evaluation and review, non-conformance issues related to organizational management and/ or practices will be addressed within a "Management Adjustment Action Plan" which will be implemented by the applicable organization(s). If it is determined that non-conformances are related to issues regarding the SFM system an “SFM System Adjustment Action Plan” will be produced and implemented by the M&L IFPA.

3.5.1. PROPONENTS MANAGEMENT ADJUSTMENT ACTION PLAN

In the event that indicator monitoring results demonstrate that management or practices by one or more of the proponents are not achieving forecasted targets, a "Management Adjustment Action Plan" will be prepared by the affected proponent which will demonstrate how management and practices will be adjusted to achieve the targets.

The "Management Adjustment Action Plan" will contain such elements as:

- A description of the indicator (i.e. the detailed indicator sheet)
- The licensee/agency specific target for the indicator that has not been met
- Reasons for not achieving target
- Schedule of actions to adjust management/practices to achieve targets (may include interim indicator monitoring)
- Management Adjustment Action Plan monitoring.

3.5.2. SFM SYSTEM ADJUSTMENT ACTION PLAN

The results from monitoring SFM performance indicators will also be used to evaluate if management assumptions are correct. In the event that indicator targets are not met due to assumptions being unrealistic, then it will be necessary to review the SFM system to evaluate if modifications are needed for strategy assumptions, indicators, indicator targets, management intent, etc.

The SFM System Adjustment Action Plans will require information such as:

1. A description of the indicator (i.e. detailed indictor sheet)
2. The target that has not been met
3. Implication of non-conformance for other values
4. The issue for non-conformance (e.g. assumptions being incorrect)
5. Schedule of remedial actions necessary to address non-conformance (e.g. SPT sessions to review/revise assumptions, re-analysis, etc.)

3.5.3. REFINEMENT

Based on the evaluation of performance indicators and the improvement in knowledge and understanding, the application of another cycle of the "McGregor Approach to SFM" may be initiated to incorporate this new information and to determine if the existing structure of resources and values is still valid or also requires adjustment. Through this process, values may be reviewed, assumptions may be changed, new information gaps revealed (and research initiated to fill the gaps), and new strategies implemented with a revised set of indicators to monitor performance.

This concept of structured learning and continual improvement is the essence of Adaptive Management, and is well suited to addressing the complex issues associated with managing ecosystems with multiple values and objectives.

4.0 M&L IFPA INDICATORS AND MONITORING

Indicators form the basis by which sustainable forest management will be monitored, evaluated, and adjusted for continual improvement. For clarity of understanding (i.e. public, operational needs, corporate, managing agencies, etc.), it is important to describe each indicator carefully with respect to the linkage of the indicator to SFM system(s) (i.e. M&L IFPA & CSA/CCFM SFM frameworks), the indicator rationale, the current status, forecasted targets, the schedule to achieve targets, how the indicator will be analyzed, the data necessary for analysis and monitoring, the schedule of implementation for indicator monitoring and reporting, and, how the results of indicator monitoring will be presented. In this context, "detailed indicator sheets" have been prepared for each indicator that has been identified in the M&L IFPA scenario planning process. The complete set of detailed indicator sheets for the Lakes TSA is contained in Appendix C.

4.1. End Use Frameworks for Indicators

The following summary tables have been prepared to clarify the relationship of the indicators to the M&L IFPA SFM framework (see Table 5) and the CSA/CCFM SFM framework (see Table 6). In each table, the indicator number is referenced which corresponds to the number "detailed indicator sheet" contained in Appendix C. Specific information (e.g. targets) was placed in the table where possible; however, for information that required more detailed explanation, the reader is referred to the specific detailed indicator sheet (contained in Appendix C).

Table 5: Linkage of indicators to M&L IFPA SFM Framework

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
Agriculture	**34** *(5.1)*	Area (ha/5 yr) harvested within the Agricultural/Settlement RMZ by licensee	Agricultural lease land expansion	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
Biodiversity	**14** *(2.1)*	Percent area retained in WTR by LU by BEC by licensee	Wildlife Trees and Wildlife Tree Patches -Habitat Element – snags -Habitat Element – large live trees -Habitat Element - CWD	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	15 *(1.1, 1.3, 2.1, 2.2)*	Percent forest in each patch type by patch size class by BEC Zone by licensee	Patch size targets	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	25 *[wildlife] (1.1, 1.3 1.4, 5.1)*	% seral stage distribution by Ecosystem and Wildlife Value Class	-BENS (general) -BENS (strong link deciduous) -rare and dry ecosystems	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

[3] **Bold characters –** indicator applies to more than one M&L-IFPA resource and/or CSA-SFM element

Italic characters– Applies to *[M&L IFPA resources]* and/or *(CSA-SFM elements)*

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
	26 *(1.1,1.1, 1.4, 2.2)*	% seral stage distribution by LU by BEC by licensee	-biodiversity emphasis options	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	27 *[timber, wildlife] (1.1, 1.2, 1.3, 2.2, 5.1)*	% species composition by BEC by licensee	-biodiversity emphasis options -BENS (general) -BENS (strong link deciduous) -connectivity -habitat element – trees species composition	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	46 *(1.2, 2.1, 4.1, 5.1)*	Percent of Harvesting by Licensee Where Recommended Operational Guidelines Have Been Applied to Retain Structural Habitat Elements	Biodiversity Emphasis Options Habitat Element – CWD Habitat Element – Snags Habitat Element – Large Live Trees	See detailed indicator sheet	Operational practices		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
Recreation	11 *(5.1)*	Percent area less than VEG by recreation class by licensee	-Backcountry lake recruitment -Backcountry lakes -Recreation areas (See detailed indicator sheet) -Recreation sites -trails (common, existing)	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	39 *(5.1)*	Road Density by recreation class by licensee	-Fly in fishing lakes -trails (common, existing) -Recreation areas (See detailed indicator sheet)	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
Timber	6 *(2.2, 5.1)*	Percentage of AAC harvested by Licensee	Harvest Flow Policy	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	13 *(2.1)*	Percent area of the THLB and non-contributing forest by beetle hazard type (extreme and high) by licensee	Bark Beetles	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	21 *(3.1,4.2)*	Percent of Gross Forest Area converted to permanent access by licensee	Roads, Trails and Landings	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
	27 *[biodiv., wildlife]* *(1.1,1.2, 1.3, 2.2, 5.1)*	% species composition by BEC by licensee	Harvest Profile	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	28 *(5.2)*	Percent species composition of harvest volume by licensee	Harvest Profile	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	33	Area treated by treatment type by licensee	-Vegetation management -Fertilization -Density management -Contributing land base conversion -Wood quality	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	41 *(2.2, 5.1)*	Area Weighted Average Minimum Harvest Age Mean annual increment (m3 / ha / year) by BEC by licensee	Harvest Flow Policy	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	49 *(4.1)*	Ecosystem Carbon Storage (tonnes/ha) by Licensee	Harvest Flow Dry wood Utilization	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
Visual	12 *(5.1)*	Percent of area less than VEG by VQO by Scenic Area by licensee	Scenic Areas	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
Water	9 *(3.2)*	Percent area less than 3m in height in stream RMAs by sensitive watershed by licensee	-Fish habitat – riparian management rivers and streams -Fish habitat – riparian management lakes -Fish habitat – riparian management wetlands	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	37 *(3.2)*	Equivalent clear cut area (ECA) by sensitive watershed by licensee	hydrology	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	45 *[Wildlife]* *(3.2)*	Road density index (RDI) by sensitive watershed by licensee	hydrology	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
Wildlife	25 *[biodiv.]* *(1.1, 1.1, 1.3 1.4, 5.1)*	% seral stage distribution by Ecosystem and Wildlife Value Class	-BENS (strong link caribou) -BENS (strong link moose) -Deer winter range (high value) -Grizzly habitat zones - Moose winter range (high value) -Mountain goat -Sydney William Caribou Herd -Tweedsmuir Caribou Herd (very high, high, moderate and low value migration corridors)	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
	27 *[biodiv., timber]* *(1.1, 1.2, 1.3, 2.2, 5.1)*	% species composition by BEC by licensee	-BENS (strong link caribou) -BENS (strong link moose) -Deer winter range (high value) - Moose winter range (high value) -Tweedsmuir Caribou Herd (very high, high, moderate and low value migration corridors)	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

M&L IFPA Resource	Indicator number[3]	Indicator	M&L IFPA Value/Issue	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
	29 *(1.2, 1.3, 5.3)*	Percent total area by Wildlife Value Class by LU by licensee	-mule deer habitat -Fisher habitat -Northern goshawk nesting habitat -Grizzly bear habitat -Marten Habitat -Moose summer Habitat -Moose winter habitat -Sydney Williams caribou herd habitat -Tweedsmuir caribou herd habitat	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	38 *(1.4)*	Road Density by Ecosystem and Wildlife Value Class by licensee	Mountain goat habitat	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	45 *[Water]* *(3.2)*	Road density index (RDI) by sensitive watershed by licensee	Grizzly habitat zones	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

Table 6: Linkage of indicators to CSA/CCFM SFM Framework

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
1 Conservation of Biological Diversity	1.1 Ecosystem Diversity	1.1.1 Connectivity	To maintain / enhance habitat connectivity over time at the landscape level across the DFA within the natural range of variability to provide opportunities for the distribution of species, populations and genetic material.	**25** *(1.1, 1.2, 1.3, 1.4, 5.1)*	% seral stage distribution by Ecosystem and Wildlife Value Class	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				27 *(1.2, 1.3, 2.2, 5.1)*	% species composition by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				15 ***(1.3, 2.1, 2.2)***	% forest in each patch type by patch size class by BEC zone by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

[4] **Bold** – indicator applies to more than one SFM element (*Italic* – other SFM elements that indicator applies to)

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
		1.1.2 Dry and Rare Ecosystems	These ecosystems are represented within their natural range of variability	25 *(1.1, 1.2, 1.3, 1.4, 5.1)*	% seral stage distribution by Ecosystem and Wildlife Value Class	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
		1.1.3 Structural Stage Distribution	Structural stages of ecosystems are represented within their natural range of variability	26 *(1.1, 1.4, 2.2)*	% seral stage distribution by LU by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
		1.1.4 Landscape Pattern	The temporal and spatial distribution of openings and leave areas are represented across the landscape within their natural range of variation	26 *(1.1, 1.4, 2.2)*	% seral stage distribution by LU by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	1.2 Species Diversity	1.2.1 Wildlife habitat	A supply of habitat types is maintained on the DFA within the natural range of variation over time.	27 *(1.1, 1.3, 2.2, 5.1)*	% species composition by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				25 *(1.1, 1.1 1.3, 1.4, 5.1)*	% seral stage distribution by Ecosystem and Wildlife Value Class by LU	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
				29 *(1.3, 5.1)*	Percent total area by Wildlife Value Class by LU by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				46 *(4.1)*	Percent of Harvesting by Licencee Where Recommended Operational Guidelines Have Been Applied to Retain Structural Habitat Elements	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	1.3 Genetic Diversity	1.3.1 Genetic Interaction	Individuals within sub-species and species have the opportunity to move and interact within their natural range in and across the DFA	15 ***(1.1, 2.1, 2.2)***	% forest in each patch type by patch size class by BEC zone by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				27 *(1.1, 1.2, 2.2, 5.1)*	% species composition by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				25 *(1.1, 1.1 1.2, 1.4, 5.1)*	% seral stage distribution by Ecosystem and Wildlife Value Class	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
				29 *(1.2, 5.1)*	Percent total area by Wildlife Value Class by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	1.4 Protected Areas and Sites of Special Significance	1.4.1 Protected Areas and Special Management Zones	Representa-tive examples of ecosystems are appropriately managed in or adjacent to the DFA to allow natural processes to occur.	26 *(1.1, 1.1, 2.2, 4.1)*	% seral stage distribution by LU by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				24 *(5.1, 5.2, 6.2)*	Percentage of forest management commitments completed on time resulting from consultations regarding non-timber features and interests by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (for all applicable licensees)
				38	Road density by ecosystem and wildlife value class by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
			Representa-tive examples of special habitat types are appropriately managed in or adjacent to the DFA to allow natural processes to occur.	25 *(1.1, 1.1, 1.2, 1.3, 5.1)*	% seral stage distribution by Ecosystem and Wildlife Value Class	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
2 Maintenance and Enhancement of Forest Ecosystem Condition and Productivity	2.1 Forest Disturbance and Stress	2.1.1 Stand-level ecosystem functionality	Stand-level ecosystem processes and conditions are maintained within a natural range of variability	15 ***(1.1, 1.3, 2.2)***	% forest in each patch type by patch size class by BEC zone by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				13	Percent area of the THLB and non-contributing forest by beetle hazard type (extreme and high) by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				14	Percent area retained in WTr by LU by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
	2.2 Ecosystem Productivity	2.2.1 Ecosystem productivity is conserved with the range of natural variability over time on the DFA	Ecosystem conditions capable of supporting naturally occurring species within the range of natural variability	15 ***(1.1, 1.3, 2.1)***	% forest in each patch type by patch size class by BEC zone by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				27 *(1.1, 1.2, 1.3, 5.1)*	% species composition by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
		2.2.2 Productive capacity of the forest resource base	The biological productive capacity of the forest resource base is sustained over time	26 *(1.1, 1.1, 1.4, 4.1)*	% seral stage distribution by LU by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				6 *(5.1)*	Percentage of AAC harvested by Licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				41 *(5.1)*	Area Weighted Average Minimum Harvest Age Mean annual increment (m3 / ha / year) by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
3 Conservation of soil and water resources	3.1 Soil Quality and Quantity	3.1.1 Productive capacity of soil resources are conserved	Soil quantity and quality are sustained throughout their characteristic range of variation	**21** *(4.2)*	Percent of Gross Forest Area converted to permanent access by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				19	Percentage of Blocks meeting NAR disturbance objectives by Licensee	100% (all applicable licensees)	Operational / Public Advisory Group decision	BCMOF – Forest Practices Code Act of BC	Licensees to manage toward target	See detailed indicator sheet	none
	3.2 Water Quality and Quantity	3.2.1 Aquatic Habitat	Water quantity and quality are sustained throughout their characteristic range of variation on the DFA through time	7	Percentage of Identified High Hazard Structures with Action Plans Implemented	100% (all applicable licensees)	Operational / Public Advisory Group decision		Licensees to manage toward target	See detailed indicator sheet	none
				9	Percent area less than 3m in height in stream RMAs by sensitive watershed by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				37	Equivalent clear cut area (ECA) by sensitive watershed by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
				45	Road density index (RDI) by sensitive watershed by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
4 Forest ecosystem Contributions to the Global Ecological Cycles	4.1 Carbon Uptake and Storage	4.1.1 Storage of carbon in forest ecosystems and products	Forest ecosystems are net carbon sinks over time on the DFA	**46** *(1.2)*	Percent of Harvesting by Licencee Where Recommended Operational Guidelines Have Been Applied to Retain Structural Habitat Elements	See detailed indicator sheet	Operational		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				49	Ecosystem Carbon Storage (tonnes/ha) by Licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	4.2 Forest Land Conversion	4.2.1 Gross Forest Area on the DFA	No net loss of the gross forest area required for ecosystems function and health on the DFA over time	**21** *(3.1)*	Percent of Gross Forest Area converted to permanent access by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
5 Multiple Benefits to Society	5.1 Timber and Non-Timber Benefits	5.1.1 The supply and variety of timber and non-timber products, services and benefits on the DFA	A sustainable harvest and use of timber products, services and benefits	**6** *(2.2)*	Percentage of AAC harvested by Licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
				41 *(2.2)*	Area Weighted Average Minimum Harvest Age Mean annual increment (m3 / ha / year) by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
			A sustainable harvest and use of botanical forest products, services and benefits	24 *(1.4, 5.1, 5.2, 6.2)*	Percentage of forest management commitments completed on time resulting from consultations regarding non-timber features and interests by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (for all applicable licensees)
			Healthy Wildlife Populations	27 *(1.1, 1.2, 1.3, 2.2)*	% species composition by BEC by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				25 *(1.1, 1.2, 1.3, 1.4)*	% seral stage distribution by Ecosystem and Wildlife Value Class	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				29 *(1.2, 1.3, 1.4)*	Percent total area by Wildlife Value Class by LU by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
		5.1.2 Agricultural Products	A variety of agricultural products are provided from the DFA	34	Area (ha/5 yr) harvested within the Agricultural/Settlement RMZ by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
		5.1.3 A variety of recreational experiences are provided on the DFA	Multiple Use Recreation Opportunities area provided on the DFA	11	Percent area less than VEG by recreation class by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				39	Road Density by recreation class by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				12	Percent of area less than VEG by VQO by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				24 *(1.4, 5.1, 5.2, 6.2)*	Percentage of forest management commitments completed on time resulting from consultations regarding non-timber features and interests by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (for all applicable licensees)

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
	5.2 Communities and Sustainability	5.2.1 Healthy and sustainable communities	Communities that exhibit economic, environmental and spiritual well being through time	24 *(1.4, 5.1, 5.1, 6.2)*	Percentage of forest management commitments completed on time resulting from consultations regarding non-timber features and interests by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (for all applicable licensees)
				4 *(6.3)*	Number of Participation Opportunities by Opportunity Type	See detailed indicator sheet	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				20 *(5.3)*	Percentage of total goods and services provided by local vendors by licensee	Maintain current status (all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (all applicable licensees)
				28	Percent species composition of harvest volume by licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
	5.3 Fair Distribution of Benefits and Costs	5.3.1 Fair distribution of timber and non-timber benefits and costs over time	The quality of timber harvested over time is in proportion to its representation on the DFA	17	Percent Seral Stage Distribution by non-timber tenure license by forest licensee	See detailed indicator sheet	Spatial forest scheduling model		Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
			Timber and non timber benefits are fairly and equitably distributed at a range of scales for current and future generations	20 *(5.2)*	Percentage of total goods and services provided by local vendors by licensee	Maintain current status (all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (all applicable licensees)
				35	Benefits directed into local communities by licensee	Maintain current status (all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (all applicable licensees)
6 Accepting Society's Responsibility for Sustainable Development	6.1 Aboriginal and Treaty Rights	6.1.1 First Nations' Aboriginal and Treaty rights	Duly-established First Nations' Aboriginal and Treaty rights are recognized and respected	2 *(6.3, 6.4)*	Number of Written Communications by licensee	Minimum of one written communica-tion annually regarding each resource value	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none
				5 ***(6.2)***	Number of Aboriginal Participation Opportunities by Licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none
				47 *(6.3, 6.4)*	Percentage of comments receiving response by type by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
	6.2 Respect for Aboriginal Forest Values, Knowledge and Uses	6.2.1 Traditional knowledge of Aboriginal Forest values and uses	Forest management incorporates traditional knowledge of Aboriginal Forest values and uses	5 ***(6.2)***	Number of Aboriginal Participation Opportunities by Licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none
				24 *(5.1, 5.1, 5.2)*	Percentage of forest management commitments completed on time resulting from consultations regarding non-timber features and interests by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	-10% (for all applicable licensees)
	6.3 Public Participation	6.3.1 Fair, equitable and effective public participation	An open public involvement process designed and implemented to the satisfaction of participants	4 *(5.2)*	Number of Participation Opportunities by Opportunity Type	See detailed indicator sheet	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	See detailed indicator sheet
				2 *(6.1, 6.4)*	Number of Written Communications by Licensee	Minimum of one written communica-tion annually regarding each resource value	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none

CSA/CCFM Criterion	CSA SFM Elements	Value	Objective	Indicator number[4]	Indicator	Target	Means to identify target	Legal requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Acceptable Variance
				42	Public Advisory Group established and maintained according to approved Terms of Reference	TOR on file	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none
				47 *(6.1, 6.4)*	Percentage of comments receiving response by type by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none
	6.4 Information for Decision-Making	6.4.1 Informed decision-making and increased knowledge	Relevant information is exchanged between interested parties to support decision-making and increased knowledge of ecosystem processes and human interactions with forest ecosystems.	2 *(6.1, 6.3)*	Number of Written Communica-tions by Licensee	Minimum of one written communica-tion annually regarding each resource value	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none
				47 *(6.1, 6.3)*	Percentage of comments receiving response by type by licensee	100% (for all applicable licensees)	Operational / Public Advisory Group decision	None (voluntary)	Licensees to manage toward target	See detailed indicator sheet	none

5.0 REFERENCES

Anon. 2000. Lakes District Land and Resource Management Plan (January 2000). British Columbia Ministry of Forests: Victoria, BC.

BCCDC 2002. BC Conservation Data Centre website (http://srmwww.gov.bc.ca/cdc/). Accessed 11/26/2002.

BCMOF 2004. Lakes Timber Supply Area: Rational for Allowable Annual Cut (AAC) Determination (effective October 1, 2004). BC Ministry of Forests: Victoria, BC.

BCMOF 2002a. Forest Investment Account: Overview of the Land-Base Investment Program. British Columbia Ministry of Forests: Victoria, BC.

BCMOF 2002b. Evidentiary Base to Support a Resource Development Permit (Results-Based Forest and Range Practices Regime: Companion Document 9). British Columbia Ministry of Forests: Victoria, BC.

BCMOF 2002c. BC Ministry of Forest – Apportionment System (TSA AAC, Apportionment and Commitments): Lakes TSA (TSA 14) Prince Report Region. Report Generated Dec 02, 2002.

BCMOF 2001. Timber Supply Review: Lakes Timber Supply Area Analysis Report and Information for Urgent Allowable Annual Cut (AAC) Increase (March 2001). British Columbia Ministry of Forests: Victoria, BC.

BCMOF 2001b. Timber Supply Review: Lakes Timber Supply Area Public Discussion Paper for Urgent Review of the Allowable Annual Cut (March 2001). British Columbia Ministry of Forests: Victoria, BC.

BCMOF 1995. Lakes TSA Socio-economic Analysis: Timber Supply Review 1 (1992-1996). Timber Supply Branch. British Columbia Ministry of Forests: Victoria, BC.

Bergen, A. 2002. Personal Communication. (Recreation Officer, Lakes Forest District) November 2002.

Coupé, R., A.C. Stewart, and B.M. Wikeem. 1991. "Chapter 15: Engelmann Spruce-Subalpine Fir Zone" in Ecosystems of British Columbia (ed. Meidinger, D. and J. Pojar). British Columbia Ministry of Forests. Crown Publications. Victoria, BC.

Eng, M.A., A. Fall, J. Hughes, T. Shore, B. Riel, and P. Hall. 2005. Provincial level projection of the current mountain pine beetle outbreak: an overview of the model (BCMPB v2) and results of year 2 of the project. Available from <http://www.for.gov.bc.ca/hre/bcmpb/BCMPB_MainReport_2004.pdf>

Fenwick, L. 2006. Personal communication. April 2006.

Holland, S.S. 1976. Landforms of British Columbia, a physiographic outline. British Columbia Department of Mines and Petroleum Resources. Bulletin 48, 138 p.

Horn, H. and G.C. Tamblyn. 2000. Morice Planning Area Background Report: An Overview of Natural, Cultural, and Socio-Economic Features, Land Uses and Resources Management. Prince Rupert Interagency Management Committee: Smithers, BC.

Maclauchlan, L. 2006. Status of mountain pine beetle attack in young lodge pole pine stands in central British Columbia. Report to the Chief Forester, Jim Snetsinger, at the 2006 Forest Health Review Committee Meeting, Victoria, B.C.

Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. Ministry of Forests Special Report Series 6. British Columbia Ministry of Forests. Crown Publications. Victoria, BC.

Meidinger, D. J. Pojar, and W.L. Harper. 1991. "Chapter 14: Sub-Boreal Spruce Zone" in Ecosystems of British Columbia (ed. Meidinger, D. and J. Pojar). British Columbia Ministry of Forests. Crown Publications. Victoria, BC.

MSRM 2002. Sustainable Resource Management Planning: A Landscape-level Strategy for Resource Development. Ministry of Sustainable Resource Management. Crown Publications. Victoria, BC.

Richard, J. 2002. Personal communication (Stewardship Forester, Lakes Forest District). December 2002.

Robinson, L. 2002. Personal communication. July 2002.

APPENDIX A – Corporate Policies related to SFM

Environment Policy

We are committed to responsible stewardship of the environment throughout our operations.

We will:

- Comply with or exceed legal requirements.
- Comply with other environmental requirements to which the company is committed.
- Achieve and maintain sustainable forest management.
- Set and review objectives and targets to prevent pollution and to continually improve our sustainable forest management and environmental performance.
- Provide opportunities for interested parties to have input into our sustainable forest management planning activities.
- Promote environmental awareness throughout our operations.
- Conduct regular audits of our forest and environmental management systems.
- Communicate our sustainable forest management and environmental performance to our Board of Directors, shareholders, employees, customers and other interested parties.

Jim Shepherd
President and Chief Executive Officer

P.J.G. Bentley
Chairman

February 2005

CANFOR

Figure 9: Canfor's Environment Policy

Canfor's Forestry Principles

Ecosystem Management

We will use the best available science to develop an understanding of ecological responses to natural and human-caused disturbances. We will incorporate this knowledge into higher level and operational plans by applying ecosystem management principles to achieve desired future forest conditions.

Scale

We will define objectives over a variety of time intervals (temporal scales), and at spatial scales of stand, landscape and forest.

Adaptive Management

We will use adaptive management to continually improve forest ecosystem management. This will require the development and implementation of collaborative research and monitoring programs.

Old Growth

We will include old growth and old growth attributes as part of our management strategies and philosophy in the forests where we operate.

Timber Resource

Canfor will ensure a continuous supply of affordable timber in order to carry out its business of harvesting, manufacturing and marketing forest products. Canfor will strive to maximize the net value of the fibre extracted for sustained economic benefits for employees, communities and shareholders.

Forest Land Base

We advocate the maintenance of the forestland base as an asset for the future.

Health and Safety

We will operate in a manner that protects human health and safety.

Aboriginal Peoples

We will pursue business partnerships and cooperative working arrangements with aboriginal people to provide mutual social, cultural and economic benefits and address mutual interests.

Communities

We will engage members of the public, communities and other stakeholders in the delivery of the Forestry Principles. The process will be open, transparent and accountable.

Accountability

We will be accountable to the public for managing the forest to achieve present and future values. We will use credible, internationally recognized, third party verification of our forestry operations as one way of demonstrating our performance.

Figure 10: Overview of Canfor's Forestry Principles

WOODLANDS OPERATION

SUSTAINABLE FOREST MANAGEMENT POLICY

June 14th, 2001

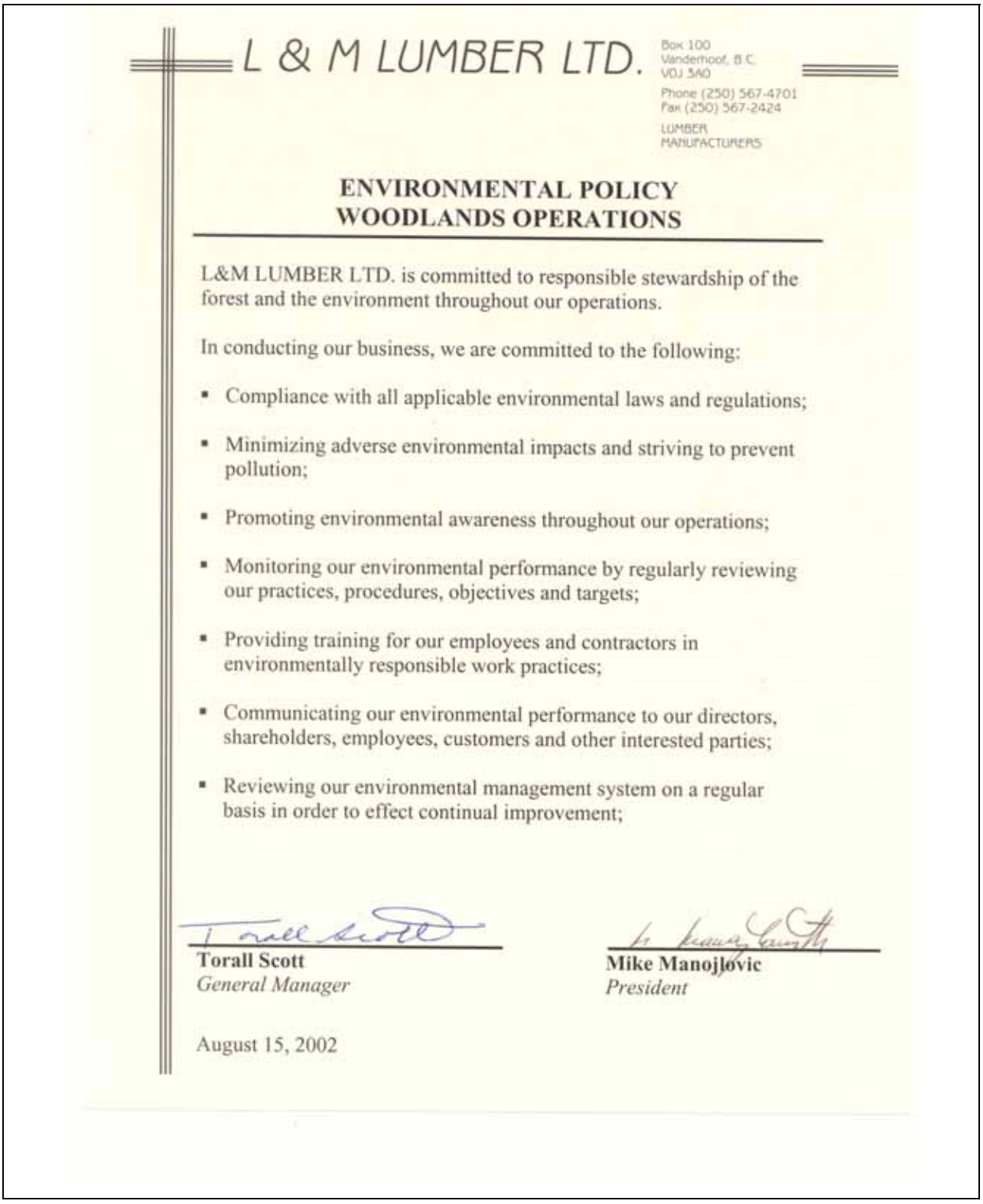
The Woodlands Operation of Babine Forest Products is committed to meeting the Weldwood of Canada "Our Environmental Stewardship Policy". To enable us to meet this policy, we are committed to:

- acting as responsible stewards in sustainable forest management, giving due consideration to all forest values and social values
- achieving and maintaining sustainable management of all forest resources within the bounds of our stewardship obligations, through the thoughtful application of Corporate, Governmental, and Divisional policies and procedures
- meeting or exceeding all applicable environmental legislation and regulations, policies, and other standards or guidelines to which Babine Forest Products subscribes
- respecting the rights of the First Nations community and actively soliciting their input to our proposed management activities with respect to their rights and interest in sustaining the forest
- continually soliciting and considering the concerns and values of the Public in our management plans and decisions
- applying prevention of pollution principles in our operational activities
- providing conditions and safeguards for the health and safety of employees, contractors and the Public
- encouraging research on the forest and on sustainable forest management
- monitoring improvements in science and technology, and incorporating them into sustainable forest management where applicable
- setting our sustainable forest and environmental goals and indicators with input from the Public and conducting a management review of these on an annual basis
- sharing the results of measurements of sustainable forest and environmental goals and indicators with the Public through local consultation processes

By acting on these commitments, we will manage the resources entrusted to us in a sustainable manner. We will demonstrate continual improvement of our Sustainable Forest Management System and its performance over time.

Henning Larsen, RPF
General Manager

Figure 11: Babine Forest Products Woodlands SFM Policy



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Phone (250) 567-4701
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LUMBER
MANUFACTURERS

ENVIRONMENTAL POLICY
WOODLANDS OPERATIONS

L&M LUMBER LTD. is committed to responsible stewardship of the forest and the environment throughout our operations.

In conducting our business, we are committed to the following:

- Compliance with all applicable environmental laws and regulations;
- Minimizing adverse environmental impacts and striving to prevent pollution;
- Promoting environmental awareness throughout our operations;
- Monitoring our environmental performance by regularly reviewing our practices, procedures, objectives and targets;
- Providing training for our employees and contractors in environmentally responsible work practices;
- Communicating our environmental performance to our directors, shareholders, employees, customers and other interested parties;
- Reviewing our environmental management system on a regular basis in order to effect continual improvement;

Torall Scott
General Manager

Mike Manojlovic
President

August 15, 2002

Figure 12: L&M Environmental Policy

West Fraser Timber Co. Ltd.

West Fraser Timber Co. Ltd. is committed to responsible stewardship of the environment. A philosophy of continual improvement of our forest practices and manufacturing procedures has been adopted to optimize the use of resources and minimize or eliminate the impact of our operations on the environment.

West Fraser recognizes that environmental excellence is an integral aspect of long-term business success. Our Company and its employees are committed to the following:

- Complying with all applicable environmental laws and regulations, and with other requirements to which the organization subscribes.
- Preventing pollution and continuing to improve our environmental performance by setting and reviewing environmental objectives and targets.
- Conducting periodic environmental audits.
- Providing training for employees and contractors to ensure environmentally responsible work practices.
- Communicating our environmental performance to employees, customers, shareholders, local communities and other stakeholders.
- Reviewing, on a regular basis, this policy to ensure that it reflects the Company's ongoing commitment to environmental stewardship.

Figure 13: West Fraser Environment Policy (Fraser Lakes Sawmills)

B C Timber Sales, Babine Business Area

SUSTAINABLE FOREST MANAGEMENT (SFM) POLICY

The British Columbia Ministry of Forests B C Timber Sales Program (BCTS) manages and administers timber harvesting and related forest management activities on BCTS timber sale licences and related tenures sold on Crown forestland throughout British Columbia.

It is the policy of the BCTS, Babine Business Area to:

- Comply with all relevant environmental legislation and regulations.
- Achieve and maintain SFM.
- Respect Aboriginal and treaty rights.
- Provide participation opportunities for Aboriginal peoples with respect to their rights and interests in SFM.
- Provide for public participation.
- Provide conditions and safeguards for the health and safety of workers and the public on lands we manage.
- Improve knowledge about the forest and SFM, and to monitor advances in SFM science and technology and incorporate them where applicable.
- Strive for excellence in forest management by continually improving the performance of resource management activities and practices. Maintain a framework for setting and reviewing environmental objectives and targets. Monitor and evaluate key BCTS forestry operations.
- Endeavour to prevent or mitigate undesired environmental impacts and pollution associated with BCTS forestry operations.
- Communicate BCTS business activities and policies to all staff and make them available to the public.

June 8, 2005 ***Original Signed by***

Updated: June 8, 2005 **Timber Sales Manager**

Babine Business Area

Figure 14: Small Business Forest Enterprise Program (Province of BC) Environment Policy

APPENDIX B – M&L IFPA Glossary of Terms

Abiotic – pertaining to the non-living component of the environment (e.g., climate, ice, soil and water). (Canadian Council of Forest Ministers)

Aboriginal – "aboriginal peoples of Canada" [which] include Indian, Inuit, and Métis peoples of Canada (Constitution Act 1992, Subsection 35(2)). (CSA Z808-96)

Abundance – the number of organisms in a population, combining density within inhabited areas with number and size of inhabited areas. (Canadian Council of Forest Ministers)

Access management - management of all access road construction, deconstruction, maintenance and deactivation. (BC MoF Website Glossary)

Activities - energetic action or movement; liveliness. (The American Heritage Dictionary of the English Language, Third Edition)

Adaptive Management (AM) – a systematic, rigorous approach to improving management and accommodating change by learning from the outcomes of management interventions. (BC Ministry of Forests - Forest Practices Management Branch)

Age Class – any interval of time into which the age range of trees, forests, stands or forest types is decided for classification and use. (BC Ministry of Forests)

Agriculture Land (High Value) – Parcels of land, which, based on soil and climate capability hearings, are deemed necessary to be maintained for agricultural use. (Common Usage)

Allowable Annual Cut (AAC) – the allowable rate of timber harvest from a specified area of land. British Columbia's Chief Forester sets AACs for timber supply areas (TSAs) and tree farm licences (TFLs) in accordance with the BC Forest Act. (BC Ministry of Forests)

Analysis Units - the basic building blocks around which inventory data and other information are organized for use in forest planning models. Typically, these involve specific tree species or type groups that are further defined by site class, geographic location or similarity of management regimes. (BC MoF Website Glossary)

Anthropogenic – relating to or influenced by the impact of man on nature (e.g., ecosystems) (Webster' Collegiate Dictionary)

Aquatic - Consisting of, relating to, or being in water. (The American Heritage Dictionary of the English Language, Third Edition)

Apportionment - the distribution of the AAC for a TSA among timber tenures by the Minister in accordance with Section 10 of the *Forest Act.* (BC MoF Website Glossary)

Backlog - a Ministry of Forests term applied to forest land areas where silviculture treatments such as planting and site preparation are overdue. Planting is considered backlog if more than 5 years have elapsed since a site was cleared (by harvesting or fire) in the interior and more than 3 years on the coast of British Columbia. (BC MoF Website Glossary)

Basic silviculture - harvesting methods and silviculture operations including seed collecting, site preparation, artificial and natural regeneration, brushing, spacing and stand tending, and other operations that are for the purpose of establishing a free growing crop of trees of a commercially valuable species and are required in a regulation, pre-harvest silviculture prescription or silviculture prescription. (BC MoF Website Glossary)

Best Management Practices – a practice or combination of practices that are determined to be the most technologically or economically feasible means of preventing or managing potential impacts. (Best Management

Practices Handbook: Hillslope Restoration in British Columbia; Watershed Restoration Technical Circular No.3 (revised); May 2000; Watershed Restoration Program, BC MoF)

Biodiversity (or biological diversity) – the variability among living organisms from all sources including *inter alia* terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Canadian Biodiversity Strategy 1995) (CSA Z808-96)

Biogeoclimatic ecosystem classification – a hierarchical classification system scheme having three levels of integration: regional, local and chronological; and combining climatic, vegetation and site factors. (BC Ministry of Forests)

Biogeoclimatic zone – a large geographic area with a broadly homogenous macroclimate. Each zone is named after one or more of the dominant climax species of the ecosystems in the zone, and a geographic or climatic modifier. British Columbia has 14 biogeoclimatic zones. (BC Ministry of Forests)

Biota – all of the living organisms in given ecosystem, including microorganisms, plants and animals. (Canadian Council of Forest Ministers)

Biotic – pertaining to any living aspect of the environment, especially population or community characteristics. (Canadian Council of Forest Ministers)

Blowdown (windthrow) - uprooting by the wind. Also refers to a tree or trees so uprooted. (BC MoF Website Glossary)

Catastrophic Event – a cataclysmic, disastrous incident, a violent usually destructive natural occurrence. (Merriam-Webster Dictionary online.

Common Trails – a widely used, unrestricted right of way. (Common usage)

Community – a group of people with collective, common goals. (Common Usage)

Community Forest Tenures – the control and use of land and resources contained within an area influenced by the urban population. (Dictionary of Natural Resource Management-J. & K. Dunster)

Communities of Interest - sectors of society which share common goals and interests e.g. First Nations, Recreation Associations. (Common usage)

Connectivity – a qualitative term describing the degree to which late-succession ecosystems are linked to one another to form an interconnected network. The degree of interconnectedness and the characteristics of the linkages vary in natural landscapes based on topography and natural disturbance regime. (BC Ministry of Forests)

Considered – mentally contemplate. (Canadian Oxford Dictionary)

Country-food harvest – the gathering and removal of crops or produce specific to an area. (Dictionary.com)

Critical - Being in or verging on a state of crisis or emergency. (The American Heritage Dictionary of the English Language, Fourth Edition)

Crown Land – land that is owned by the Crown; referred to as federal land when it is owned by Canada, and as provincial Crown land when it is owned by a province. Land refers to the land itself and the resources or values on or under it. (BC Ministry of Forests)

Cut Control – a set of rules and actions specified in the *Forest Act* that describes the allowable variation in the annual harvest rate either above or below the allowable annual cut (AAC) approved by the chief forester. (BC MoF Website Glossary)

Defined Forest Area (DFA) – a specified area of forest, land, and water delineated for the purposes of registration of a Sustainable Forest Management System. (CSA Z808-96)

Degradation – potentially detrimental disturbance. (Morice CSA SPT 10/10/01)

Disturbed areas – localities which have been impacted by natural events (fire, wind, flood, insects and also by human activities such as forest harvesting or construction of roads (Dictionary of Natural resource management + common usage)

Diverse - made up of distinct characteristics, qualities, or elements. (The American Heritage Dictionary of the English Language, Fourth Edition)

Duly Established Aboriginal and Treaty Rights – existing Aboriginal and Treaty Rights are recognised and affirmed in the Canadian Constitution. When discussed in relation to renewable resources, such Aboriginal and Treaty Rights generally relate to hunting, fishing, and trapping, and in some cases, gathering. (CSA Z808-96 Page 31 Section 2.6.1)

Ecological Reserves – areas of Crown land which have the potential to satisfy one or more of the following criteria:
-areas suitable for scientific research and educational purposes associated with studies in productivity and other aspects of the natural environment;
-areas which are representative of natural ecosystems;
-areas in which rare or endangered native plants or animals may be preserved in their natural habitat; and
-areas that contain unique geological phenomena. (BC MoF Website Glossary)

Ecosystem - a functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size-a log, pond, field, forest, or the earth's biosphere-but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem, old-growth ecosystem, or range ecosystem. (BC MoF Website Glossary)

Educational - Of or relating to education. (The American Heritage Dictionary of the English Language, Fourth Edition)

Enhance – to make greater (as in value, desirability, or attractiveness). (Webster's Collegiate Dictionary)

Environment – the surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation. (CSA Z808-96)

Extraction – The act of extracting, or drawing out; as, the extraction of a tooth, of a bone or an arrow from the body, of a stump from earth, of a passage from a book, of an essence or tincture. (Webster's Revised Unabridged Dictionary)

Fauna – the animal community found in one or more regions. (Canadian Council of Forest Ministers)

Flora – the plant species found in one or more regions. (Canadian Council of Forest Ministers)

Forest – a plant community of predominantly trees and other woody vegetation growing more or less closely together, its related flora and fauna, and the values attributed to it. (CSA Z808-96)

Forest Area – see Defined Forest Area.

Forest Ecosystem – includes both terrestrial and aquatic ecosystems. (Morice TSA CSA Scenario Planning Team 11/14/01)

Forest Land – land supporting forest growth or capable of so doing, or, if totally lacking forest growth, bearing evidence of former forest growth and not now in other use. (CSA Z808-96)

Forest Product – an item that is manufactured from trees. Forest products can be classified as primary (originating from harvested timber, i.e., lumber, pulp, etc.), or secondary (a by-product of the lumber or pulp process, i.e. furniture, wood-based chemicals, etc.). (Common Usage)

Forest Resources – resources and values associated with forests and range including, without limitation, timber, water, wildlife, recreation, botanical forest products, forage and biological diversity. (Forest Practices Code of British Columbia Act)

Forest Worker – Any contractors and or their employees woking on a licensee's DFA (Morice TSA CSA Scenario Planning Team 09/12/01)

Fragmentation - the process of transforming large continuous forest patches into one or more smaller patches surrounded by disturbed areas. This occurs naturally through such agents as fire, landslides, windthrow and insect attack. In managed forests timber harvesting and related activities have been the dominant disturbance agents. (BC MoF Website Glossary)

Genetic diversity - variation among and within species that is attributable to differences in hereditary material. (BC MoF Website Glossary)

Genetically improved stock - seed or propagule that originate from a tree breeding program and that have been specifically designed to improve some attribute of seeds, seedlings, or vegetative propagules selection. (BC MoF Website Glossary)

Goal – a broad, general statement that describes a desired state or condition related to one or more forest values. (CSA Z808-96)

Grazing Tenure – the use and control of range land for cattle grazing purposes (common usage)

Habitat - the place where an organism lives and/or the conditions of that environment including the soil, vegetation, water, and food. (BC MoF Website Glossary)

Habitat Networks - physical features within landscapes that contribute to, or are integral parts of, habitats for a range of species and/or provide spatially fixed locations for movement. (Morice CSA SPT 11/13/01)

Healthy - having or indicating good health in body or mind; free from infirmity or disease. (Dictionary,com)

Healthy Community – a community evidencing growth, interdependence, and cooperation in a variety of areas. (Common usage)

High Value Trails- a widely used, unrestricted right of way acknowledged as having local social or cultural significance. (Common usage)

Hydrologic Flows – the movement of groundwater near the durface. (Common Usage)

Hydrogeology - The branch of geology that deals with the occurrence, distribution, and effect of ground water. (The American Heritage Dictionary of the English Language, Fourth Edition)

Hydrology - the science that describes and analyzes the occurrence of water in nature, and its circulation near the surface of the earth. (BC MoF Website Glossary)

Incremental silviculture - a Ministry of Forests term that refers to the treatments carried out to maintain or increase the yield and value of forest stands. Includes treatments such as site rehabilitation, conifer release, spacing, pruning, and fertilization. Also known as intensive silviculture. See Basic silviculture. (BC MoF Website Glossary)

Indicator – a measurable variable used to report progress toward the achievement of a goal. (CSA Z808-96)

Indicator species - species of plants used to predict site quality and characteristics. (BC MoF website glossary)

Indigenous – a species of plant, animal, or abiotic material that is nature to a particular area (i.e., occurs naturally in an area and is not introduced). (Dictionary of Natural Resource Management, Julian and Katherine Dunster, 1996)

Infringe – refer to provincial documentation related to infringement. (Morice CSA SPT 10/10/01)

Independent – autonomous, self regulating. (Common Usage)

Inoperable lands - lands that are unsuited for timber production now and in the foreseeable future by virtue of their: elevation; topography; inaccessible location; low value of timber; small size of timber stands; steep or unstable soils that cannot be harvested without serious and irreversible damage to the soil or water resources; or designation as parks, wilderness areas, or other uses incompatible with timber production. (BC MoF website glossary)

Keystone Species - a species that plays an important ecological role in determining the overall structure and dynamic relationships within a biotic community. A keystone species presence is essential to the integrity and stability of a particular ecosystem. (BC MoF website glossary)

Known – To be able to distinguish; recognize as distinct. (The American Heritage Dictionary of the English Language, Fourth Edition)

Landscape – a spatial mosaic of several ecosystems, landforms and plant communities intermediate between an organism's normal home-range, size and its regional distribution. (Canadian Council of Forest Ministers). A watershed or series of similar and interacting watersheds, usually between 10,000 and 100,000 hectares in size. (BC Ministry of Forests Biodiversity Guidebook pp76.)

Linkage – A physical, biological, cultural, psychological, or policy connection or influence between two or more objects, processes, or policies. (Dictionary of Natural Resource Management, Julian and Katherine Dunster, 1996)

Local – Of, relating to, or characteristic of a particular place (i.e. the Lakes TSA). (The American Heritage Dictionary of the English Language, Fourth Edition)

Mean Annual Increment – the total volume increment for a given area to a given age in years, divided by that age (m^3/ha/year). (BC MoF website glossary)

Natural – being in accordance with or determined by nature or having a form or appearance found in nature. (Webster' Collegiate Dictionary)

Natural Disturbance Type – An area that is characterized by a natural disturbance regime. (BC Ministry of Forests Biodiversity Guidebook pp76.)

Natural disturbance pattern - the historic patterns (frequency and extent) of fire, insects, wind, landslides and other natural processes in an area. (BC MoF Website Glossary)

Natural range of variability – the variation in extent or occurrence through time of ecosystems, and species resulting from naturally occurring biotic or abiotic disturbances. (Common Usage)

Net Area to be Reforested (NAR) - (a) the portion of the area under a silviculture prescription that does not include
(i) an area occupied by permanent access structures,
(ii) an area of rock, wetland or other area that in its natural state is incapable of growing a stand of trees that meets the stocking requirements specified in the prescription,
(iii) an area of non-commercial forest cover of 4 ha or less that is indicated in the silviculture prescription as an area where the establishment of a free growing stand is not required,
(iv) a contiguous area of more than 4 ha that the district manager determines is composed of non-commercial forest cover, or
(v) an area indicated in the silviculture prescription as a reserve area where the establishment of a free growing stand is not required, and
(b) if there is no silviculture prescription for a cutblock in a woodlot licence area or community forest agreement area, the portion of the cutblock that does not include
(i) an area occupied by permanent access structures,
(ii) an area of rock, wetland or other area that in its natural state is not capable of supporting a stand of trees that meets the stocking requirements specified in the regulations,
(iii) an area of non-commercial forest cover of 4 ha or less that is indicated in an operational plan as an area where the establishment of a free growing stand is not required,
(iv) a contiguous area of more than 4 ha that the district manager determines is composed of non-commercial forest cover, or
(v) an area indicated in an operational plan as a reserve area where the establishment of a free growing stand is not required. (Forest Practices Code of BC Act; Part 1 – Definitions)

Non-contributing - having no involvement or effect (Common Usage)

Non-replaceable Forest Licenses (NRFLs) -

Objective – a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator. (CSA Z808-96)

Opportunities – potential or possibilities of action and change (Common Usage)

Patch – A stand of similar-aged forest that differs in age from adjacent patches by more than 20 years. When used in the design of landscape patterns, the term refers to the size of either a natural disturbance opening that led to an even-aged forest of an opening created by cutblocks. (BC Ministry of Forests Biodiversity Guidebook pp76.)

Period – an interval of time, typically expressed in hours, days, months or years.

Permanent Access Structures – the area of land within the Designated Forest Area that has been converted through land-use policy (permanently removed from the productive forest landbase) to provide access for resources development and protection. To facilitate forest management, part of the forest land base is occupied permanently by roads and other structures that provide access to the forest. Permanent access structures include those main haul roads, spur roads, landings, gravel pits, borrow pits and permanent logging trails required to meet present and future management needs. Permanent access structures are to be identified on operational plans and prescriptions. These structures may be treated to prevent erosion or to reduce slope stability hazard (e.g., decompacting the running surface, pulling sidecast fill slope soil up onto the running surface, or revegetating exposed mineral soil surfaces). This does not alter their status as permanent access structures, if these treatments are not adequate to enable reforestation or to ensure that the prescribed stocking and performance requirements will be met within the free growing time limits. (BC Forest Practices Code Soil Conservation Guidebook)

Permanent Site Disturbance - roads, landings, gravel pits, and permanent skid trails

Productive forest land - forest land that is capable of producing a merchantable stand within a defined period of time. (BC MoF Website Glossary)

Productive Land base – see Defined Forest Area

Profitable - Yielding profit; advantageous or lucrative. *(*The American Heritage Dictionary of the English Language, Fourth Edition)

Protect – the action of safe guarding and caring for the welfare of a person, area or thing. (Common Usage)

Public Advisory Group – An assembly that provides local people, community groups and general public that are interested in, or affected by, the Sustainable Forest Management (SFM) certification for HFP's Defined Forest Area with a focused process for shared decision-making. (Common Usage)

Rare Ecosystems – Infrequently occurring; uncommon functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. (Common Usage)

Rare Flora and Fauna – Infrequently occurring; uncommon plants and animals in a given area. (Common Usage)

Recreation Feature - a biological, physical, cultural or historic feature that has recreational significance or value. (BC MoF Website Glossary)

Recreation Opportunity Spectrum (ROS) - a mix of outdoor settings based on remoteness, area size, and evidence of humans, which allows for a variety of recreation activities and experiences. The descriptions used to classify the settings are on a continuum and are described as: rural, roaded resource, semi-primitive motorized, semi-primitive non-motorized, and primitive. (BC MoF Website Glossary)

Recruitment - the action of enrolling or enlisting people and resources (Common Usage)

Regeneration – the renewal of a tree crop through either natural means (seeded on-site from adjacent stands or deposited by wind, birds, or animals) or artificial means (by planting seedlings or direct seeding). (BC MoF Website Glossary)

Regeneration Assumptions – Hypotheses regarding the renewal of a tree crop through either natural means (seeded on-site from adjacent stands or deposited by wind, birds, or animals) or artificial means (by planting seedlings or direct seeding). (Common Usage)

Regeneration Delay - the maximum time allowed in a prescription, between the start of harvesting in the area to which the prescription applies, and the earliest date by which the prescription requires a minimum number of acceptable well-spaced trees per hectare to be growing in that area. (BC MoF Website Glossary)

Resource Value – values on Crown land which include but are not limited to biological diversity, fisheries, wildlife, minerals, oil and gas, energy, water quality and quantity, recreation and tourism, natural and cultural heritage resource, timber, forage, wilderness and aesthetic values. (BC Ministry of Forests)

Return on Capital Employed – a key financial statistic reflecting the rate of return that the company's management has obtained, on the shareholders' behalf, by their management of the company's assets. ROCE is determined by dividing net income before income taxes for the past 12 months by Common Shareholder's Equity and Long-term Liability. The result is shown as a percentage. (Common Usage)

Riparian - an area of land adjacent to a stream, river, lake or wetland that contains vegetation that, due to the presence of water, is distinctly different from the vegetation of adjacent upland areas. (BC MoF Website Glossary)

Road Density Index – a ratio describing the extent of road development within a given watershed. (Common Usage)

Scenic area - any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by the district manager. (BC MoF Website Glossary)

Seral Stages – the stages of ecological succession of a plant community, e.g., from young stage to old stage. The characteristic sequence of biotic communities that successively occupy and replace each other by which some components of the physical environment becomes altered over time. The age and structure of seral stages varies significantly from one biogeoclimatic zone to another. (BC Ministry of Forests Biodiversity Guidebook).

Social – of or relating to human society and its modes of organization. (The American Heritage Dictionary of the English Language, Fourth Edition).

Soil – the naturally occurring, unconsolidated mineral or organic material at the surface of the earth that is capable of supporting plant growth. It extends from the surface to 15 cm below the depth at which properties produced by soil-forming processes can be detected. The soil-forming processes are an interaction between climate, living organisms, and relief acting on soil and soil parent material. Unconsolidated material includes material cemented or compacted by soil-forming processes. Soil may have water covering its surface to a depth of 60 cm or less in the driest part of the year. (BC MoF Website Glossary).

Special and Unique Aboriginal needs – site-specific archeological, cultural, and spiritual values related to traditional aboriginal use. (Morice CSA SPT 10/10/01)

Species Sensitive to Disturbance – plants or animals susceptible to disrurbance by natural events (fire, wind, flood, insects) and also by human activities such as forest harvesting or construction of roads. (Common Usage).

Stability - The state or quality of being stable, especially: (a) Resistance to change, deterioration, or displacement; (b) Constancy of character or purpose; steadfastness; (c) Reliability; dependability. (The American Heritage Dictionary of the English Language, Fourth Edition)

Stand - a community of trees sufficiently uniform in species composition, age, arrangement, and condition to be distinguishable as a group from the forest or other growth on the adjoining area, and thus forming a silviculture or management entity. (BC MoF Website Glossary)

Standard Operating Procedure - Established procedure to be followed in carrying out a given operation or in a given situation. (The American Heritage Dictionary of the English Language, Fourth Edition).

Structural stage – The existing dominant stand appearance and structure for an ecosystem unit. (Common Usage)

Sustainability - the concept of producing a biological resource under management practices that ensure replacement of the part harvested, by regrowth or reproduction, before another harvest occurs. (BC MoF Website Glossary)

Temporary Access Structures – the area of land within the Designated Forest Area that has been converted through land-use policy (temporarily removed from the productive forest landbase to be rehabilitated after use) to provide access for resources development and protection. Temporary access structures include those haul roads, landings and excavated or bladed trails that will be restored to a productive state upon completion of harvesting. Temporary access structures are identified on operational plans and prescriptions. All areas occupied by temporary access structures must be rehabilitated so that all silvicultural obligations are achieved on the whole of the net area to be reforested. (BC Forest Practices Code Soil Conservation Guidebook)

Tourism - the business of providing tours and services for tourists. (The American Heritage Dictionary of the English Language, Fourth Edition).

Tree species profile – A description of the tree species composition of a DFA. (Common Usage)

Trekking – a hike or journey, perceived to be long and possibly arduous. (Common Usage)

Understory - any plants growing under the canopy formed by other plants, particularly herbaceous and shrub vegetation under a tree canopy. (BC MoF Website Glossary)

Value – a principle, standard, or quality considered worthwhile or desirable. (CSA Z808-96)

Viable – An action or proposed action which has a feasible, realistic outcome (Common Usage)

Visually Effective Greenup - the stage at which regeneration is seen by the public as newly established forest. When VEG is achieved the forest cover generally blocks views of tree stumps, logging debris and bare ground. Distinctions in height, colour, and texture may remain between a cutblock and adjacent forest but the cutblock will no longer be seen as recently cut-over. (BC MoF Visual Landscape Design, Training Manual)

Visual Quality Objective - A resource management objective established by the district manager or contained in a higher level plan that reflects the desired level of visual quality based on the physical characteristics and social concern for the area. Five categories of VQO are commonly used: preservation; retention; partial retention; modification; and, maximum modification. (BC MoF Website Glossary)

Water Flow Regime – the passage of water under the influence of gravity through soils, rocks, and other substrates. (Dictionary of Natural Resource Management, Julian and Katherine Dunster, 1996)

Watershed – An area of land, which may or may not be under forest cover, draining water, organic matter, dissolved nutrients, and sediments into a lake or stream. The topographic boundary, usually a height of land that marks the dividing line from which surface streams flow in two different directions. (Dictionary of Natural Resource Management, Julian and Katherine Dunster, 1996)

Well-used Trails - a widely used, unrestricted right of way acknowledged as receiving a significant amount of public use. (Common usage)

Windthrow - see Blowdown.

Winter Range – a range, usually at lower elevation, used by migratory deer, elk, caribou, moose, etc., during the winter months and typically better defined and smaller than summer range. (BC MoF Website Glossary)

GLOSSARY OF ACRONYMS

AF: Alpine Forest
AT: Alpine Tundra
AAC: Allowable Annual Cut
BCFS: BC Forest Service
BEC: Biogeoclimatic Classification
BEO: Biodiversity Emphasis Option
BMP: Best Management Practice
CWD: Coarse Woody Debris
DFA: Defined Forest Area
DFO: Federal Department of Fisheries and Oceans
ESA: Environmentally Sensitive Area
ESSF: Englemann Spruce-Subalpine Fir
FEN: Forest Ecological Network
FPC: Forest Practices Code
GIS: Geographic Information System
ICH: Interior Cedar-Hemlock
IRMA: Integrated Resource Management Area
IWAP: Interior Watershed Assessment Program
LRMP: Land and Resource Management Plan
LRUP: Local Resource Use Plan
MAI: Mean Annual Increment
MELP: BC Ministry of Environment, Lands and Parks
MOF: BC Ministry of Forests
MSYT: Managed Stand Yield Table
NAR: Net Area to be Reforested
NcBr: Non-Commercial Brush
NDT: Natural Disturbance Type
NDT1: ecosystems with rare stand-initiating events
NDT2: ecosystems with infrequent stand-initiating events
NDT3: ecosystems with frequent stand-initiating events
NDT4: ecosystems with frequent stand-maintaining fires
NDT5: alpine tundra and subalpine parkland
NSR: Not Satisfactorily Restocked
NSYT: Natural Stand Yield Table
OAF: Operational Adjustment Factor
OGMA: Old Growth Management Area
OPR: Operational Planning Regulation
PAS: Protected Area Strategy
RDI: Road Density Index
RFA: Regenerating Forest Area
RMA: Riparian Management Area
RMZ: Riparian Management Zone
ROCE: Return On Capital Employed
RPM: Roads Performance Model (Houston Forest Products)
SBS: Sub-Boreal Spruce
SOP: Standard Operating Procedure
SP: Silviculture Prescription
TFL: Tree Farm Licence
THLB: Timber Harvesting Land Base
TSA: Timber Supply Area
TSR: Timber Supply Review
WTP: Wildlife Tree Patch

APPENDIX C – Detailed Indicator Description Sheets

Structure of the Detailed Indicator Description Sheets

For each SFM indicator selected for the Lakes TSA, a detailed indicator description sheet has been prepared which contains the following information:

Indicator: Name of the indicator

Indicator Linkages: The linkages of the indicator to the M&L IFPA and CSA/CCFM framework parameters.

Indicator Rationale: An explanation of the terms used to describe the indicator and how the indicator relates to the M&L IFPA and CSA/CCFM parameters.

Current Status and Forecasted Targets/Thresholds of Indicator: Reflects the current status and forecasted targets/thresholds of the indicator as derived by resource analysis or other means. Also reflected is the timeframe to meet targets. *For analytical indicators (i.e. those being assessed and forecasted through spatial modelling and resource analysis), the current status has been summarized in an MSAccess database which can be access through hyperlinks within each applicable indicator detail sheet.*

Indicator Analysis Information: States the strategy practices that were used in the resource analysis to model indicator (if applicable) and which will need to be followed to realize targets. Furthermore, the methods, assumptions and criteria are used for the indicator stated.

Calculation of Indicator: *A formula is also presented which indicates how the indicator is calculated and the variables in the formula are also defined.*

Analysis comments/discussion: *A summary of the discussion/comments for the "current condition" and "forecasted conditions" analyses.*

Indicator Monitoring Plans:

Inventories Needed to Monitor and Analyze Indicator: *Listing of the data, the source, and update requirements (if applicable) for inventories needed to monitor and analyze data.*

Indicator Monitoring Implementation Schedule: *A list of activities and associated tasks to implement indicator monitoring. This includes assigning responsibility for completing tasks according to a defined schedule.*

Output for indicator reporting: Specifies the format to report results from indicator monitoring.

References: Sources of information referenced throughout indicator sheets.

Notes regarding Detailed Indicator Description sheets:

- The numbering of indicators is consistent with the Lakes SPT indicator list (from Aug 13, 2002). As such, there are some numbers missing from the numerical sequence. In general, those indicator numbers missing from the numerical sequence of the original list have been reconsidered by the Implementation Team and, in most cases, have been covered with existing indicators. This numbering is consistent with the "End Use Framework" summary tables contained in the main text of the SFM plan (i.e. *Table 5* and *Table 6*).
- "Licensees" include the BC Timber Sales Program (BCTS)
- The Lakes District BCMOF is responsible for Non-replaceable forest licenses (NRFLs). Reporting requirements for these tenures is unknown at this time.
- The dates listed for *inventory updates* and *indicator monitoring reporting schedules* will be reconciled once the base case analysis has been completed; thereby providing much more confidence around specific dates.
- For those licensees who are not currently pursuing certification, the indicators that apply only to the CSA framework (and not specifically to M&L IFPA framework), may have *current status, targets,* and *variances* labeled as "N/A" (i.e. Not Applicable).
- The BCTS is committed to the indicators put forth in this SFM plan, however, the reporting capability has yet to be determined.

List of Lakes TSA SFM Detailed Indicator Description Sheets Page number

Indicator L2: Number of Written Communications by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion: 6** Accepting Society's Responsibility for Sustainable Development **SFM Element:1** Aboriginal and Treaty Rights **Value: 1** First Nations' Aboriginal and Treaty rights **Objective: 1** Duly- established First Nations' Aboriginal and Treaty rights are recognized and respected. **SFM Element:3** Public Participation **Value: 1** Fair, equitable and effective public participation **Objective: 1** An open public involvement process designed and implemented to the satisfaction of participants. **SFM Element:4** Information for Decision-Making **Value: 1** Informed decision-making and increased knowledge **Objective: 1** Relevant information is exchanged between interested parties to support decision-making and increased knowledge of ecosystem processes and human interactions with forest ecosystems.

Indicators 2, 4, 24 & 46 are closely related

Indicator Rationale

What does this indicator mean?

Communications are an important tool for the IFPA and its proponents to make the public aware of issues regarding resource management toward local values. This indicator describes the level of outreach to the community. The number of written communications are documented for the IFPA and each of the IFPA proponents.

How does this indicator relate to the M&L IFPA and to SFM?

The M&L IFPA encourages open and effective communication regarding various aspects of the process in working towards SFM. Effective communication by the IFPA and its proponents ensures opportunities exist for community awareness regarding resource management. Proactive communication which encourages public input/participation in SFM is an important tool by which to incorporate public values in long-term SFM planning. Maintaining effective communication is not only important for developing the SFM plan, but will also be important in the monitoring, evaluation and continual improvement part of the M&L IFPA SFM process. By maintaining effective communication between the public, licensees, managing agencies and other stakeholders, there is a much greater ability to work together to develop mutually compatible objectives on the land base.

Current Status and Forecasted Targets/Thresholds of Indicator

Percentage of Contacts Sent Written Communications by Licensee						
		Current Status (2004)				
	IFPA reporting Period	**% of Contacts sent Written Communications**	**# of Contacts**	**Target %**	**Variance**	**Achieve Target**
Canfor	Apr. 1 – Mar. 31	**100**	60	100	none	Annually
BFP	Apr. 1 – Mar. 31	**?**	**?**		none	Annually
FLSM	**N/A**	**N/A**	**?**		**N/A**	**N/A**
L&M	**N/A**	**N/A**	**?**		**N/A**	**N/A**
BCTS	Apr. 1 – Mar. 31	**121**	**?**		none	Annually
IFPA	Apr. 1 – Mar. 31	**100**	**6000**		none	Annually

Rationale for variance: It is expected that the licensees, the Babine BCTS and the M&L IFPA maintain written communications with each contact on their contact list,, therefore, no variance is indicated.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
IFPA – specific communication to be identified and reported See Analysis Comments/Discussion below.
Licensees review communication records to determine Current Status See Analysis Comments/Discussion below.
Develop and implement licensee - specific communications strategies with interested parties (for example): Send a map of proposed blocks when they are planned within a certain area Send a map or list of roads to be deactivated Send a map or list of blocks planned for harvest on a seasonal basis Develop another agreed to method of communication if applicable.

Calculation of Indicator

Formula:

%C

#C

#C_{Total}

Variables:

%C : % of Contacts sent Written Communications

#C : Number of Contacts sent Written Communications

#C_{Total} : Total Number of Contacts by licensee

Analysis Comments/Discussion

- Reporting period is the fiscal year.
- Each licensee will maintain a list of all interested parties who may be impacted or others who want to be kept informed of the licensee's activities (Trappers, Guides, Stakeholders, etc).
- This list could come from existing tenure holders, from those that the licensee is already in contact with or from newspaper invitations, etc.
- For each interested party, and or member of the public, a record of communications will be maintained. Licensees and the IFPA Manager will describe the type of written communication in their annual reporting (eg. one newsletter sent to 500 households).

Communication Type (examples):

- Written (Letter, Fax, Email)

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Communication records database	Each Licensee	Yes	As communications are sent
IFPA communication records database	Tweedsmuir Forest Ltd.	Yes	As communications are sent

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Set up system to document communications	Ensure a system is organized to document	• Woods Managers for each licensee	December, 2004

	communications within the M&L IFPA and licensee-specific DFA's.	• Babine BCTS Manager • IFPA manager	
Monitor and update data	Ensure data is continually updated	• Woods Managers for each licensee • Babine BCTS Manager • IFPA manager	Starting in 2005
Analysis	Not applicable	Not applicable	Not applicable
Report	Indicator Performance Management Report for Management Adjustment Purposes (review updated data only)	• Woods Managers for each licensee • Babine BCTS Manager	Annually starting January 31, 2006
	M&L IFPA SFM Report	• Woods Managers for each licensee • Babine BCTS • IFPA manager	Annually starting January 31, 2006

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L4: Number of Participation Opportunities by Opportunity Type

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 5. Multiple Benefit to Society **SFM Element:** 2. Communities and Sustainability **Value:** 1. Healthy and sustainable communities **Objective:** 1. Communities that exhibit economic, environmental and social well being through time. **Criterion:** 6. Accepting Society's Responsibility for Sustainable Development **SFM Element:** 3. Public Participation **Value:** 1. Fair, equitable and effective public participation **Objective:** 1. An open public involvement process designed and implemented to the satisfaction of participants

Indicators 2, 4, 24 & 46 are closely related

Indicator Rationale

What does this indicator mean?

Maintaining and enhancing the ability for the public to participate in SFM (i.e. development, planning, implementation and monitoring, etc.), is fundamental to ensuring public values are expressed in SFM. The type of opportunities that have commonly been available for public participation in the M&L IFPA SFM process have been IFPA and licensee workshops, open houses, public exhibits, public advisory group meetings, scenario planning team meetings and knowledge transfer sessions. It is anticipated that the diversity of participation opportunities will increase as the M&L IFPA SFM process matures.

How does this indicator relate to the M&L IFPA and to SFM?

The opportunity for the public to participate in the development of SFM, contributes to the ability of the public to ensure local values are considered and incorporated within SFM planning. In this regard, values pertaining to the economic, ecological and social well being of the local communities can be expressed and incorporated into long-term SFM strategies and practices. Furthermore, as values change throughout time, maintaining and increasing the opportunities for ongoing public participation in the M&L IFPA SFM process ensures that local values will continue to be incorporated.

Current Status and Forecasted Targets/Thresholds of Indicator

Number of participation opportunities by opportunity tyoe				
Opportunity Type	**Current Status (2004 M&L IFPA fiscal)**	**Target**	**Variance**	**Achieve Target**
IFPA meetings: (PAG, Strategic Committee & other meetings including field trips and scenario planning).	12	2	None	Annually
Workshops(ML-IFPA and licensees)	0	≥ 1 per year	None	Annually

Rationale for variance: Not applicable

Indicator Analysis Information

Strategy Practices	Methods, Assumptions and Criteria
IFPA – specific opportunities to be identified and reported	See "Analysis Comments/Discussion"

Calculation of Indicator

Formula:

$\#\ P_{\text{opportunity type}}$

Variables:

$\#\ P_{\text{opportunity type}}$ **:** Number of Participation Opportunities by Opportunity Type

Analysis Comments/Discussion

Participation Opportunities include:

- Public Participation Meetings (strategic committee, public advisory group meetings, scenario planning team meetings, value/issue focus meetings)
- Displays (open houses, poster displays, public exhibits)
- Workshops (technical workshops, knowledge transfer sessions)

Reporting period for this indicator will be the IFPA fiscal year (April 1 - March 31)

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
IFPA participation records database	Tweedsmuir Forest Ltd.	Yes	Update monthly, as participation opportunities occur. Compile results annually.

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Set up system to document participation opportunities	Ensure a system is organized to document participation opportunities within the M&L IFPA.	IFPA manager	December 31, 2002
Monitor and update data	Ensure data is reviewed and updated	IFPA manager	Annually starting May 31, 2003
Analysis	Compile results	IFPA Manager	Annually starting May 31, 2003
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	IFPA manager	Annually starting May 31, 2004
	M&L IFPA SFM Report	IFPA manager	Annually starting May 31, 2004

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L5: Number of Aboriginal Participation Opportunities by License

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 6. Accepting Society's Responsibility for Sustainable Development **SFM Element:** 1. Aboriginal and Treaty Rights **Value:** 1. First Nations' Aboriginal and Treaty Rights **Objective:** 1. Duly-established First Nations' Aboriginal and Treaty Rights are recognized and respected. **SFM Element:** 2. Respect for Aboriginal Forest Values, Knowledge and Uses **Value:** 1. Indigenous Knowledge of forest values and uses **Objective:** 1. Forest management incorporates Indigenous Knowledge of forest values and uses

Indicators 2, 4, 5, 24 & 47 are closely related

Indicator Rationale

What does this indicator mean?

Maintaining and enhancing the ability for First Nations to participate in SFM (i.e. development, planning, implementation and monitoring, etc.), is fundamental to ensuring aboriginal values are expressed in SFM. The types of opportunities that have commonly been available for aboriginal participation include consultation and information sharing with licensees and involvement in the M&L IFPA SFM process. Aboriginal rights and Aboriginal title are recognized and affirmed in Section 35 of the Constitution Act, 1982. The SFM requirements do not in any way intend to define, interpret, or prejudice ongoing or future discussions and negotiations regarding these legal rights and do not stipulate how to deal with treaty rights. The appropriate bodies to make decisions related to Aboriginal and treaty rights are the governments. Organizations are required to be in compliance with government regulations and policies and should be able to demonstrate that they are operating in accordance with the requirements applicable to their jurisdictions. Organizations are also required to make special efforts to secure Aboriginal participation.

How does this indicator relate to the M&L IFPA and to SFM?

The opportunity for First Nations to participate in the development of SFM contributes to the ability of the First Nations to ensure traditional and local values are considered and incorporated within SFM planning and forest management. In this regard, values pertaining to the economic, ecological and social well being of the local First Nations communities can be expressed and incorporated into long-term SFM strategies and practices. Furthermore, as values change throughout time, maintaining and increasing the opportunities for ongoing First Nations participation in the M&L IFPA SFM process ensures that these values will continue to be incorporated.

Current Status and Forecasted Targets/Thresholds of Indicator

Number of Aboriginal participation opportunities					
Licensee	**First Nations**	**Current Status (2005)**	**Target**	**Variance**	**Achieve Target**
Canfor	All	No Data	2 per group per year	none	Annually
BFP	All	No Data	2 per group per year	none	Annually
FLSM	N/A	N/A	N/A	N/A	N/A
L&M	N/A	N/A	N/A	N/A	N/A
BCTS	All	No Data	2 per group per year	none	Annually

Rationale for variance: The frequency of meetings may fluctuate as the M&L IFPA process matures.

Indicator Analysis Information

Strategy Practices Methods, Assumptions and Criteria
Licensee – specific opportunities to be identified and reported. Licensees with targets will ensure identified First Nations Groups are provided the opportunity to participate in consultation sessions regarding forest management and to participate in the SFM process. Canfor will achieve the targets through the implementation of its *Aboriginal Strategy.* See "Analysis Comments/Discussion"

Calculation of Indicator

Formula:

$\#\ \mathbf{AP}_{licensee}$

Variables:

$\#\ \mathbf{AP}_{licensee}$ **:** Number of Aboriginal Participation Opportunities by licensee

Analysis Comments/Discussion

Aboriginal Participation Opportunities include:

- Invitations to consult or share information with licensees;

The following list of recognized Aboriginal Groups in the Lakes TSA is based on digital map data provided by Nadina Forest District in 2005:

- Burns Lake Band
- Cheslatta Carrier Nation
- Lake Babine Nation
- Nadleh Whut'en Band
- Nee Tahi Buhn Band
- Office of the Wet'suwet'en
- Skin Tyee Band
- Stellat'en First Nation
- Tl'azt'en Nation
- Ulkatcho Band
- Wet'suwet'en First Nation
- Yekooche First Nation

Targets will apply to the Traditional Territories of all the Aboriginal Groups listed above. Licensee-specific targets will apply to only those Traditional Territories intersecting the licensee operating areas.

As described in the section "What does this indicator mean?", organizations are required to make special efforts to secure Aboriginal participation in SFM planning. Furthermore, Sections 5.2 (c)&(d) of the CSA Z809-02 standard require the organization to: "demonstrate through documentation that efforts were made to contact Aboriginal forest users and communities affected by or interested in forest management on the DFA; demonstrate through documentation that efforts were made to work with Aboriginal forest users and communities to become involved in identifying and addressing SFM values." The licensees have expended considerable recruitment effort in an attempt to gain aboriginal participation. A record of those efforts is tracked by the licensees.

Reporting period for this indicator will be the fiscal year (April 1 - March 31)

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Licensee-specific participation records database	Each Licensee	Yes	Update monthly, as participation opportunities occur. Compile results annually.

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Set up system to document participation opportunities	Ensure a system is organized to document aboriginal participation opportunities.	• Woods Managers for each Licensee • Babine BCTS Manager	December 31, 2006
Monitor and update data	Ensure data is reviewed and updated	• Woods Managers for each Licensee • Babine BCTS Manager	Annually starting 2007
Analysis	Compile results	• Woods Managers for each Licensee • Babine BCTS Manager	Annually starting 2007
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	• Woods Managers for each Licensee • Babine BCTS Manager • IFPA Manager	Annually starting May 31, 2008
	M&L IFPA SFM Report	• IFPA Manager	Annually starting May 31, 2008

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L6: Percentage of AAC harvested by Licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Timber **Value/Issue:** Harvest Flow Policy		**Criterion:** 2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity **SFM Element:** 2. Ecosystem Productivity **Value:** 2. Productive capacity of the forest resource base. **Objective:** 1. The biological productive capacity of the forest resource base is sustained over time. **Criterion:** 5. Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 1. The supply and variety of timber and non-timber products services and benefits on the DFA. **Objective:** 1. A sustainable harvest and use of botanical forest products, services and benefits.

Indicator Rationale

What does this indicator mean?

The allowable annual cut (AAC) is the allowable rate of timber harvest from a specified area of land. The Chief Forester makes a determination of AACs for timber supply areas (TSAs) in accordance with Section 8 of the Forest Act. Within each TSA, the AAC is apportioned among timber tenures by the Minister in accordance with Section 10 of the Forest Act (BCMOF 2002). After the apportionment of the AAC among the licensees in the TSA, licensees must meet this harvest level within certain thresholds established by the Crown (i.e. cut control). Currently the threshold is to maintain the AAC within +/- 10 % of the AAC apportionment over each 5 year cut control period.

This indicator, therefore, reports on the percentage of the timber actually harvested by the licensee relative to the licensee's AAC apportionment.

How does this indicator relate to the M&L IFPA and to SFM?

In order to provide multiple timber and non-timber benefits for current and future generation, the determination of the harvest rate on the forest land base must consider how these values will be affected now and in future generations. In the determination of the AAC by the Chief Forester of the Province there are various considerations which are factored into the AAC determination in order to balance the various timber and non-timber values associated with the forest land base over the long term. Among these considerations are the long-term sustainable harvest of the timber resource, community stability, employment benefits, wildlife use, recreational use, productivity of the defined forest area, etc. The Chief Forester makes an independent determination of AAC which is considered to be sustainable over the long term with consideration of all the other values on the forest land base. In order to address new circumstances and incorporate new information, the AAC is determined every 5 years.

In order to maintain the values considered in the AAC determination, the licensees are required to harvest their AAC apportionment according to legislated rules (i.e. cut control regulation). Maintaining harvest levels according to these regulations helps to ensure that current benefits exist in local communities (i.e.

employment, community stability, recreation uses, wildlife uses, etc.) and also that the forest land base will be able to provide similar benefits for future generations.

Current Status and Forecasted Targets/Thresholds of Indicator

Percentage of AAC Harvested				
Licensee	**Current Status (2004)**	**Forecasted Target**	**Variance****	**Achieve Target**
Canfor	**184**%	100% of the AAC apportionment	AAC apportionment -50%	Annually
BFP	**92% Babine** **75% Decker**	100% of the AAC apportionment	AAC apportionment -50%	Annually
FLSM	**62.8%***	100% of the AAC apportionment	AAC apportionment -50%	Annually after 2002
L&M	No data *	100% of the AAC apportionment	AAC apportionment -50%	2008 (i.e. end of 10 year cut control period)
BCTS	No data	100% of the AAC apportionment	AAC apportionment -50%	Annually

*As stated under the Forest Act of BC Part 4, Division 3, sub-section 65 (3): *Excess harvesting*:

> "If timber on Crown land is in imminent danger of being lost or destroyed, a regional manager may authorize the holder of an agreement to harvest it, whether or not the timber is within the authorized cutting area of the agreement, and whether or not the volume to be harvested exceeds a limit specified in section 64, and if the regional manager so authorizes, he or she may grant to the holder of the agreement an exemption from the requirements of subsection (1) and section 64 (1), (2) or (3.1)" (BCMOF 2002b)

**Where a periodic cut applies (i.e. small licences), a target of 100% with a 10% variance over the period.

Rationale for variance: BC Ministry of Forests cut control regulations (BCMOF 2001).

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
Licensees will provide information as per monitoring schedule.

Calculation of Indicator

Formula:

$$H\%_{licensee} = H_{licensee}/AAC_{licensee}$$

Variables:

$H\%_{licensee}$: % of AAC apportionment harvested by Licensee

$H_{licensee}$: Volume harvest by Licensee (includes quota wood and wood purchased within the Lakes TSA)

$AAC_{licensee}$: Licensee AAC apportionment

Analysis Comments/Discussion

Licensees will provide AAC information for this indicator on an annual basis (as per outlined in the monitoring schedule). For BCTS, "AAC apportionment harvested by Licensee" is deemed to be the volume advertised for sale.

Current status of member licensees AAC from license documents (licensee allocation may increase in future if portion of any future cut uplift in Lakes TSA is allocated to the licensees).

Reporting period for this indicator will be the calendar year (January 1 - December 31)

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Harvest records/cut control database	Each licensee	Yes	Annual

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Document cut control in the DFA by licensee	Obtain necessary information from harvest records/cut control database	• Woods Manager for each licensee • Babine BCTS Manager	December 2002
Monitor and update data	Ensure data is updated	• Woods Manager for each licensee • Babine BCTS Manager	Annually starting 2003
Analysis	Obtain necessary data and conduct analysis	• Woods Manager for each licensee • Babine BCTS Manager	Annually starting 2003
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	• Woods Manager for each licensee • Babine BCTS Manager	Annually starting June 30, 2004
	M&L IFPA SFM Report	• Woods Manager for each licensee • Lakes BCTS Manager • IFPA manager	Annually starting June 30, 2004

Output for indicator reporting

This indicator will be reported in tabular format.

References

BCMOF 2002. BCMOF Glossary of Forestry Terms. BCMOF website (http://www.for.gov.bc.ca/PAB/PUBLCTNS/GLOSSARY/A.htm#AAC) accessed Aug. 29, 2002.

BCMOF 2001. Forest Act of BC (May 30, 2002). BCMOF website (http://www.for.gov.bc.ca/tasb/legsregs/forest/foract/contfa.htm) accessed Oct. 23, 2002.

BCMOF 2001. BC Ministry of Forests Cut Control Regulation (Dec. 10, 2001). BCMOF website (http://www.for.gov.bc.ca/tasb/legsregs/forest/faregs/cutcontr/ccr.htm) accessed Sept. 30, 2002.

Indicator L7: Percentage of Identified High Hazard Structures with Actions Plans Implemented by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 3. Conservation of Soil and Water Resources **SFM Element:** 2. Water Quality and Quantity **Value:** 1. Productive capacity of water resources is conserved **Objective:** 1. Water quantity and quality are sustained through their characteristic range of variation, on the DFA through time.

Indicators 7, 9, 37, and 45 are closely related

Indicator Rationale

What does this indicator mean?

Sediment delivery to streams at road crossings may have a major impact to water quality in a watershed. This indicator will use an inspection procedure to evaluate the size and characteristics of road-related sediment sources at crossings and the potential for the eroded sediment to reach the stream environment. A high score infers that there is potentially a significant erosion problem, which may in turn cause sediment related water quality problems.

How does this indicator relate to the M&L IFPA and to SFM?

The indicator will ensure that the productive capacity of water is conserved by identifying through inspections, high hazard structures in sensitive watersheds with high road densities (see indicator L45). It also evaluates the effectiveness of management practices for drainage structure installation in reducing the risk of sediment delivery to streams. In order to minimize the risk of stream sedimentation impacts upon water quality, where potential sedimentation occurrences are identified, corrective action plans must be developed. By committing to identifying and addressing potential stream sediment sources, this indicator demonstrates the commitment of the IFPA partners to respond appropriately to potential environmental issues relating to water quality.

Current Status and Forecasted Targets/Thresholds of Indicator

Percentage of Identified High Hazard Structures with Actions Plans Implemented by licensee				
Licensee	**Current Status (2005)**	**Target**	**Variance**	**Achieve Target**
Canfor	No data	100% of high hazard structures identified during inspections with action plans implemented.	- 50%	Annually
BFP	No data	100% of high hazard structures identified during inspections with action plans implemented.	- 50%	Annually
L&M	No data	100% of high hazard structures identified during inspections with action plans implemented.	- 50%	Annually
FLSM	N/A	N/A	N/A	N/A
BCTS	No data	100% of high hazard structures identified during inspections with action plans implemented.	- 50%	Annually

Rationale for variance: The variance is meant to account for completing corrective action plans outside of reporting period.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
Sensitive watersheds with the highest road densities as identified by indicator L45 will be a priority for a survey and hazard rating score. Corrective Action Plans will be developed for drainage structures with a high hazard rating that have been identified in the survey. Road construction practices and standards will use methods for minimizing sediment delivery to streams. New roads and their associated drainage structures are inspected within 1 year after construction is complete to ensure that sedimentation control methods are effective. If the results of the initial inspection result in a downgrading of the hazard, the inspection frequency may change. Drainage structures identified during the inspections with a perceived high hazard for sediment delivery to streams will have action plans developed to reduce the hazard.

Calculation of Indicator

Formula:

$$\%SORC_{licensee} = (SHPI_{licensee} / SHS_{licensee}) \times 100$$

Variables:

%SHPI $_{licensee}$: % of identified high hazard structures with actions plans implemented by licensee

SHPI$_{licensee}$: Number of Structures with a High hazard rating with action Plans Developed within the calendar year

SHS$_{licensee}$: Number Structures with a High hazard rating Surveyed within the calendar year

Analysis Comments/Discussion

Only drainage structures surveyed in identified watersheds from indicator L45 will be used to calculate this indicator.

Minimizing the effects of sediment delivery on new roads is managed by licensee standard operating and inspection procedures.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Sediment survey inspection reports	Each Licensee	Yes	Annual
Records of status of corrective action plans.	Each Licensee	Yes	Annual

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Document percentage of corrective action plans completed for high hazard structures to mitigate sediment occurrences	Review road sediment survey inspection reports for high hazard watersheds.	• Woods Managers for each applicable licensee • Babine BCTS Manager	Annually starting 2006
	Set up system to track development of action plans.	• Woods Managers for each applicable licensee • Babine BCTS Manager	Annually starting 2006
Monitor and update data	Ensure inventories (as above) are updated	• Woods Managers for each applicable licensee • Babine BCTS Manager	Starting in 2006

Analysis	Obtain necessary data and conduct analysis for indicator	• Woods Managers for each applicable licensee • Babine BCTS Manager	Annually starting 2006
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	• Woods Managers for each applicable licensee • Babine BCTS Manager	Annually starting January 31, 2007
	M&L IFPA SFM Report	• Woods Managers for each applicable licensee • Babine BCTS Manager • IFPA Manager	Annually starting January 31, 2007

Output for indicator reporting

This indicator will be reported in tabular format.

Indicator reporting will:

- make a notation as to general location (e.g. road name, section, etc.) of the structures assessed and their hazard rating.. This will allow analysis to identify effectiveness of best management practices.

References

The stream Crossing Quality Index: A Water Quality Indicator for Sustainable Forest Management developed P. Beaudry and Associates Ltd.

Indicator L9: Percent area less than 3m in height in stream RMAs by Sensitive Watershed by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Watershed and Riparian **Value / Issue:** Fish Habitat - Riparian Management Rivers and Streams **Value / Issue:** Fish Habitat - Riparian Management Lakes **Value / Issue:** Fish Habitat - Riparian Management Wetlands		**Criterion:** 3. Water Quality and Quantity **SFM Element:** 2. Conserve water resources by maintaining water quality and quantity **Value:** 1. Aquatic Habitat **Objective:** 1. Water quantity and quality are sustained through their characteristic range of variation, on the DFA through time.

Indicators 9, 37 & 45 are closely related

Indicator Rationale

What does this indicator mean?

Riparian areas occur adjacent to streams, rivers, lakes and wetlands and are characterized by high moisture and relatively dense vegetation and structure. They are generally very productive. Riparian management areas (RMAs) often support some of the highest concentrations of non-timber values in the forest. Functioning riparian management areas offer an array of benefits such as, contributing to water quality, modulating water flow, stream bank protection, and providing a diversity of habitats for fish, birds and animals. This indicator allows tracking of the rate at which forests within RMAs are disturbed in watersheds that are terrain sensitive, temperature sensitive, or have significant fisheries values. In order to maintain riparian function for the long term, it is essential that forest harvesting in these zones proceeds at a rate that maintains the functional integrity of the associated values within the RMA.

How does this indicator relate to the M&L IFPA and to SFM?

The Morice and Lakes IFPA area contains many streams and rivers that provide a host of non-timber benefits as well as supplies of quality timber products. The ability of RMAs to provide a sustained source of benefits depends on maintaining riparian management areas in a healthy and functioning condition. Managing the rate of harvest within the RMAs provides assurance that these areas continue to provide benefits and maintain water quality in sensitive watersheds.

Current Status and Forecasted Targets / Thresholds of Indicator

Percent area less than 3m in height in Stream RMAs by Sensitive watershed by licensee				
Licensee	**Sensitive Watershed > 15% (2005)**	**Forecasted Target (%)**	**Variance (%)**	**Achieve Target by**
BFP	Watershed 21-Babine Lake Watershed 55-Francois Lake	<= 15	0	Immediately
FLSM	Watershed 42-Babine Lake Watershed 67-Francois Lake	<= 15	0	Immediately
BCTS	Watershed 40-Bulkley River Group Watershed 60-Bulkley River Group	<= 15	0	Immediately

Rationale for variance: N/A

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
The Target will be achieved in the short term by managing for riparian management areas as specified in the Forest and Range Practices Act, Forest Planning and Practices Regulation. Riparian Reserve Zones, Riparian Management Zones and Riparian Management Best Practices will be specified in site plans Where the target is exceeded and any one of the following conditions apply: • a significant number of landslides that entered the stream channel are known to have occurred; **or** • stream channel stability problems are evident; **or** • over 25% of the riparian forest along either bank of the main stream channels has been logged over the past 40 years; **or** • landslide problems are anticipated due to recent harvesting on unstable terrain. An evaluation of the watershed will be conducted by a qualified professional if additional harvesting is scheduled. The Table above lists the watersheds will be considered for an evaluation in the next five years (based on 2005 Annual Report)..

Calculation of Indicator

Formula:

$$\%ALT3_{LU,SS,\ licensee} = (ALT3_{\ LU,\ SS,\ licensee} / RMA_{\ LU,\ licensee}) \times 100$$

Variables:

$\%ALT3_{SW,\ ,\ licensee}$: Percent Area Less than 3m by sensitive watershed by licensee

$ALT3_{SW,\ ,\ licensee}$: Area within stream RMAs that is less than 3m by sensitive watershed by licensee

$RMA_{SW, licensee}$: Areas of stream Riparian Management Area by sensitive watershed by licensee

Analysis Comments / Discussion

For this analysis, RMAs were defined according to the Forest and Range Planning and Practices Regulation section 47, 48, and 49. . Consistent with TSRII, a 50 metre riparian reserve zone (RRZ) along S1 rivers, a 30 metre RRZ along S2 streams and a 20 metres RRZ along S3 streams was removed from the THLB. In addition, a 20 metre riparian management zone (RMZ) along S1 rivers and S2 streams was removed from the THLB. No management practices were applied to the remaining RMZs.

Partial cut systems will apply the following factors to calculate area below 3m in riparian zones.

- <20% basal area removal Zero area harvested.
- 20–40% basal area removal 20% of area harvested.
- 40–60% basal area removal 40% of area harvested.
- 60–80% basal area removal 60% of area harvested.
- >80% basal area removal. 100% of area harvested.

The Interior Watershed Assessment Guidebook, second addition page 2, indicates that watershed size suitable for analysis are between 500 and 50,000 ha. The analysis indicates 99.8%% of the area of sensitive watersheds in the Lakes are in watersheds equal to or greater than 1000 ha. (Therefore we have not considered establishing targets for watersheds less than 1000 hectares.

This indicator only applies to the Sensitive Watersheds defined by the Scenario Planning Team. These consist of watersheds that are considered temperature, fish, or terrain sensitive, or a combination of these factors.

Stable vegetated stream banks provide cover for fish as well as shade, which helps regulate water temperature. The area below 3m green up height provides a threshold level where a more detailed evaluation needs to be conducted.

Km of stream logged to total km of stream value of 15% equates to an impact score of 0.5, which is at the bottom end of the moderate potential impact rank. (IWAP Guidebook 1995 edition, page 16).

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
VRI (Forest Cover)	ILMB	Yes	Use most current version
Silviculture Database (Harvesting History)	Each Licensee	Yes	Annual
Stream Inventory	ILMB (augmented with licensee data)	Yes	Use most current version
Operational Stream data from SPs	Each Licensee	Yes	Annual

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)

Procure data	Inventory data to be used to delineate RMA; survey data required to determine areas less than 3m by applied silviculture system	Tweedsmuir Forest Ltd.	Annually starting 2005
Analyze data	Conduct analysis	Tweedsmuir Forest Ltd.	Annually starting 2006
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	2006
	M&L IFPA SFM Report	IFPA Manager	2006

Output for indicator reporting

This indicator will be reported in tabular format.

References

Anon. 1995. Riparian Management Guidebook. Forest practices Code of British Columbia. Province of British Columbia. 68p.

Anon. 2005. "Forest Planning and Practices Regulation Forest and range Practices Act. Province of British Columbia. Ministry of Forests internet site: OPERATIONAL AND SITE PLANNING REGULATION.

Indicator L11: Percent area less than VEG by recreation class by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Recreation **Value / Issue:** Backcountry lake recruitment **Value / Issue:** Backcountry lakes **Value / Issue**: Recreation Areas (1) - Augier Lava Dome, Eagle Creek Opal Beds, China Nose, Knox Lake, Nez Lake East, Nourse-Allin-Maxan Trail, Tchesinkut Lake East. **Value / Issue**: Recreation Areas (2) – Boo Mountain – Fish Lakes, Uncha-Binta-Knapp Lakes, Takysie Lake, Moose Lake, Taltapin Lake-Pinkut Creek, Cheslatta Lake North. **Value / Issue:** Recreation Areas (3) – Kager-Star Lakes, Burns Lake South, Guyishton Lake **Value / Issue:** Recreation Sites **Value / Issue:** Trails (Common, Existing)		**Criterion:** 5. Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 3. A variety of recreational experiences are provided on the DFA. **Objective:** 1. Multiple use recreation opportunities are provided on the DFA

Indicator Rationale

What does this indicator mean?

The general public is making greater use of recreation opportunities that are available on crown land. At the same time, public concerns are increasing as recreational opportunities overlap on areas supporting forest management activities. Concerns arise primarily because of visual and physical alterations to the landscape, noise, direct interaction with harvesting activities and removal of some areas from public access. The recreational experience is based on the degree of disturbance by forest management and the recreational expectations of the public. The degree to which areas recover from the impact of harvesting activities influences the quality of the recreation experience. The percentage of area within a recreational class failing to achieve Visually Effective Greenup (VEG) is deemed not to contribute fully to a specific recreational experience because of the visual remnants of harvesting (bare ground, stumps, disturbed soil, skid trails, etc). The height of trees to achieve VEG will depend on slope. Generally greater tree height is required with increasing slope class. This indicator provides some measure of the extent to which the quality of the recreational experiences is being influenced.

How does this indicator relate to the M&L IFPA and to SFM?

The implied definition of sustainable forest management embraces the need for forest managers to manage for an array of non timber values that contribute to community well being. This indicator measures the proportion of managed areas that represent recreational value that have yet to attain VEG.

Current Status and Forecasted Targets / Thresholds of Indicator

Percent area less than VEG by recreation class by licensee					
Licensee	**Recreation Class**	**Current Status (2004)**	**Forecasted Target**	**Variance**	**Achieve Target by**
Canfor	Recreation Areas	1.6%	<=7.5%	Up to 9.5% after Period 16	Immediately
	Recreation Sites	9.1%	<12%		Immediately.
	Trails	5.4%	<=18%		Immediately
BFP	Backcountry Lakes	1.9%	<=2.0%	<=2.1% period 7	Immediately
	Recreation Areas	11.8%	<=7.5%		Period 3
	Recreation Sites	1.1%	<16%		Immediately
	Trails	12.5%	<18%		Immediately
BCTS	Backcountry Lakes	0.3%	<=2.0%		Immediately
	Recreation Areas	6.1%	<= 7.5%		Immediately
	Recreation Sites	2.9%	<7%		Immediately
	Trails	15%	<=16%		Immediately
FLSM	Backcountry Lakes	0.8%	<=2.0%		Immediately
	Recreation Areas	7.8%	<=7.5%	Up to 23% past period 12	Period 2
	Recreation Sites	5.5%	<=40%		Immediately
	Trails	14.4%	<17%		Immediately

Targets are based on Decision Scenario outputs

Rationale for variance:

Canfor Recreation area. The only recreation area in CFP's DFA is the Nourse Allen creek trail. The target of <=7.5% is achieved over all when other licensee DFA's are included.

FLSM The only recreation area in FLSM's DFA is the Uncha-Bitna-Knapp Lakes area. The target of <=7.5% is achieved over all when other licensee DFA's are included.

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
VEG is calculated according to Lakes District LRMP specifications listed under Appendix 5 (Anon. 2000). Scheduling of timber harvest on the THLB will be modeled through the planning horizon. **Backcountry Lakes** Harvesting will only occur in areas of extreme beetle hazard only. Up to 2% of the crown forested area can be less than 7 m. in height. Opening sizes of 1 hectare maximum will be used. No permanent roads within will be allowed in backcountry lake zones.

Recreation Areas
Harvesting will ensure that no more than 7.5% of the Crown forested area of any recreation polygon may be below 5m in height at any time. No permanent roads within will be allowed in these zones.

Recreation Sites and Trails
Harvesting or road construction will not damage or render ineffective a recreation site or trail.

Calculation of Indicator

Formula:

$$\%ALTVEG_{\text{Rec. Class, licensee}} = ALTVEG_{\text{Rec. Class, licensee}} / TA_{\text{Rec. Class, licensee}}) \times 100$$

Variables:

$\%ALTVEG_{\text{Rec. Class, licensee}}$: Percent area less than VEG by recreation class by licensee

$ALTVEG_{\text{Rec. class, licensee}}$: Area less than VEG by recreation class by licensee

$TA_{\text{Rec. class, licensee}}$: Total area by recreation class by licensee

Analysis Comments / Discussion

Model input assumptions for Backcountry Lakes - No more than 2% of the Crown forested area of any backcountry lake polygon may be below 7m in height at any time. In areas of

Model input Assumptions for Recreation areas - No more than 7.5% of the Crown forested area of any recreation polygon may be below 5m in height at any time.

Recreation classes for this indicator (as defined by SPT):

- Gingee Lake
- Backcountry lakes - Bob Lake, Chief Louis Lake, Fleming Lake, Gullwing Lake, Haney Lake, Henriette Lake, Mackenzie Lake, Sather Lake, Trout Lake.
- Recreation Areas (1) - Augier Lava Dome, Eagle Creek Opal Beds, China Nose, Knox Lake, Nez Lake East, Nourse-Allin-Maxan Trail, Tchesinkut Lake East
- Recreation Areas (2) – Boo Mountain – Fish Lakes, Uncha-Binta-Knapp Lakes, Takysie Lake, Moose Lake, Taltapin Lake-Pinkut Creek, Cheslatta Lake North.
- Recreation Areas (3) – Kager-Star Lakes, Burns Lake South, Guyishton Lake
- The following Recreation Sites:

Agate Point
Augier Lake
Bird Lake
Bitna Lake North
Bitna Lake South
Chaoborus Lake
Cheslatta Lake
Co-op Lake
Decker Lake Recreation
Dock
Division Lake
Ferry Terminal Area
Francois Lake
Gale Lake
Getzuni Lake
Government Point
Haney Lake
Hannay Lake
Hanson Lake
Helene Lake
Indian Bay
Knapp Lake
Ling Lake
Llgitiyuz Lake
Maxan Lake
McLure Pit
Mollice Lake
Nellion Lake
Ootsa Lake - Intata Reach
Ootsanee Lake
Richarson Lake
Richmond Lake
Robinson Lake
Sam Hardy Lake
Spillway Campground
Takysie Lake
Taltapin Lake
Trout Lake
Uncha Lake
Unnamed Lake
Unnamed Lake E of Uncha Lake
Unnamed Lake N of Wistoria
Unnamed Lake SW of Boo Mtn
Wasp Lake
West Francois

- Trails (Common, Existing) - BL Comfor Trail, Boer Mtn. Trail – East, Boer Mtn. Trail – North, Lava Dome Trail, Tchesinkut Lake Trail.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
VRI (forest cover)	ILMB	Yes	Use most current version
IFPA Recreation Features Inventory	Tweedsmuir Forest Ltd.	Yes	Use most current version
Recreation Inventory	ILMB	Yes	Use most current version
Silviculture database (harvesting data)	Licensees	Yes	Annual
Digital Elevation Model (DEM)	ILMB (augmented by licensees)	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Generate harvesting overlays and establishment information	Tweedsmuir Forest Ltd.	Annually starting 2003
	Obtain Recreation Features information over DFA.	Tweedsmuir Forest Ltd.	Every 5 years starting 2003 (using 2001 forest cover data)
Analysis	Analyze data by licensee	Tweedsmuir Forest Ltd.	Annually using harvest database information
	Project VRI for tree heights	Tweedsmuir Forest Ltd.	Every 5 years starting 2003
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually using harvest database information Every 5 years starting 2004 using VRI (reconciled with harvesting data)
	M&L IFPA SFM Report	IFPA Manager	Annually by Sept 15

Output for indicator reporting

This indicator will be reported in tabular format.

References

Anon. 2000. Lakes District Land and Resource Management Plan (January 2000). Government of British Columbia: Victoria, BC.

Indicator L12: Percent of area less than VEG by VQO class by Scenic Area by Licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Visual **Value / Issue:** Scenic Areas		**Criterion:** 5. Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 3. A variety of recreational experiences are provided on the DFA. **Objective:** 1. Multiple use recreation opportunities are provided on the DFA.

Indicator Rationale

What does this indicator mean?

Public concerns are increasing with regards to visual quality since forest management has the potential to alter the visual landscape. The impact on the visual quality by forest management is based on the degree of disturbance. The rate at which areas recover from the impact of disturbance influences the visual quality. Licensees are sensitive to landscape design and Visual Quality Objectives (VQOs) are set in areas with high visual value. These objectives define a level of acceptable landscape alteration. The types of VQOs recognized are: preservation, retention, partial retention, modification/maximum modification. The percentage of area within a VQO failing to achieve VEG (Visually Effective Greenup) is deemed not to contribute fully to a specific visual quality objective because of the visual remnants of harvesting (bare ground, stumps, disturbed soil, skid trails, etc). The height of trees to achieve VEG will depend on slope. Generally greater tree height is required with increasing slope class. This indicator, therefore, provides some measure of alteration to the visual landscape.

How does this indicator relate to the M&L IFPA and to SFM?

The implied definition of sustainable forest management embraces the need for forest managers to manage for an array of non timber values that contribute to personal and community well being. This indicator represents the proportion of managed areas subject to Visual Quality Objectives that are deemed to possess scenic value, but have yet to attain VEG.

Current Status and Forecasted Targets/Thresholds of Indicator

Percent of area less than VEG by VQO Class by Scenic Area by licensee

Licensee	Scenic Area	VQO Class	Current Status (2004)	Forecast Target	Variance by VQO	Achieve Target by
Canfor	FRANCOIS	M/MM	4.2%	<28%		Immediately
		PR	8.05	<=20%		Immediately
		R	0.5%	<=23%		Immediately
	GALE	M/MM	3.3%	<18%		Immediately
		PR	3.5%	<18%		Immediately
	HIGHWAY 16	M/MM	16.5%	<=30%		Immediately

Percent of area less than VEG by VQO Class by Scenic Area by licensee						
Licensee	**Scenic Area**	**VQO Class**	**Current Status (2004)**	**Forecast Target**	**Variance by VQO**	**Achieve Target by**
		PR	11.8%	<=37%		Immediately
	ISAAC	M/MM	1.1%	<16%		Immediately
		PR	0.2%	< 11%		Immediately
	MAXAN	PR	1.0%	<=30%		Immediately
	PINKUT	PR	31%	<50%		Immediately
	TBA	PR	49.5%	<=35%		Period 3
	WASP	PR	4.3%	<20%		Immediately
BFP	AUGIER	PR	1.4%	<=24%		Immediately
		R	1.7%	<8%		Immediately
	BABINE	M/MM	41.5%	<=31%		Period 3
		PR	18.1%	<=22%		Immediately
		R	12.9%	<=15%		Immediately
	BABINE/TOCHCHA	PR	9.2%	<=10%		Immediately
	FLEMING	R	4.9%	<=11%		Immediately
	GULLWING	M/MM	7.9%	<=24%		Immediately
		PR	1.4%	<=8.0%		Immediately
	HANNAY	M/MM	21.5	<=38%		Immediately
		PR	0.5%	<=20%		Immediately
	HELENE	PR	5.8%	<=24%		Immediately
		R	5.8%	<=10%		Immediately
	HENRIETTA	M/MM	37%	<=39%		Immediately
		PR	11.3%	<=13%		Immediately
	HIGHWAY 16	PR	12.3%	<=27%		Immediately
	KLAYTAHNKUT	M/MM	25.3%	<=26%		Immediately
		PR	15.5%	<=15%		Immediately
	PINKUT	PR	0%	<=17%		Immediately
	TALTAPIN	PR	23.1%	<=25%		Immediately
		R	19.1%	<=19%		Immediately
	TBA	PR	13.8%	<=29%		Immediately
BCTS	BINTA	M/MM	24.8%	<=31%		Immediately
		PR	11.9%	<=14%		Immediately

Percent of area less than VEG by VQO Class by Scenic Area by licensee						
Licensee	**Scenic Area**	**VQO Class**	**Current Status (2004)**	**Forecast Target**	**Variance by VQO**	**Achieve Target by**
		R	11.1%	<=14%		Immediately
	BOER MOUNTAIN	PR	7.5%	<=14%		Immediately
	BULKLEY	PR	8.7%	<=9%		Immediately
		R	27.8%	<=10%		Period 3
	CHESLATTA	R	0%	<=21%		Immediately
	DAY	M/MM	24.9%	<=25%		Immediately
		PR	6.8%	<=24%		Immediately
	ELWIN	M/MM	13.8%	<=37%		Immediately
		PR	0.8%	<=5%		Immediately
	FRANCOIS	PR	9.9%	<=13%		Immediately
		R	13.1%	<=6%		Period 3
	HANEY	R	1.6%	<=18%		Immediately
	HIGHWAY 16	M/MM	20.6%	<=21%		Immediately
		PR	15.3%	<=15%		Period 1
		R	13.7%	<=17%		Immediately
	HWY16	R	4.0%	<=7%		Immediately
	KNAPP	M/MM	25.1%	<=34%		Immediately
		PR	9.8%	<=24%		Immediately
	MAXAN	PR	17.4%	<=27%		Immediately
		R	9.1%	<=11%		Immediately
	OOTSA	PR	3.8%	<=12%		Immediately
		R	32%	<=12%		Period 4
	OOTSANEE	M/MM	27.9%	<=24%		Period 3
	PINKUT	PR	8.0%	<=32%		Immediately
	TAKYSIE	PR	29.1%	<=30%		Immediately
		R	13.2%	<=12%		Period 3
	TBA	M/MM	12.7%	<=31%		Immediately
		R	25%	<=11%		Period 4
	TCHESINKUT	PR	7.6%	<=20%		Immediately
		R	2.4%	<=10%		Immediately
	UNCHA	M/MM	47.6%	<=50%		Immediately
		PR	12.3%	<=24%		Immediately

Percent of area less than VEG by VQO Class by Scenic Area by licensee						
Licensee	**Scenic Area**	**VQO Class**	**Current Status (2004)**	**Forecast Target**	**Variance by VQO**	**Achieve Target by**
		R	0.8%	<=7%		Immediately
FLSM	BINTA	M/MM	12.4%	<=30%		Immediately
		PR	13.8%	<=17%		Immediately
		R	10.8%	<=14%		Immediately
	BIRD	M/MM	25%	<=25%		Immediately
		PR	30.7%	<=23%		Period 3
		R	22.8%	<=16%		Period 3
	CHAOBORUS	PR	17.1%	<=20%		Immediately
	CHIEF LOUIS	PR	27.5%	<=20%		Immediately
	GETZUN	PR	28%	<=25%		Immediately
	LIGITYUZ	M/MM	0%	<=64%		Immediately
		PR	7.4%	<=22%		Immediately
	MACKENZIE	PR	8.0%	<=25%		Immediately
		R	8.4%	<=30%		Immediately
	OOTSA	PR	18.0%	<= 16%		Immediately
	TAKYSIE	PR	25.4%	<=30%		Immediately
	UDUK	R	0.1%	<=16%	<=32% period 4	Immediately
	UNCHA	PR	5.3%	<=32%		Immediately
		R				

Rationale for variance:

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
Timber harvest has been spatially modeled and subsequently scheduled throughout the planning horizon. Visual quality objectives (VQOs) in the Lakes TSA have been identified for known Scenic Areas. In TSRII, forest cover requirements were applied in Scenic Areas. For the Lakes analysis, constraints were applied to VQOs in a manner consistent with TSRII, but with a later vintage of visual landscape inventory coverage. Also, the Lakes analysis constraints are more precisely applied in that there are targets for each VQO polygon, and in that we are using visually effective green-up based on slope rather than fixed green-up ages. Visual design evaluations will be conducted when planning roads and cut blocks in Recommended Visual Quality Class (RVQC) polygons. Design concepts and principles such as those outlined in the Visual Landscape Design Training Manual will be used when planning the shape of harvest openings and road

construction to ensure that blocks and roads meet the RVQC for the scenic area where they are located.

Calculation of Indicator

Formula:

$$\%ALTVEG_{VQO\ class,\ scenic\ area,\ licensee} = (ALTVEG_{by\ VQO\ class,\ scenic\ area,\ licensee} / TA_{VQO\ class,\ scenic\ area,\ licensee}) \times 100$$

Variables:

$\%_{class,\ scenic\ area,\ licensee}$: percent area less than VEG by VQO class by scenic area by licensee

$ALTVEG_{VQO\ class,\ scenic\ area,\ licensee}$: Area less than VEG by VQO class by scenic area by licensee

$TA_{VQO\ class,\ scenic\ area,\ licensee}$: Total area by VQO class by scenic area by licensee

Analysis Comments / Discussion

For the Lakes TSRII base case, "Modification" and "Maximum Modification" were considered as one RVQ class, accordingly, targets have been established for the combined class.

Some scenic areas were made known by the District Manager of the Lakes Forest District in letters to licensees on May 28, 1996, December 14, 1996, and January 10, 2001.

Targets were not set for areas:

- Where the productive area of polygon for the licensee, scenic area, VQO combination is less than 10.0 ha;

Parameters for calculating VQOs for partial cuts are contained in "Visual Impacts Of

Partial Cutting (Summary Report) - A Technical Analysis and Public Perception Study" (pages 8-10) (Anon. 1997)

The method outlined in the Bulletin – Modelling Visuals in TSR III (Anon. 2003) was used for calculating plan to perspective ratios to determine the targets for area below VEG Height for each VQO polygon and scenic area.

Procedures for Factoring Visual Resources into Timber Supply Analyses (Anon. no date) was used for defining the appropriate VEG Height for the purposes of this indicator. The VEG height was averaged using the appropriate Slope class and green up height to calculate the weighted average VEG height for each RVQC polygon.

Definitions:

- Preservation = P
- Retention = R
- Partial Retention = PR
- Modification = M
- Maximum Modification = MM

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Visual Landscape Inventory (VQO)	ILMB	Yes	Use most current version
VRI (forest cover)	ILMB	Yes	Use most current version
Silviculture database (harvesting data)	Licensees	Yes	Annual
Digital Elevation Model (DEM)	ILMB (augmented by licensees)	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Ensure availability of coverages (area of cut blocks by VQO, VEG status)	Generate harvesting overlays and establishment information	Tweedsmuir Forest Ltd.	Every 5 years starting 2003 (using 2001 forest cover data)
Analysis	Analyze data by licensee	Tweedsmuir Forest Ltd.	Annually using harvest database information
	Project VRI for tree heights	Tweedsmuir Forest Ltd.	Every 5 years starting 2003
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting 2004 using harvest database information Every 5 years starting May 31, 2004 using VRI (reconciled with harvesting data)
	M&L IFPA SFM Report	IFPA Manager	Every 5 years starting May 31, 2004

Output for indicator reporting

Tables will be prepared by licensees that denote VQOs by scenic area and that portion of each (ha) that has been harvested and supports vegetation less than VEG.

References

Anon. 2003. Bulletin – Modelling Visuals in TSR III December 2003.

Anon (no date). Procedures for Factoring Visual Resources into Timber Supply Analyses Page 9 http://www.for.gov.bc.ca/hfp/PUBS/Visual/TSR10.pdf

Anon. 1997. Visual Impacts Of Partial Cutting (Summary Report) - A Technical Analysis and Public Perception Study" (August 1997). Province of British Columbia, Ministry of Forests. Forest Practices Branch. BC. 53 p. (contained on BCMOF internet site: http://www.for.gov.bc.ca/hfp/fordev/visual_res_mngt/visual_impacts.pdf (accessed 09/26/02)

Anon. 1981. Forest Landscape Handbook. Province of British Columbia, Ministry of Forests. Information Services Branch. BC. 97p.

Indicator L13: Percent area of the THLB and non-contributing forest by beetle hazard type (extreme and high) by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Timber **Value / issue:** Bark beetles		**Criterion:** 2. Maintenance and Enhancement of Forest ecosystem Condition and Productivity **SFM Element:** 1. Forest Resilience **Value:** 1. Bark beetles **Objective:** 1. Forest ecosystems resilient to disturbances and stresses. *(abiotic, stress)*

Indicator Rationale

What does this indicator mean?

This indicator relates to acknowledging the growing threat and dynamics that beetle infestations present to forest management in the Lakes TSA (i.e. current and future). Developing a plan of action requires that the hazards and risks of beetle infestations be understood. In addition to the proportion of the timber harvesting land base (THLB) in high and extreme hazard condition, the proportion of non-contributing forest within the DFA in high and extreme hazard condition is of particular importance. Such areas can continue to provide a source for infestation unless they are managed in conjunction with the THLB.

How does this indicator relate to the M&L IFPA and to SFM?

The short to medium term sustainability of the M&L IFPA is to be related to management plans to address the timber losses attributable to the current beetle infestation. This indicator also acts as a long term measure to reduce the impact to susceptible stands. In addition to addressing the loss of timber, it will be important to manage the forests consistent with higher level plans and landscape level planning to target susceptible stands for harvesting. The rapidity with which renewal occurs will contribute to securing growing stock and other values for the new forest.

Current Status and Forecasted Targets/Thresholds of Indicator

Percent area of the THLB and non-contributing forest by beetle hazard type (extreme and high) by licensee							
Licensee	**Forest Classification**	**Beetle Species**	**Beetle Hazard**	**Current Status (2004)**	**Forecasted Target***	**Variance**	**Achieve Target by**
Canfor	THLB	MPB	Extreme	18	<15	0	Period 2
			High	13	<13	0	Immediately
		SBB	Extreme	1	<5	0	Immediately
			High	7	<7	0	Immediately
		WBBB	Extreme	0	<1	0	Immediately

			High	2	<2	0	Immediately
	NCF	MPB	Extreme	19	N/A		
			High	11	N/A		
		SBB	Extreme	2	N/A		
			High	8	N/A		
		WBBB	Extreme	0	N/A		
			High	9	N/A		
BCTS	THLB	MPB	Extreme	15	<15	0	Period 2
			High	14	<13	0	Immediately
		SBB	Extreme	1	<7	0	Immediately
			High	9	<10	0	Immediately
		WBBB	Extreme	0	<1	0	Immediately
			High	4	<4	0	Immediately
	NCF	MPB	Extreme	9	N/A		
			High	7	N/A		
		SBB	Extreme	1	N/A		
			High	7	N/A		
		WBBB	Extreme	0	N/A		
			High	2	N/A		
BFP	THLB	MPB	Extreme	15	<15	0	Period 2
			High	15	<13	0	Immediately
		SBB	Extreme	3	<6	0	Immediately
			High	13	<13	0	Immediately
		WBBB	Extreme	0	<1	0	Immediately
			High	8	<8	0	Immediately
	NCF	MPB	Extreme	9	N/A		
			High	10	N/A		
		SBB	Extreme	2	N/A		
			High	12	N/A		
		WBBB	Extreme	0	N/A		
			High	16	N/A		
FLSM	THLB	MPB	Extreme	8	<15	0	Period 2
			High	31	<13	0	Period 4
		SBB	Extreme	1	<9	0	Immediately
			High	5	<15	0	Immediately
		WBBB	Extreme	0	<1	0	Immediately
			High	0	<1	0	Immediately
	NCF	MPB	Extreme	9	N/A		

			High	35	N/A		
		SBB	Extreme	0	N/A		
			High	9	N/A		
		WBBB	Extreme	0	N/A		
			High	0	N/A		

Note: THLB: timber harvesting land base
NCF: Non-contributing forest
MPB: Mountain Pine Beetle
SBB: Spruce Bark Beetle
WBBB: Western Balsam Bark Beetle

Rationale for variance:

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
The target will be achieved by implementing the harvest rules contained in TSR2 which state that extreme and high hazard pine and spruce stands will be harvested first. Other land-based constraints may delay the achievement of the targets The block design generated by Tesera Scheduling Model (TSM) will be considered when developing future harvest proposals. Model outputs are based on a forecast across a 250 yr planning horizon.

Calculation of Indicator

Formula:

$$\%A_{\text{species, hazard class, THLB/NCF, licensee}} = (A_{\text{species, hazard class, THLB/NCF, licensee}} / TA_{\text{hazard class, THLB/NCF, licensee}}) \times 100$$

Variables:

$\%A_{\text{species,hazard class, THLB/NCF}}$: Percent area by beetle species in hazard class (high or extreme) in timber harvesting landbase (THLB) or non-contributing forest (NCF) by licensee

$A_{\text{species, hazard class, THLB/NCF, licensee}}$: Area by beetle species in hazard class (high or extreme) in THLB or NCF by licensee

$TA_{\text{hazard class, THLB/NCF, licensee}}$: Total area in hazard class (high or extreme) in THLB or NCF by licensee

Analysis Comments / Discussion

Use criteria outlined in Shore and Safranyik (1992) for mountain pine beetle hazard in the Lakes TSA. For Spruce and Balsam Bark beetle use criteria outlined in table below.

Beetle Species	Hazard Rating	Criteria
Mountain Pine Beetle	Extreme	Pine leading species Age class 7,8,9 Site Index ≥ 16
	High	Pine leading species Age class 7,8,9 Site Index < 16
Spruce Bark Beetle	Extreme	Spruce leading species Age class 7,8,9 Site Index ≥ 15
	High	Spruce leading species Age class 7,8,9 Site Index < 15
Western Balsam Bark Beetle	Extreme	Balsam leading species Age class 7,8,9 Site Index ≥ 15
	High	Balsam leading species Age class 7,8,9 Site Index < 15

Source: *Morice/Lakes IFPA Analysis (Lakes TSA) Data Inputs and Assumptions Tables and Charts* (Table 24: Timber_Lakes_MRAG – Beetle hazard rating criteria and harvest priority)

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
VRI (forest cover)	ILMB	Yes	Use most current version
Silviculture data (harvesting data)	Licensees	Yes	Annually
Bark Beetle Hazard Criteria (See "Analysis comments / discussion")	MoF, Licensee	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Obtain and update inventories	Tweedsmuir Forest Ltd.	Every 5 years starting 2003 (using 2001 forest cover data)
Data analysis	Inventory projection (VRI)	Tweedsmuir Forest Ltd.	Every 5 years starting 2004
	Re-assess beetle hazard using projected VRI	Tweedsmuir Forest Ltd.	Every 5 years starting 2004
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Every 5 years starting May 31, 2004
	M&L IFPA SFM Report	IFPA Manager	Every 5 years starting May 31, 2004

Output for indicator reporting

This indicator will be reported in tabular format. If resources are available, may be possible to report out with maps illustrating the stands classified according to the rating system.

References

Shore, T.L. and L. Safranyik. 1992. Susceptibility and risk rating systems for the mountain pine beetle in lodgepole pine stands. Canadian Forest Service, Pacific Forestry Centre, Report BC-X-336.

Indicator L14: Percent area retained in WTR by LU by BEC by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Landscape and Stand Level Biodiversity **Value / Issue:** Wildlife Trees & Wildlife Tree Patches **Value / Issue:** Habitat Element – Snags **Value / Issue:** Habitat Element – Large Live Trees **Value / Issue:** Habitat Element – CWD		**Criterion**: 2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity **SFM Element**: 1. Forest Ecosystem Productivity **Value**: 1. Stand-level ecosystem functionality across the landscape **Objective**: 1. Stand-level ecosystem processes and conditions are maintained within the natural range of variability.

Indicator Rationale

What does this indicator mean?

This indicator will track the proportion of a landscape unit retained as wildlife tree retention (WTR) within each landscape unit and for each biogeoclimatic subzone by forest licensee. WTR provides important stand level biodiversity attributes such as vertical structure, snags, large trees and coarse woody debris (CWD) for future stands. Provincial legislation requires that stand level retention objectives be included in operational plans. The Lakes South Sustainable Resource Management Plan contains established objectives for the retention of mature and old forest within cutblocks. The process for the establishment of WTR objectives in the Lakes North is underway. Until the process is completed, Forest Licensees will use objectives in section 9.1 as a minimum, and apply the defaults in section 66 of the Forest Planning and Practices Regulation. Tracking the proportion of WTR in the Lakes TSA will provide an indicator that can be used as a surrogate for explicit tracking of the wildlife habitat elements for snags, large live trees and CWD.

How does this indicator relate to the M&L IFPA and to SFM?

Sustainable forest management requires that biological processes of the ecosystems are functioning. While the degree to which they may function is modulated by harvesting, their resiliency is assumed through the presence of their components through time.

This indicator relies on the proposition that WTR is a continuum of residual forest structure that provides a broad range of habitats (i.e. source of food, physical and thermal protection) for a broad range of species. By ensuring representative elements are present across the landscape through time, it can be assumed that ecosystems are being sustained and biological productivity is maintained.

Current Status and Forecasted Targets / Thresholds of Indicator

Percent area retained in WTR by LU by BEC by licensee						
Licensee	**Landscape Unit**	**BEC**	**Current Status (2004)**	**Target**	**Variance**	**Achieve Target By**
BCTS	Babine West	SBSdk	N/A	>=7%		Immediately
		SBSmc2	8.5%	>=7%		Immediately
		ESSF	3.4%	>=7%		Period 2
	Burns Lake East	SBSdk	11.9%	>=7%		Immediately
		SBSmc2	10.2%	>=7%		Immediately
		ESSFmc	7.6%	>=7%		Immediately
		ESSFmv1	11.9%	>=7%		Immediately
	Bulkley	SBSdk	4.9%	>=7%		Period 2
		SBSmc2	5.2%	>=7%		Period 2
		ESSF	4.2%	>=7%		Period 2
	Burns Lake West	SBSdk	12.2%	>=7%		Immediately
		SBSmc2	12.9%	>=7%		Immediately
		ESSF	8.1%	>=7%		Immediately
	Francois West	SBSdk	5.6%	>13%		Period 2
		SBSmc2	6.1%	>13%		Period 2
		ESSFmc	N/A	>12%		Immediately
	Francois East	SBSdk	10.6%	>14%		Period 2
		SBSmc2	11.1%	>14%		Period 2
		ESSFmc	10.2%	>9%		Immediately
	Cheslatta	SBSdk	6.4%	>12%		Period 2
		SBSmc2	6.4%	>12%		Period 2
		ESSF	N/A	>9%		Immediately
	Ootsa	SBSmc2	7.4%	>12%		Period 2
		ESSF	N/A	>9%		Immediately
		SBSdk	N/A	>12%		Immediately
Canfor	Francois West	SBSdk	3.8%	>13%		Period 2
		SBSmc2	5.9%	>13%		Period 2

Percent area retained in WTR by LU by BEC by licensee						
Licensee	**Landscape Unit**	**BEC**	**Current Status (2004)**	**Target**	**Variance**	**Achieve Target By**
		ESSFmc	5.0%	>12%		Period 2
	Bulkley	SBSdk	6.6%	>=7%		Period 2
		SBSmc2	8.6%	>=7%		Immediately
		ESSFmc	12.4%	>=7%		Immediately
BFP	Babine East	SBSdk	6.8%	>=7%		Period 2
		SBSmc2	6.2%	>=7%		Period 2
		ESSFmc	5.7%	>=7%		Period 2
		ESSFmv1	N/A	>=7%		Immediately
	Babine West	SBSdk	12.4%	>=7%		Immediately
		SBSmc2	10.6%	>=7%		Immediately
		ESSFmc	11.8%	>=7%		Immediately
	Bulkley	SBSdk	6.1%	>=7%		Period 2
		SBSmc2	5.2%	>=7%		Period 2
		ESSFmc	3.7%	>=7%		Period 2
	Burns Lake East	SBSdk	14.5%	>=7%		Immediately
		SBSmc2	12%	>=7%		Immediately
		ESSFmc	11.9%	>=7%		Immediately
	Burns Lake West	SBSdk	9.0%	>=7%		Immediately
		SBSmc2	10.6%	>=7%		Immediately
		ESSFmc	14.8%	>=7%		Immediately
	Fleming	SBSdk	4.8%	>=7%		Period 2
		SBSmc2	5.9%	>=7%		Period 2
		SBSwk3	5.4%	>=7%		Period 2
		ESSFmv3	3.8%	>=7%		Period 2
	Francois West	SBSdk	5.4%	>13%		Period 2
		SBSmc2	5.0%	>13%		Period 2
		ESSFmc	2.6%	>12%		Period 2
	Taltapin	SBSdk	9.4%	>=7%		Immediately
		SBSmc2	11.8%	>=7%		Immediately
		ESSFmc	9.8%	>=7%		Immediately

Percent area retained in WTR by LU by BEC by licensee						
Licensee	**Landscape Unit**	**BEC**	**Current Status (2004)**	**Target**	**Variance**	**Achieve Target By**
		Essfmv1	11.1%	>=7%		Immediately
FLSM	Francois East	SBSdk	10.9%	>14%		Period 2
		SBSmc2	14.2%	>14%		Immediately
		ESSFmc	N/A	>9%		Immediately
	Cheslatta	SBSdk	7.8%	>12%		Period 2
		SBSmc2	7.6%	>12%		Period 2
		ESSFmc	4.7%	>9%		Period 2
	Chelaslie	SBSdk	8.7%	>12%		Period 2
		SBSmc2	3.3%	>12%		Period 2
		ESSFmc	3.1%	>9%		Period 2
	Intata	SBSdk	11.4%	>16%		Period 2
		SBSmc2	10.4%	>16%		Period 2
		ESSFmc	1.8%	>9%		Period 2
	Ootsa	SBSmc2	2.5%	>12%		Period 2
		ESSFmc	4.5%	>12%		Period 2
		SBSdk	5.6%	>9%		Period 2

Rationale for variance:

Variance to account for the high variability in the landbase for non-productive, marginal growing sites and other resource values. Some landscape unit / BEC combinations do not yet have the requisite proportion of WTR, but will be managed to achieve the targets over time.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
The targets will be achieved by retaining Wildlife Trees (WTs) and Wildlife Tree Patches (WTPs) in harvest areas. This will be accomplished operationally and by retaining patches identified in stand level plans. WTR in the Lakes South, will have structural attributes consistent with those described in the Lakes South SRMP to guide the delineation of WTRs within harvested areas. It is expected that WTR objectives for the Lakes North SRMP will be established at the end of 2006. Until WTR objectives are established in the Lakes North SRMP, licensees and BCTS will use FPPR Section 66 to set the retention target and the variance. Licensee, LU BEC combinations with N/A in table – Harvesting with WTR has not occurred in these combinations. Any new harvesting will have the retention targets specified in the table. Licensees will properly characterize WTR, calculating proportion in Riparian Reserve Zones

(RRZ), patches, and single trees during field audits.

For Licensee, BEC, LU combinations that are below the target, a higher proportion of WTR will be prescribed until the target level is achieved.

Where the scale and rate of salvage operations and landscape conditions warrant, additional WTR may be prescribed.

Calculation of Indicator

Formula: **%** WTR $_{LU, BEC, Licensee}$ **= (** WTR $_{LU, BEC, Licensee}$ **/ TAH** $_{LU, BEC, Licensee}$**) / 100**

Variables:

% WTR $_{LU, BEC, licensee}$: percent area in wildlife tree retention relative to the total area harvested by Landscape Unit by Biogeoclimatic Ecosystem Classification Zone by licensee

WTR $_{LU, BEC, licensee}$: area in wildlife tree retention by Landscape Unit by Biogeoclimatic Ecosystem Classification Zone by licensee

TAH $_{LU, BEC, licensee}$**:** Total Area Harvested by Landscape Unit by Biogeoclimatic Ecosystem Classification Zone by licensee

Analysis Comments / Discussion

Licensee, Landscape unit and BEC combinations that are less than 15 ha. do not have targets set.

The proportion of WTPs maintained on the landscape will be an important operational and modeling requirement to help maintain stand level attributes such as snags, large live trees and CWD. Within the scheduling model, WTPs will be maintained and tracked as a proportion of a harvested cutblock rather than as a discrete polygon. Operationally, WTPs will be tracked through site plans and operational mapping. Periodic review of the model, operational values and development of tools to measure functional attributes will be required.

Current status is calculated on a cumulative total since 1996.The Biodiversity Guidebook (Anon. 1995) and DM policy provided the target proportions of a cutblock or group of cut blocks that should be maintained as a WTR since the FPC came into effect in 1995. The targets were based on the available area within the landscape unit that can be harvested, with higher targets in landscape units that have a larger proportion of their harvestable area being harvested without WTR. As the FPC came into effect in 1995, the area harvested without WTR is generally recognized as the amount of harvesting that occurred prior to 1996.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Site plans	Licensee	Yes	annual
VRI (forest cover)	ILMB	Yes	Use most current version

BEC	ILMB	Yes	Use most current version
Landscape Units	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Obtain Silviculture data	Licensees	Annually starting 2003
Analyze data	Calculate percent areas in WTPs (and RRZs within blocks) by LU by BEC from Silviculture data	Licensees	Annually starting 2004
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting May 31, 2004
	M&L IFPA SFM Report	IFPA Manager	Annually starting May 31, 2004

Output for indicator reporting

This indicator will be reported in tabular format.

References

Anon. 2004. Ministry Of Sustainable Resource Management Order Establishing Landscape Units And Old Growth Objectives June 30th, 2004. http://srmwww.gov.bc.ca/rmd/oldgrowth/notice.htm

Anon. 2003. Lakes South SRMP, June 2003.

Anon. 2000. http://www.for.gov.bc.ca/hfp/pubs/wildlife_trees/WLTpolicyfinalMay15-00.pdf

Anon. 1995. Biodiversity Guidebook. Forest Practices Code of British Columbia. Government of British Columbia, Victoria, BC. 99p.

Indicator L15: Percent forest in each patch type by patch size class by BEC zone by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Landscape and Stand Level Biodiversity **Value / Issue:** Landscape Pattern		**Criterion**: 1. Conservation of Biological Diversity **SFM Element**: 1. Ecosystem Diversity **Value**: 1. Connectivity **Objective**: 1. To maintain/enhance habitat connectivity over time at the landscape level across the DFA within the natural range of variability to provide opportunities for the distribution of species, populations and genetic materials. **SFM Element**: 3. Genetic Diversity **Value**: 1. Genetic Interaction **Objective**: 1. Individuals within sub-species and species have the opportunity to move and interact within their natural range in and across the DFA. **Criterion**: 2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity **SFM Element**: 1. Forest Ecoystem Resilience **Value**: 1. Stand-level ecosystem functionality **Objective**: 1. Stand-level ecosystem processes and conditions are maintained within a natural range of variability. **SFM Element:** 2 Ecosystem Productivity **Value:** 1 Ecosystem Productivity is conserved within the range of natural variability over time on the DFA **Objective:** 1 Ecosystem conditions capable of supporting naturally occurring species within the range of natural variability

Indicator Rationale

What does this indicator mean?

This indicator will track the percentage of the forest land base in each patch type by patch size class by Biological Ecosystem Classification (BEC) zone by licensee. When used in the design of landscape patterns, the term patch size refers to the size of either a natural disturbance opening that led to even-aged forests or an opening created by cutblocks (BCMOF 2002). Forest patches will be grouped into patch size classes, which are differentiated by seral stage and area class (see "Analysis Comments/Discussion" below). Thresholds for each patch size class vary according to NDTs and are defined in the *Landscape Unit Planning Guide* (Anon. 1999) or the Lakes South Sustainable Resource Management Plan (MSRM Skeena Region 2003). The desired representation of each patch size class on the landscape is defined by BEC zone units, which are delineated on the basis of topographic, climatic, and ecosystem features.

How does this indicator relate to the M&L IFPA and to SFM?

The distribution of patches across the BEC zone can be used as an indicator of ecosystem health at the BEC zone level. Natural disturbance regimes create different size patches based on variables such as disturbance agents (e.g. wind, fire, insects, disease), frequency, intensity and size of disturbance. Patches can range in size from very small (stand gaps caused by windfall or root rot) to very large (tens of thousands of hectares caused by fire or insect epidemic). The *Biodiversity Guidebook* and other analyses have suggested patch size distributions that follow natural disturbance patterns based on Natural Disturbance Types (NDTs). Objectives, measures and targets have been proposed for patch sizes for the plan area by BEC zone, based on an analysis of historic disturbance regime and fire return intervals.

By maintaining patch sizes that are close to their natural distribution it is expected that landscape level ecological processes such as habitat connectivity and genetic diversity will be maintained within an acceptable proportion of the range of natural variability. This indicator in conjunction with other landscape level indicators such as seral stage distribution and species composition indices will provide important information on BEC zone level ecosystem health.

Current Status and Forecasted Targets / Thresholds of Indicator

Percent forest in each patch type by patch size class by BEC zone by licensee

Licensee	SRMP Area	BEC Variant	Patch Type	Patch Size Class	Current Status (2004) (%)	Forecast Target	Variance	Achieve Target by
BCTS	Lakes South SRMP	ESSF	Early	<= 40 ha.	12.3%	30 – 40%		Between Period 4 & 10
			Mature/Old	<= 40 ha.	3%	>5%		Between Period 4 & 10
			Early	>80	51.7%	20 – 40%		Between Period 4 & 10
			Mature/Old	>80	96.2%	>75%		Immediately
		SBS	Early	<=40 ha.	24.9%	10 – 30%		Immediately
			Mature/Old	<= 40 ha.	6%	6 – 23%		Immediately
			Early	>250	32.4%	40 – 80%	>35% period 10	Period 1
			Mature/Old	>250	83%	>45%		Immediately
	Lakes North	ESSF	Early	<= 40 ha.	13.4%	30 – 40%		Period 4
			Mature/Old	<= 40 ha.	3.6%	>3%		Immediately
			Early	>80	59.5%	20 – 40%		Period 4
			Mature/Old	>80	95%	>85%		Immediately
		SBS	Early	<=40 ha.	27.9%	10 – 20%		Period 4
			Mature/Old	<= 40 ha.	8.1%	8 – 24%		Immediately
			Early	>250	23.1%	60 – 80%	> 28% period 4	Period 1

Percent forest in each patch type by patch size class by BEC zone by licensee								
Licensee	**SRMP Area**	**BEC Variant**	**Patch Type**	**Patch Size Class**	**Current Status (2004) (%)**	**Forecast Target**	**Variance**	**Achieve Target by**
			Mature/Old	>250	80%	>47%		Immediately
BFP	Lakes South SRMP	ESSF	Early	<= 40 ha.	N/A[5]	N/A[1]		
			Mature/Old	<= 40 ha.	N/A[1]	N/A[1]		
			Early	>80	N/A[1]	N/A[1]		
			Mature/Old	>80	N/A[1]	N/A[1]		
		SBS	Early	<= 40 ha.	15.9%	10 – 30%	>6% period 20	Immediately
			Mature/Old	< =40 ha.	3.7%	1 – 27%		Immediately
			Early	>250	9.7%	40 – 80%		Between Period 10 and 20
			Mature/Old	>250	96.2%	>= 40%		Immediately
	Lakes North	ESSF	Early	<= 40 ha.	8.3%	30 – 40%		Immediately
			Mature/Old	<= 40 ha.	2.0%	2 – 6%		Immediately
			Early	>80	36.6%	20 – 40%	<61% period 1	Immediately
			Mature/Old	>80	97.4%	>90%		Immediately
		SBS	Early	<= 40 ha.	13.8%	10 – 20%		Immediately
			Mature/Old	< =40 ha.	2.1%	2 – 20%		Immediately
			Early	>250	24.7%	60 – 80%	>22% Period 10 > 36% period 20	Period 1
			Mature/Old	>250	96.6%	>59%		Immediately
Canfor	Lakes South SRMP	ESSF	Early	<= 40 ha.	0.5%	30 – 40%	< 57% period 10 and 20	Period 1
			Mature/Old	<= 40 ha.	4.5%	>4%	0% period 4 and 10	Immediately
			Early	>80	99.5%	20 – 40%	> 14 % period 20	Period 4

[5] Area less than 1000 ha. Too small to manage patch size distribution

Percent forest in each patch type by patch size class by BEC zone by licensee								
Licensee	**SRMP Area**	**BEC Variant**	**Patch Type**	**Patch Size Class**	**Current Status (2004) (%)**	**Forecast Target**	**Variance**	**Achieve Target by**
			Mature/Old	>80	95.5%	>95%		Immediately
		SBS	Early	<= 40 ha.	19.1%	10 – 30%		Immediately
			Mature/Old	<= 40 ha.	4.0%	4 – 35%		Immediately
			Early	>250	19.1%	40 – 80%	> 11% period 10	Period 4
			Mature/Old	>250	90.4%	>25%		Immediately
	Lakes North	ESSF	Early	<= 40 ha.	15.6%	30 – 40 %	> 17.5% period 20	Between 4 and 10
			Mature/Old	<= 40 ha.	2.2%	2 – 22%		Immediately
			Early	>80	67.8%	20 – 40%		Period 35
			Mature/Old	>80	97.8%	> 58%		Immediately
		SBS	Early	<= 40 ha.	14%	10 – 20%		Immediately
			Mature/Old	<= 40 ha.	4.6%	4 – 45%		Immediately
			Early	>250	0%	60 – 80%		Period 20
			Mature/Old	>250	95.3%	>35%	>1% in period 10	Immediately
FLSM	Lakes South SRMP	ESSF	Early	<= 40 ha.	7.7%	30 –40%	<50% period 4 & 20	Between period 1 & 4
			Mature/Old	<= 40 ha.	2%	2 – 15%		Immediately
			Early	>80	71.3%	20 – 40%		Between period 4 and 10
			Mature/Old	>80	96.1%	>75%		Immediately
		SBS	Early	< =40 ha.	9.6%	10 – 30%		Period 4
			Mature/Old	<=40 ha.	7.6%	7- 40%		Immediately
			Early	>250	55%	40 – 80%	> 28% period 4	Immediately
			Mature/Old	>250	84.7%	> 17%		Immediately
	Lakes North	ESSF	Early	<= 40 ha.	11.1%	30 –40%	<67% period 4	Between period 1 & 4
			Mature/Old	<= 40 ha.	0.6%	0 – 10%		Immediately
			Early	>80	45%	20 – 40%	>6.9% period 20	Between period 1 & 4

Percent forest in each patch type by patch size class by BEC zone by licensee								
Licensee	**SRMP Area**	**BEC Variant**	**Patch Type**	**Patch Size Class**	**Current Status (2004) (%)**	**Forecast Target**	**Variance**	**Achieve Target by**
			Mature/Old	>80	99.4%	>70%		Immediately
		SBS	Early	< =40 ha.	6.4%	10 – 20%	<25 % in period 4 >5% period 10 <29% in period 20	Between period 1 & 4
			Mature/Old	<=40 ha.	0.1%	0 – 31%		Immediately
			Early	>250	46.1%	60 – 80%	>9% period 1 > 20% period 10 & 20	Period 1
			Mature/Old	>250	98.3%	>50%		Immediately

Rationale for variance:

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
The targets will be achieved by continuing to gradually plan harvesting so that the patch size distribution for the BEC zone will be moving toward the targets outlined for the Lakes South SRMP and the Landscape planning guide.

Calculation of Indicator

Formula: $\%A_{PSC,\ BEC,\ Licensee} = (A_{PSC,\ BEC,\ Licensee} / A_{BEC\ Licensee}) / 100$

Variables:

$\%A_{PSC,\ BEC,\ licensee}$: percent forest area in each patch size class by patch type BEC zone by licensee

$A_{PSC,\ BEC,\ licensee}$: forest area in each patch size class by patch type by BEC zone by licensee

$A_{PSC,\ BEC,\ licensee}$: forest area by BEC zone by licensee

Analysis Comments / Discussion

For this analysis, non-forested polygons such as roads, wetlands, lakes etc. are not included in the patch calculations.

Age criteria for patches type are as follows:

- Early <=20 year old forest.
- Mature/old >=100 year old forest

Patch size Classes area as follows:

- LT_1Ha <=1 HA. No targets set
- Small >1 and <=40
- ESSF medium >40 and <=80 No targets set.
- SBS Medium >40 and <=250 No targets set.
- ESSF Large > 80 ha.
- SBSLarge >250

Modeling input assumptions for early age patches are:

- Lakes South SRMP
- All SBS
  - <=40 ha. Range 10% to 30% of the forested area.
  - >250 ha. Range 40% to 80% of the forested area.
- All ESSF, CWH, and MH
  - <=40 ha. Range 30% to 40% of the forested area.
  - >80 ha. Range 20% to 40% of the forested area.
- Lakes North SRMP
- All SBS
  - <=40 ha. Range 10% to 20% of the forested area.
  - >250 ha. Range 60% to 80% of the forested area.
- All ESSF, CWH, and MH
  - <=40 ha. Range 30% to 40% of the forested area.
  - >80 ha. Range 20% to 40% of the forested area.

There were no modeling input assumptions for mature/old patch type. Targets were based on model outputs.

Patch size statistics will be compiled by BEC zone, Lakes North or South, and licensee combinations for monitoring reports for this indicator.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Silviculture Records Harvesting Coverage	Licensees	Yes	annual
VRI (forest cover)	MOFR (augmented by licensees)	Yes	Use most current version

NDT mapping	ILMB	Yes	Use most current version
Landscape Units/BEC Zones	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Obtain Silviculture data (harvesting coverage)	Licensees	Annually
Analyze data	Define forest patches using ecologically meaningful seral stage criteria from Silviculture coverage/harvesting mapping and VRI. Calculate percent areas in each forest patch size class by BEC.	Licensees	Annually
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually
	M&L IFPA SFM Report	IFPA Manager	Annually by Sept 15

Proposed output for indicator reporting

This indicator will be reported in tabular format.

References

Anon. 1995. Biodiversity Guidebook. Forest Practices Code of British Columbia. Government of British Columbia, Victoria, BC. 99p.

Anon. 1999. Landscape unit planning guide. Min. of For. and Min. Env., Lands and Parks, Victoria, BC. 101pp.

Research Working PaperHarvesting Patterns, Fragmentation, and Historic Landscape Patterns in Sub-boreal Forests of the Prince Rupert Forest Region Prepared by: J.D. Steventon, M.Sc., R.P. Bio.Research Wildlife Habitat Ecologist Prince Rupert Forest Region

http://www.for.gov.bc.ca/hre/dulp/pdf/pred/dulpp07.pdf

Working Paper Historic Disturbance Regimes of the Morice and Lakes Timber Supply Areas Prepared by: J.D. Steventon, R.P. Bio.Research Wildlife Habitat Ecologist Prince Rupert Forest Region October 2002.

..\Background material\Biodiversity Landscape Level\Historic Disturbance Regimes.pdf

(Note: Steventon defines a patch as an area of forest in the same age class less and < than 100 m. apart. See page 6 para. 2).

Indicator L17: Percent Seral Stage Distribution by non-timber tenure license by forest licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
This indicator applies to the M&L IFPA as a whole		**Criterion**: 5. Multiple Benefits to Society **SFM Element**: 3. Fair Distribution of Benefits and Costs **Value**: 1. Fair distribution of timber and non-timber benefits and costs over time **Objective**: 1. Timber and non-timber benefits and costs are fairly and equitably distributed at a range of scales for current and future generations.

Indicator Rationale

What does this indicator mean?

This indicator will track seral stage distribution in non-timber tenure areas to determine if forests attributes continue to support the values associated with non-timber tenures. Seral stage is a descriptive term to refer to broad age classes of forests (early, mid-seral, mature, and old). In addressing non-timber values using seral stage, it is important to measure the rate of forest management development within non-timber tenures. As some areas of the landscape are capable of supporting other non-timber tenured activities such as trapping, guide outfitting, and grazing, it is important that forest conditions are consistent with the intended purposes of individual non-timber tenures.

How does this indicator relate to the M&L IFPA and to SFM?

By maintaining a range of seral stages within non-timber tenures, the productive capacity of these tenures may be supported. The primary purpose of non-timber tenures is to provide opportunities for non-timber products and services.

Current Status and Forecasted Targets / Thresholds of Indicator

Percent Seral Stage Distribution by non-timber tenure license by forest licensee						
Forest Licensee	**Non-timber tenure type license**	**Seral Stage**	**Current Status (2004)**	**Forecasted Target***	**Variance**	**Achieve Target by**
All	All Guide Territories	Mature + old	>54	>27	None	Immediately
All	All Trapline Territories	Mature + old	>54	>27	None	Immediately
	All Range Licenses Combined	early	>23	>23	None	Immediately

Rationale for variance: N/A

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
Based on Base Case forecast across a 250 yr planning horizon as forecast using the Tesera Scheduling Model (TSM).

Calculation of Indicator

Formula:

$$\%SSD_{NTT,\ licensee} = (A_{Seral\ stage,\ NTT,\ licensee} / A_{\ NTT,\ licensee}) \times 100$$

Variables:

$\%SSD_{NTT,\ licensee}$: % Seral Stage Distribution (early, mid-seral, mature, old) by individual non-timber tenure license by forest licensee

$A_{SeralStage,\ NTT,\ licensee}$: Area of seral stage (early, mature, old) by individual non-timber tenure license by forest licensee

$A_{\ NTT,\ licensee}$: Area of individual non-timber tenure license by forest licensee

Analysis Comments / Discussion

The Biodiversity Guidebook (Anon. 1995) provides the definitions and landscape unit targets for seral stages for the Biogeoclimatic Subzones found in the Lakes TSA.

Non-timber tenures are defined as trapping, guide-outfitting, and grazing licenses.

Areas <1000 ha are not part of the target setting.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Silviculture database (harvesting)	Licensee	Yes	Annually
VRI	ILMB	Yes	Use most current version
Maps to define non-timber tenures (guiding, trapping and grazing licenses)	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Ensure inventories are current. Update digital coverage. Add information to annual reporting resultant file.	Tweedsmuir Forest Ltd.	Annually starting 2003
Analysis	Query resultant file and determine percent seral stage distribution by non-timber tenure license by forest licensee	Tweedsmuir Forest Ltd.	Annually starting 2004
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting 2004

	M&L IFPA SFM Report	IFPA Manager	Annually starting 2004

Output for indicator reporting

This indicator will be reported in tabular format and may be supplemented by maps delineating the distribution of the seral stages, non-timber tenures, and licensees.

References

Anon. 1995. Biodiversity Guidebook. Forest Practices Code of British Columbia. Government of British Columbia, Victoria, BC. 99p.

Indicator L19: Percentage of Blocks meeting NAR disturbance objectives by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 3. Conservation of Soil and Water Resources **SFM Element:** 1. Soil Quality and Quantity **Value:** 1. Productive capacity of soil resources are conserved **Objective:** 1. Soil quantity and quality are sustained through their characteristic range of variation.

Indicator Rationale

What does this indicator mean?

An objective of placing limits on the amount of soil disturbance allowed within the "Net Area to be Reforested" (NAR) is to ensure that site productivity is maintained and that impacts to other resource values are prevented or mitigated. NAR is defined as the area which the licensees are legally obligated to regenerate to free growing status (i.e. gross harvest area minus deletions for roads, landing, gravel pit, wildlife tree patches, etc.) Harvesting and silviculture activities must be carried out such that the total amount of soil disturbance at any time during operations does not exceed the specified maximum (BCMOF 2001). Soil disturbance objectives are outlined in the Soil Conservation Guidebook (BCMOF 2001) and also the Bark Beetle Regulation (BCMOF 2001a)

Soil disturbance objectives are on the site level plan for each block that is harvested and subsequently reforested. If applicable, the Bark Beetle Regulation for soil disturbance objectives may also apply. Subsequent to harvesting and reforestation, soil conservation compliance surveys and reports are completed and are used to determine the compliance to the soil disturbance objectives. This indicator reports how many of these blocks have conformed to the soil disturbance objectives, thereby contributing to the maintenance of site productivity.

How does this indicator relate to the M&L IFPA and to SFM?

Maintaining soil productivity is one of the most important elements to ensure forests can be re-established on harvested areas. Several soil disturbance risks occur during the harvesting and associated activities. These risks are assessed and recognized as soil disturbance objectives when preparing the site level plan for a block, and following harvest and re-forestation, the blocks are assessed as to whether these objectives have been met. Maintaining site productivity by meeting soil disturbance objectives on harvested and reforested blocks aims to ensure that subsequent forests can be re-established with as little damage to soil productivity as possible. The maintenance of soil productivity on each block harvested also provides opportunity for natural succession of local species (i.e. flora and fauna) to proceed on harvested blocks, which contributes to the maintenance of biological diversity within the individual stand and collectively across the landscape.

Current Status and Forecasted Targets/Thresholds of Indicator

Percentage of Blocks meeting Net Area Reforested (NAR) soil disturbance objectives				
Licensee	**Current Status (2004)**	**Target**	**Variance**	**Achieve Target**
Canfor	100%	100%	0%	Annually
BFP	100%	100%	0%	Annually
FLSM	N/A	N/A	N/A	N/A
L&M	No data	100%	0%	Annually
BCTS	98%	100%	0%	Annually

Rationale for variance: It is expected that the licensees will meet all NAR soil disturbance objectives on the Lakes TSA (as per the Soil Conservation Guidebook (BCMOF 2001)), therefore no variance is indicated.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
# of blocks where harvesting activity occurred in the calendar year - Licensees will provide figures as per monitoring schedule.
# of blocks where site disturbance objectives were not achieved - Licensees will provide figures as per monitoring schedule. Stand level protection measures will be developed on a site by site basis. See "Analysis Comments/Discussion" for description of NAR Soil Description Objectives.

Calculation of Indicator

Formula:

$$\%SDO_{licensee} = SDO_{licensee} / H_{licensee} \times 100$$

Variables:

$\%SDO_{licensee}$: % of Blocks meeting Net Area Reforested (NAR) soil disturbance objectives by licensee

$SDO_{licensee}$: Blocks meeting Net Area Reforested (NAR) soil disturbance objectives by licensee

$H_{licensee}$: Total number of blocks harvested by licensee

Analysis Comments/Discussion

With regard to NAR soil disturbance objectives, under the current requirements, silviculture prescriptions must specify:

- the maximum percentage of the NAR that may be occupied by detrimental soil disturbance; and
- the extent to which the maximum percentage of soil disturbance in the NAR can be temporarily exceeded to construct temporary access structures (BCMOF 2001b).

Business Rules:
- Reported by calendar year

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Harvest records	Each licensee	Yes	Annual
MOF Soil Conservation Compliance Reports	Each licensee	Yes	Annual
Internal inspection reports	Each licensee	Yes	Annual

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Document # of blocks harvested annually by licensee	Review and obtain necessary information from harvest records	• Woods Manager for each licensee • BCTS Manager	Annually
Determine the number of blocks where detrimental soil disturbance objectives have not been achieved.	Review and obtain necessary information from Soil Conservation Compliance Reports and internal inspection reports	• Woods Manager for each licensee • BCTS Manager	Annually
Analysis	Compile information to calculate indicator	• Woods Manager for each licensee • BCTS Manager	Annually
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	• Woods Manager for each licensee • BCTS Manager	Annually
	M&L IFPA SFM Report	• Woods Manager for each licensee • BCTS Manager • M&L IFPA Manager	Annually by Sept 15

Output for indicator reporting

This indicator will be reported in tabular format.

For blocks not meeting the NAR soil disturbance objective, the indicator report must make a notation as to the location of blocks and area affected.

References

BCMOF 2001. Soil Conservation Guidebook (2nd Edition). BC Ministry of Forests: Victoria, BC (May 2001).

BCMOF 2001a. Bark Beetle Regulation – Forest Practices Code of BC Act. BC Ministry of Forests: Victoria, BC (December 2001).

BCMOF 2001b. Soil Conservation Surveys Guidebook (2nd Edition). BC Ministry of Forests: Victoria, BC (May 2001).

Indicator L20: Percentage of total goods and services provided by local vendors by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion: 5.** Multiple Benefits to Society **SFM Element: 2.** Communities and Sustainability **Value: 1.** Healthy and sustainable communities **Objective: 1.** Communities that exhibit economic, environmental and social well-being through time. **SFM Element: 3.** Fair distribution of Benefits and Costs **Value: 1.** Fair distribution of timber and non-timber benefits and costs over time **Objective: 2.** Timber and non-timber benefits and costs a fairly and equally distributed at a range of scales for current and future generations.

Indicator Rationale

What does this indicator mean?

This indicator tracks the proportion that each licensee spends on total goods and services in the local community. The amount spent on goods and services can be tracked to local vendors through accounting records and postal codes. Within the Lakes TSA, local vendors are those with Burns Lake, Francois Lake, Endako and Grassy Plains postal codes.

How does this indicator relate to the M&L IFPA and to SFM?

SFM strives for a balance between ecological, social and economic values, ensuring communities within the surrounding forest area remain healthy and sustainable is an important social and economic aspect. As forestry is the primary industry in the Lakes TSA, forest licensees play a substantial role in the local economy. Ensuring that revenue that is associated with licensee forest management activities are distributed through the local economy is a means that licensees can contribute to the health and sustainability of the local communities.

Current Status and Forecasted Targets/Thresholds of Indicator

Percentage of licensees' total goods and services provided by local vendors				
Licensee	**Current Status (2004)**	**Target**	**Variance**	**Achieve Target**
Canfor	13.1%	3.3%	- 10%	Annually
BFP	84%	84%	- 10%	Annually
FLSM	N/A	N/A	N/A	N/A
L&M		0.6%	- 10%	Annually
BCTS	N/A	N/A	N/A	N/A

Rationale for variance: The variance is meant to account for fluctuations (i.e. potential declines) in supply of local vendors and being able to respond accordingly (i.e. finding suitable local alternatives within an appropriate timeframe).

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
Local goods & services vendors to be identified and reported. In order to achieve target, each licensee will target an appropriate amount of spending locally. Each licensee and Morice BCTS to provide information. • Goods and services only • Locally is defined by Burns Lake, Francois Lake, Endako and Grassy Plains postal codes

Calculation of Indicator

Formula:

$$\%GS\$_{local,licensee} = GS\$_{local,licensee} / TGS\$_{licensee}$$

Variables:

$\%GS\$_{local,licensee}$: Percentage of total goods and services provided by local vendors by licensee

$GS\$_{local,licensee}$: Value of goods and services provided by local vendors by licensee

$TGS\$_{licensee}$: Total value of goods and services purchased by licensee

Analysis Comments/Discussion

Business Rules:

- Stumpage and salaries/hourly employee wages are excluded from the calculation of this indicator.
- Includes purchase wood value

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Accounts payable	Licensees	Yes	As contracts are paid.

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Document local accounts payable for consumable goods and services by licensee	Set up system within individual organizations to document local accounts payable for consumable goods and services by licensee	• Woods Manager for each licensee • BCTS Manager • IFPA manager	December, 2002
Monitor and update data	Ensure data is updated	• Woods Manager for each licensee • BCTS Manager • IFPA manager	Annually
Analysis	Obtain necessary data for analysis	• Woods Manager for each licensee • BCTS Manager • IFPA manager	Annually
	Conduct analysis for indicator	• Woods Manager for each licensee • BCTS Manager • IFPA manager	Annually
Report	Indicator Performance Management Report for Management Adjustment Purposes (review updated data only)	• Woods Manager for each licensee • BCTS Manager	Annually
	M&L IFPA SFM Report	• Woods Manager for each licensee • BCTS Manager • IFPA manager	Annually by Sept 15

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L21: Percent of Gross Forest Area converted to permanent access by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Timber **Value / Issue:** Roads, Trails and Landings		**Criterion**: 3. Conservation of Soil and Water Resources **SFM Element**: 1. Soil Quality and Quantity **Value**: 1. Productive capacity of soil resources are conserved **Objective**: 1. Soil quantity and quality are sustained through their characteristic range of variation. **Criterion**: 4 Forest Ecosystem Contributions to Global Ecological Cycles **SFM Element**: 2. Forest Land Conversion **Value:** 1. Gross forest area on the DFA **Objective:** 1. Minimize loss of the gross forest area on the DFA over time.

Indicator Rationale

What does this indicator mean?

This indicator will track the extent to which the gross forest area is reduced as a result of permanent access structures. A permanent access structures is defined as a structure, including a road, bridge, landing, gravel pit or other similar structure, that provides continued access for timber management (BCMOF 2002). The areas occupied by permanent access structures will not be able to grow trees since these structures are required to continually access the land base to conduct forest management activities.

How does this indicator relate to the M&L IFPA and to SFM?

As withdrawals are made from the gross forest land base there is a commensurate decline in the capacity of this land base to provide expected benefits. In order to provide sufficient overall productive capacity of the land base (to maintain the array of desirable values water, ecosystem function and productivity values), any permanent removal of productive forest from the gross forest area must be minimized.

Forest productivity is also linked to the productive capacity of soil. In this context, the productive capacity of the soil is a measure of the ability of the forest land base to provide a flow of benefits to society. It applies to both timber and non-timber resources and is a key factor in assessing progress toward sustainable forest management. Furthermore, soil resources are functional components of the ecosystem and provide other benefits important in maintaining desirable characteristics for ecological function (e.g. carbon and nutrient cycling, hydrologic cycle, etc.).

Current Status and Forecasted Targets / Thresholds of Indicator

Percent of Gross Forest Area converted to permanent access by licensee				
Licensee	**Current Status (2004) (%)**	**Forecasted Target (%)**	**Variance**	**Achieve Target by**
Canfor	1.5%	<=2.3%	0	Immediately
BFP	1.7%	<=2.4%	0	Immediately
FLSM	2.1%	<=2.4%	0	Immediately
BCTS	1.3%	<=2.2%	0	Immediately

Rationale for variance: Not applicable

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
In order to achieve the target, the following practices will be followed: • Site plans will be designed in such a manner to minimize the amount of permanent access structures required for timber harvesting to achieve the landscape level targets. • Area in permanent access structures will be prescribed in cut block site plans based on the degraded width by road class. • Degraded width will be specified in road site plans for each class of road outside of cut blocks. • As built road inspections will document the average actual degraded width to ensure that the constructed roads are within the targets identified in site plans. • Road inspection data will be used to periodically adjust the degraded width assumptions to be used in modeling and site plans. • Road construction techniques will be employed such as low impact winter roads, snow roads, reducing ditch depths, and rehabilitating roads where appropriate, to reduce the amount of degraded area for the length of road

Calculation of Indicator

Formula: $\%PA_{licensee} = (PA_{licensee} / GFA_{licensee}) \times 100$

Variables:

%PA $_{licensee}$: Percent of Gross Forest Area converted to permanent access by licensee

PA $_{licensee}$: Area of permanent access by licensee

GFA $_{licensee}$: Gross Forest Area by licensee

Analysis Comments / Discussion

The area of road is based on the degraded width which includes the subgrade width plus the ditch width and debris and stripping area.

Gross Forest Area: The landbase that is capable of growing trees within the defined forest area. The area of unclassified lands, non-productive area without trees, and highways have been subtracted from the gross forest area.

Permanent access structures include roads, gravel pits, borrow pits and landings within cut blocks and roads constructed between cut blocks.

Standard IFPA degraded road widths by road class for calculating area in permanent access structures used in the modeling assumptions.

- Mainline = 30m
- Operational = 18m
- Spur = 10m

Targets were derived by forecasting cumulative amount of area in permanent access structures from model outputs as harvesting proceeds through the first two periods (2002 – 2012) of the planning horizon.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Site Plans	Licensee	Yes	Annually
Road Inventory	Licensee	Yes	Annually
VRI (forest cover)	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure and prepare inventory information for analysis	Licensee to provide road information (within block) from silviculture prescriptions	Licensee	Annually

	System to be developed to track roads outside of block (i.e. road inventory). Update digital coverage (road inventory) from licensee data and enter it into the reporting database. Add information to annual reporting resultant file.	Licensee and Tweedsmuir Forest Ltd.	Annually
Analysis	Query resultant file and determine percent of gross forest area converted to permanent access by licensee.	Tweedsmuir Forest Ltd.	Annually
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually
	M&L IFPA SFM Report	IFPA Manager	Annually by Sept 15

Output for indicator reporting

This indicator will be reported tabular format.

References

Anon. 2001. Soil Conservation Guidebook. Second Edition. Forest Practices Code Act of BC.

Web reference: http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/soil/soil-toc.htm (accessed 09/29/02)

BCMOF 2002. BC Ministry of Forest Glossary of Forestry terms. Web reference: http://www.for.gov.bc.ca/PAB/PUBLCTNS/GLOSSARY/P.htm (accessed 09/30/02)

Indicator L24: Percentage of forest management commitments completed on time resulting from consultations regarding non-timber features and interests by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 1. Conservation of Biological Diversity **SFM Element:** 4. Protected Areas and Sites of Biological Significance **Value:** 1. Protected areas and sites of biological significance are identified and managed appropriately **Objective:** 1. A sustainable harvest and use of non-timber forest products, services and benefits **Criterion:** 5. Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 1. The supply and variety of timber and non-timber products services and benefits on the DFA **Objective:** 2. A sustainable harvest and use of non-timber forest products, services and benefits **Value:** 3. A variety of recreational experiences are provided on the DFA. **Objective:** 1. Multiple Use Recreation Opportunities are provided on the DFA. **SFM Element:** 2. Communities and Sustainability **Value:** 1. Healthy and sustainable communities **Objective:** 1. Communities that exhibit economic, environmental and social well-being through time. **Criterion:** 6. Accepting Society's Responsibility for Sustainable Development **SFM Element:** 2. Respect for Aboriginal Forest Values, Knowledge and Uses **Value:** 1. Indigenous Knowledge of forest values and uses **Objective:** 1. Forest management incorporates Indigenous Knowledge of forest values and uses

Indicators 2, 4, 24 & 46 are closely related

Indicator Rationale

What does this indicator mean?

Many timber and non-timber forest values are represented on the Lakes TSA landscape. Where non-timber values are impacted by forest management activities, forest companies may be made aware of these impacts through consultations with individuals or interest groups. Licensees can proactively solicit consultation regarding specific values/interests through advertisement (i.e. newspaper, radio, etc.) or, if values and interests are captured on spatial databases and contact information exists, the licensee can make efforts to contact the representatives of affected values/interests for consultation. This indicator, therefore, tracks the percentage of the commitments completed on time which result from these consultations.

How does this indicator relate to the M&L IFPA and to SFM?

Striving for a balance between timber and non-timber values on the DFA requires the incorporation of non-timber related values into forest management planning and activities. As forest management activities can have varying degrees of impact on non-timber forest values, it is important to consult with parties that represent the values/interests affected. The IFPA has made substantial progress regarding the collection of data regarding areas of special interest (i.e. traditional use), protected areas and areas of biological significance, recreational areas, and areas which support non-timber forest products. As greater awareness evolves regarding the IFPA process and SFM in general, greater amounts of information will be collected for non-timber values. Having knowledge of these areas is the first step in the process of consultation and, subsequently, licensees can make commitments around forest management activities that encourages balanced use of forest resources on the Lakes TSA.

Current Status and Forecasted Targets/Thresholds of Indicator

Percentage of forest management commitments completed on time resulting from consultations regarding non-timber features and interests				
Licensee	**Current Status (2004)**	**Target**	**Variance**	**Achieve Target**
Canfor	75%	100%	-10%	Annually
BFP	83%	100%	-10%	Annually
FLSM	N/A	N/A	N/A	N/A
L&M	N/A	100%	-10%	Annually
BCTS	100%	100%	-10%	Annually

Rationale for variance: The variance is meant to take into account timing delays when indicator is calculated (i.e. completed commitments falling just outside the reporting period of the indicator).

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
Report on percent of forest management commitments completed on time resulting from consultation regarding non-timber features and interests Each licensee will document and analyze/compile information related to this indicator and provide results

Calculation of Indicator

Formula:

$$\%FMC_{\text{on time, licensee}} = (FMC_{\text{on time, licensee}} / FMC_{\text{total, licensee}}) \times 100$$

Variables:

$\%FMC_{\text{on time, licensee}}$: Percentage of forest management commitments completed on time resulting from consultation regarding non-timber features and interests by licensee

$FMC_{\text{on time, licensee}}$: Forest management commitments completed on time resulting from consultation regarding non-timber features and interests by licensee

$FMC_{\text{total, licensee}}$: Total forest management commitments resulting from consultation regarding non-timber features and interests by licensee

Analysis Comments/Discussion

Business rules:

- Forest management commitments must result from recorded consultations.
- Commitments must be documented such that context and timelines agreed to by all parties.
- Timelines to complete commitment can be modified if mutually agreed to by all parties.
- Reporting period is calendar year (January 1 – December 31).

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Database to track forest management commitments and completion	Licensee (as applicable)	Yes	Annually

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Track forest management commitments completed on time resulting from consultations regarding non-timber features and interests	Ensure system exists within individual organizations to document indicator information	• Woods Manager • BCTS Manager	December 2002
Monitor and update data	Ensure data is updated	• Woods Manager • BCTS Manager	Annually starting January 2003
Analysis	Obtain necessary data for analysis	• Woods Manager • BCTS Manager	Annually starting 2003
	Conduct analysis for indicator	• Woods Manager • BCTS Manager	Annually starting January 31, 2004
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	• Woods Manager • BCTS Manager	Annually starting January 31, 2004
	M&L IFPA SFM Report	• Woods Manager • IFPA Manager	Annually starting January 31, 2004

Output for indicator reporting

This indicator will be reported in tabular format.

Any non-conformances are detailed in reporting.

References

Indicator L25: Percent Seral Stage Distribution by Ecosystem & Wildlife Value Class

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Landscape and Stand Level Biodiversity **Value / Issue:** Biological Ecosystem Networks - General **Value / Issue:** Biological Ecosystem Network – Strong Link Deciduous **Value / Issue:** Rare and Dry Ecosystems **Resource:** Wildlife **Value / Issue:** Biological Ecosystem Network – Strong Link Caribou **Value / Issue:** Biological Ecosystem Network – Strong Link Moose **Value / Issue:** Deer Winter Range (High Value) **Value / Issue:** Grizzly Habitat Zones **Value / Issue:** Moose Winter Range (High Value) **Value/Issue:** Mountain Goat **Value/Issue:** Sydney Williams Caribou Herd **Value / Issue:** Tweedsmuir Caribou Herd – high and very high value migration corridors **Value / Issue:** Tweedsmuir Caribou Herd – low value migration corridors **Value / Issue:** Tweedsmuir Caribou Herd – moderate value migration corridors		**Criterion**: 1. Conservation of Biological Diversity **SFM Element**: 1. Ecosystem Diversity **Value**: 1. Connectivity **Objective**: 1. To maintain/enhance habitat connectivity over time at the landscape level across the DFA within the natural range of variability to provide opportunities for the distribution of species, populations and genetic materials. **Value**: 2. Rare and Dry Ecosystems **Objective**: 1 These ecosystems are represented in their natural range of variability. **SFM Element**: 2. Species Diversity **Value**: 1. Wildlife Habitat **Objective**: 1. A supply of habitat types is maintained on the DFA within the natural range of variation over time. **SFM Element**: 3. Genetic Diversity **Value**: 1. Genetic Interaction **Objective**: 1. Individuals within sub-species and species have the opportunity to move and interact within their natural range in and across the DFA. **SFM Element**: 4. Protected Areas and Sites of Special Significance **Value**: 1. Protected Areas and Special Management Zones **Objective:** 1. Representative examples of ecosystems are appropriately managed in or adjacent to the DFA to allow natural processes to occur. **Objective**: 2. Representative examples of special habitat types are appropriately managed in or adjacent to the DFA to allow natural processes to occur. **Criterion:** 5. Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 1. The supply and variety of timber and non-timber products, services and benefits on the DFA. **Objective:** 3. Healthy Wildlife Populations

Indicator Rationale

What does this indicator mean?

This indicator tracks the proportion of area within various seral stages (i.e similarly aged forest) for "Ecosystem and Wildlife value classes" in the Lakes TSA. Seral stage is a descriptive term to refer to broad age classes of forests (early, mid-seral, mature, and old). As forest stands age, the composition of plant and animal communities change. "Ecosystem and Wildlife Value classes" is a generic term used in this plan to describe areas delineated on maps for a variety of wildlife habitats or habitat zones from the Lakes Land and Resource Management Plan (LRMP), the Lakes South Sustainable Resource Management Plan (SRMP) and for describing rare ecosystems. Rare ecosystems are ecosystems that are uncommon on the landscape or are considered threatened at certain seral stages on the landscape.

In order to determine if forest attributes are being maintained that support the values associated with these areas, this indicator will track the proportion of seral stages within: the Biological Ecosystem Networks (BENs), High Value Mountain Goat habitat, the Lakes South Landscape Corridors, the Caribou Migration Corridor, High Value Grizzly Bear Habitat, High and Very High Value Deer Winter Range and High Value Moose Winter Range. This indicator will provide information on the level of disturbance that occurs within the identified areas as early seral stages, as well as tracking the maintenance and recovery of the areas as proportions of later seral stages.

How does this indicator relate to the M&L IFPA and to SFM?

Many of the zones developed in the Lakes District LRMP (Anon. 2000),the Lakes District Higher Level Plan and Lakes South SRMP have management strategies associated with them for seral stage distributions such as maintenance of representative old-growth and mature forests across the landscape. Furthermore, the technical committee has developed a number of strategies for other values reflected in this indicator. To ensure that objectives associated with the values are achieved, the seral stage distribution within these areas will be tracked. This indicator provides information on the use of these zones as a management strategy for maintaining seral stage distributions in selected areas across the landscape. The comparison of seral stage distributions inside and outside these zones and areas of interest will provide resource managers with information on the management strategies that will best maintain seral stage distributions required for the maintenance of landscape level and species specific biodiversity.

Current Status and Forecasted Targets/Thresholds of Indicator

% Seral Stage Distribution by Ecosystem and Wildlife Value Class							
Licensee	**Species / Ecosystem of interest**	**Wildlife Value Class**	**Seral Stage[1]**	**Current Status (2004)(%)***	**Forecasted Target %***	**Variance**	**Achieve Target by**
	Lakes North Landscape Corridors	N/A	Mature	N/A	TBD		
All	Lakes South Landscape Corridors	N/A	Mature	54	>40%	>28 Periods 10 -22	Immediately

All	Mountain Goat Key Habitat Zones and Buffer Areas	N/A	Early	15	<30%	30 – 40 Periods 6 to 11 32 – 53 Periods 18 - 35	Immediately
All	Klaytunkut and Sutherland Grizzly Zones	High	Mature	84	>50%	0	Immediately
All	Deer Winter Range	High and Very High	Mature	37	>50%	0	Period 4
All	Moose Winter Range	High	Mature	43	>30%	0	Immediately
All	Rare Ecosystems	N/A	Early	Unknown	0	0	Immediately

Note: *Current status and targets for rare ecosystems have been presented as total hectares.

Rationale for variance:

Lakes South Landscape Corridors: Due to MPB killed stands converting from Mature/Old to Early/Mid Seral in periods 10 – 22.

Mountain Goat Key Habitats: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
1. Lakes North Landscape Corridors To Be Determined upon completion of Lakes North SRM Plan. **2. Lakes South Ecosystem Corridors** Targets will be achieved by: • Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM) • Limiting block size to 3.0 hectares unless stands are heavily impacted by beetles and salvage strategies are employed. In these case maximum block size may increase to 4.0 hectares. **3. Mountain Goat Key Habitat Zones and adjacent Buffer areas:** Targets will be achieved by: • Currently, operational management practices consist of the following: o Checking for the presence of mountain goats, trails, hair, or in key habitat areas (e.g. consult with local resource users and/or Guide Outfitters) prior to development.

- Where feasible incorporate Old Growth Areas in and/or around occupied key goat habitat areas.
- Maintaining a minimum of 70% of the forested area in goat habitat areas in suitable thermal cover (minimum 7 m tree height and minimum 30% Crown Closure) where the habitat use has been confirmed.
- Avoid known Key Habitat areas when designing cutblocks.

4. **Klaytunkut and Sutherland Grizzly Zones,**
   Targets will be achieved by:
   - Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM).
   - Minimum 50% Mature plus Old Seral as referenced in the IWMS Orders.
5. **Deer Winter Range**
   Targets will be achieved by:
   - Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM).
   - Minimum 50% Mature plus Old Seral as referenced in the IWMS Orders.
6. **Moose**
   Targets will be achieved by:
   - Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM)
   - Minimum 30% Mature plus Old Seral as referenced in the IWMS Orders.
7. **Rare Ecosystems**
   Targets will be achieved by:
   - Avoiding road construction and harvesting activities in Rare Ecosystems when developing new stand level plans.

Calculation of Indicator

Formula:

$$\%SSD_{Ecosystem,\ WVC,\ licensee} = (SS_{Ecosystem,\ WVC,\ licensee} / SS_{licensee}) \times 100$$

Variables:

$\%SSD_{Ecosystem,\ WVC,\ licensee}$: % Seral Stage Distribution by Ecosystem & Wildlife Value Class by licensee

$SS_{Ecosystem,\ WVC,\ licensee}$: Area of Seral Stage by Ecosystem & Wildlife Value Class by licensee

$SS_{licensee}$: Area of Seral Stage by licensee

Analysis Comments/Discussion

Mountain goat habitat mapping is from an inventory of mountain goat habitats in forested areas. Rare ecosystem mapping is based on information from the Conservation Data Centre on rare ecosystems for the Lakes TSA. All other data layers are static data layers derived from the Lakes LRMP or Biological Ecosystem Network (BENs) mapping.

The inventory data layers are considered static on the landscape.

The following criteria are used for defining seral stage.

Species / Ecosystem of interest	**Forest Type**	**Early Criteria**	**Mature Criteria**	**Old Criteria**
Lakes South Ecosystem Corridors and BEN Strong Linkages	SBS coniferous forest	N/A	>or = 70 years old	N/A
	ESSF coniferous forest	N/A	>or = 100 years old	N/A
	Deciduous leading forest	N/A	>or = 40 years old	N/A
Mountain Goat Key Habitat	N/A	<40 years old	N/A	N/A
Caribou Migration Corridor	N/A	<40 years old	>80 years old	>140 years old
Klaytunkut and Sutherland Grizzly Zones	N/A	N/A	>120 years	N/A
Deer and Moose Winter Range	N/A	N/A	>or = 100 years old	N/A

Mountain Goat Zones: Targets in the model will use the following thermal cover requirements: Generally, adequate thermal cover in forests has been defined as crown closure greater than 30% and tree heights over 7m. Qualified advice and direction indicates that 70% of the forest area in these key habitats should provide adequate thermal cover. This will be a model input, however, the targets in the indicator will be expressed as amount of early seral for consistency. The amount of early seral in key goat habitat will be reported as a model output based on the thermal cover requirements.

The following list of Site Series represent Rare Ecosystems in the Lakes TSA (as of *December 2005)* (Anon. 2005)

Site Series	English_Name	BC Status
SBSdk/81	saskatoon / slender wheatgrass	Red
SBSdk/02	lodgepole pine / common juniper / rough-leaved ricegrass	Blue
SBSdk/82	Sandberg's bluegrass - slender wheatgrass	Red
SBSdk/08	black cottonwood / red-osier dogwood - prickly rose	Red
SBSdk/04	Douglas-fir / red-stemmed feathermoss - step moss	Blue
SBSdk/Wf05	slender sedge / common hook-moss	Blue

SBSmc2/Wf05	slender sedge / common hook-moss	Blue
SBSwk3/02	lodgepole pine / black huckleberry / reindeer lichens	Blue
SBSwk3/03	Douglas-fir - hybrid white spruce / thimbleberry	Blue
SBSwk3/Ws06	Sitka willow / Sitka sedge	Blue
SBSwk3/Ws11	Spruces - subalpine fir / skunk cabbage	Blue
SBPSmc/W15	Hard-stemmed bulrush Deep Marsh	Blue

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Silviculture data (harvesting data)	Licensee/BCMOF	Yes	Annually
Rare Ecosystem Data	Conservation Data Centre	Yes	Annually
BEN Strong Linkages and Landscape Corridors	ILMB	No	
Wildlife Habitat mapping	ILMB	Yes	Use most Current Version
VRI (forest cover)	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Ensure inventories are current (e.g. VRI). Add information to annual reporting resultant file.	Tweedsmuir Forest Ltd.	Annually starting 2006
Analysis	Query resultant file and determine percent seral stage distribution by “ecosystem and wildlife value class”	Tweedsmuir Forest Ltd.	Annually starting 2007

Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	2007
	M&L IFPA SFM Report	IFPA Manager	2007

Output for indicator reporting

This indicator will be output in tabular format.

References

Anon. 2000. Lakes District Land and Resource Management Plan (January 2000). Government of British Columbia: Victoria, BC.

Anon. 1995. Biodiversity Guidebook. Forest Practices Code of British Columbia. Government of British Columbia, Victoria, BC. 99p.

Anon. 2003. Lakes South Sustainable Resource Management Plan. Government of British Columbia: Victoria, B.C. 42p.

Anon. 2004. Identified Wildlife Management Strategy - Accounts and Measures for Managing Identified Wildlife http://www.env.gov.bc.ca/wld/identified/accounts.html

Anon. 2005. Forest District lists of BC CDC Natural Plant Communities: December, 2005 Nadina Forest District.

MacKenzie, W and J.R. Moran, 2004. Wetlands of British Columbia: A Guide to Identification. Res. Br., B.C. Min. For. Victoria, B.C. Land Management Handbook No.52. http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh52.pdf

Murray, R, 2001. Statement of District Manager's policy concerning LRMP implementation. Lakes Forest District, Burns Lake, B.C. 40p.

Indicator L26: Percent Seral Stage Distribution by LU by BEC by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Landscape and Stand Level Biodiversity **Value / Issue:** Biodiversity Emphasis Options		**Criterion**: 1. Conservation of Biological Diversity **SFM Element**: 1. Ecosystem Diversity **Value**: 3. Structural Stage Distribution **Objective**: 1. Structural stages of ecosystems are represented within their natural range of variability **Value**: 4. Landscape Pattern **Objective**: 1. The temporal and spatial distribution of openings and leave areas are represented within their natural range of variation. **SFM Element**: 4. Protected Areas and Sites of Special Significance **Value**: 1. Protected Areas and Special Management Zones **Objective**: 1. Representative examples of ecosystems are appropriately managed in or adjacent to the DFA to allow for natural processes to occur. **Criterion**: 2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity **SFM Element**: 2. Forest Ecosystem Productivity **Value**: 2. Productive capacity of the forest resource base **Objective**: 1. The biological productive capacity of the forest resource base is sustained over time.

Indicator Rationale

What does this indicator mean?

This indicator tracks the proportion of area within various seral stages (i.e. similarly aged forest) at a landscape level. Seral stage is a descriptive term to refer to broad age classes of forests (early, mid-seral, mature, and old). As forest stands age, the composition of plant and animal communities change and can be classified into different seral stages. In addressing objectives associated with biodiversity, it is considered impractical to manage for individual species. Rather, taking a coarse filter approach directs management to implement practices that ensures a range of forest conditions (including seral stages) exist somewhere on the landscape at all times. This indicator will allow for the tracking of natural diversity through the inferred relationship with seral stages and their distribution across the landscape.

How does this indicator relate to the M&L IFPA and to SFM?

As forest stands age, the composition of plant and animal communities change and can be classified into different seral stages. The species that use the various seral stages can be quite different, with most specialist species associated with early shrub/herb or mature/old stages. In forests disturbed by natural agents such as windfall, insects and fire, the distribution of seral stages is dependant on the severity, frequency and spatial pattern of the disturbance. By maintaining the natural range of variability of seral stages, conditions under which natural species, gene pools, communities, and ecosystems evolved should be retained, thereby managing the risk to biodiversity. The range of the conditions provided allows for the management of varied ecosystems and their natural processes and in turn providing the broad range of habitats that are necessary to maintain natural diversity of species. This will allow ecosystem resiliency and productivity to be maintained for important forest values.

Current Status and Forecasted Targets / Thresholds of Indicator

Percent Seral Stage Distribution by LU by BEC by licensee							
Licensee	**Landscape Unit**	**BEC**	**Seral Stage**	**Current Status (2004)**	**Forecasted Target*** (age/ %target)	**Variance**	**Achieve Target by**
Canfor	**Babine West** (BEO - Low)	SBS	Early	29.1	N/A		
			Mature + Old	69.6	>100/>11%	0	Immediately
			Old	69.6	>140/>11%	0	Immediately
Canfor	**Bulkley** (BEO - Interm.)	ESSF	Early	3.6	<40/<36%	0	Immediately
			Mature + Old	33.6	>120/>28%	>18% Period 3 and Periods 10 - 20	Immediately
			Old	0	>250/>9%	0	Period 28
		SBS	Early	20.6	<40/<54%	0	Immediately
			Mature + Old	48.7	>100/>23%	>13% Periods 10 to 19	Immediately
			Old	22.2	>140/>11%	>10 % Periods 10 to 13	Immediately
Canfor	**Francois West** (BEO - Interm.)	ESSF	Early	4.8	<40/<36%	0	Immediately
			Mature + Old	58.6	>120/>28%	0	Immediately
			Old	26.3	>250/>9%	0	Immediately
		SBS	Early	28.1	<40/<54%	0	Immediately
			Mature + Old	49.7	>100/>23%	0	Immediately
			Old	35.1	>140/>11%	0	Immediately

Percent Seral Stage Distribution by LU by BEC by licensee							
Licensee	**Landscape Unit**	**BEC**	**Seral Stage**	**Current Status (2004)**	**Forecasted Target*** (age/ %target)	**Variance**	**Achieve Target by**
BCTS	**Babine West** (BEO - Low)	ESSF	Early	5.9	N/A		
			Mature + Old	88.8	>120/>14%	0	Immediately
			Old	0	>250/>9%	0	Period 5
		SBS	Early	21.5	N/A		
			Mature + Old	78.5	>100/>11%	0	Immediately
			Old	50.6	>140/>11%	0	Immediately
BCTS	**Bulkley** (BEO - Interm.)	ESSF	Early	25.7	<40/<36%	0	Immediately
			Mature + Old	63.3	>120/>28%	0	Immediately
			Old	3.6	>250/>9%	0	Period 4
		SBS	Early	32.5	<40/<54%	0	Immediately
			Mature + Old	54.3	>100/>23%	0	Immediately
			Old	39.3	>140/>11%	0	Immediately
BCTS	**Burns Lake East** (BEO - Low)	ESSF	Early	12	N/A		
			Mature + Old	23.5	>120/>14%	0	Immediately
			Old	0	>250/>9%	>8% Period 15	Period 12
		SBS	Early	11.3	N/A		
			Mature + Old	26.4	>100/>11%	0	Immediately
			Old	14.2	>140/>11%	0	Immediately
BCTS	**Burns Lake West** (BEO - Low)	SBS	Early	25.3	N/A		
			Mature + Old	63.3	>100/>11%	0	Immediately
			Old	47.6	>140/>11%	0	Immediately
BCTS	**Cheslatta** (BEO - Interm.)	SBS	Early	16.6	<40/<54%	0	Immediately
			Mature + Old	51.3	>100/>23%	>21% Periods 10-13	Immediately
			Old	21.5	>140/>11%	0	Immediately

Percent Seral Stage Distribution by LU by BEC by licensee							
Licensee	**Landscape Unit**	**BEC**	**Seral Stage**	**Current Status (2004)**	**Forecasted Target*** (age/ %target)	**Variance**	**Achieve Target by**
BCTS	**Francois East** (BEO - Low)	ESSF	Early	15.4	N/A		
			Mature + Old	71.8	>120/>14%	0	Immediately
			Old	0	>250/>9%	0	Period 20
		SBS	Early	25	N/A		
			Mature + Old	48.4	>100/>11%	0	Immediately
			Old	32.6	>140/>11%	0	Immediately
BCTS	**Francois West** (BEO - Interm.)	ESSF	Early	19	<40/<36%	0	Immediately
			Mature + Old	58.4	>120/>28%	0	Immediately
			Old	37.2	>250/>9%	0	Immediately
		SBS	Early	16.9	<40/<54%	0	Immediately
			Mature + Old	42.3	>100/>23%	0	Immediately
			Old	31.5	>140/>11%	0	Immediately
BCTS	**Taltapin** (BEO - Low)	ESSF	Early	4	N/A		
			Mature + Old	43.2	>120/>14%	0	Immediately
			Old	0	>250/>9%	0	Period 10
		SBS	Early	23.8	N/A		
			Mature + Old	42.8	>100/>11%	>10% Periods 15 - 18	Immediately
			Old	39.2	>140/>11%	>6% Periods 5 - 24	Immediately
BFP	**Babine East** (BEO - Interm.)	ESSF	Early	1.4	<40/<36%	0	Immediately
			Mature + Old	58.4	>120/>28%	0	Immediately
			Old	5.7	>250/>9%	0	Period 4
		SBS	Early	8.6	<40/<54%	0	Immediately
			Mature + Old	55	>100/>23%	0	Immediately
			Old	36	>140/>11%	0	Immediately

Percent Seral Stage Distribution by LU by BEC by licensee							
Licensee	**Landscape Unit**	**BEC**	**Seral Stage**	**Current Status (2004)**	**Forecasted Target*** (age/ %target)	**Variance**	**Achieve Target by**
BFP	**Babine West** (BEO - Low)	ESSF	Early	14.6	N/A		
			Mature + Old	84.6	>120/>14%	0	Immediately
			Old	11.6	>250/>9%	0	Immediately
		SBS	Early	25.3	N/A		
			Mature + Old	57.6	>100/>11%	0	Immediately
			Old	24.2	>140/>11%	0	Immediately
BFP	**Bulkley** (BEO - Interm.)	SBS	Early	16.7	<40/<54%	0	Immediately
			Mature + Old	69.3	>100/>23%	>17% Periods 10 - 17	Immediately
			Old	32.1	>140/>11%	0	Immediately
BFP	**Burns Lake East** (BEO - Low)	ESSF	Early	6.5	N/A		
			Mature + Old	26.9	>120/>14%	0	Immediately
			Old	7.9	>250/>9%	0	Period 3
		SBS	Early	15.2	N/A		
			Mature + Old		>100/>11%	0	Immediately
			Old		>140/>11%	0	Immediately
BFP	**Burns Lake West** (BEO - Low)	SBS	Early	21.3	N/A		
			Mature + Old	73.3	>100/>11%	0	Immediately
			Old	50.9	>140/>11%	0	Immediately
BFP	**Fleming** (BEO - Interm.)	ESSF	Early	4	<40/<36%	0	Immediately
			Mature + Old	91.5	>120/>28%	0	Immediately
			Old	8.4	>250/>9%	0	Period 3
		SBS	Early	23.1	<40/<54%	0	Immediately
			Mature + Old	65.9	>100/>23%	0	Immediately
			Old	46.4	>140/>11%	0	Immediately

Percent Seral Stage Distribution by LU by BEC by licensee							
Licensee	**Landscape Unit**	**BEC**	**Seral Stage**	**Current Status (2004)**	**Forecasted Target*** (age/ %target)	**Variance**	**Achieve Target by**
BFP	**Francois West** (BEO - Interm.)	SBS	Early	18.2	<40/<54%	0	Immediately
			Mature + Old	52.7	>100/>23%	>21% Period 15 - 16	Immediately
			Old	37.3	>140/>11%	0	Immediately
BFP	**Taltapin** (BEO - Low)	ESSF	Early	16	N/A		
			Mature + Old	66.1	>120/>14%	0	Immediately
			Old	11.6	>250/>9%	0	Immediately
		SBS	Early	27.3	N/A		
			Mature + Old	64.1	>100/>11%	0	Immediately
			Old	51.9	>140/>11%	0	Immediately
FLSM	**Caribou Migration Corridor Moderate**	All	Early	22	<40/<32%	0	Immediately
			Mature + Old	77.5	>80/>45%	>16.6% Periods 10 - 16	Immediately
			Old	71.3	>140/>30%	>12.7% Periods 10 - 23	Immediately
FLSM	**Caribou Migration Corridor Low**	All	Early	30.2	<40/<54%	0	Immediately
			Mature + Old	67	>80/>30%	>25.2% Periods 10 - 13	Immediately
			Old	44.8	>140/>20%	0	Immediately
FLSM	**Cheslatta** (BEO - Interm.)	ESSF	Early	23.3	<40/<36%	0	Immediately
			Mature + Old	43.1	>120/>28%	>8 Periods 10-21	Immediately
			Old	0	>250/>9%	0	Period 29
		SBS	Early	29.9	<40/<54%	0	Immediately
			Mature + Old	42.4	>100/>23%	>10 Periods 10-21	Immediately

Percent Seral Stage Distribution by LU by BEC by licensee							
Licensee	**Landscape Unit**	**BEC**	**Seral Stage**	**Current Status (2004)**	**Forecasted Target*** (age/ %target)	**Variance**	**Achieve Target by**
			Old	28.8	>140/>11%	>7 Periods 10-24	Immediately
FLSM	**Francois East** (BEO - Low)	SBS	Early	54	N/A		
			Mature + Old	35.9	>100/>11%	0	Immediately
			Old	32.8	>140/>11%	>9 Periods 10-14	Immediately
FLSM	**Intata North** (BEO - Interm.)	SBS	Early	60	<40/<54%	<63 Periods 1-4	Immediately
			Mature + Old	26.9	>100/>23%	>5 Periods 8-21	Immediately
			Old	19	>140/>11%	>4 Periods 10-23	Immediately

Rationale for variance:

Canfor / **Bulkley** / ESSF / Mature + Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

Canfor / **Bulkley** / ESSF / Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

Canfor / **Bulkley** / SBS / Mature + Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

Canfor / **Bulkley** / SBS / Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

BCTS / **Burns Lake East** / ESSF / Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

BCTS / **Cheslatta** / SBS / Mature + Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

BCTS / **Taltapin** / SBS / Mature + Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

BCTS / **Taltapin** / SBS / Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

BFP / Bulkley / SBS / Mature + Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

BFP / **Francois West /** SBS / Mature + Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

FLSM / **Caribou Migration Corridor Moderate** / Mature + Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Caribou Migration Corridor Moderate** / Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Caribou Migration Corridor Low** / Mature + Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Caribou Migration Corridor** Low / Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Cheslatta** / ESSF / Mature + Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Cheslatta** / ESSF / Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Cheslatta** / SBS / Mature + Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Cheslatta** / SBS / Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

FLSM / **Francois East** / SBS / Old: Targets were set by licensee Defined Forest Area. The overall target meets or exceeds the HLP targets.

FLSM / **Intata North** / ESSF / Mature + Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

FLSM / **Intata North** / ESSF / Old: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
Based on Decision Scenario forecasts across a 250 yr planning horizon as forecast using the Tesera Scheduling Model (TSM), the target will be achieved by following the management direction in the Lakes HLP Order (Lakes North) and the Lakes South SRM Plan (Lakes South).

Calculation of Indicator

Formula:

$$\%SSD_{LU, , BEC, licensee} = (AS_{LU, , BEC, licensee} / A_{LU, ,BEC, licensee}) \times 100$$

Variables:

$\%SSD_{LU, , BEC, licensee}$: Seral Stage Distribution by Landscape Unit by BEC by licensee

$AS_{LU, , BEC, licensee}$: Area of seral stage (early, mid-seral, mature, old) by Landscape Unit by BEC by licensee

$A_{LU, ,BEC, licensee}$: Area by Landscape Unit by BEC by licensee

Analysis Comments / Discussion

Starting with the 2007 reporting the ESSF Old Seral Stage age definition will be >200 years or to the age in which the stand meets old growth characteristics.

Seral Stage Distribution for the Lakes South SRMP outside the Caribou Migration Corridor

Landscape Unit/ BEC Zone/ Biodiversity Emphasis Option[d]	Early[a]		Mature plus Old[b]	Old[c]
	Short Term	**Long Term**	**Short and Long Term**	**Short and Long Term**
Francois West / Int. BEO				
SBS	**NA**	**<54%**	**>23%**	**>11%**
ESSF	**NA**	**<36%**	**>28%**	**>9%**
Francois East / Low BEO				
SBS	**NA**	**NA**	**>11%**	**>11%**
ESSF	**NA**	**NA**	**>14%**	**>9%**
Cheslatta / Int. BEO				
SBS	**NA**	**<54%**	**>23%**	**>11%**
ESSF	**NA**	**<36%**	**>28%**	**>9%**
Ootsa and Intata North / Int. BEO				
SBS	**NA**	**<54%**	**>23%**	**>11%**
ESSF	**NA**	**<36%**	**>28%**	**>9%**

[a] The early seral stage objective will not be implemented in the short term. Early forest is <40 years for SBS and ESSF

[b] Mature forest is >100 years for SBS and >120 years for ESSF

[c] Old forest is >140 years for SBS and >250 years for ESSF

[d] Biodiversity Emphasis Options (BEOs) assigned to Landscape Units as per the Prince Rupert Region Landscape Unit Planning Strategy. Low BEO targets apply to the Francois East Landscape Unit, Intermediate BEO targets apply to the Cheslatta, Intata, and Ootsa Landscape Units. The Intata and Ootsa Landscape Units are both divided by the Nechako Reservoir with the southern portions of both units falling within the "Low Use" Caribou Management Zone. The northern portions of both units will be treated as a single unit for the purposes of seral stage distribution in which the Intermediate BEO targets will apply. High biodiversity emphasis option targets are included in this table for reference only as the High BEO landscape unit (Chelaslie) is located in the caribou migration corridor and the targets listed belowtherefore apply to this landscape unit. SBS is Sub-Boreal Spruce, its subzones and variants. ESSF is Engelmann Spruce Subalpine Fir, its subzones and variants.

Seral Stage Distribution for the Caribou Migration Corridor

Seral Stage Management Zone	Seral Stages			
	> 140 Years	> 80 Years	Early[a] < 40 Years	
			Short Term	Long Term
High Use (LRMP CMC zone B,C, and D)	> 40%	> 60%	< 25%	< 25% <32%
			NA	<54%
Moderate Use (LRMP CMC zone A)	> 30%	> 45%	NA	
Low Use (LRMP CMC zone E)	> 20%	> 30%		

[a] The early seral stage objective will not be implemented in the caribou Moderate Use and Low Use zones for the short term.

Seral Stage Distribution Targets for the Lakes North

Biodiversity Emphasis Option	Early			Mature plus Old			Old		
	L	I	H	L	I	H	L	I	H
SBS dk, mc2, wk3	N/A	<54 %	<40 %	>11 %	>23%	>34 %	>11 %	>11 %	>16 %
ESSF mc, mv1, mv3	N/A	<36 %	<27 %	>14 %	>28%	>42 %	>9%	>9%	>13 %

Seral Stage Definitions for the Lakes North

BEC	NDT	Mean event interval	Early seral stage	Mature seral stage	Old seral Stage
SBS dk, mc2, wk3	3	125 yr	<40 yr	> 100 yr	>140
ESSF mc, mv1, mv3	2	200 yr	<40 yr	>120 yr	>250 yr

Targets will be measured by BEC zone and Landscape Unit.

This indicator, in conjunction with other indicators such as patch size, interior forest area, edge to area ratio, etc. are used to describe and monitor landscape level biodiversity.

For reporting purposes,the Biodiversity Guidebook (BGB) defines landscape units as generally greater than 10,000 hectares in size. For the purpose of managing landscape level biodiversity indicators it is practical to determine a minimum area for managing performance toward achievement of the target. Areas less than 1000 ha within Operating Area/LU/BEC combinations will not be considered for reporting current status since they are well below the suggested area of a landscape.(Reference: Definition of Landscapes on Page 75 of the BGB).

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Silviculture data	Licensee	Yes	Annually
BEC	ILMB	Yes	Use most current version
VRI (forest cover)	ILMB	Yes	Use most current version
Landscape Units	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Ensure inventories are current and that all natural disturbances are accounted for. Update digital coverage. Add information to annual reporting resultant file.	Tweedsmuir Forest Ltd.	Annually starting 2003
Analysis	Query resultant file and determine percent seral stage distribution by LU by BEC by licensee	Tweedsmuir Forest Ltd.	Annually starting 2004
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting on May 31, 2004
	M&L IFPA SFM Report	IFPA Manager	Annually starting on May 31, 2004

Output for indicator reporting

This indicator will be reported in tabular form.

References

Anon. 1995. Biodiversity Guidebook. Forest Practices Code of British Columbia. Government of British Columbia, Victoria, BC. 99p.

Indicator L27: Percent Species Composition by BEC by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Landscape and Stand Level Biodiversity **Value / Issue:** Biodiversity Emphasis Options **Value / Issue:** Biological Ecosystems Networks – General **Value / Issue:** Biological Ecosystems Networks – Strong Link Deciduous **Value / Issue:** Connectivity **Value / Issue:** Habitat Element – Tree Species Composition **Resource:** Timber **Value / Issue:** Harvest Profile **Resource:** Wildlife **Value / Issue:** Biological Ecosystems Networks – Strong Link Caribou **Value / Issue:** Biological Ecosystems Networks – Strong Link Moose **Value / Issue:** Deer Winter Range (High Value) **Value / Issue:** Moose Winter Range (High Value) **Value / Issue:** Tweedsmuir Caribou Herd – High and Very High Value Migration Corridors **Value / Issue:** Tweedsmuir Caribou Herd – Moderate Value Migration Corridors **Value / Issue:** Tweedsmuir Caribou Herd – Low Value Migration Corridors		**Criterion**: 1. Conservation of Biological Diversity **SFM Element**: 1. Ecosystem Diversity **Value**: 1. Connectivity **Objective**: 1. To maintain/enhance habitat connectivity over time at the landscape level across the DFA within the natural range of variability to provide opportunities for the distribution of species, populations and genetic materials. **SFM Element**: 2. Species Diversity **Value**: 1. Wildlife Habitat **Objective**: 1. A supply of habitats is maintained on the DFA within the natural range of variation over time. **SFM Element**: 3. Genetic Diversity **Value**: 1. Genetic Interaction **Objective**: 1. Individuals within sub-species and species have the opportunity to move and interact within their natural range in and across the DFA. **Criterion**: 2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity **SFM Element: 2** Ecosystem Productivity **Value: 1** Ecosystem Productivity is conserved within the range of natural variability over time on the DFA **Objective: 1** Ecosystem conditions capable of supporting naturally occurring species within the range of natural variability **Criterion:** 5 Multiple Benefits to Society **SFM Element:** 1 Timber and Non-Timber Benefits **Value:** 1 The supply and variety of timber and non-timber products, services and benefits on the DFA. **Objective:** 3 Healthy Wildlife Populations

Indicator Rationale

hat does this indicator mean?

This indicator will track the proportion of tree species on the Lakes TSA. Species composition (the relative abundance of a species expressed as a percentage) is variable across the landscape and is influenced over time by the interactions of soil, water availability, climate, species' silvics, influence of disturbance and forest management activities. In British Columbia, the Biogeoclimatic Ecosystem Classification (BEC) describes the landscape based on these and other characteristics.

How does this indicator relate to the M&L IFPA and to SFM?

Maintaining species composition within the range of natural variability is an important aspect to conserve biodiversity. For example, maintaining species composition at the landscape level influences the dynamic creation of habitats that provide the necessary requirements for resident wildlife to be

maintained. Furthermore, maintaining species composition typical of the range of natural variation enables the ecosystem to respond and recover from disturbance. In fire dominated ecosystems, resiliency is an important functional characteristic that ensures a vibrant ecosystem. A productive and resilient ecosystem is sustainable and is capable of providing the many products and services desired by the public. Therefore, the maintenance of the natural range of species composition is crucial in achieving biodiversity objectives.

Current Status and Forecasted Targets / Thresholds of Indicator

Percent Species Composition by BEC by licensee						
Licensee	**BEC**	**Species**	**Current Status (%) (2004)**	**Forecasted Target (%)**	**Variance**	**Achieve Target by**
BFP	ESSFmc & ESSFmv3	B (BA, BG, BL)	41	>=41	0	Immediately
		P (P, PL)	36	>26	0	Immediately
		S (S, SE, SW)	22	>=22	0	Immediately
BFP	ESSFmv1	B (BA, BG, BL)	23	>=23	0	Immediately
		P (P, PL)	51	>14	0	Immediately
		S (S, SE, SW)	55	>25	0	Immediately
BFP	SBS dk	AC	1	>=1	0	Immediately
		AT	13	>=13	0	Immediately
		B (BA, BG, BL)	2	>1	0	Immediately
		P (P, PL)	54	>36	0	Immediately
		S (S, SE, SW)	29	>=29	0	Immediately
BFP	SBS mc 2 & SBSwk3	AC	1	>=1	0	Immediately
		AT	6	>=6	0	Immediately
		B (BA, BG, BL)	8	>4	0	Immediately
		P (P, PL)	55	>34	0	Immediately
		S (S, SE, SW)	31	>=31	0	Immediately
BCTS	ESSFmc & ESSFmv3	B (BA, BG, BL)	26	>=26	0	Immediately
		P (P, PL)	44	>35	0	Immediately
		S (S, SE, SW)	30	>20	0	Immediately
BCTS	ESSFmv1	B (BA, BG, BL)	11	>=11	0	Immediately
		P (P, PL)	63	>16	0	Immediately

Percent Species Composition by BEC by licensee						
Licensee	**BEC**	**Species**	**Current Status (%) (2004)**	**Forecasted Target (%)**	**Variance**	**Achieve Target by**
		S (S, SE, SW)	23	>=23	0	Immediately
BCTS	SBS dk	AC	1	>=1	0	Immediately
		AT	23	>19	0	Immediately
		B (BA, BG, BL)	1	>=1	0	Immediately
		P (P, PL)	50	>36	0	Immediately
		S (S, SE, SW)	25	>=25	0	Immediately
BCTS	SBS mc 2 & SBSwk3	AC	1	>=1	0	Immediately
		AT	4	>=4	0	Immediately
		B (BA, BG, BL)	6	>3	0	Immediately
		P (P, PL)	64	>39	0	Immediately
		S (S, SE, SW)	26	>=26	0	Immediately
Canfor	ESSFmc & ESSFmv3	AT	2	>1	0	Immediately
		B (BA, BG, BL)	22	>=22	0	Immediately
		P (P, PL)	52	>34	0	Immediately
		S (S, SE, SW)	25	>19	0	Immediately
	SBS dk	AT	11	>10	0	Immediately
		B (BA, BG, BL)	1	>=1	0	Immediately
		P (P, PL)	68	>45	0	Immediately
		S (S, SE, SW)	19	>=19	0	Immediately
	SBS mc 2 & SBSwk3	AC	3	>=3	0	Immediately
		AT	1	>=1	0	Immediately
		B (BA, BG, BL)	5	>2	0	Immediately
		P (P, PL)	69	>40	0	Immediately
		S (S, SE, SW)	23	>=23	0	Immediately
FLSM	ESSFmc & ESSFmv3	AT	0	>1	0	Immediately
		B (BA, BG, BL)	2	>=2	0	Immediately
		P (P, PL)	70	>44	0	Immediately

Percent Species Composition by BEC by licensee						
Licensee	**BEC**	**Species**	**Current Status (%) (2004)**	**Forecasted Target (%)**	**Variance**	**Achieve Target by**
		S (S, SE, SW)	28	>23	0	Immediately
	SBS dk	AT	4	>=4	0	Immediately
		B (BA, BG, BL)	1	>=1	0	Immediately
		P (P, PL)	68	>42	0	Immediately
		S (S, SE, SW)	27	>=27	0	Immediately
	SBS mc 2 & SBSwk3	AC	1	>=1	0	Immediately
		AT	1	>=1	0	Immediately
		B (BA, BG, BL)	1	>=1	0	Immediately
		P (P, PL)	71	>45	0	Immediately
		S (S, SE, SW)	25	>=25	0	Immediately

Rationale for variance:

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
* A target of >= 1 indicates a trend toward trace amounts or a trend towards a lack of representation of a species in a particular BEC/Licensee area due to existing inventory information and the regeneration assumptions that were modeled. Forest inventory tree species percentage is estimated to the nearest 10%. For any given forest inventory polygon. The species estimates from the model will have a precision of +/- 10%. The target will be achieved by using the following strategies: • regenerate harvested stands with ecologically appropriate species as reflected in stand level plans. • tree species that are encountered that are not currently in the forest cover inventory or rare will be included in WTP's or other reserve zones at the stand level (e.g. cedar). • Deciduous species will be targeted for retention in WTP's, riparian reserve zones, and single tree retention. • Follow the regeneration assumptions used to model species composition for the decision scenario. This in turn will maintain species composition within the range of natural variability. Model outputs are based on a forecast across a 250 yr planning horizon, using the Tesera Scheduling Model (TSM).

Calculation of Indicator

Formula: $\%SC_{BEC,\ licensee} = (A_{sp,\ BEC,\ licensee} / A_{BEC,\ licensee}) \times 100$

Variables: $\%SC_{BEC,\ licensee}$: Percent species composition by BEC by licensee

$A_{sp,\ BEC,\ licensee}$: Area of species within BEC by licensee

$A_{BEC,\ licensee}$: Area of BEC by licensee

Analysis Comments / Discussion

Tree species composition at the stand (polygon) level will be tracked using the forest cover tree species available from the forest cover database. In the analysis and forecasting of this indicator (using the scheduling model) trees will be replanted based on ecosystem parameters and existing restocking standards after the model harvests a stand.

If the species is not present in the Current Status/Forecast Table within a BEC subzone, this means that the species is not found in the inventory or does not occur in that particular subzone variant. In some BEC/licensee areas, certain tree species percentages decrease over time due to the regeneration assumptions being applied and a lack of current knowledge regarding ingress of natural regeneration in plantations.

Tree species composition at the stand (polygon) level will be tracked using the forest cover tree species available from the forest cover database. In the analysis and forecasting of this indicator (using the scheduling model) trees will be replanted based on ecosystem parameters and existing restocking standards after the model harvests a stand.

Areas that have been harvested but not re-planted will not be included in the calculation:

- The following BEC zones have been combined for reporting purposes due to their relatively small area in the Lakes T.S.A. and similarity in tree species distribution.
  - SBS mc 2 and SBSwk3
  - ESSFmc and ESSFmv 3

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Silviculture data	Licensee	Yes	Annually
VRI (Forest cover)	ILMB (augmented by licensee)	Yes	Use most current version
BEC	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Ensure licensee inventories are current. Update digital coverage. Add information to annual reporting resultant file.	Tweedsmuir Forest Ltd.	Five years starting 2003
Analysis	Query resultant file and determine percent species composition by BEC by licensee	Tweedsmuir Forest Ltd.	Five years starting May 31, 2004
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	May 31, 2004 Next Report May 31, 2009
	M&L IFPA SFM Report	IFPA Manager	May 31, 2004 Next Report May 31, 2009

Output for indicator reporting

This indicator will be reported in tabular format.

References

Anon. 1998. Vegetation Resources Inventory Photo Interpretation Standards Prepared by Ministry of Forests Resources Inventory Branch for the Resources Inventory Committee March 31, 1998 Version 1.0

http://srmwww.gov.bc.ca/risc/pubs/teveg/photostandards/stds-pub-03.htm#p596_10733

Anon. 1995. Biodiversity Guidebook. Forest Practices Code of British Columbia. Government of British Columbia, Victoria, BC. 99p.

Indicator L28: Percent species composition of harvest volume by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Timber **Value / Issue:** Harvest Profile		**Criterion:** 5. Multiple Benefits to Society **SFM Element:** 2. Communities and Sustainability **Value:** 1. Healthy and sustainable communities **Objective:** 1. Communities that exhibit economic, environmental and social well-being through time

Indicator Rationale

What does this indicator mean?

Forest harvesting must be carefully planned in order to harvest the existing species profile. Harvesting the existing species profile ensures that the values (i.e. timber and non-timber) of the forest is not deteriorated for future generations. This indicator allows for a determination to be made as to the proportion of species that, over time, make up the harvest volume and will be used to monitor the harvest with regards to maintaining the existing species profile.

How does this indicator relate to the M&L IFPA and to SFM?

This indicator is important to long term community well being which in turn is dependent on forest ecosystems to supply the array of products and services necessary for community stability. The strength of a forest ecosystem to supply a myriad of products and services is derived fundamentally from its diversity. Therefore, it is prudent to maintain the natural mix of species over the long run. Shifts in harvesting the natural species profile can lead to a decline in economic prosperity particularly if mills depend on broad profiles of species / size and quality of forest products. Shifts in species profile can also have associated and significant impacts on other resource values (e.g. wildlife).

Current Status and Forecasted Targets / Thresholds of Indicator

Percent species composition of harvest volume by license					
Licensee	**Species**	**Current Status (2004)***	**Forecasted Target ****	**Variance**	**Achieve Target by**
Canfor	Pine	**83%**	>17 for periods 2-4	None	Immediately
	Balsam	**0%**	N/A	N/A	N/A
	Spruce	**17%**	N/A	N/A	N/A
BFP	Pine	**64.4%**	>10 for periods 2-4	None	Immediately
	Balsam	**6.9%**	N/A	N/A	N/A
	Spruce	**28.7%**	N/A	N/A	N/A

Percent species composition of harvest volume by license					
Licensee	**Species**	**Current Status (2004)***	**Forecasted Target ** **	**Variance**	**Achieve Target by**
FLSM	Pine	**74.2%**	7-86 for periods 2-4	None	Immediately
	Balsam	**3.4%**	N/A	N/A	N/A
	Spruce	**22.4%**	N/A	N/A	N/A
BCTS	Pine	**79%**	20-76 for periods 2-4	None	Immediately
	Balsam	**4%**	N/A	N/A	N/A
	Spruce	**17%**	N/A	N/A	N/A

*based on billed volumes

**based on modelling assumptions

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
The target will be achieved by ensuring annual harvest plans consider species profile forecasts and by considering block design generated by TSM when proposing future harvest Based on a Decision Scenario forecast across a 250 yr planning horizon as forecast using the Tesera Scheduling Model (TSM)

Calculation of Indicator

Formula:

$$\%SpV_{licensee} = (SpV_{licensee} / HV_{licensee}) \times 100$$

Variables:

$\%SpV_{licensee}$: % Species volume (m^3) by licensee

$SpV_{licensee}$: Species volume (m^3) by licensee

$HV_{licensee}$: Harvest volume (m^3) by licensee

Analysis Comments / Discussion

- Current condition of "% species composition of harvest" is based on scaled volume.
- Forecasted targets and variances will be determined by resource analysis.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Data Source	Source	Updating required for future analysis?	Date / interval required
Scale receipts, payments	Licensee	Yes	Annual
VRI (forest cover)	ILMB	Yes	Use most current version
Silviculture database (harvest records)	Licensee	Yes	Annual

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure information	Obtain data from licensees	Tweedsmuir Forest Ltd.	Annually starting 2003
Analyze data	Evaluate data by licensee	Tweedsmuir Forest Ltd.	Annually starting January 31, 2004
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting January 31, 2004
	M&L IFPA SFM Report	IFPA Manager	Annually starting January 31, 2004

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L29: Total area by Wildlife Value Class by LU by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Wildlife **Value / Issue:** Mule Deer Winter Habitat **Value / Issue:** Fisher Habitat **Value / Issue:** Northern Goshawk Nesting Habitat **Value / Issue:** Grizzly Bear Foraging Habitat **Value / Issue:** Marten Habitat **Value / Issue:** Moose Summer Habitat **Value / Issue:** Moose Winter Habitat **Value / Issue:** Takla Caribou Herd Habitat **Value / Issue:** Tweedsmuir Caribou Herd Habitat		**Criterion**: 1. Conservation of Biological Diversity **SFM Element**: 2. Species Diversity **Value**: 1. Wildlife Habitat **Objective**: 1. A supply of habitat types is maintained on the DFA within the natural range of variation over time. **SFM Element**: 3. Genetic Diversity **Value**: 1. Genetic Interaction **Objective**: 1. Individuals within sub-species and species have the opportunity to move and interact within their natural range in and across the DFA. **Criterion:** 5 Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 1. The supply and variety of timber and non-timber products, services and benefits on the DFA. **Objective:** 3. Healthy Wildlife Populations

Indicator Rationale

What does this indicator mean?

This indicator will track the changes in habitat values for selected wildlife species within the Lakes TSA. In general, "ecosystem and wildlife value classes" are defined by the level of suitability (high, moderate, low, nil) for selected wildlife species habitat requirements. Detailed habitat suitability models have been completed for selected wildlife species of interest: Moose, Grizzly Bear, Mule Deer, and Caribou. Each habitat suitability model evaluates each mapped polygon for variables such as forest structure, site series and assumed habitat attributes to determine habitat suitability values, either high, moderate, low, or nil. By running the models under different time intervals, a time series of habitat suitability is created which can be used for habitat supply. Changes in the total area for the habitat values for the selected species over time can be used to monitor the effects of various forest and habitat management strategies on wildlife.

How does this indicator relate to the M&L IFPA and to SFM?

Maintenance of wildlife habitat over the long-term is critical to meeting the environmental requirements of sustainable forest management. The wildlife species selected for habitat supply modeling were chosen to reflect social, environmental and economic values important to the members of the IFPA scenario planning team and public advisory group. Each of the wildlife species selected for modeling have specific habitat attribute requirements (i.e. snags, closed canopy forests, limited road access, etc.) that need to be maintained for optimal habitat value. Species were also selected based on species at risk, available information, methods for inventory/management, and their roles as potential keystone/indicator species.

Current Status and Forecasted Targets / Thresholds of Indicator

Total area by Ecosystem & Wildlife Value Class by licensee

Licensee	Species of interest	Ecosystem Wildlife Value Class	Current Status (ha) (2004)	Forecasted Target (ha)	Variance	Achieve Target by
Canfor	Grizzly Bear (Spring)	High	1592	>1592	0	Immediately
BFP	Grizzly Bear (Spring)	High	11419	>11419	0	Immediately
FLSM	Grizzly Bear (Spring)	High	2756	>2756	0	Immediately
BCTS	Grizzly Bear (Spring)	High	13607	>13607	0	Immediately
Canfor	Grizzly Bear (Summer)	High	4504	>4504	0	Immediately
BFP	Grizzly Bear (Summer)	High	46348	>45002	0	Period 10
FLSM	Grizzly Bear (Summer)	High	8274	>7108	0	Period 10
BCTS	Grizzly Bear (Summer)	High	27181	>27181	0	Immediately
Canfor	Grizzly Bear (Fall)	High	1798	>945	0	Period 10
BFP	Grizzly Bear (Fall)	High	23533	>15747	0	Period 10
FLSM	Grizzly Bear (Fall)	High	2816	>1511	0	Period 10
BCTS	Grizzly Bear (Fall)	High	6507	>5701	0	Period 10
Canfor	Moose (winter)	Moderate + High	10801	>9224	0	Period 10
BFP	Moose (winter)	Moderate + High	64614	>63884	0	Period 10
FLSM	Moose (winter)	Moderate + High	21174	>14956	0	Period 10
BCTS	Moose (winter)	Moderate + High	119121	>100202	0	Period 10
BFP	Caribou Calving (Takla)	Moderate + High	10179	>10168	0	Period 10
BFP	Caribou Summer (Takla)	Moderate + High	12077	>10820	0	Period 35
BFP	Caribou Winter (Takla)	Moderate + High	998	>934	0	Period 4
FLSM	Caribou Calving (Tweedsmuir)	Moderate + High	2433	>2413	0	Period 10
BCTS	Caribou Calving (Tweedsmuir)	Moderate + High	547	>539	0	Period 20
FLSM	Caribou Summer (Tweedsmuir)	Moderate + High	6570	>3436	0	Period 10
BCTS	Caribou Summer (Tweedsmuir)	Moderate + High	575	>575	0	Immediately
FLSM	Caribou Winter (Tweedsmuir)	Moderate + High	5912	>1891	0	Period 10
BCTS	Caribou Winter (Tweedsmuir)	Moderate + High	942	>935	0	Period 10

Rationale for variance: Not applicable

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria

The models will be reported on the resulting mapped information from the scheduling model at selected time intervals (e.g. 0, 5, 10, 25, 50, 100, 200 years) and targets will be established based on model results.
 	
The targets will be achieved with the following management direction:
 	
• Grizzly Bear Habitat - Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM). Minimum 50% Mature plus Old Seral as referenced in the IWMS Orders.
  o The modeling of Grizzly Bear habitat included basic silviculture such as planting and minor amounts of brushing activities. Intensive silviculture practices such as fertilization and brushing were not modeled. Operational application of silviculture practices will consider the maintenance of brush species such as vaccinium, berry producing and herbaceous (ie cow parsnip).
• Moose Winter Habitat - Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM)
  o The modeling of Moose Winter habitat included basic silviculture such as planting and minor amounts of brushing activities. Intensive silviculture practices such as fertilization and brushing were not modeled. Operational application of silviculture practices will consider the maintenance of brush species such as willow, red-osier dogwood and cranberrys.
• Takla Caribou Herd Habitat - The strategies described in the Northern Caribou Ungulate Winter Range Proposal – Takla Herd will be followed.
• Tweedsmuir Caribou Herd Habitat - Targets for calving habitat and post calving habitat will be refined when the recovery action plan has been completed.
 	
Other species of management concern may be identified in the future. Appropriate management strategies for these species will be developed in future versions of the SFM Plan.

Calculation of Indicator

Formula:

$$\%WVC_{licensee} = (AWVC_{Licensee} / ADFA_{licensee}) \times 100$$

Variables:

$\%WVC_{licensee}$: Percent of total area within Wildlife Value Classes by licensee

$AWVC_{Licensee}$: Area within Wildlife Value Classes by licensee

$ADFA_{Licensee}$: Area of Defined Forest Management Area by licensee

Analysis Comments / Discussion

The external habitat suitability models provide an opportunity to test and modify the models and their assumptions independently of the scheduling model. Integration of management targets back into the scheduling model for subsequent learning scenarios will be accomplished through analysis of the habitat attributes that contribute to the desired habitat conditions and managing for those targets within the scheduling model.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Silviculture data	Licensee	Yes	Annual
Wildlife habitat models	Tweedsmuir Forest Ltd.	Yes	Use most current version
VRI (forest cover)	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Obtain data from habitat suitability models Ensure inventories are current (e.g. VRI). Add information to annual reporting resultant file.	Tweedsmuir Forest Ltd.	Every 5 years, starting 2006
Analysis	Query resultant file and determine percent total area by "wildlife value class"	Tweedsmuir Forest Ltd.	Every 5 years, starting 2006
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Every 5 years, starting 2006
	M&L IFPA SFM Report	IFPA Manager	Every 5 years, starting 2006

Proposed output for indicator reporting

This indicator will be reported in tabular format.

References

Turney, L. and A.M. Roberts. 2003. Species accounts for Fisher (*Martes pennanti*), Grizzly Bear (*Ursus arctos horribilis*), and Woodland Caribou (*Rangifer tarandus caribou*) in the Morice and Lakes IFPA.

Indicator L33: Area (ha) treated by Treatment Type

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Timber **Value / issue:** Vegetation Management (maintain Base Case) **Value / issue:** Fertilization **Value / issue:** Density Management **Value / issue:** Contributing land base conversion **Value/Issue:** Wood quality		**Not applicable**

Indicator Rationale

What does this indicator mean?

"Treatments" are prescribed silviculture activities following harvesting. Treatments are prescribed based on site characteristics and stand specific objectives for product type quality and value. Within silviculture and stand management prescriptions, operational details regarding treatments are described with respect to the type of treatment, timing of treatment, and the geographical extent of the treatment (i.e. treatment unit). With regard to the M&L IFPA, the treatments identified above (under the "value/issue" category) are those relating to intensive silviculture treatments, which are intended to enhance long term forest productivity, quality, and value. This indicator will track the area treated by treatment type by licensee.

How does this indicator relate to the M&L IFPA and to SFM?

Ensuring that the forest land base is able to contribute to the long term timber supply (while ensuring high quality fibre and product value) is one of the key factors in progressing toward sustainable forest management. By virtue of varying site characteristics and stand specific objectives across the TSA, various intensive silviculture treatment methods can be applied in order to maintain and improve the productive capacity and value of harvested stands.

Current Status and Forecasted Targets/Thresholds of Indicator

Area treated by treatment type				
Treatment Type	**Current Status* (2004) (ha) (5 year rolling avg.)**	**Forecasted Target (ha)**	**Variance**	**Achieve Target by**
Vegetation Management	0			
Fertilization	0			
Density Management	0			

*Current status based on operational data (if available).

Rationale for variance:

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
Licensees to monitor this indicator internally (i.e. using internal SOPs). IFPA representative to contact individual licensee 2 months in advance of reporting date to gather and format data. Licensees to provide IFPA with "Area (ha) treated by Treatment Type *Licensees should also indicate if there has been any change in method for calculating indicator (this should be recorded in reporting document).* Data from each licensee will be compiled by the IFPA and summarized for reporting purposes in the format shown in the table above.

Calculation of Indicator

Formula:

$$A_{\text{treatment type, licensee}}$$

Variables:

$A_{\text{treatment type, licensee}}$**:** Area treated by treatment type by licensee

Analysis Comments / Discussion

Effectiveness of treatment will be verified through Growth and Yield Monitoring Program.

Current status will be based on a 5 year rolling average (based on calendar year).

Treatment Types are defined as:

Vegetation Management

- Brushing (chemical)

Fertilization

- Repeat & Late Rotation

Density Management

- Pre-free growing & Incremental Spacing
- Problem Forest Type Rehab, - High density
- Thinning

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Silviculture data	Licensees	Yes	annually

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	ensure data updated in silviculture database Indicator information to be provided by licensee.	Licensees	Annually starting 2006
Data analysis	Compile information from licensees.	Tweedsmuir Forest Ltd.	Not applicable
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting January 31, 2007
	M&L IFPA SFM Report	IFPA Manager	Annually starting January 31, 2007

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L34: Area (ha/yr) harvested within the Agricultural/Settlement RMZ by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Agriculture **Value/Issue**: Agriculture Lease Land Expansion		**Criterion:** 5. Multiple Benefits to Society **Critical Element:** 1. Timber and Non-Timber Benefits **Value:** 2. Agricultural Products **Objective:** 1. A variety of agricultural products are provided from the DFA

Indicator Rationale

What does this indicator mean?

This indicator will report on annual harvest within the areas designated as "Agricultural/ Settlement" Resource Management Zones (RMZ). RMZs were designated for various resources during the Lakes District Land and Resource Management Planning (LRMP) process. In the Lakes District LRMP process, the intent of the Agricultural/Settlement zone was to identify the areas most appropriate for future agricultural development and settlement expansion. Areas incorporated in this zone include: the provincial Agricultural Land Reserve; foreshore lands and water source storage areas that are currently used for agricultural purposes; and, areas of settlement, especially those in rural areas, where it is considered important to retain the rural-agricultural character of the settlements and their surrounding lands (Anon. 2000).

How does this indicator relate to the M&L IFPA and to SFM?

While one of the premises of SFM is to maintain the productivity of the forest ecosystem, the conversion of forested land to agriculture is also an important factor in contributing to multiple benefits to society with regards to non-timber forest values. Agriculture is an important socio-economic activity in the Lakes TSA, and as such, a balance must exist between the different timber and non-timber resources. One of the intentions within the ML-IFPA "Agriculture" Resource Value is to expand agriculture land use within the Agriculture Settlement RMZ on the Lakes TSA land base. The maintenance of agriculture opportunities helps to maintain the economic diversity of the area while preserving a well-established and long standing way of life in the Lakes TSA.

Current Status and Forecasted Targets/Thresholds of Indicator

Area (ha/5 yr) harvested within the Agricultural/Settlement RMZ by licensee				
Licensee	**Current Status (2004)**	**Target**	**Variance**	**Target Achieved By**
Canfor	**67.1**	<200	0	Immediately
BFP	**0**	0	0	Immediately
FLSM	**0**	0	0	Immediately
BCTS	**441.7**	<1200	<1600 period 2	Immediately

Rationale for variance:

BCTS: Period 2 harvest levels reflect a focused harvest on Beetle damaged timber

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
Report Area (ha/in five year period) harvested within the Agriculture/Settlement RMZ. The target will be achieved by regularly harvesting area within the Agriculture/Settlement RMZ thus providing an opportunity for agricultural expansion. The block design generated by TSM will be considered when developing future harvest proposals. Based on Decision Scenario forecast across a 250 yr planning horizon as forecast using the Tesera Scheduling Model (TSM). Note: Assumption is that area in Agriculture/Settlement RMZ is suitable for those purposes.

Calculation of Indicator

Formula:

$H_{A/S\ RMZ,\ licensee}$

Variables:

$H_{A/S\ RMZ,\ licensee}$ **:** Area (ha/5 yr) harvested within the Agriculture/Settlement RMZ by licensee

Analysis Comments/Discussion

None

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Agriculture/Settlement RMZ coverage	ILMB	Yes	Use most current version
VRI (forest cover)	ILMB	Yes	Use most current version
Silviculture data	Licensees	Yes	Annually

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Obtain necessary information from data custodian (ILMB)	Review data and determine if updates have occurred	Tweedsmuir Forest Ltd.	Every 5 years, starting 2006

Analysis	Determine values (ha/yr) for the indicator	Tweedsmuir Forest Ltd.	Every 5 years, starting 2006
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	Tweedsmuir Forest Ltd.	Every 5 years, starting January 31, 2007
	M&L IFPA SFM Report	IFPA Manager	Every 5 years, starting January 31, 2007

Output for indicator reporting

This indicator will be reported in tabular format.

References

Anon. 2000. Lakes District Land and Resource Management Plan (January 2000). Government of British Columbia: Victoria, BC.

Indicator L35: Benefits directed into local communities by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 5. Multiple Benefits to Society **Critical Element:** 3. Fair Distribution of Benefits and Costs **Value:** 1. Fair distribution of timber and non-timber benefits and costs over time. **Objective:** 2. Timber and non timber benefits and costs are fairly and equitably distributed at a range of scales for current and future generations.

Indicator Rationale

What does this indicator mean?

This indicator tracks the volunteer contributions (in dollars) made by each IFPA partner toward the local communities in the Lakes TSA on an annual basis. Examples of these contributions can be scholarships, donations (cash and in-kind contributions) and sponsorship. Within the Lakes TSA, local is defined by Burns Lake, Francois Lake, Endako and Grassy Plains postal codes

How does this indicator relate to the M&L IFPA and to SFM?

Benefits directed toward local communities by the forest licensees contribute to the distribution of benefits obtained from the surrounding forest resources. With forestry as the primary industry in local communities, licensees can demonstrate good corporate citizenship through various volunteer contribution mechanism such as providing scholarships, sponsorship, corporate donations, etc. The licensees also demonstrate their commitment to investing in the community for present and future generations by maintaining a certain level of benefits to the local communities over time.

Current Status and Forecasted Targets/Thresholds of Indicator

Benefits directed into local communities				
Licensee	**Current Status 2004 (5 year rolling average)**	**Target**	**Variance**	**Achieve Target**
Canfor	$1,114	Maintain 2002 level of $2000	- 10%	Annually
BFP	$79,448	Maintain 2002 level of $25,338	- 10%	Annually
FLSM	N/A	N/A	N/A	N/A
L&M	N/A	N/A	- 10%	Annually
BCTS	N/A	N/A	- 10%	Annually

Rationale for variance: the variance is meant to account for annual fluctuations in the indicator which may be beyond the control of the licensee (e.g. amount of requests, economic limitations, etc.).

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
In order to achieve target, benefits will be directed into local communities. Benefits directed into local communities will be identified and reported. Each licensee to provide information. ▪ Benefits include scholarships, donations, etc. ▪ Local is defined by Burns Lake, Francois Lake, Endako and Grassy Plains postal codes

Calculation of Indicator

Formula:

$$\$B_{\text{local community, licensee}}$$

Variables:

$\$B_{\text{local community, licensee}}$: Benefits directed into local community by Licensee (in dollars)

Analysis Comments/Discussion

Business rules:

- Current status will be based on a 5 year rolling average (based on calendar year).
- In-kind contributions will be calculated within the value of this indicator
- Employee time is not considered as in-kind contributions

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Accounts payable	Licensee	Yes	As contracts are paid.

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Set up system within individual organizations to document benefits to the local community	Ensure a system is organized to document the benefits to the local community	• Woods Manager for each licensee •	December, 2002
Monitor and update data	Ensure data is updated	• Woods Manager for each licensee •	Annually starting 2003
Analysis	Obtain necessary data for analysis	• Woods Manager for each licensee •	Annually starting 2003
	Conduct analysis for indicator	• Woods Manager for each licensee •	Annually starting 2003

Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	• Woods Manager for each licensee • • IFPA manager	Annually starting January 31, 2004
	M&L IFPA SFM Report	• Woods Manager for each licensee • IFPA manager	Annually starting January 31, 2004

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L37: Equivalent clear cut area (ECA) by sensitive watershed by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Watershed and Riparian **Value / Issue:** Hydrology		**Criterion:** 3. Conservation of Soil and Water Resources **SFM Element:** 2. Conserve water resources by maintaining water quality and quantity **Value:** 1. Aquatic Habitat **Objective:** 1. Water quantity and quality are sustained through their characteristic range of variation, on the DFA through time.

Indicators 9, 37, and 45 are closely related

Indicator Rationale

What does this indicator mean?

Forests and associated vegetation are central to maintaining hydrological cycles. In regions of mountainous terrain, the integrity of forest ecosystems is critical in safe guarding water quality and quantity. Although it is recognized that many biophysical features of a watershed influence hydrology, forest cover is deemed to be very influential in governing water quality, quantity and flow patterns. Forest cover modulates peak flows and, as forest cover is removed, the amount of snow interception decreases and the timing of snow melt changes with respect to elevation. This can result in extreme episodes of flooding, erosion and mass wasting with loss of water quality and productive capacity of aquatic ecosystems. The potential impact of harvesting on watersheds must be continually evaluated to assist in determining the extent of best management practices.

Equivalent clearcut area (ECA) is a calculated term that reflects the cumulative effect of harvesting within a watershed that is equivalent to the impact of a clearcut (Anon. 1999). Depending on the characteristics of a watershed, rate of recovery in terms of regrowth of vegetation (development of tree cover and shrub layer) will dictate the continuance of forest operations within a watershed. If it is deemed through the calculation of ECA that a threshold value has been exceeded, further examination may be necessary to determine if forest operations need to be modified (e.g. road deactivation and maintenance practices, alternative silviculture systems or possibly discontinuation of operations) until acceptable recovery has occurred. This indicator provides an approximate measure of disturbance in relation to hydrology impacts on water quality, quantity and flow patterns.

How does this indicator relate to the M&L IFPA and to SFM?

This indicator provides guidance in forest management planning with respect to the extent to which watersheds can be harvested in a manner that maintains water quality, quantity and flow patterns. Other factors are also important in this regard such as, road density, presence of other access structures and the occurrence of natural events. The avoidance of erosion events contributes to the maintenance of overall productive capacity of the site and ensures other associated forest products are maintained.

Current Status and Forecasted Targets/Thresholds of Indicator

Equivalent Clearcut Area (ECA) by Sensitive watershed by licensee				
Licensee	**Current Status (2004) (Sensitive Watershed > Threshold)**	**Forecasted Target (%)**	**Variance**	**Achieve Target by**
Canfor	Watershed 47-Babine Lake Group-4th Order Watershed 80-Francois Lake Group-3rd Order	<=30%	0	Immediately
BFP	Watershed 21, 26, 27, 28, 31, 32, 35, 47-Babine Lake Group-3rd Order Watershed 55-Francois Lake Group-5th Order	<=30%	0	Immediately
FLSM	Watershed 116-Lower Nechako River Group-3rd Order	<=30%	0	Immediately
L&M	N/A	<=30%	0	Immediately
BCTS	Watershed 60-Bulkley River Group-3rd Order	<=30%	0	Immediately

Rationale for variance: N/A

Indicator Analysis Information

Strategy, Practices, Methods, Assumptions and Criteria
In order to achieve the target, the block design generated by Tesera Scheduling Model (TSM) will be considered when developing future harvest proposals. Model outputs are based on the Decision Scenario forecast across a 250 yr planning horizon. Where the target is exceeded and any one of the following conditions apply: o a significant number of landslides that entered the stream channel are known to have occurred; **or** o stream channel stability problems are evident; **or** o over 25% of the riparian forest along either bank of the main stream channels has been logged over the past 40 years; **or** o landslide problems are anticipated due to recent harvesting on unstable terrain. An evaluation of the watershed will be conducted by a qualified professional. The watersheds in the Current Status column will be considered for an evaluation within the next 5 years: See “Analysis Comments” section for additional assumptions. Timber harvest will be spatially modeled and subsequently scheduled throughout the planning horizon. ECA calculation will use methodology outlined in the IWAP guidebook (Anon. 1999). Growth / recovery of vegetation within watershed can be interpreted but yield functions are required. As an alternative, field measurement may be used.

Calculation of Indicator

Formula:

ECA $_{\text{watershed by licensee}}$

The methods to calculate ECA is contained in the *Coastal and Interior Watershed Assessment Procedure Guidebook* (Anon. 1999).

Variables:

ECA $_{\text{watershed by licensee}}$: Equivalent clearcut area

Analysis Comments / Discussion

Analysis is conducted for watersheds where harvesting activities are occurring and proposed.

The Interior Watershed Assessment Guidebook, second addition page 2, indicates that watershed size suitable for analysis are between 500 and 50,000 ha.

The analysis indicates 99.8% of the area of critical watersheds in the Lakes TSA are in watersheds equal to or greater than 1000 ha; therefore, we have not considered establishing targets for watersheds less than 1000 hectares.

ECA and RDI values of 30% and 1.5 respectively indicate an impact score of 0.5, which is at the bottom end of moderate impact rank. (IWAP Guidebook 1995 edition, page 16).

Targets have only been established for Sensitive Watersheds defined by the Scenario Planning Team. See the "Sensitive Watersheds GE 1000 ha" tab for a description of Sensitive watersheds.

Analysis for watersheds where harvesting activities are occurring and proposed.
The methods to calculate ECA is contained in the *Coastal and Interior Watershed Assessment Procedure Guidebook*. The following table reflects the methods to calculate this indicator.

The following table reflects the methods to calculate this indicator:

Regeneration Height	ECA	% Recovery
0-3	100	0
3-7	50	50
7-9	30	70
9+	10	90

(source: Anon. 1999)

Refer to the *Coastal and Interior Watershed Assessment Procedure Guidebook* for the complete methodology to calculate ECA (e.g. partial harvest, etc.).

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
VRI (forest cover)	ILMB	yes	Use most current version

Silviculture Database	Licensees	yes	annually
Watershed data layer	ILMB (augmented by licensees)	yes	Use most current version
Digital Elevation Model (DEM)	ILMB (augmented by licensees)	yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Data procurement	Obtain all necessary data layers required in order to conduct GIS analysis	Tweedsmuir Forest Ltd.	Every 5 years starting 2003
Update data layers	Update data on a regular basis determined by rate of change within individual watersheds. Update inventories.	Tweedsmuir Forest Ltd.	Every 5 years starting 2003
	Create Resultant (enables querying for ECA)	Tweedsmuir Forest Ltd.	Every 5 years starting 2003
Analysis	Determination of ECA thresholds for watersheds	Tweedsmuir Forest Ltd.	Every 5 years starting 2003
	Conducts analysis	Tweedsmuir Forest Ltd.	Every 5 years starting 2004
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Every 5 years starting 2004
	M&L IFPA SFM Report	IFPA Manager	Every 5 years starting 2004

Output for indicator reporting

This indicator will be reported in tabular format.

References

Anon. 1999. Coastal Watershed Assessment Procedure Guidebook (CWAP) and Interior Watershed Assessment Procedure Guidebook (IWAP) Second Edition Version 2.1, 40p.

Indicator L38: Road density by Ecosystem & Wildlife Value Class by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Wildlife **Value/Issue:** Mountain Goat Habitat		**Criterion**: 1. Conservation of Biological Diversity **SFM Element:** 4. Protected Areas and Sites of Special Biological Significance **Value:** 1. Protected areas and sites of biological significance are identified and appropriately managed **Objective:** 1. Protected Areas identified through government processes are respected and accommodated. Biologically significant areas are identified and management strategies appropriate to their long-term maintenance are implemented.

Indicator Rationale

What does this indicator mean?

This indicator tracks road density (km/km^2) of maintained roads in areas for selected "Ecosystem and Wildlife value classes" in the Lakes TSA. The value of interest in this indicator is mountain goat habitat. This inventory data layer is considered static on the landscape for this analysis. This indicator will provide information on the level of roads built and their status that occurs within the identified areas.

How does this indicator relate to the M&L IFPA and to SFM?

Mountain goats have had inventories conducted to determine their locations on the Lakes TSA and are species that are impacted by increased access due to roads. This indicator will provide information on the amount of roads near mountain goat habitat.

Current Status and Forecasted Targets/Thresholds of Indicator

Road density by Ecosystem & Wildlife Value Class by licensee

Licensee	Species / Ecosystem of interest	Wildlife Value Class	Total Area Km^2	Current status (2004)		Forecasted Target Road Density (km/km^2)	Variance	Achieve Target by
				Km in wildlife value class area	Road Density (km/km^2)			
Canfor	Lakes North Landscape Corridors	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately
	Lakes South Landscape Corridors	N/A	30.9	19.0	0.6	<2.0	0	Immediately
	Mountain Goat Key Habitat	N/A	4.5	0.9	0.2	<0.3	>0.3 Periods 3 -35	Immediately
	Caribou Migration	Very High	N/A	N/A	N/A	N/A	0	Immediately

Road density by Ecosystem & Wildlife Value Class by licensee								
Licensee	**Species / Ecosystem of interest**	**Wildlife Value Class**	**Total Area Km²**	**Current status (2004)**		**Forecasted Target Road Density (km/km²)**	**Variance**	**Achieve Target by**
				Km in wildlife value class area	**Road Density (km/km²)**			
	Corridor	High	N/A	N/A	N/A	N/A	0	Immediately
		Moderate	N/A	N/A	N/A	N/A	0	Immediately
		Low	N/A	N/A	N/A	N/A	0	Immediately
	Klaytunkut and Sutherland Grizzly Zones	N/A	N/A	N/A	N/A	N/A	0	Immediately
	Deer Winter Range	N/A	N/A	N/A	N/A	N/A	0	Immediately
	Moose Winter Range	N/A	3.5	1.5	0.4	<3.5	0	Immediately
	Rare Ecosystems	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately
BFP	Lakes North Landscape Corridors	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately
	Lakes South Landscape Corridors	N/A	93.4	53.0	0.6	<2.0	0	Immediately
	Mountain Goat Key Habitat	N/A	23.1	8.6	0.4	<1.2	>1.2 Periods 3 -35	Immediately
	Caribou Migration Corridor	Very High	N/A	N/A	N/A	N/A	0	Immediately
		High	N/A	N/A	N/A	N/A	0	Immediately
		Moderate	N/A	N/A	N/A	N/A	0	Immediately
		Low	N/A	N/A	N/A	N/A	0	Immediately
	Klaytunkut and Sutherland Grizzly Zones	N/A	16.7	7.8	0.47	<.5	<=2.9 periods 3-35	Immediately
	Deer Winter Range	N/A	33.2	14.6	0.44	<2.5	0	Immediately
	Moose Winter Range	N/A	88.9	94.3	1.1	<2.5	0	Immediately
	Rare Ecosystems	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately
FLSM	Lakes North Landscape Corridors	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately
	Lakes South Landscape Corridors	N/A	96.0	112.4	1.2	<2.1	0	Immediately
	Mountain Goat Key Habitat	N/A	4.1	3.7	0.9	<1.1	>1.1 Periods 3 -35	Immediately
	Caribou Migration Corridor	Very High	N/A	N/A	N/A	N/A	0	Immediately
		High	N/A	N/A	N/A	N/A	0	Immediately

Road density by Ecosystem & Wildlife Value Class by licensee								
Licensee	Species / Ecosystem of interest	Wildlife Value Class	Total Area Km^2	Current status (2004)		Forecasted Target Road Density (km/km^2)	Variance	Achieve Target by
				Km in wildlife value class area	Road Density (km/km^2)			
		Moderate	115.9	141.8	1.2	<2.1	0	Immediately
		Low	144.6	177.3	1.2	<2.1	0	Immediately
	Klaytunkut and Sutherland Grizzly Zones	N/A	N/A	N/A	N/A	N/A	0	Immediately
	Deer Winter Range	N/A	6.6	15.6	2.4	<3.3	0	Immediately
	Moose Winter Range	N/A	N/A	N/A	N/A	N/A	0	Immediately
	Rare Ecosystems	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately
BCTS	Lakes North Landscape Corridors	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately
	Lakes South Landscape Corridors	N/A	133.6	56.0	0.4	<2.2	0	Immediately
	Mountain Goat Key Habitat	N/A	12.8	0.07	0.005	<0.5	>.5 Periods 3 -35	Immediately
	Caribou Migration Corridor	Very High	N/A	N/A	N/A	N/A	0	Immediately
		High	N/A	N/A	N/A	N/A	0	Immediately
		Moderate	N/A	N/A	N/A	N/A	0	Immediately
		Low	N/A	N/A	N/A	N/A	0	Immediately
	Klaytunkut and Sutherland Grizzly Zones	N/A	N/A	N/A	N/A	N/A	0	Immediately
	Deer Winter Range	N/A	220.6	157.1	0.7	<2.5	0	Immediately
	Moose Winter Range	N/A	133.2	95.9	0.7	<2.6	0	Immediately
	Rare Ecosystems	N/A	Unknown	Unknown	Unknown	Unknown	0	Immediately

Rationale for variance:

Klaytunkut and Sutherland Grizzly Zones: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

Mountain Goat Key Habitats: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
1. Lakes North Landscape Corridors To Be Determined upon completion of Lakes North SRM Plan. 2. Lakes South Ecosystem Corridors Targets will be achieved by: • Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM) • Limiting block size to 3.0 hectares unless stands are heavily impacted by beetles and salvage strategies are employed. In these case maximum block size may increase to 4.0 hectares. • In the future deactivated/access controlled roads should not be considered for this indicator. 3. Mountain Goat Key Habitat: Targets will be achieved by: • Checking for the presence of mountain goats, trails, hair, or in key habitat areas (e.g. consult with local resource users and/or Guide Outfitters) prior to development. • Where feasible, incorporate Old Growth Areas in and/or around occupied goat habitat areas. • Increasing yarding distance and modifying road locations to reduce road density • Use low impact, winter, or temporary roads to minimize access. • Use deactivation, access control or road rehabilitation to achieve the road density target. • Avoid known Key Habitat areas when designing cutblocks and roads. • In the future deactivated/access controlled roads should not be considered for this indicator. 4. Caribou Migration Corridor Targets will be achieved by: • Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM) • Following the management direction in the Lakes South SRMP. • In the future deactivated/access controlled roads should not be considered for this indicator. 5. Klaytunkut and Sutherland Grizzly Zones, Targets will be achieved by: • Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM) • Operational management practices will focus on minimizing permanent road access to this zone. • In the future deactivated/access controlled roads should not be considered for this indicator. 6. Deer Winter Range Targets will be achieved by: • Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM) • In the future deactivated/access controlled roads should not be considered for this indicator. 7. Moose

Targets will be achieved by:

- Considering rate and pattern developed through the Decision Scenario forecasts across a 250 yr planning horizon using the Tesera Scheduling Model (TSM)
- In the future deactivated/access controlled roads should not be considered for this indicator.

8. Rare Ecosystems
   Targets will be achieved by:
   - Avoiding road construction and harvesting activities in Rare Ecosystems when developing new stand level plans.

Future road networks have been modeled in the decision scenario.

Calculation of Indicator

Formula:

$$RD_{EWVC,\ licensee}: L_{EWVC,\ licensee} / A_{EWVC,\ licensee}$$

Variables:

$RD_{EWVC,\ licensee}$: road density (km/km^2) by Ecosystem & Wildlife Value Class by licensee

$L_{km,\ EWVC,\ licensee}$: Length of road (km) by Ecosystem & Wildlife Value Class by licensee

$A_{EWVC,\ licensee}$: Total area (km^2) of by Ecosystem & Wildlife Value Class by licensee

Analysis Comments/Discussion

The inventory data layers are considered static on the landscape.

The following list of Site Series represent Rare Ecosystems in the Lakes TSA (as of *December 2005)* (Anon. 2005)

Site Series	English_Name	BC Status
SBSdk/81	saskatoon / slender wheatgrass	Red
SBSdk/02	lodgepole pine / common juniper / rough-leaved ricegrass	Blue
SBSdk/82	Sandberg's bluegrass - slender wheatgrass	Red
SBSdk/08	black cottonwood / red-osier dogwood - prickly rose	Red
SBSdk/04	Douglas-fir / red-stemmed feathermoss - step moss	Blue
SBSdk/Wf05	slender sedge / common hook-moss	Blue
SBSmc2/Wf05	slender sedge / common hook-moss	Blue
SBSwk3/02	lodgepole pine / black huckleberry / reindeer lichens	Blue
SBSwk3/03	Douglas-fir - hybrid white spruce / thimbleberry	Blue
SBSwk3/Ws06	Sitka willow / Sitka sedge	Blue
SBSwk3/Ws11	Spruces - subalpine fir / skunk cabbage	Blue
SBPSmc/W15	Hard-stemmed bulrush Deep Marsh	Blue

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Roads	Licensees	Yes	Annual
Rare Ecosystem Data	Conservation Data Centre	Yes	Annually
Lakes North Ecosystem Corridors and Lakes South Ecosystem Corridors	ILMB	No	Use most current version
Wildlife Habitat mapping (Deer and Moose Winter Range, Klaytunkut and Sutherland Grizzly Zones, Caribou Migration Corridor, Mountain Goat Key Habitat	ILMB	Yes	Use most Current Version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Ensure inventories are current	Tweedsmuir Forest Ltd.	Annually starting 2006
Analyze	Compile information - road density by wildlife and ecosystem value class	Tweedsmuir Forest Ltd.	Annually starting January 31, 2007
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting January 31, 2007
	M&L IFPA SFM Report	IFPA Manager	Annually starting January 31, 2007

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L39: Road Density by Recreation Class by Licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Recreation **Value / Issue:** Fly-in Fishing Lakes (Existing and Proposed) **Value / Issue**: Recreation Areas (1) - Augier Lava Dome, Eagle Creek Opal Beds, China Nose, Knox Lake, Nez Lake East, Nourse-Allin-Maxan Trail, Tchesinkut Lake East. **Value / Issue**: Recreation Areas (2) – Boo Mountain – Fish Lakes, Uncha-Binta-Knapp Lakes, Takysie Lake, Moose Lake, Taltapin Lake-Pinkut Creek, Cheslatta Lake North. **Value / Issue:** Trails (Common, Existing)		**Criterion:** 5. Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 3. A variety of recreational experiences are provided on the DFA. **Objective:** 1. Multiple use recreation opportunities are provided on the DFA.

Indicator Rationale

What does this indicator mean?

There are exceptional opportunities for unique recreational experiences in the Lakes TSA. Road development throughout the DFA is an important aspect of ensuring safe and enduring recreational experiences. It also provides a measure of back country recreational opportunities where lower road densities area desired. With roads being linked to recreational class this indicator provides a measure of the potential of providing a variety of recreational opportunities.

How does this indicator relate to the M&L IFPA and to SFM?

The varied terrain of BC's forest environments offers a variety of recreational experiences. Access plays an important role allowing the public to derive their desired recreational experience. Roads and the degree of access they provide within the DFA vary depending on the status of forest operations. In this regard, access influences the recreation experience. As forest operations proceed throughout the DFA, access will constantly change as will the recreation experience. The licensees are committed to working with the public to provide opportunities for recreation while at the same time, managing access in a manner that is responsible and provides for necessary safeguards for recreational values.

Current Status and Forecasted Targets/Thresholds of Indicator

Road Density by recreation class by licensee					
Licensee	**Recreation Class**	**Current Status (2004)** (km/km^2)	**Forecasted Target** (km/km^2)	**Variance**	**Achieve Target by**
Canfor	Fly-in Fishing Lakes (Existing and Proposed)	N/A	N/A	N/A	Immediately
	Recreation Areas (1)	0.5	<3.3	0	Immediately
	Recreation Areas (2)	N/A	N/A	N/A	Immediately
	Trails (Existing, Common)	0.38	3.1	0	Immediately
BFP	Fly-in Fishing Lakes (Existing and Proposed)	0.57	<2.5	0	Immediately
	Recreation Areas (1)	0.5	<3.3	0	Immediately
	Recreation Areas (2)	1.8	<3.5	0	Immediately
	Trails (Existing, Common)	0.8	<3.5	0	Immediately
	Backcountry Lakes	0.03	0.06	>.06 Periods 3- 35	Immediately
FLSM	Fly-in Fishing Lakes (Existing and Proposed)	N/A	N/A	N/A	Immediately
	Recreation Areas (1)	N/A	N/A	N/A	Immediately
	Recreation Areas (2)	2.4	<3.3	0	Immediately
	Trails (Existing, Common)	1.3	<2.7	0	Immediately
	Backcountry Lakes	0.09	0.09	>.09 Periods 3- 35	Immediately
L&M	Fly-in Fishing Lakes (Existing and Proposed)	N/A	N/A	N/A	Immediately
	Recreation Areas (1)	N/A	N/A	N/A	Immediately
	Recreation Areas (2)	N/A	N/A	N/A	Immediately
	Trails (Existing, Common)	N/A	N/A	N/A	Immediately
BCTS	Fly-in Fishing Lakes (Existing and Proposed)	0	<2.8	0	Immediately
	Recreation Areas (1)	0.04	<3.1	0	Immediately
	Recreation Areas (2)	0.57	<3.5	0	Immediately
	Trails (Existing, Common)	0.6	<2.9	0	Immediately
	Backcountry Lakes	0	1.16	>1.16 Periods 3- 35	Immediately

Rationale for variance:

Backcountry Lakes: Mitigating measures can be investigated and applied well in advance of these areas violating targets due to the timing of the periods where the issues appear.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
The strategies are based on the Decision Scenario forecast across a 250 yr planning horizon as forecast using the Tesera Scheduling Model (TSM). The block design generated by TSM will be considered when developing future harvest proposals. Backcountry Lakes: Skid roads or winter roads only.

Calculation of Indicator

Formula:

$$RD_{\text{rec. class, licensee}} = L_{\text{km, rec. class, licensee}} / A_{\text{rec. class, licensee}}$$

Variables:

$RD_{\text{rec. class, licensee}}$: road density by recreation class by licensee

$L_{\text{km, rec. class, licensee}}$: Length of road (km) by recreation class by licensee

$A_{\text{rec. class, licensee}}$: Total area ($km^2$) of recreation class by licensee

Analysis Comments / Discussion

Recreation classes for this indicator (as defined by SPT):

- Fly-in Fishing Lakes (Existing and Proposed)
- Recreation Areas (1) - Augier Lava Dome, Eagle Creek Opal Beds, China Nose, Knox Lake, Nez Lake East, Nourse-Allin-Maxan Trail, Tchesinkut Lake East.
- Recreation Areas (2) – Boo Mountain – Fish Lakes, Uncha-Binta-Knapp Lakes, Takysie Lake, Moose Lake, Taltapin Lake-Pinkut Creek, Cheslatta Lake North.
- Trails (Common, Existing)

Road phases are defined as:

– built

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Roads	Licensees	Yes	Annual
IFPA Recreation Features Inventory	ILMB	Yes	Use most current version
Recreation Inventory	ILMB	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure data	Ensure inventories are current	Tweedsmuir Forest Ltd.	Annually starting 2006
Analyze	Compile information - road density by road class and recreation class	Tweedsmuir Forest Ltd.	Annually starting January 31, 2007
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting January 31, 2007
	M&L IFPA SFM Report	IFPA Manager	Annually starting January 31, 2007

Proposed output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L41: Area Weighted Average Minimum Harvest Age Mean annual increment (m^3 / ha / year) by BEC by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Timber **Value / Issue:** Harvest Flow Policy		**Criterion:** 2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity **SFM Element:** 2. Ecosystem Productivity **Value:** 2. Productive capacity of the forest resource base. **Objective:** 1. The biological productive capacity of the forest resource base is sustained over time. **Criterion:** 5. Multiple Benefits to Society **SFM Element:** 1. Timber and Non-Timber Benefits **Value:** 1. The supply and variety of timber and non-timber products, services and benefits on the DFA **Objective:** 1. A sustainable harvest and use of timber products, services and benefits

Indicators 33 and 41 are closely related

Indicator Rationale

What does this indicator mean?

Mean Annual Increment (MAI) is a measure of the rate at which a stand of trees accumulates merchantable volume. Merchantable volume is known as the yield of a stand which is different than growth, as trees below merchantability limits grow but do not contribute to merchantable volume until they reach a merchantable size. Minimum harvest age (MHA) is the age at which a stand achieves the volume per hectare considered to be economically viable to harvest. MHA MAI is the average yield of a stand at the age at which it becomes economically viable to harvest expressed as unit volume per unit area per year (i.e. cubic meters/hectare/ year). MAI is a function of site factors such as aspect, slope, soil, nutrient, moisture and climate, and of operational factors such as species selection, genetics, merchantability specifications, regeneration delays and silviculture treatments. Because sites differ in their productivity across the DFA, in order to report overall productivity the MHA MAI for each stand must be weighted (area weighted average - AWA) by it's relative contribution to the productivity of the forest in the DFA. This indicator provides a direct measure of the rate of merchantable timber production across the defined forest area, and an indirect measure of the biological site productivity for other values.

How does this indicator relate to the M&L IFPA and to SFM?

This is an important indicator for a number of reasons, as indicated in the indicator linkages section above. From the perspective of the IFPA, maintenance and enhancement of the capacity of forest sites to grow merchantable timber provides the financial incentive for investment in the overall program. At the time of writing of the IFPA proposal, for example, the Morice and Lakes Timber Supply Areas contributed $140 million annually to provincial revenue through stumpage payments which equated to 8% of provincial revenue from that source. This has increased in more recent times due to attrition in coastal industry and mill closures in other parts of the province. Government and industry make substantial investments in timber production and related processing facilities and infrastructure to support this

revenue flow and its contribution towards economic stability locally, provincially and corporately. These investments also support CSA criterion 5 by providing timber based benefits to society as a whole. This indicator measures the basic driver of that economic activity within the defined forest area that in turn provides for investment and the various economic and social benefits that result from that investment. The AWA MHA MAI at harvest measures the benefit that is captured in the future from the activities that are conducted on the DFA now.

From a CSA perspective, maintenance of forest site productivity addresses a number of SFM elements besides timber production and its related benefits. Sustainable rates of ecosystem and biological productivity provide for a number of related values to be conserved. This productive capacity can be managed for any number of end uses or products, but only when the basic site productivity is maintained can these uses or products be sustainable. The biological capacity of forest sites to produce timber can be viewed as an indicator of capacity of forest sites to produce other biologically based amenities that are valued by society.

Current Status and Forecasted Targets / Thresholds of Indicator

Area Weighted Average Minimum Harvest Age Mean Annual Increment (m^3/ha/year) by BEC by licensee					
Licensee	**BEC**	**Current Status (2004)**	**Forecasted Target**	**Variance**	**Achieve Target by**
Canfor	ESSFmc	1.71	>1.71		Immediately
	SBS dk	2.73	>2.73		Immediately
	SBS mc 2	2.45	>2.45		Immediately
BFP	ESSFmc	1.93	>1.93		Immediately
	ESSFmv 1	1.84	>1.84		Immediately
	ESSFmv 3	1.18	>1.18		Period 2
	SBS dk	2.6	>2.6		Immediately
	SBS mc 2	2.39	>2.39		Immediately
	SBS wk 3	2.66	>2.66		Period 2
FLSM	ESSFmc	2.26	>2.26		Immediately
	SBS dk	3.21	>3.21		Immediately
	SBS mc 2	2.74	>2.74		Immediately
BCTS	ESSFmc	1.77	>1.77		Immediately
	SBS dk	2.59	>2.59		Immediately
	SBS mc 2	2.33	>2.33		Immediately

Rationale for variance:

Indicator Analysis Information

Strategy Practices ,Methods, Assumptions and Criteria
The target will be achieved by implementing harvest, and regeneration practices, on the ground that were model assumptions contained in the Decision Scenario. The block design generated by Tesera Scheduling Model (TSM) will be considered when developing future harvest proposals. Model outputs are based on Decision Scenario forecast across a 250 yr planning horizon. For calculating current status and targets, Area Weighed Average (AWA) MHAMAI on the timber harvesting landbase was considered since this is the area licensees can influence MHAMAI. The AWA MHA MAI for stands is the projected volume per ha. at the age the stand becomes economically viable for harvest (MHA) divided by the MAI multiplied by it's representative proportion of the THLB. The sum of this is the AWA MHA MAI for the DFA.

Calculation of Indicator

Formula:

$$\textbf{AWA MHA MAI}_{\text{BEC, licensee}} = \textbf{PV}_{\text{stand, BEC, licensee}} / \textbf{A}_{\text{total, BEC, licensee}}$$

Variables:

AWA MHA MAI$_{\text{BEC, licensee}}$: Area weighted average of Mean Annual Increment at Minimum Harvest Age by BEC by licensee (m^3/ha/year)

PV$_{\text{stand, BEC, licensee}}$: Projected Volume of stand at Minimum Harvest Age cubic meters by BEC by licensee

A$_{\text{total, BEC, licensee}}$: Average total stand age at minimum harvest age (years) by BEC by licensee

Analysis Comments / Discussion

BEC Subzones with licensee operable areas less than 100 ha were excluded.

Minimum Volume per ha. for natural existing stands are: 140 m^3/Ha. for Spruce and Pine leading stands and 200 m^3/Ha. for Balsam leading stands. Minimum Volume per ha. for future managed stands are: 140 m^3/Ha. for all species.

Different minimum harvest ages were applied to different locations on the DFA based on constraints.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Yield curves	ILMB and IFPA	Yes	Use most current version
VRI (merchantable volume/ha and age from harvest)	ILMB	Yes	Use most current version
Silviculture database	Licensees	Yes	Use most current

			version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure and prepare inventory information for analysis	Obtain most current VRI Obtain silviculture records from licensees Conduct stand disturbance update Update VRI with projections of 5 year stand growth Add updated VRI to reporting resultant file for analysis	Tweedsmuir Forest Ltd.	Every 5 years starting 2006
Analysis	Query resultant file and compile MAI by BEC by licensee	Tweedsmuir Forest Ltd.	Every 5 years starting 2006
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Every 5 years starting 2007
	M&L IFPA SFM Report	IFPA Manager	Every 5 years starting 2007

Output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L42: Public Advisory Group established and maintained according to approved Terms of Reference

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 6. Accepting Society's Responsibility for Sustainable Development **SFM Element:** 3. Public Participation **Value:** 1. Fair, equitable and effective public participation **Objective:** 1. An open public involvement process designed and implemented to the satisfaction of participants.

Indicator Rationale

What does this indicator mean?

This indicator acts to ensure that there is a properly functioning Public Advisory Group (PAG) which operates in accordance with an accepted Terms of Reference (TOR). Terms of Reference document contain operating rules containing goals, key timelines, communication methods, provisions for resources, conflict of interest provisions, roles and responsibilities, decision making methods, dispute resolution methods, access to information provisions and TOR review and adjustment mechanisms. This document acts to ensure the Public Advisory Group operates efficiently and effectively toward achieving its goals. Reviewing such a document at specified intervals acts to ensure that it remains relevant.

How does this indicator relate to the M&L IFPA and to SFM?

"Public participation is a vital component of SFM in Canada. Members of the public are widely considered to have the right to be involved in the management of publicly owned forests." (CSA 2002). The Public Advisory Group is a fundamental mechanism to ensure that decisions are made as a result of informed, inclusive and fair consultation with local people who are directly affected by, or have an interest in sustainable forest management. The members of the PAG represent diverse interests on the TSA, and as such, each member of the PAG must be able to have the opportunity for effective and fair communication with one another and with the PAG as a whole. The TOR document is intended to provide the framework and protocol to ensure that all PAG members have the opportunity for effective input. Periodically, the TOR will be reviewed and, if necessary, revised to ensure the TOR remain relevant and effective for future needs of the PAG.

Current Status and Forecasted Targets/Thresholds of Indicator

	Current Status (2004)	Target	Variance	Achieve Target
PAG Terms of Reference	Approved PAG TOR on File No review or revision took place in this reporting period	Review and update (as required) TOR on file	Not applicable	Annually

Rationale for variance: Variance not applicable.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
PAG Terms of Reference to be reviewed on an annual basis and revised if necessary. Review of TOR will occur on an "as needed" basis with a minimum of 1 review annually in conjunction with the annual indicator performance review.

Calculation of Indicator

Formula:

Not applicable

Variables:

Not applicable

Analysis Comments/Discussion

None

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Lakes PAG Terms of Reference Document	Tweedsmuir Forest Ltd.	Yes	Annual

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Maintain and update TOR	Ensure TOR is reviewed and updated	IFPA Manager	Annually
Report	Indicator Performance Management for Management Adjustment Purposes	IFPA Manager	Annually – as per indicator reporting SOP
	M&L IFPA SFM Report	IFPA Manager	Annually – as per indicator reporting SOP

Output for indicator reporting

This indicator will be reported in tabular format and show when the PAG Terms of Reference were reviewed, document the necessary changes and indicate when revisions were made.

References

CAN/CSA- Z809-2002. Sustainable Forest Management: Requirements and Guidance Document February 2002 (Draft). Canadian Standards Association, Etobicoke, Ont.

Indicator L45: Road density index (RDI) by sensitive watershed by licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Watershed and Riparian **Value / Issue:** Hydrology **Resource:** Wildlife **Value / Issue:** Grizzly Habitat Zones		**Criterion:** 3. Conservation of Soil and Water Resources **SFM Element:** 2. Water Quality and Quantity **Value:** 1. Aquatic Habitat **Objective:** 1. Water quantity and quality are sustained through their characteristic range of variation, on the DFA through time.

Indicators 9, 37 and 45 are closely related

Indicator Rationale

What does this indicator mean?

Road density index (RDI) is defined as the total length of road per unit area. Roads are a necessary component of forest management as they are necessary to access timber. The presence of roads, however, imparts stress on the environment through alteration of hydrological characteristics, the potential for erosion & mass wasting and the effect of roads on wildlife (road kill, predator/prey relationships, hunting pressure, habitat fragmentation and reduction of interior forest conditions). Roads need to be carefully planned and constructed to minimize the above effects and for economic efficiency. High values of RDI indicate that a given watershed or management unit area is densely roaded and that other features and values may be negatively affected. This indicator provides a measure of the potential effects of roads within a watershed.

How does this indicator relate to the M&L IFPA and to SFM?

A balance must be struck between the value of forest management access, the social cost/benefits and the ecological cost of the road network in terms of impacts to other resource values. If the effects of roads in accessing the timber resource are offset by impacts to other values (e.g. wildlife habitat, water quality) the result can compromise the sustainability of those resources and associated values.

Current Status and Forecasted Targets / Thresholds of Indicator

Road density index (RDI) by sensitive watershed by licensee				
Licensee	**Current Status (2006)** **Sensitive Watersheds > Threshold**	**Threshold Value**	**Variance**	**Not Exceed Threshold Value**
BFP	Watershed 13, 21, 24, 26, 32, 35, 44, 46, 47-Babine Lake Group Watershed 4, 5, 13 -Upper Trembleur Lake Group Watershed 55 -Francois Lake Group	<= 1.5	0	Immediately
FLSM	Watershed 24, 31, 37, 39, 42, 47 - Babine Lake Group Watershed 98-Cheslatta River Group Watershed 61-Bulkley River Group Watershed 13 -Upper Trembleur Lake Group Watershed 67, 81 -Francois Lake Group	<= 1.5	0	Immediately
L&M	N/A	<= 1.5	0	Immediately
BCTS	Watershed 24, 47-Babine Lake Group Watershed 97-Cheslatta River Group Watershed 43, 61-Bulkley River Group Watershed 79, 80 -Francois Lake Group	<= 1.5	0	Immediately

∗ Other watersheds may be identified for an assessment that does not have the highest density score if there are significant, fisheries values, terrain sensitivity, or temperature sensitivity in the watershed that may be impacted by proposed development.

Rationale for variance: N/A

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
In order to achieve the target, the block design generated by Tesera Scheduling Model (TSM) will be considered when developing future harvest proposals. Model outputs are based on a Decision Scenario forecast across a 250 yr planning horizon. Where the target is exceeded and any one of the following conditions apply: o a significant number of landslides that entered the stream channel are known to have occurred; **or** o stream channel stability problems are evident; **or** o over 25% of the riparian forest along either bank of the main stream channels has been logged over the past 40 years; **or** o landslide problems are anticipated due to recent harvesting on unstable terrain. An evaluation of the watershed will be conducted by a qualified professional within their scope of practice. The watersheds in the Current Status column will be considered for an evaluation within the next 5 years (based on 2006 Annual Report). In addition to completing evaluations of watersheds, watersheds that are below the threshold value but have the highest road density index will be selected for sediment source survey annually by each licensee. Other watersheds may be considered for evaluation that do not have the highest density score if there are significant, fisheries values, terrain sensitivity, or temperature sensitivity in

the watershed that may be impacted by proposed development.

The survey method to be used is the SQCI procedure (Anon. 2004) or other suitable method provided funding is available.

Future road networks will be modelled spatially and road phase (existing and future roads) will be tracked throughout the planning horizon. RDI calculation will use methodology outlined in the IWAP guidebook (Anon. 1999).

See "Analysis Comments" section for additional assumptions.

Calculation of Indicator

Formula:

$$RDI_{watershed,\ licensee} = R_{km,\ watershed,\ licensee} / A_{watershed,\ licensee}$$

Variables:

$RDI_{S\_watershed,\ licensee}$: Road Density Index by sensitive watershed by licensee (km/km^2)

$R_{km,\ S\_watershed,\ licensee}$: Kilometres of roads by sensitive watershed by licensee (km)

$AS\_{watershed,\ licensee}$: Area by sensitive watershed by licensee (km^2)

(source: Anon. 1999)

Analysis Comments / Discussion

The Interior Watershed Assessment Guidebook, second addition page 2, indicates that watershed size suitable for analysis are between 500 and 50,000 ha. Therefore we have not considered establishing targets for watersheds less than 1000 hectares. Targets have only been established for Sensitive Watersheds defined by the Scenario Planning Team.

ECA and RDI values of 30% and 1.5 respectively indicate an impact score of 0.5, which is at the bottom end of moderate impact rank. (IWAP Guidebook 1995 edition, page 16).

General Access Management Considerations:

For the decision scenario, different levels of road activity by road class will occur across the planning horizon.

- Mainline roads will remain active across the planning horizon.
- Operational and spur roads that do not have hauling for a three year period will be considered inactive.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Road inventory	Licensee	yes	Annually
Watershed data layer	ILMB (augmented by licensees)	yes	Use most current version
Digital Elevation Model (DEM)	ILMB (augmented by licensees)	yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Procure and prepare inventory information for analysis	Update inventories and enter into the reporting database. Add information to annual reporting resultant file.	Tweedsmuir Forest Ltd.	Annually starting 2003
Analysis	Query resultant file and determine RDI	Tweedsmuir Forest Ltd.	Annually starting 2007
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually starting January 31, 2007
	M&L IFPA SFM Report	IFPA Manager	Annually starting January 31, 2007

Output for indicator reporting

This indicator will be reported in tabular format. Upon sufficient year-to-year data, graphs can be prepared to demonstrate the change over time of the RDI with respect to the designated threshold value.

References

Anon. 2004. The Stream Crossing Quality Index: A Water Quality Indicator for Sustainable Forest management. P. Beaudry and Associates Ltd. April 2004.

Anon. 1999. Coastal Watershed Assessment Procedure Guidebook (CWAP) and Interior Watershed Assessment Procedure Guidebook (IWAP) Second Edition Version 2.1 40p.

Indicator L46: Percent of Harvesting by Licensee Where Recommended Operational Guidelines Have Been Applied to Retain Structural Habitat Elements

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Landscape and Stand Level Biodiversity **Value / Issue:** Biodiversity Emphasis Options **Value / Issue:** Habitat Element – CWD **Value / Issue:** Habitat Element – Snags **Value / Issue:** Habitat Element – Large Live Trees		**Criterion**: 1. Conservation of Biological Diversity **SFM Element**: 2. Species Diversity **Value**: 1. Abundance and distribution of common and rare habitats within a range of variability over time to conserve species in the DFA **Objective**: 1. A constant supply of habitats and/or attributes sufficient to conserve species that occur naturally on the DFA through time. **Criterion:** 4. Forest Ecosystem Contributions to Global Ecological Cycles **SFM Element:** 1. Carbon uptake and storage **Value:** 1. Storage of Carbon in forest ecosystems and products **Objective:** 1. Forest ecosystems are net carbon sinks over time on the DFA

Indicator Rationale

What does this indicator mean?

Coarse woody debris (CWD) is defined as "dead woody material, in various stages of decomposition, located above the soil, larger than 7.5cm diameter and not self-supporting" (MoF and MELP, 1998). CWD is an important component of forest ecosystems, contributing to nutrient, soil and water cycles, soil and slope stability and long term carbon storage, as well as providing habitat for a large number of organisms (Keisker 2000, Lofroth 1998, Stevens 1997, Caza 1993, Maser *et al.* 1988). Recruitment of CWD into a regenerating stand is achieved through the maintenance of standing dead snags and large live trees (wildlife trees), as well as immature trees, within the harvested area. Standing dead wood, recruited from dying large live trees, provides habitat for a broad-range of species until it falls down and contributes to CWD mid-rotation (Byman 2003). Retention of residual immature stems that mature into large live trees ensures recruitment of snags late in the rotation of the managed stand, thereby providing for long-term CWD recruitment. Residual retention also contributes to structural habitat diversity across harvested openings and throughout the life of the regenerating stand.

This indicator will track the frequency, consistency and efficacy of the application of stand level operational guidelines intended to retain CWD and those structural habitat elements related to the recruitment of CWD: snags, large live trees and immature trees. Retention of these habitat elements with the objective of maintaining the dead wood cycle in managed forests will address the biodiversity and habitat needs of a wide range of species. Operational CWD guidelines are intended to produce volumes of CWD consistent with the range of values found in ecologically similar unmanaged mature and old seral stands (Lloyd 2001a; Lloyd 2004; Lloyd in prep). Volume retained will be morphologically consistent with (diameter class and piece length), and distributed similarly to (horizontal and vertical), unmanaged CWD within site series groups from the prevalent interior biogeoclimatic (BEC) variants of SBSmc2, SBSdk and ESSFmc (Lloyd 2001b, Lloyd 2001c, Lloyd 2002, Lloyd 2003). Operational guidelines are also intended to enhance retention of residual immature trees and stubs. CWD retention matrices have been developed against which to monitor the performance of operational guidelines in producing the

representative CWD volumes and attributes by site series groups by major BEC variant (Lloyd and Todd in prep). Operational management trials have demonstrated that operational guidelines produce CWD retention consistent with matrix values (Lloyd 2004, Lloyd 2004 in prep). Trials have also indicated that operational practices enhance retention of immature trees. CWD within less frequent BEC variants will be managed according to the operational guidelines of the most ecologically similar prevalent variant on the assumption that their CWD attributes and dynamics are comparable and will be maintained. Operational CWD guidelines are intended to retain existing blow down and logging debris on site, associated with the retention of residual immature stems. Standing dead and large live trees are maintained in harvested stands through the retention of Wildlife Trees (WT) and Wildlife Tree Patches (WTP) (refer to Indicator 14).

How does this indicator relate to the M&L IFPA and to SFM?

Coarse woody debris functions at the scale of the stand, site or microsite, and is a consequence of disturbance type and intensity, site productivity (tree species, nutrient and moisture levels), successional processes, and the age of the stand. Management cannot replicate natural dead wood dynamics due to large scale biomass removal by harvesting; however, it can attempt to emulate natural patterns and buffer anticipated troughs in CWD supply. Operational guidelines have been developed to maintain CWD volumes, piece sizes (diameter and length) and distributions within managed stands in the Lakes Timber Supply Area (TSA) which are reflective of those found within mature to old unmanaged stands of similar site series. Guidelines for the application of CWD management practices within landscapes are currently under investigation and will allow for both coarse and fine scale natural variability as well as the accommodation of times when CWD retention is operationally impractical (e.g. ground requiring site preparation). Understanding the persistence and recruitment of CWD and its related supply attributes of snags, large live trees and residual, immature trees, is required for the development of growth and yield curves to allow forecasting of CWD levels into the future and monitoring the results of stand level management strategies applied across landscapes. However, our current understanding of CWD dynamics is limited and existing datasets are inadequate to fairly represent the influence of stand initiation conditions and successional processes. The consistent application of stand level operational guidelines across harvested areas in the near future will provide an improved interim supply of CWD as we improve our understanding of the linkage between CWD dynamics and landscape pattern.

Similar to CWD, snags and large live trees function at the scale of the stand or site, but must be supplied at both the stand and landscape scale to account for variability and operational limitations (e.g. wildlife danger tree regulations). Work has not yet been completed to evaluate the abundance, distribution and structural characteristics of these habitat elements relative to site series groups. Such information will allow for the expansion of operational guidelines and monitoring matrices to include snags and large live trees. It will also improve our understanding of stand dynamics, allowing for the refinement of growth and yield curves to improve our ability to forecast and plan at landscape scales. In the interim, retention of these elements is achieved through wildlife tree retention (WTR) as per indicator 14. Future monitoring will be required to assess the performance of WTR in maintaining a supply of snags and large trees to address their dual roles as habitat and CWD supply.

Current Status and Forecasted Targets / Thresholds of Indicator

Percentage of area harvested each year for which recommended operational practices for structural habitat retention has been applied by licensee				
Licencee	**Current Status**	**Forecasted Target %**	**Variance**	**Achieve Target By**
Canfor	0	100	0	2007
BFP	0	100	0	2008
FLSM	0	100	0	2008
L&M	0	100	0	2008
BCTS	0	100	0	2008

Implementation of operational CWD guidelines will commence in 2006 or later, dependent on licencee. Guidelines may be implemented in a step-wise fashion, either by logging contractor, operating area, landscape unit, or BEC variant.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria

1. Implementation of Operational CWD Guidelines

The target is to apply operational CWD guidelines to 100% of new harvesting and will be expressed as the proportion of area harvested annually on which operational CWD guidelines are applied. Contractor training is an integral part of implementation.

2. Performance Monitoring of Operational CWD Guidelines

Performance: an assessment of whether the guidelines and the means in which they're being applied are producing the expected field results in terms of CWD volumes, piece size and distribution as well as residual immature retention.

Performance monitoring supports the objective of this indicator. The intent is to find that 100% of the post-harvest CWD survey plots within areas for which guidelines were applied do contain volumes and attributes of CWD consistent with the monitoring matrices.

The results of operational trials indicate there is a wide variability in CWD volumes and attributes produced through the application of operational guidelines; however, the trend is for areas treated to consistently produce CWD volumes and attributes which approach or exceed the expected values based on old to mature unmanaged stands (Lloyd 2004). Operational trials produced an insufficient sample size to allow the setting of any meaningful variances around the monitoring matrix values. Therefore, field audits will be performed for the first 2 years in which practices are applied to create a dataset of sufficient size to determine if setting variances to describe consistency with management targets would be a meaningful exercise given the naturally high variability found in CWD volume, structure and distribution; and what variances, if any, are appropriate. This will also allow for the short-term determination of efficacy of the guidelines. Thereafter, field audits will be performed at 5 year intervals.

Calculation of Indicator

Indicator Formula:

$$\%HAGA_{licensee} = HAGA_{licensee} / TAH_{licensee} * 100$$

Variables:

$HAGA_{licensee}$: Harvested Area with Guidelines Applied

$TAH_{licensee}$: Total Area Harvested per annum

Analysis Comments / Discussion

There are three stages of monitoring in the application and assessment of operational CWD guidelines: implementation monitoring, performance monitoring and effectiveness monitoring.

1. Implementation Monitoring:

This indicator tracks implementation of the guidelines and as such, serves a role in implementation monitoring.

A variance is not required, as the operational guidelines will be consistently applied during all new harvesting. However, there are several variables that will affect the efficacy of the application of the guidelines; these include forest type, mechanical site preparation or changing pulp markets. Forests with abundant regeneration and blowdown will be better candidates for the full application of retention guidelines, such as residual patch retention and jack-strawing; simpler, less vertically stratified forests may only lend themselves to a limited practices, such as laying logs parallel to skid. Many blocks will have smaller areas within them that require mechanical site prep mixed in amongst larger areas of direct plant. Site preparation guidelines will be developed to ensure that harvesting retention results are not compromised. Not all stands will have the dead wood potential to contribute to pulp and those that do (e.g. ESSFmc sites) have naturally high amounts of CWD and residual understory which will produce a significant level of CWD and immature trees (Lloyd 2004); sufficient to waterbed the effects of short term changes in markets. It is assumed that this type of limited reduction in CWD retention should be absorbed by the larger gains made by retention across all new harvesting throughout landscapes. Future investigations in landscape level managed of this stand level resource should assist us in testing this assumption.

2. Performance Monitoring:

Performance will be monitored periodically by CWD/residual field audits applied to a sub-sample of area harvested in the survey period. A field sampling protocol will be used that is consistent with the original operational trials. CWD results will be analysed and reported as per Lloyd (2004), by grouping all plots by BEC variant and site series groups. Performance will be evaluated by determining the proportion of survey plots, by BEC variant and site series group, that are consistent with the CWD values provided in the monitoring matrices.

Residual retention will also be surveyed. However, the high variability of this attribute pre-harvest is reflected in the high variability observed post-harvest during operational trials. There is currently no baseline on which to establish meaningful stand level targets for residual retention. In the short-term, operational trials have indicated that operational CWD guidelines produce substantially “more” residual retention than control areas. Survey data collected during field audits will assist in the potential development of residual retention targets.

3. Effectiveness Monitoring

An evaluation of the effectiveness of operational CWD guidelines in maintaining ecologically meaningful levels of CWD is required. Current investigations are underway to assess the use of CWD dependent invertebrates as indicators of the effectiveness of CWD management. Other potential species groups include CWD dependent plants and bryophytes.

This operational indicator will develop over time, with modifications to existing monitoring values and sampling protocols, development of new protocols and guidelines, and the ongoing investigation into landscape level management and forecasting. The bias associated with CWD management values based on mature to old seral stand attributes versus those resulting from natural stand initiation events such as fire or blowdown is clearly recognized and will be addressed in continued study. Future landscape evaluation will consider CWD in the non-contributing forest, Wildlife Tree Patches, riparian reserves, other constrained areas and CWD dispersed across harvested areas.

Indicator Monitoring Plans

Inventories Needed to Implement, Monitor and Analyse Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Silviculture data (ecotype)	Licensees	Yes	Annually
Post-harvest inspections for CWD (volume, piece size and distribution)	Licensees	Yes	Annually
Pre-work Form	Licencees	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Develop protocol for sampling	Develop post harvest inspection protocol for CWD	Licensees and BCMOF	Complete
Procure data	Obtain CWD information from post-harvest inspections.	Licensees and BCMOF	Annually for 2 years, starting one year post implementation. 2007 Every 5 years after that.
Analysis	Compile data from licensees and BCMOF and combine with analysis information (to account for areas that haven't been harvested)	Tweedsmuir Forest Ltd.	Annually for 2 years, starting one year post implementation. 2007 Every 5 years after that.
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	Annually for 2 years, starting one year post implementation. 2007 Every 5 years after that.

Output for indicator reporting

This indicator will be presented in tabular format.

Supporting Documentation

Operational Strategies for CWD Management, Operational CWD Monitoring Matrices & Field Sampling Protocol for CWD Post-harvest Performance Monitoring

References

B.C. Ministry of Environment, Lands and Parks and B.C. Ministry of Forests. 1998. Field manual for describing terrestrial ecosystems. Land Mgmt. Handbook. No.25. Victoria, B.C.

Byman, Patience. 2003. Strategic plan for identifying and maintaining snags in managed forest stands in the Prince George TSA. Report prepared by the Mixedwood Ecology and Management Program for Canfor, Prince George Woodlands. Unpubl. Rep. 64 pp.

Caza, C.L. 1993. Woody debris in the forests of British Columbia: a review of the literature and current research. Land Management Report No. 78. Min. of For. Victoria, BC. 115pp.

Keisker, D.G. 2000.Types of wildlife trees and coarse woody debris required by wildlife of north-central British Columbia. Res.Br. Min.For., Victoria, B.C. Work. Pap 50. 92pp.

Lofroth, E. 1998. The dead wood cycle. Chapter 7 *In* Voller, J. and S. Harrison, (Eds.) Conservation biology principles for forested landscapes. UBC Press. Vancouver, BC. 243pp.

Lloyd, Ruth A. 2001c. An approach to coarse woody debris management in interior forests, interim summary report. Results of the Interior Woody Debris Pilot Project: Ministry of Forests and Houston Forest Products. Unpubl. Rep. 4 pp.

Lloyd, R. 2001b. Characteristics of coarse woody debris in forests of the SBSdk, SBSmc2, and ESSFmc biogeoclimatic zones. Unpub. Rep. Prep. for Houston Forest Products, Houston, BC. 27pp. + append.

Lloyd, R. 2001c. A comparison of coarse woody debris in harvested and unharvested sites in the SBSmc2. Rep. Prep. for Houston Forest Products, Houston, BC. 19pp + append.

Lloyd, Ruth. A. 2002. A comparison of coarse woody debris in harvested and unharvested sites. Morice and Lakes IFPA project 442.01 report. 38 pp.

Lloyd, Ruth. A. 2003. A comparison of coarse woody debris in harvested and unharvested sites. Third-year Report. Morice and Lakes IFPA project 442.01. 45 pp.

Lloyd, Ruth. A. 2004. Results of operational trials to manage coarse woody debris in the northern interior. Interim report. Morice and Lakes IFPA project 442.01. 22 pp.

Lloyd, Ruth. A. In prep. Results of operational trials to manage coarse woody debris in the northern interior. Final report. Morice and lakes IFPA project 442.01.

Lloyd, Ruth A. and M. A. Todd. In prep. Operational planning matrix for CWD retention: a tool for retaining CWD in managed forests.

Maser, C., R.F. Tarrant, J.M. Trappe, J.F. Franklin, (Tech. Eds.). 1988. From the forest to the sea: a story of fallen trees. Gen. Tech. Rep. PNW-GTR-229. 153 p.

Stevens, V.. 1997. The ecological role of coarse woody debris: an overview of the ecological importance of CWD in B.C. forests. Res. Br., B.C. Min. For., Victoria, B.C. Work. Pap. 30. 26pp.

Indicator L47: Percentage of comments receiving response by type by licensee

Indicator Linkages

M&L IFPA Framework		CSA/CCFM SFM Framework
Applies to the M&L IFPA process as a whole		**Criterion:** 6. Accepting Society's Responsibility for Sustainable Development **SFM Element:** 1. Aboriginal and Treaty Rights **Value:** 1. First Nations' Aboriginal and Treaty rights **Objective:** 1. Duly- established First Nations' Aboriginal and Treaty rights are recognized and respected **SFM Element:** 3. Public Participation **Value:** 1. Fair, equitable and effective public participation **Objective:** 1. An open public involvement process designed and implemented to the satisfaction of participants. **SFM Element:** 4. Information for Decision- Making **Value:** 1. Informed decision- making and increased knowledge **Objective:** 1. Relevant information is exchanged between interested parties to support decision-making and increased knowledge of ecosystem processes and human interactions with forest ecosystems.

Indicators 2, 4, 24 & 47 are closely related

Indicator Rationale

What does this indicator mean?

This indicator tracks the level of response to public communications received by the IFPA and its partners related to forest management activities. It will be the responsibility of the IFPA and its partners to track comments received through communications, and also track the response to these comments in order to monitor and report on this indicator

How does this indicator relate to the M&L IFPA and to SFM?

Public participation and communication in SFM are important means by which to incorporate public values in long-term SFM planning. The M&L IFPA SFM process encourages open and effective communication of values from a diversity of interests. As such, it is important ensure that communication from individuals and/or groups representing various interests directed towards forest management plans and activities received by the IFPA and it's proponents receive appropriate response. By maintaining effective communication between the public, licensees, managing agencies and other stakeholders, there is a much greater ability to work together to develop mutually compatible objectives on the land base. Maintaining effective communication is not only important for developing the SFM plan, but will also be important in the monitoring, evaluation and continual improvement part of the M&L IFPA SFM process.

Current Status and Forecasted Targets/Thresholds of Indicator

Percentage of comments receiving response by licensee				
Licensee	**Current Status (2004)**	**Target**	**Variance**	**Achieve Target**
Canfor	80%	100%	none	Annually
	100%	100%	none	Annually
BFP	100%	100%	none	Annually
	100%	100%	none	Annually
FLSM	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A
L&M	No data	100%	none	Annually
	No data	100%	none	Annually
BCTS	100%	100%	none	Annually
		100%	none	Annually

Rationale for variance: It is expected that the licensees, the Lakes BCTS and the M&L IFPA respond to all recorded (i.e. written and verbal) comments, therefore, no variance is indicated.

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria
Licensees review response records to determine Current Status See Analysis Comments/Discussion below

Calculation of Indicator

Formula:

$$\%CR_{\text{Resource Value, type, IFPA/licensee}} = (R_{\text{Resource Value, type}} / C_{\text{Resource Value, type}}) \times 100$$

Variables:

$\%CR_{\text{Resource Value, type, IFPA/licensee}}$: % of Comments receiving response by resource value by Type by Licensee

$R_{\text{Resource Value, type, IFPA/licensee}}$: Number of responses to comments received by Resource Values by type by IFPA/licensee

$C_{\text{Resource Value, type, IFPA/licensee}}$: Number of comments received by resource values by type by IFPA/licensee

Analysis Comments/Discussion

Response Type (examples)
- Written (Letter, Fax, Email)
- Verbal (Conversation) - must be a recorded conversation

Business Rules:
- Response is defined as sent.
- Reporting period for this indicator will be the calendar year.

- Public communications
    - o includes First Nations and other interest groups
    - o excludes
        - government communications
        - public meetings
          rationale: commitments from meeting proceedings are tracked by "*Percentage of forest management commitments resulting from consultations regarding non-timber features and interests completed on time by licensee*" indicator).

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Communication records database	Each licensee and Lakes BCTS	Yes	As communications are sent
IFPA Communication records database	Tweedsmuir Forest Ltd.	Yes	As communications are sent

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Set up system to document response	Ensure a system is organized to document responses within the M&L IFPA and licensee-specific DFA's.	• Woods Manager for each licensee • Lakes BCTS Manager • IFPA manager	December, 2002
Monitor and update data	Ensure data is updated	• Woods Manager for each licensee • Lakes BCTS Manager • IFPA manager	Annually starting 2003
Analysis	Not applicable	Not applicable	Not applicable
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	• Woods Manager for each licensee • Lakes BCTS Manager • IFPA Manager	Annually starting January 31, 2004
	M&L IFPA SFM Report	• Woods Manager for each licensee • Lakes BCTS Managers • IFPA Manager	Annually starting January 31, 2004

Proposed output for indicator reporting

This indicator will be reported in tabular format.

References

Indicator L49: Ecosystem Carbon Storage (tonnes/ha.) by Licensee

Indicator Linkages:

M&L IFPA Framework		CSA/CCFM SFM Framework
Resource: Timber **Value / Issue:** Harvest Flow Policy **Value / Issue:** Dry wood Utilization		**Criterion: 4** Forest Ecosystem Contributions to Global Ecological Cycles **SFM Element: 1** Carbon Uptake and Storage **Value: 1** Storage of carbon in forest ecosystems and products. *(plant, restock)* **Objective: 1** Forest ecosystems are net carbon sinks over time on the DFA.

Indicator Rationale

What does this indicator mean?

Ecosystem carbon storage is the amount of the amount of Carbon stored in several components of forests including tree biomass, plant biomass, coarse woody debris, forest floor litter, and soil. Forest soils are a large but relatively stable reservoir of C with minimal changes over time. In contrast, variation in C storage in tree biomass is the dominant factor regulating temporal patterns in total ecosystem C storage (Seely and Nelson, 2002).

Total volume of standing timber in both the THLB and Non-THLB (m^3) is used as a surrogate for storage of Carbon within the Lakes Timber supply Area. Harvest levels natural disturbances, fire protection policies and fire suppression success, influence this indicator over time.

How does this indicator relate to the M&L IFPA and to SFM?

As a result of the 1997 Kyoto protocol, international attention has been focused on the problem of global greenhouse gas emissions. This has placed considerable pressure on the public and private sectors to account for the role of forests in storing carbon and reducing global CO_2 emissions.

Maintaining productivity of the forests is an important factor in carbon uptake and storage. The process of photosynthesis depends on the absorption of carbon dioxide (CO_2), water and availability of solar energy for the manufacture of carbohydrates that drives the process of tree growth and the production of wood. As stands grow at a positive rate (growth minus mortality) it can be assumed that carbon (the fundamental building block of wood) is accumulating. Fixation of carbon contributes to the lowering of $C0_2$ in the atmosphere and the reduction of greenhouse gases noted for contributing to global warming. Wood is eventually broken down releasing the carbon as $C0_2$ and water into the atmosphere. The amount retained per ha per year depends on the diversity of forest landscape, the vigour of trees and other vegetation, the quality of the site, and the amount of disturbance or mortality each year. In a broad sense, maintaining a positive balance of carbon requires that growth (rate of carbon fixation) exceeds the rate of decomposition (the release of carbon) and this is accomplished by ensuring the rate of harvest maintains this positive balance.

The calculation of total ecosystem Carbon storage within the defined forest area allows for a long-term evaluation of effects of management activities and/or natural disturbance on forest Carbon stocks.

Current Status and Forecasted Targets / Thresholds of Indicator

Licensee	Current Status (2004)	Forecasted Target	Variance	Achieve Target by
Canfor	87	>57	0	Immediately
BFP	87	>57	0	Immediately
FLSM	N/A	N/A	N/A	N/A
L&M	N/A	N/A	N/A	N/A
BCTS	87	>57	0	Immediately

Indicator Analysis Information

Strategy Practices, Methods, Assumptions and Criteria

The block design generated by Tesera Scheduling Model (TSM) will be considered when developing future harvest proposals

This indicator requires the use of external carbon curve tables developed and provided by Brad Seely of Forrex. Based on the ages and species composition of the stands, the stands are assigned a corresponding carbon curve strata. From the strata the carbon storage can be generated for each stand. This is performed for the entire forested land base.

The carbon curve values are already in tonnes which is required for the indicator.

The ecosystem carbon storage by ha by year (t) is calculated by interpolating the values from the carbon curves based on the ages of the stands.

The target will be achieved by implementing harvest, regeneration, and incremental silviculture treatment on the ground that were model assumptions contained in the Decision Scenario Analysis Data package.

As better tools become available to measure and manage carbon storage and sequestration this indicator will be modified to use them.

Calculation of Indicator

Formula:

$$ECS_{tonnes/ha,\ licensee}$$

Variables:

$ECS_{tonnes/har,\ licensee}$: Ecosystem Carbon Storage by tonnes/ha. by Licensee

Analysis Comments / Discussion

Carbon stock change is the current method accepted for Carbon accounting under the Kyoto Protocol. It assumes that Carbon stored in harvested materials is returned to the atmosphere immediately following harvesting.

Because carbon accounting must be summarized at the landscape scale Carbon Analysis Units (CAU) were defined based on Timber Supply Review (TSR) analysis units to represent existing natural stands, existing managed stands, and future managed stands based on species composition, site quality, and regeneration assumptions.

The federally and provincially approved forest carbon modeling tool FORECAST was used to generate ecosystem carbon storage curves for each CAU that tracked the amount of carbon stored over time in above and below-ground biomass, dead organic matter, and soil in each CAU as a result of harvesting, succession and natural disturbance.

These in turn were used by TSM to account for the amount of carbon stored over the management unit over the planning horizon.

See the report referenced below *Development of carbon curves for addressing CSA certification requirements in the Morice and Lakes Timber Supply Areas* for details on analysis units and methods for development and modeling of the ecosystem carbon curves.

Indicator Monitoring Plans

Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date / interval required
Growth & Yield data	ILMB	Yes	
Forest Inventory	ILMB	Yes	Use most current version
Silviculture database	Licensees	Yes	Use most current version

Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Obtain growth and yield information	Collect growth and yield information	Tweedsmuir Forest Ltd.	5 years Starting 2006
Analysis	Compile and analyze data	Tweedsmuir Forest Ltd.	Starting 2006
Report	Indicator Performance Management Report for Management Adjustment Purposes	IFPA Manager	2007
	M&L IFPA SFM Report	IFPA Manager	2007

Proposed output for indicator reporting

The most appropriate for of reporting out on this indicator will be in a table format by licensee.

References

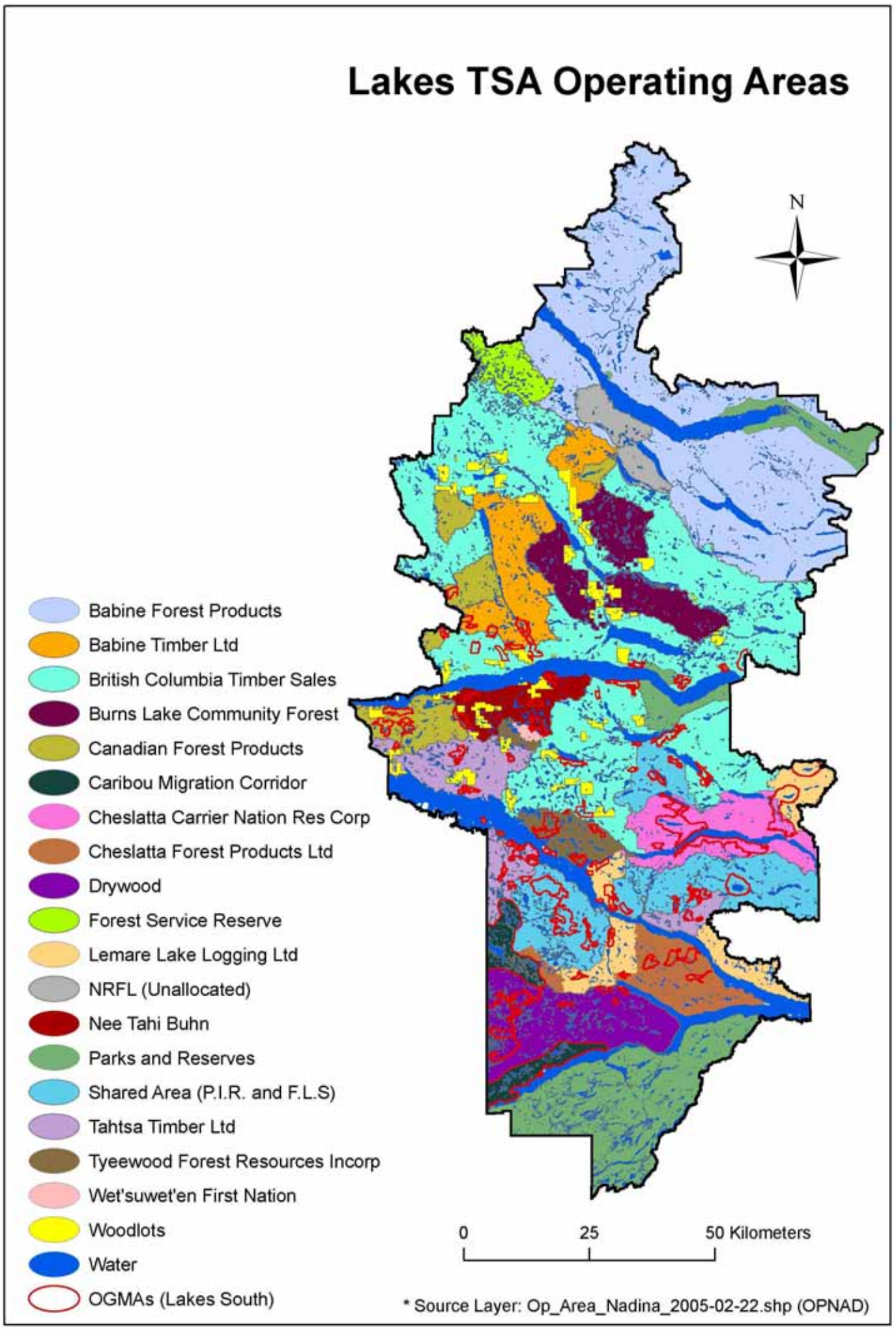
Hirano, A., Tsuchida, M., Ishibashi, M., and Ogino, K. (no date). Carbon Sink and Storage Capacity of Forest Ecosystems in Oze, Central Japan. http://www.rite.or.jp/GHGT6/pdf/BUTP1.pdf

Martin von Mirbach Carbon Budget Accounting at the forest Management unit Level: An overview of Issues and Methods.

http://dsp-psd.pwgsc.gc.ca/Collection/Fo42-312-2000E.pdf

Development of carbon curves for addressing CSA certification requirements in the Morice and Lakes Timber Supply Areas Prepared by: Brad Seely, Ph.D. Feb. 22, 2005.

APPENDIX D – Key Map for the Lakes Timber Supply Area


Lakes TSA Operating Areas
N
Babine Forest Products
Babine Timber Ltd
British Columbia Timber Sales
Burns Lake Community Forest
Canadian Forest Products
Caribou Migration Corridor
Cheslatta Carrier Nation Res Corp
Cheslatta Forest Products Ltd
Drywood
Forest Service Reserve
Lemare Lake Logging Ltd
NRFL (Unallocated)
Nee Tahi Buhn
Parks and Reserves
Shared Area (P.I.R. and F.L.S)
Tahtsa Timber Ltd
Tyeewood Forest Resources Incorp
Wet'suwet'en First Nation
Woodlots
Water
OGMAs (Lakes South)
0
25
50 Kilometers
* Source Layer: Op_Area_Nadina_2005-02-22.shp (OPNAD)