SUSTAINABLE FOREST MANAGEMENT PLAN 4

for Tree Farm Licence 48

held by Canadian Forest Products Ltd.

(Plan Period – October 15, 2006 – October 14, 2011)

Submitted for approval to the

Provincial Chief Forester
British Columbia Ministry of Forests and Range

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Cover Photo:
Photo by Jon Erickson from Thunder Mountain looking west towards TFL 48 Block 5 in the background

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1 INTRODUCTION

1.1 Purpose

The purpose of the Sustainable Forest Management Plan 4 (also referred to as 'SFMP 4' or 'the plan') document is to define the objectives, goals, commitments, and strategies for TFL 48 for the period October 15, 2006 to October 14, 2011. Overall, SFMP 4 uses past performance towards predetermined milestones to measure success, involves the public to establish future performance, and provides commitments and strategies to ensure those objectives are met. SFMP 4 represents a suite of tools that we can use to develop broad resource objectives to meet explicit site-specific expectations on TFL 48.

SFMP 4 is organized into the following sections:

- Section 1 describes TFL 48 and SFMP 4.
- Section 2 describes Canfor's management principles and vision for TFL 48. It also explores existing certifications, external relationships, strategic plans and inventories.
- Section 3 specifically articulates the objectives, indicators and targets for TFL 48.
- Section 4 Links the TFL 48 Licence requirement management objectives to the SFMP Objectives throughout the document.
- Section 5 summarizes the changes between SFMP 3 and SFMP 4 including the impact summary of each plan.
- Section 6 summarizes the public involvement during the development of SFMP 4.
- Section 7 provides a list of references and literature cited.
- Section 8 outlines abbreviations and definitions for technical terms used in the plan.
- Section 9 is a series of appendices to provide background and support for the initiatives, standards and procedures discussed in the plan.

1.2 Description of the Licence/Defined Forest Area

1.2.1 Description of the TFL

TFL 48, also known as the Chetwynd TFL, is held by Canadian Forest Products Ltd. (Canfor) and comprises five supply blocks in the western half of the Dawson Creek Forest District in the Prince George Forest Region. The blocks are clustered around the communities of Chetwynd, Hudson's Hope and Tumbler Ridge and cover approximately 643,239 hectares. For the most part, the blocks border the Dawson Creek Timber Supply Area (TSA), but they also share boundaries with the Mackenzie, Fort St. John and (for a very short distance) Prince George TSA's. Additionally, a substantial portion of the TFL (67%) overlaps the operating area of Pulpwood Agreement (PA) 13, issued to Tembec.

The TFL ranges from 54^0 to 56^0 longitude and 120^0 to 122^0 latitude with the eastern portions of the TFL located in the Alberta Plateau while the western portion is within the Rocky Mountains. The northeastern parts of the TFL lie on flat or gently rolling terrain in the Boreal White and Black Spruce biogeoclimatic zone. Further west and south the licence area enters the lee side of the Rocky Mountains, and the more rugged terrain there falls in the Engelmann Spruce-Subalpine Fir, Sub-Boreal Spruce and Alpine Tundra biogeoclimatic zones. This diversity of terrain and climate has led to considerable variation in tree species and productivity. The principal commercial species are white spruce and aspen in the northeast, and white spruce, lodgepole pine, subalpine fir, aspen and cottonwood in the mountainous areas to the west and south.

The communities in the area are Chetwynd (over 3000), Tumbler Ridge (over 2300), Hudson's Hope (over 1,100), Saulteau (over 180), West Moberly (approximately 70) and Moberly Lake (over 100). Of these, Chetwynd, the site of Canfor's sawmill, is the most economically dependent upon harvesting operations in TFL 48. Other economic activities in the area include oil and gas, mining, hydroelectric power generation, agriculture, trapping, outdoor recreation and public service.

A requirement of the CSA standard CAN/CSA-Z809-02 (CSA 2002) is to define "a specific area of forest, land and water delineated for the purposes of registration of the Sustainable Forest Management System". Canfor has chosen to define TFL 48 as the Defined Forest Area (DFA) for the purposes of certification. The terms DFA and TFL will be used interchangeably throughout this document.

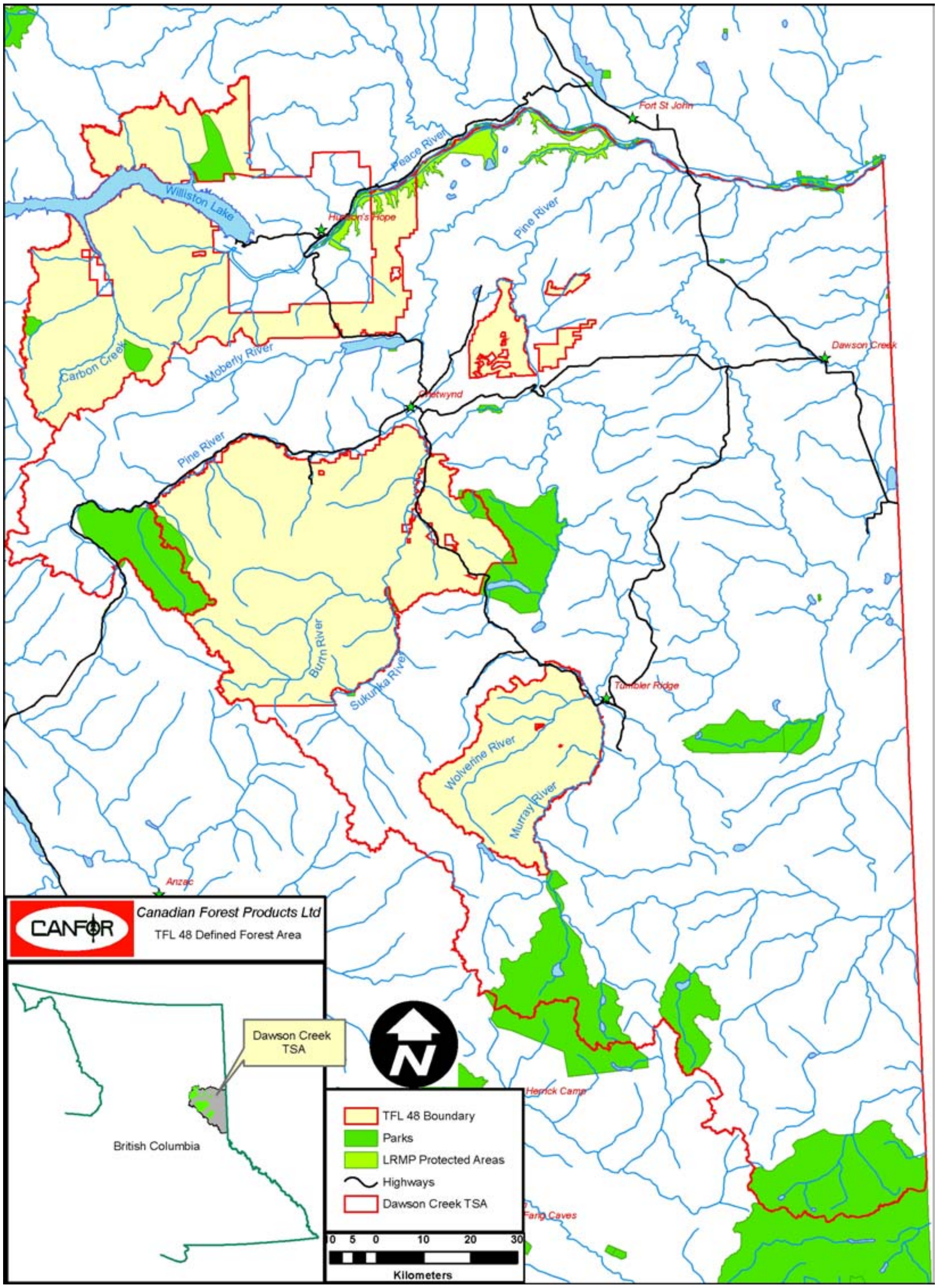


Figure 1: Tree Farm Licence 48 Defined Forest Area

1.2.2 History

TFL 48 was first awarded to Canfor on December 1, 1988. It was first replaced 10 years later on December 1, 1998. The most recent replacement Tree Farm Licence (TFL) 48 agreement came into effect on March 1, 1999. The document has since been amended through Instruments 4 and 5. Instrument 4 came into effect on April 1, 2000 to reflect changing government policy. Instrument 5 came into effect on July 27, 2004 to remove some fields in the Rice property, and add some forested land in the Stewart Lake area, north of the Rice property.

As part of the granting of TFL 48 to Canfor, Canfor committed to eliminating specified pre-1982 backlog NSR areas on the TFL no later than November 30, 2008.

Canfor manages the area according to a long term strategic plan. Our continuous improvement approach allows us to periodically revisit regulatory changes, determine new resource needs, identify information deficiencies, review our management goals and objectives, and develop a forecast that sustains the harvest level over several rotations. The key to this approach is to make our assumptions explicit so they can be measured, monitored and adjusted to reflect future management strategies.

Canfor continues to conduct operations on TFL 48 according to the approach described in the current Management Plan 3. MP 3 was approved by the Ministry of Forests for a five year planning period from October 15, 2001 to October 14, 2006.

A number of significant forest management initiatives of local and provincial importance have developed since the approval of MP 3, including:

- Approval of Instrument 5 of the TFL 48 Licence document. This removes fields on the Rice Property and adds forested land in the Stewart Lake area.
- Completion of the Dunlevy Creek Management Plan under the Dawson Creek LRMP
- Change of CSA standard to Z809-02 from Z809-96
- Removal of new woodlot areas from the TFL
- Completion of VRI
- Introduction of Forest Range and Practices Act for the eventual replacement of the Forest Practices Code

These developments directly impact our management approach and our productive land base allocation. SFMP 4 will address these changing economic, social and environmental needs.

In April 1997 Canfor purchased the Rice Property for inclusion into TFL 48. In August 1998, the Ministry of Forests and Range approved the transfer of land into TFL 48 and the conversion to coniferous forests. To preserve the cultivated fields present on the Rice property, a land transfer was approved to remove the fields, and add immature forested land from the nearby Stewart Lake area. This was approved on July 27, 2004 through Instrument 5. The addition of the Rice Property/Stewart Lake land (6,295 ha gross) increased the operable landbase through the conversion of marginal agricultural land, mature deciduous stands and logged over coniferous sites to sustainable coniferous forest management.

1.2.3 Licence Holder and Administration

Canfor is a leading integrated forest products company based in Vancouver, British Columbia. The company is the largest producer of softwood lumber and one of the largest producers of northern softwood kraft pulp in Canada. Canfor also produces kraft paper, plywood, remanufactured lumber products, oriented strand board (OSB), hardboard paneling and a range of specialized wood products, including baled fibre and fibre mat at 30 facilities located in BC, Alberta and Quebec.

Through its operations, affiliated companies and contractors, Canfor employs approximately 9,700 people.

Canfor has an annual production capability of approximately 5.2 billion board feet of lumber, 950 million square feet of plywood and OSB, 1.2 million tonnes of pulp, and 142,000 tonnes of kraft paper. Additionally, Canfor has approximately 14 million cubic metres of allowable annual cut under its forest tenures, all of which are ISO 14001 certified. Canfor (CFP) is listed on the Toronto Stock Exchange. The main operating company is Canadian Forest Products Ltd., from which the name Canfor is derived.

The Chetwynd division of Canadian Forest Products Ltd located in Chetwynd manages TFL 48.

1.3 Progress on Commitments

1.3.1 Pre-1982 Backlog NSR

Section 21.00 of the TFL licence agreement requires Canfor to eliminate all pre-1982 backlog NSR areas prior to November 30, 2008.

Over the period of Management Plan 3, Canfor was able to complete all of its pre-82 backlog NSR commitments included in the TFL 48 licence document.

- Canfor met with the District Manager regarding the outstanding pre-82 backlog NSR commitments contained within the TFL 48 license document.
- A plan to complete Canfor's pre-82 backlog NSR obligations was approved by the district manager on January 19, 2004.
- The last of the outstanding silviculture treatments were completed in June 2004.
- In a letter dated January 20, 2005, the District Manager confirmed that Canfor has completed all of its outstanding silviculture obligations on the pre-82 backlog NSR sites.
- As part of Canfor's commitment to the District Manager, yield curves for these backlog areas are included in the information package as Analysis Units 131 and 132.

1.3.2 Rationale Statement Requests from the Deputy Chief Forester

In the last AAC Determination for TFL 48, the Deputy Chief Forester made some requests for works to be completed leading to the next determination. The requests and the progress towards the requests are summarized in the following:

Request: That the licensee complete Phase 2 of the vegetation resource inventory.

Progress: Phase 2 of the VRI was completed in March 2005. A discussion of this can be found in Section 2.7.

Request: That the licensee classify areas within the TFL that do not currently have an inventory label.

Progress: The missing data was immediately recovered. The current information is complete.

Request: That the licensee monitor harvesting performance in deciduous-leading stands which are currently classified as having a low timber growing potential.

Progress: All harvesting activities are monitored and tracked. There has been no significant harvesting in these areas since MP 3, but an increase is anticipated due to recently developed deciduous processing facilities.

Request: That the licensee document the success of stand conversion activities being conducted on the Rice properties.

Progress: All primary stand conversion treatments have been completed. These areas are properly reflected in the inventory and are included in the information package. The performance of these plantations will be monitored.

Request: That the licensee obtain localized site productivity information.

Progress: Predictive Ecosystem Mapping accuracy assessment has been completed and meets the provincial standard for inclusion in timber supply analysis. A sample plan has been developed to collect localized data. Fieldwork has not yet commenced.

Request: That the licensee monitor the productivity of regenerating and advanced regeneration stands in areas managed under the irregular shelterwood silvicultural system.

Progress: Canfor has developed a managed stand sample plan to be implemented in the term of SFMP 4. Please refer to Section 2.8.

Request: That the licensee document actual wildlife tree patch retention.

Progress: WTP retention is documented and has been reported in Indicator 9 (Section 3.9).

Request: That the licensee track and quantify the area of forested land on the TFL that is denuded as a result of energy exploration and development activities.

Progress: This information is now tracked spatially and is current. Between Trim II and the latest VRI work, all existing development has been captured as of 1997. Current development is captured via digital referrals from the industrial users, and is constantly updated as the information is supplied. All known denudations as of December 2004 due to other industrial users have been incorporated into the VRI and are reflected in the long-term harvest level base case determinations for TFL 48.

Request: That the licensee in conjunction with the BCFS staff confirm the actual management practices in riparian management areas.

Progress: Actual performance is tracked and has been reported in Indicator 7 (Section 3.7). Annual performance is captured in the CSA annual reports which are sent to the MoFR.

Request: That the licensee in conjunction with the BCFS staff confirm the area of not satisfactorily restocked land.

Progress: Canfor met with the district manager regarding the outstanding pre-82 NSR backlog commitments contained within the TFL 48 license document. A plan to complete Canfor's pre-82 backlog obligations was approved by the district manager on January 19, 2004. The last of the outstanding silviculture treatments was completed in June 2004.

1.3.3 Management Plan 3 Approval Letter Requests from the Deputy Chief Forester

In the approval letter dated September 20, 2001, the Deputy Chief Forester made some requests for works to be completed leading to the next determination. Some of those requests were also included in the rationale statement and have been addressed in Section 1.3.2 above. The requests not addressed above and the progress towards the requests are summarized in the following:

Request: With regard to the non-replaceable timber sale licenses, please note that the district manager and the Licensee must agree upon areas of Schedule B land for forest development purposes, in accordance with paragraph 1.12 of the TFL 48 agreement.

Progress: Canfor has jointly developed Operating Guidelines with BCTS for their operations within TFL 48. This agreement was made effective September 12, 2005. See Section 2.3.1 for more information on the process for BCTS and Canfor to agree on areas for forest development.

Request: In the timber supply analysis, I note that your estimate for non-recoverable losses is equivalent to approximately ten percent of the allowable annual cut. This is a significant factor, and I would ask that you work with the Dawson Creek Forest District district manager to confirm or vary this estimate in time for the next timber supply analysis.

Progress: During the term of MP 3 losses have been tracked with a total of 21,975 m^3, or an average of 4,395 m^3/year (See Table 27). This is significantly less than the amount currently being modeled, however in consideration of the current Mountain Pine Beetle outbreak currently on TFL 48 Canfor has chosen not to adjust downward the non-recoverable losses estimate at this time.

Request: I encourage you to continue working with the regional working group that is formulating recommendations on boreal mixed wood management in the northeast part of the province.

Progress: Canfor has participated continuously with this group during the term of MP 3 and we are encouraged that there is continued progress being made, including the inclusion of deciduous species into managed stand growth models (although not in time for inclusion in SFMP 4) and ongoing work on developing mixed wood stocking standards.

Request: On an ongoing basis, please provide the Dawson Creek Forest District district manager with copies of the minutes of meetings held by the Canadian Forest Products – Chetwynd Public Advisory Committee, for CSA Certification.

Progress: The Dawson Creek Forest District, now Peace Forest District has had continuous representation as an advisor on the Chetwynd Public Advisory Committee (PAC) during the term or MP 3. Copies of the meeting minutes and annual reports have been forwarded to all members and advisors of the PAC.

2 SUSTAINABLE FOREST MANAGEMENT

2.1 Management Principles

Canfor adopts an adaptive management approach in the short-term to achieve long-term goals of sustainable forest management (SFM). This incorporates the experience gained from the results of previous management methods and actions into updated objectives and strategies. The key to adaptive management is making strategies and assumptions explicit so they can be measured, monitored, and adjusted for future management strategies.

Canfor has defined the guiding vision, policies and principles for the company in the following documents: Mission Statement, Environment Policy and Forestry Principles.

2.1.1 Canfor Mission Statement

CANFOR

Canfor's Mission

We will be a highly successful competitor in the global forest products industry, managing with integrity the resources entrusted to our care.

We will be characterized by:

- Employing and developing highly motivated, empowered and committed people who enjoy their work.
- Consistently satisfying customer needs with quality products and services
- Enhancing the forest resource, ensuring responsible stewardship of the environment, and protecting human health and safety.
- Encouraging, recognizing and rewarding excellence in all our endeavours, with an emphasis on innovation and results.
- Increasing value for shareholders.

We will be guided by the core values of integrity, trust, openness and respect for people.

Figure 2: Canfor's Mission

2.1.2 Canfor Environment Policy

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

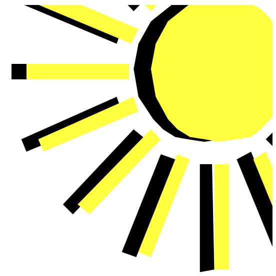
February 2005

CANFOR

Figure 3: Canfor's Environment Policy

2.1.3 Canfor's Forestry Principles

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 forest land 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 4: Canfor's Forestry Principles

2.2 Forest Management Systems Certification

2.2.1 ISO Environmental Management System

As a preparatory step to sustainable forest management certification, Canfor developed an environmental management system (EMS) for the company's woodlands operations. In November 1999 this environmental management system was certified to the ISO 14001 standard developed by the International Organization for Standardization. The company EMS provides a platform on which to build the sustainable forest management elements required to meet CAN/CSA-Z809-02.

2.2.2 CSA Sustainable Forestry System

In July of 1999 Canfor formally announced its commitment to seek sustainable forest management certification of the company's forestry operations under the Canadian Standards Association Sustainable Forest Management System standard CAN/CSA-Z809-96. TFL 48 was initially registered to the CSA Standard in July 2000 and was re-registered in October 2002. Re-registration will be required in October 2005 to the CAN/CSA-Z809-02 standard. This plan is intended to fulfill the requirements for re-registration. Additionally in 2005 BCTS expressed interest to join the certification for their operation on TFL 48. A gap analysis was completed in the fall of 2005 and BCTS registration audit for their operations is scheduled for September 2006.

2.3 Roles and Responsibilities

Canfor is not the sole operator within TFL 48. BC Timber Sales has access to 55,350 m^3 per year of conifer leading volume. Tembec has access to 55,000 m^3 of deciduous leading volume through the PA 13 licence.

2.3.1 BC Timber Sales

Canfor and BCTS have agreed to seek a joint certification to the CAN/CSA-Z809-02 standard in 2006. See Appendix 2 – BCTS SFM Policies for copies of BCTS Environment Policy and Sustainable Resource Management Policy. This SFMP serves as the SFMP for this process.

Canfor has jointly developed Operating Guidelines with BCTS for their operations within TFL 48 where Canfor will sell pre-developed volume to BCTS. Canfor retains control over the planning stages of these areas and can therefore directly ensure that the proposed cut blocks meet the SFM objectives. BCTS has the responsibility to report all harvesting and silviculture activities to Canfor until free growing has been achieved and is committed to operate within the requirements of the joint certification SFM plan. Canfor incorporates all of the BCTS activities in the annual reports. In addition to this summary a detailed responsibility action matrix has been developed for all the indicators listed in section 3 which includes all of BCTS responsibilities as well as Canfor’s.

BCTS has currently awarded 40,000 m3/year of their allocation to licence A64393 issued to Emporium Investments Ltd. All of the blocks harvested in this licence have been included in the analysis supporting this SFMP. Approximately 178,101 m^3 was laid out during MP 3 and will not be subject to stand level requirements of SFMP 4. All future blocks will come from Canfor’s FDP/FSP and Canfor is responsible for conducting the analysis for these areas. BCTS assumes the responsibility to ensure layout conducted after 2005 and harvesting activities are consistent with this SFMP. This licence expires April 19, 2011. BCTS retains the silviculture liability for this licence.

2.3.2 Other Forest Tenure Holders

Canfor had a memorandum of understanding with the former PA 13 holder, Louisiana Pacific. When LP sold the license to Tembec, this MoU was dissolved. Although a new agreement has not yet been formalized with Tembec, Canfor and Tembec have been operating under the intent of the former MoU. The MoU outlined that LP (Tembec) was going to operate on the cutblocks approved under their FDP. Once these blocks were depleted, Canfor would assume responsibility for the planning and sale of these blocks to LP (Tembec), in a method similar to BCTS. Tembec has the same commitment to report activities to Canfor, so that they can be incorporated into the annual reports.

2.3.3 Other Industrial Users (Oil and Gas, Mining, etc)

All oil, gas and mining activities (e.g., seismic, roads, pipelines, well sites, mine sites) proposed for the TFL are referred to the Canfor office. Canfor provides comments to minimize impacts on the timber harvesting land base (e.g., reforest disturbed sites), proposed road locations and known resource features.

For oil and gas these comments are provided to the company proposing development. The company is then obligated to report these comments and how they will incorporate these comments to the Oil and Gas Commission.

For mining activities (e.g., mine review) the comments are provided to the company proposing development and to the Ministry of Energy and Mines.

Canfor offers to purchase merchantable coniferous timber from these developments at market value.

Industrial developments (e.g., well sites, pipelines, mines) are mapped by Canfor and included in timber supply analysis and Forest Development Plans.

2.3.4 Chetwynd Public Advisory Committee

The Chetwynd Public Advisory Committee (PAC) serves to provide the vital public participation component of SFM in Canada. Since its first meeting on February 4, 2000, the members' participation has enhanced their own knowledge of SFM in general and has provided a valuable opportunity to be involved with the decision making for the local forest. Please refer to Section 3.49 for specific roles and responsibilities of the PAC group.

2.4 Existing Strategic Plans

2.4.1 Dawson Creek Land and Resource Management Plan

Objectives for values and resources, and acceptable uses on Crown land, were outlined in the Dawson Creek LRMP, a public land use process. The plan was approved by cabinet on March 4, 1999. The plan incorporates the principles of integrated resource management into a long term plan (ten years) for resource development on Crown land within the Dawson Creek Timber Supply Area (TSA) and TFL 48. TFL 48 falls completely within the area covered by the Dawson Creek LRMP.

The Dawson Creek LRMP is the outcome of the deliberations of a range of local private citizens, stakeholders, including Canfor and government agency representatives. The Dawson Creek LRMP process incorporated a form of consensus-based decision-making that enabled general agreement on all issues.

The Dawson Creek LRMP adopts the following principles as stated in the approved document:

- Sustainable use of renewable natural resources.
- The management of any one resource shall take into consideration other resource values, rights, tenures, and development opportunities and shall recognize the biological and physical limitations of the land and resources.
- Maintenance or enhancement of the quality of life, social and economic stability, employment opportunities including job creation, and the vitality of the local communities.
- Acknowledgement that communities located within the planning area should have the opportunity to benefit from the natural resources within the planning area. This can be achieved through, but is not limited to, the following: economic diversification, managed access to resources, and increased value-added manufacturing and processing.

- Land, water, air and all living organisms are integral parts of the ecosystem and should be sustained and accommodated by management plans.

An implementation plan for the LRMP has been developed and is reviewed periodically by a core of representatives from the original planning table. The implementation plan is under the direction of the Ministry of Agriculture and Lands.

Forest resource planning conducted by Canfor, including the Sustainable Forest Management Plan, will be consistent with the objectives of the Dawson Creek LRMP. Canfor is committed to managing to the spirit and intent of the LRMP and this is reflected in this SFMP. Appendix 11 – Linkages of SFMP 4 to Dawson Creek LRMP cross-references the linkages between SFMP 4 objectives, indicators and targets, and the Dawson Creek LRMP objectives.

2.4.2 Dunlevy Creek Management Plan

The Dawson Creek LRMP identifies several special resource management zones in recognition of their respective wildlife habitat / wilderness recreation values. The Dunlevy Creek Special Management Zone (SMZ) is one of these zones.

Under the direction of the LRMP, the Dunlevy Creek SMZ project was initiated in May 2000. This project resulted in a strategic management plan for the Dunlevy Creek SMZ that guides oil and gas development and the disposition of petroleum and natural gas tenures, and enables landscape level planning to guide forest development.

In the Dunlevy Creek Management Plan, recommendations to coordinate resource development activities among tenured users and to plan resource developments in consultation with interested stakeholders in the Dunlevy Creek SMZ are intended to integrate resource planning and development in a manner that is consistent with the Dawson Creek LRMP.

Refer to Section 3.15 for specific information on the Dunlevy Creek Management Plan.

2.5 Sustaining Biological Richness

The concept of "sustaining biological richness" as described in this SFMP was derived from the work initially developed by Dr. Fred Bunnell and the Weyerhaeuser Adaptive Management Working Group (Bunnell et. al. 2003). This concept is further described in discussion papers completed for Canfor's TFL 48 (Bunnell 2002), and for the Prince George Timber Supply Area (Wells et. al. 2003b). The following section describes the importance of "sustaining biological richness" as it relates to "biodiversity" and three "indicators" that may be used to assess achievement. The term "indicator" used by Bunnell et. al. 2003; Bunnell 2002; and Wells et. al. 2003a,b is used in the context of providing broad qualitative tests not to be confused with the indicators in Section 3 of this plan, which are specific measures of performance.

Table 1 identifies biological richness and the indicators and sub-indicators defined by Wells et. al. 2003a,b. Performance indicators are contained in Section 3 that measure and demonstrate performance with regard to the conservation of biological richness over time.

Table 1: Biological Richness and its Indicators and Sub-indicators (Wells et. al. 2003)

Biological Diversity Criterion: Biological richness and its associated values are sustained within the management unit.	
Indicator 1: Ecologically distinct ecosystem types are represented in the non-harvestable land base of the management unit to maintain lesser known species and ecological functions.	
Indicator 2: The amount, distribution and heterogeneity of habitat and landscape structure important to sustain biological richness is maintained over time.	Coarse woody debris
	Large live trees
	Cavity trees (snags)
	Shrubs
	Broad-leaved trees
	Riparian areas
	Late seral and early seral
	Adjacent or continuous canopy
Indicator 3: Productive and well-distributed populations of forest dwelling species are maintained over time.	

Table 2 identifies the critical habitat and landscape elements (sub indicators in Table 1) defined by Bunnell et. al.1999 and their importance for ecosystem management.

Table 2: Habitat and Landscape Elements Identified by Bunnell et al. (1999)

Coarse woody debris (downed wood)	Important habitat for a wide range of invertebrates, small vertebrates and cryptogams (mosses, liverworts and lichens). Large variations in persistence exist by size (diameter) and species.
Large live trees	Important contributors to snags and coarse woody debris. Important for larger sized cavities. Abundance dramatically affected by forest management.
Cavities (snags)	Snags form critical habitat for at least a portion of the life cycle for a significant portion of all animal species. Tree species preferences exist. Large variations in persistence exist by size (diameter) and species.
Shrubs	Important as food sources for many species (leaves and berries). Important as a habitat component for small mammals and birds, including nest sites. Species diversity increases in early seral, riparian and open stands.
Broad-leaved trees	Mixtures of coniferous and deciduous trees frequently increase niche diversity. Deciduous snags are frequently preferred as habitat for cavity dwellers. Broad-leaved trees are frequently early seral colonizers, and abundance may decline in low intensity managed and unmanaged areas protected from fire.
Riparian	Unique assemblages of species and stand structures. Frequently large impacts on aquatic habitat through temperature controls and biotic inputs. Potentially large impact on water quality.
Late seral and early seral	Very old and very young stands have the greatest niche diversity. Many species appear dependant on either late or early seral stands. Relative importance varies with natural disturbance type and large impact on habitat. Influences water quality and quantity through leaf area (evapotranspiration) and runoff.
Adjacent or continuous canopy	Important habitat attribute for some species through influences on species movements. When coupled with spatial considerations, has a large impact on habitat connectivity. Closely associated with patch size and seral stage distributions. Relative frequency of forest opening of different sizes. Major influence on decisions related to scale. Large impact on interior forest and thus habitat.

The term "***biodiversity***" is complex and difficult to demonstrate the conservation of the value over time. Biological richness is a much more concise term and is a credible surrogate for biological diversity (Bunnell 1998; Wells et. al. 2003a,b,c). The intent of sustaining biological richness is to maintain productive, well-distributed populations of species in a defined management area over time, and can be assessed through the use of the three (3) indicators identified in Table 1:

- Ecosystem representation
- Habitat and landscape elements
- Species productivity and distribution

Biodiversity: The variability among living organisms from all sources including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems. (Canadian Biodiversity Strategy 1995)

Ecosystem representation is a coarse filter approach intended to ensure a proportion of ecologically distinct ecosystem types are maintained within the non-harvestable land base (NHLB). Maintaining representative ecosystems in an unmanaged state (i.e. NHLB) is important for three (3) reasons (Wells et. al. 2003): 1) They sustain poorly understood ecological functions and species habitat requirements; 2) They act as a precautionary buffer against errors in efforts intended to sustain species in the managed forest, and; 3) They provide an ecological baseline against which the effects of human activities can be compared.

Habitat and landscape elements are structural attributes that occur at a variety of temporal and spatial scales. Maintaining these elements is a medium filter approach and is important for two (2) reasons (Bunnell and Kremsater 1990; Lindenmayer and Franklin 2002; Wells et. al. 2003): 1) Studies have shown that most forest dwelling species require these elements as a habitat requirement, and; 2) Forest management activities have a strong influence over the abundance, distribution and functionality of these elements.

Species productivity and distribution is a fine filter approach intended to monitor the presence and trends of species in response to changes in habitat structure and pattern. This indicator is a long-term adaptive approach, which tests the "effectiveness" of the provisions designed to manage indicators 1 and 2 (above). This approach is often referred to as "effectiveness monitoring" and relies on the results of long-term forest monitoring and research programs such as, forest inventory monitoring plots, and wildlife research that supports species accounts (distribution and abundance). As stated above, effectiveness monitoring can be used to support adaptive management or continuous improvement of forest practices related to Indicators 1 and 2 (see Table 1) over time. Continuous improvement of the SFMP is further discussed in Section 2.9.

2.6 Natural Disturbance Unit Planning

Natural disturbance unit planning refers to the work completed by DeLong (2002) which provides a summary of research findings to illustrate the range of natural variability for some of elements described in Table 2 across a set of Natural Disturbance Units (NDU). The Ministry of Sustainable Resource Management and the Ministry of Forests have indicated (MSRM and MoF 2002) that the guidance provided in DeLong 2002, is a synthesis of the most current scientific information on the natural range of variability for habitat management in the previous Prince George Forest Region. The indicators and targets identified in Section 3 therefore rely on DeLong 2002 for local-level baseline information.

The underlying assumption of NDU's is that the biota of a forest is adapted to the conditions created by natural disturbances and thus should cope more easily with the ecological changes associated with forest management activities if the pattern and structure created resemble those of natural disturbance.

The underlying assumption of NDU's is that the biota of a forest is adapted to the conditions created by natural disturbances and thus should cope more easily with the ecological changes associated with forest management activities if the pattern and structure created resemble those of natural disturbance (Hunter 1993, Swanson et al. 1993, Bunnell 1995, DeLong and Tanner 1996, Bergeron and Harvey 1997, Angelstam 1998, DeLong and Kessler 2000). Adopting forest management practices that approximate the natural range of variability is being widely accepted as an appropriate way to manage for the needs of many organisms. The Biodiversity Guidebook (1995) was the first attempt in British Columbia to present guidance for forest management based on the natural disturbance template. Since the completion of the Biodiversity Guidebook, more information on natural disturbance dynamics has become available. Within the Prince George Forest Region a number of studies have investigated particular aspects of natural disturbance (DeLong 1998, DeLong and Kessler 2000, Lewis and Lindgren 2000, Rogeau 2001).

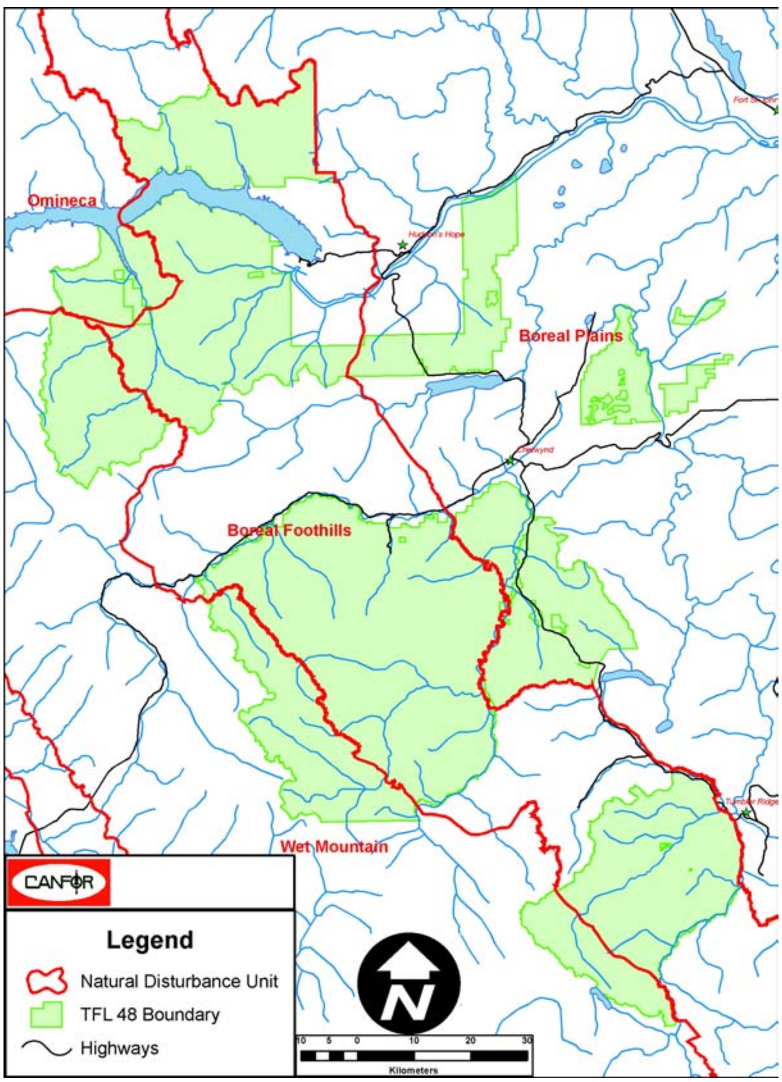


Figure 5: Natural Disturbance Units

Instead of adopting the Natural Disturbance Types (NDT's) presented in the Biodiversity Guidebook (1995) DeLong 2002 presents information for nine Natural Disturbance Units. These units better separate areas based on differences in disturbance processes, stand development, and temporal and spatial landscape pattern. DeLong 2002 contains guidance on management of old forest, young natural forest, patch size distribution, and stand species composition and structure. Most of the guidance relates to approximating wildfire as it was the key stand replacement disturbance agent in most landscapes and it is the one that we have exhibited the most control over. In other words it is the disturbance process we are attempting to replace with harvesting.

Examples of how this plan has adopted the principles identified in DeLong 2002 include:

- Maintenance of some naturally disturbed areas over time, which is not salvaged.
- Openings, which represent a more natural patch, size distribution.
- Providing for stand-level characteristics (e.g. species composition, stand structure) that emulate natural baseline information as much as possible.

To move towards a more natural range of variation and to emulate patterns of natural disturbance many of the indicators and targets identified in Section 3 are established at a NDU or DFA level, as opposed to management strategies directed at individual stands or cutblocks.

2.7 Resource Inventories

Canfor has completed a variety of resource inventories since it was awarded TFL 48. These are periodically updated as needed to meet strategic or operational planning needs. Key inventories are briefly discussed below while additional detail is provided in the information package (Appendix 5 – Timber Supply Analysis Information Package).

Vegetation Resource Inventory

Canfor recently completed several projects focusing on improving forest cover or Vegetation Resource Inventory (VRI) information within TFL 48. These projects include:

- Photo Interpretation (Phase I) – Classification completed in June 2000 to the VRI 1998 standard.
- Ground Sampling (Phase II) – Sampling forest cover polygons and compiling the data was completed in the fall of 2002 to the VRI standard.
- Adjustment – Statistical analysis and adjustment of the VRI was completed in March 2003 to the VRI standard.
- Net Volume Adjustment Factors (NVAF) – Sampling trees from the Phase II project, compiling, analyzing and adjusting the VRI was completed in March 2005 to the VRI standard. See report titled Tree Farm Licence 48 Vegetation Resources Inventory Statistical Adjustment (Appendix 9 – TFL 48 Vegetation Resource Inventory Statistical Adjustment).

Recreation

The most recent recreation inventory was completed in 1994 to the MoFR standard, while a separate inventory of recreation sites and trails was completed in 1999.

Visual Landscape Inventory

During the term of MP 2 (1994), an inventory of visual portions of the TFL landscape was completed by Canfor. In 1999 this visual landscape inventory was added to and updated to the 1997 standard. In 2005 the Ministry of Forests consolidated all visual landscape inventories within the previous Dawson Creek Forest District (TFL48 and Dawson Creek TSA). During this process it was discovered that some areas that had been declared and made known were not part of the TFL 48 visual inventory used in MP3. The 2005 consolidated inventory that was provided by the MoFR, and identifies polygons having an existing VQO (EVQO) on the file, is used in the base case for TFL 48.

The areas added during the 1999 inventory are represented in the 2005 consolidated inventory with recommended VQO’s (RVQO). Sensitivity analysis will be carried out that adds ‘Recommended’ VQO's to the 2005 consolidated visual landscape inventory. The sensitivity analysis is the cumulative amount of established and recommended VQO’s from the 2005 consolidated inventory.

Terrain Mapping

In March 2001 Terrain Mapping to the RIC 1994 standard was completed for TFL 48. This inventory along with a landslide inventory formed the basis for operability definitions and the Predictive Ecosystem Mapping.

Physical Operability

Using the terrain components of the TEM work completed for the Burnt River LU and the Lower Sukunka LU, the terrain mapping for the remainder of the TFL, and the Landslide Inventory Terrain Stability Classes were derived for the entire TFL using the Stability Index MAPing (SINMAP) model.

The SINDEX map is then further analyzed and classified into physical operability classes.

Predictive Ecosystem Mapping

Using the terrain mapping completed for the TFL along with VRI and TRIM data a predictive ecosystem map was completed for TFL 48 in January 2003. An August 2006 accuracy assessment demonstrated that the area weighted dominant correct score on the PEM database, based on 88 field polygons is over 77%. This information is used for habitat modeling and managed stand site index estimates.

Fish and Fish Habitat

Since 1995, Canfor has been conducting 1:20,000 reconnaissance level RIC standard fish and fish habitat surveys within TFL 48.

RIC standard reconnaissance level fish and fish habitat inventories have been completed across the TFL. In 2005 Canfor completed the stream modeling project which assigned stream classifications based on stream barriers and derived stream width for all streams within TFL 48. This information is used for strategic planning purposes.

Fish inventories will continue to be required on an operational basis (e.g., cut block and road planning).

Cultural Heritage

Canfor obtained GIS coverage's for the Archaeological Overview Assessment (AOA) and Archaeological Site Information for the Dawson Creek Forest District from the Ministry of Small Business Tourism and Culture (MSBTC) in June 1999. The data is maintained under a Confidentiality Agreement with the MSBTC.

At the time of timber supply analysis there were 20 known heritage sites within the TFL, six of these sites occurred within new Protected Areas and up to six of the known sites were expected to occur in riparian management areas.

We have completed over 50 Archaeological Impact Assessments (AIAs) for forest roads and cut blocks since 1995. To date we have not found any Heritage Resources during these surveys. Canfor expects that heritage resources will be identified and protected on site-specific areas in the future.

Wildlife and Wildlife Habitat

Since 1996, Canfor has undertaken a series of measures to address wildlife and wildlife habitat. These measures include wildlife habitat modeling (Table 3), wildlife inventories, habitat monitoring and wildlife research.

Wildlife habitat modeling on TFL 48 began in 1997. The species chosen for habitat modeling (Table 3) were selected relative to their importance as defined in the LRMP, and to their provincial or federally listed status. The list was presented to Canfor's Public Advisory Committee (PAC) in April-May 2000 and subsequently revised based upon expert opinion. These models have been forecasted explicitly and reported on in the SFMP 4 (see section 3.10)

Table 3: Species Selected for Habitat Modeling and Some of the Criteria for their Selection

Species	National Status	Provincial Status	LRMP/Local Use
Grizzly Bear	Vulnerable	Blue/Identified	Locally Important/Hunting
Marten			Trapping
Fisher		Blue/Identified	Trapping
Wolverine	Vulnerable	Blue	Trapping
Caribou	Vulnerable	Blue	Hunting
Moose			Hunting
Elk			Hunting

All models have been developed through the cooperative efforts of Canfor, MELP, Forest Renewal BC and Forest Investment Account. The models are based on the relationships between a site series (as identified by Predictive Ecosystem Modeling (PEM) or Terrestrial Ecosystem Mapping (TEM)), and the structural stage of the forest as derived from Vegetation Resources Inventory (VRI) and forecasted in the spatial modeling forecast. The animals' relationship to its habitat is based on the literature including local studies and environmental impact assessments wherever possible. Detailed ground sampling throughout the TFL as part of the TEM and Terrain mapping processes was used to assist in developing the species habitat relationships.

2.8 Managed Stand Monitoring

Under the principles of SFM, monitoring is defined as the periodic measurement and assessment of change of an indicator, where an indicator is a variable used to report progress towards achieving an objective. Objectives are broad, general statements that describe a desired state or condition related to one or more forest values (CAN/CSA-Z809-02). In this context, two broad categories of monitoring can be recognized. The first, which may be referred to as "administrative monitoring", checks that planned SFM activities are carried out (i.e., did we do what we said we were going to do?). An example is monitoring to ensure conformance with late seral targets.

The second category of monitoring may be referred to as monitoring the state of the forest, which includes activities that measure timber and non-timber variables over time. Growth and Yield (GY) monitoring, which is the process of checking GY estimates for a defined population, is in this broad category. Monitoring the state of the forest requires a long-term commitment to establishing and re-measuring plots over time.

Monitoring is a key process in adaptive management. It is a feedback loop that provides information for continuous improvement. The level of success in achieving objectives can be evaluated, and planning and management activities can be improved accordingly.

Canfor is committed to implementing a GY monitoring program for managed stands within the TFL 48 DFA. This program is based upon a 2-km grid covering the whole DFA. When any one of the points is harvested a GY monitoring plot will be established 15 years post-harvest and periodically re-measured over time. The GY monitoring objectives for the TFL 48 DFA are as follows:

- Monitor the change in volume, species composition, top height, and site index in managed stands from 15 years post-harvest onwards.

  The intent is that this data will be compared with predicted values of the same attributes used in timber supply analysis. This is to develop a level-of-confidence in the accuracy and precision of projections used in timber supply analysis. This data can also be used to address several SFM indicators pertaining to maintaining or improving the harvest level over time.
- Provide data on snags, coarse woody debris, and shrubs to address SFM objectives.
- Provide data on stand growth and development that can be used as a subset of the data required for developing new GY models.
- Use a sample design that can be modified in the future to incorporate establishment of plots in mature stands and linkages with other inventory sampling.

See Appendix 10 – TFL 48 Change Monitoring Inventory Sample Plan for a detailed description of the sample design and objectives developed for the TFL 48 DFA.

2.9 Continuous Improvement

In keeping with the principles of SFM, opportunities to continuously improve the SFMP are built into the SFM process. Continuous improvement relies on the ability to recognize, plan for, and adapt to change as it occurs. As time goes by, changes will occur to both the practice of forest management and the process in which it is delivered. Ensuring that a process is in place to accept and adapt to change is a necessary part of SFM. To ensure continuous improvement occurs means that the sources of "change" are recognized and strategies developed to accept and adapt to these changes. Table 4 identifies the sources of change with regard to forest management and the strategies that are in place to adapt.

Table 4: Continuous Improvement Process for the SFMP

Source of Change	Adaptation Strategy
Change in environmental circumstance i.e. natural events such as large fires or insect epidemics.	• Performance monitoring as outlined in Section 3 will occur on an annual basis. • Conduct an annual *performance management evaluation and review* of monitoring results and compare to original targets. • Adjustments to practices and/or targets are made.
New information that can reveal assumptions, targets or measures are incorrect or could be improved.	• Annually, an SFM Investment Plan is developed that demonstrates how resources are allocated and prioritized with regard to research, effectiveness monitoring, and adaptation of measures and targets in the SFMP. • The SFM Investment Plan will seek to collaborate wherever possible with other associations having mutual interests in SFM. Examples include, The McGregor Model Forest Association, other industry partners, the Ft St John Pilot Project, the Forest Investment Account, and Government Agencies • The results of the SFM Investment Plan will be reviewed on an annual basis. • Adjustments to practices and/or targets are made as a result of the new information.
Changing social values or SFM criteria/standards.	• Periodic meetings are held with the Public Advisory Committee annually to gather local changes in public values over time. • The annual performance management evaluation and review will take into account government policy and land base planning and zonation changes. • Annual audits will be completed to verify compliance to the existing SFM Criteria/Standards. • Adjustments to practices and/or targets are made if necessary.

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 Canfor. If it is determined that non-conformances are related to issues regarding the SFM system a "SFM System Adjustment Action Plan" will be produced and implemented by Canfor.

The SFMP is intended to be delivered and implemented through the existing FMS organizational structure. Since the FMS is designed as a performance management loop, the SFMP will continuously improve, adjust and adapt to changing circumstances.

3 SFM OBJECTIVES, INDICATORS AND TARGETS

Values & Objectives - What is locally important and what is desirable?

The first step in developing the SFMP is to identify what is locally important and describe what is desirable. This involves reviewing SFM standards and TFL 48 licence requirements and comparing them to the local area so that *values* that are considered locally important are identified. Once values are identified, one or more *objectives* are then developed to describe the future state or condition of each of the values. Objectives are usually broad, general statements that are qualitative as opposed to quantitative. To develop this SFMP, local values and objectives were derived from reviewing SFM Standards, TFL 48 Licence requirements, LRMP's and input from the PAC.

Objective: a broad statement describing a desired future state or condition for a value.

Indicators & Targets - How do we know we have been successful?

A method of knowing when we are successful has often been a missing link within past and contemporary forest management plans. Strategic objectives are well defined throughout BC, but forest managers are often challenged with implementing on-the-ground practices and knowing whether or not the overall strategic objectives have been met. To overcome this uncertainty, SFMP's establish one or more performance measures *(indicators)* for each objective. One or more *targets* are then identified for each indicator. This is a fundamental difference between SFMP's and other strategic plans that exist throughout the Province. Indicators and targets are also a core part of the Performance Management system as a whole. A detailed description of each indicator and target are provided as demonstrated in the example below.

Indicator: a variable that measures the state or condition of an objective for which one or more targets is set.

Target: a specific statement describing a desired future state or condition of an indicator. Targets are succinct, measurable, achievable, realistic, and time bound.

X INDICATOR

Indicator Statement	Target Statement
A reiteration of the indicator as identified in the landscape level strategy or the SFM matrix	A specific statement describing a desired future state or condition of an indicator. Targets are succinct, measurable, achievable, realistic, and time bound
SFM Objective: A description the SFM objectives that this indicator and target relate to.	
Linkage to TFL 48 Licence: If applicable, a brief statement regarding whether this indicator is submitted for approval to the Ministry of Forests and Range in fulfillment of sections 2.27(f) and (g) of the TFL 48 Licence. Canfor is required under sections 2.27(f), and (g) of the TFL licence document to propose certain management objectives and measures to be taken for meeting those proposed management objectives. Those management objectives indicated in section 4 of this document and the means to meet the objectives are covered by the SFM Objectives in section 3 of this document and the Strategy and Implementation identified for those management objectives. The Indicators, Targets and Acceptable Variance for each of the SFM Objectives are used to determine how the proposed objective has been met.	

ACCEPTABLE VARIANCE

This provides the acceptable variance from the desired level of the Indicator.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

A description of the indicator.

CURRENT STATUS

The information provided under this heading summarizes the current state (if known) and objective levels of the quantifiable indicator. This information will usually be summarized in table format by Natural

Disturbance Unit and BEC sub zone, or whatever scale at which the objective is to be met. Where current and quantitative information is available for the indicator, that information will be presented here.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

CSA specifies that: a) quantitative and long-term projections of expected future indicator levels have been prepared; b) that the assumptions and analytic methods used in forecasting have been specified; and c) the public participation process was used to select the preferred forecast.

Where possible and when they exist, this section provides a summary of the forecasting assumptions and analytical methods used to project a variety of possible future forest conditions that could result from present forest management activities.

STRATEGY AND IMPLEMENTATION SCHEDULE

A description of the chosen strategy, including all significant actions to be undertaken and their associated implementation schedule.

MONITORING PROCEDURE

The information provided under this heading summarizes the sources of monitoring information, timing and frequency of monitoring to ensure that Canfor meet the targets.

LINKAGES TO OPERATIONAL PLANS

A demonstration of the links between short-term operational plans and the SFMP.

Classifying indicators is important because it helps us understand the variable we are attempting to measure and the data that is produced. Indicators can be divided into three groups: context, process, and response indicators (Duinker 2000):

- **Context Indicators** – These indicators measure the output of a system where the outcome cannot be controlled at the local level. An example is measuring climate variables such as temperature or precipitation. These indicators provide useful data to help us understand the context in which we operate, but provide little value within our SFMP because the outcome is not directly linked to our actions.
- **Process Indicators** – These indicators measure the output of an agreed upon practice or process. An example is measuring the number of seedlings planted in a given year or season. These indicators are usually very effective because it is relatively easy to establish targets and measure and record data. However, they are based on an assumption that the practice or process is correct in the first place. Further investigation and validation of the assumptions used can help mitigate these uncertainties and facilitate continuous improvement.
- **Response Indicators** – These indicators measure the output of a system as a direct response to actions applied. An example is the change in site index of a managed stand as various silviculture or harvesting practices are applied. These indicators are very useful but are often difficult to measure, or the results are difficult to interpret. The lack of knowledge of biological systems and/or the expense of providing meaningful results can be preventative in the short term. Gathering more knowledge about biological systems, coupled with technological improvements will aid in the development of these types of indicators.

To be effective, an SFMP should contain both process and response indicators. Once all SFM objectives are covered by one or more of these types of indicators, the addition of context indicators may provide enhanced value.

All indicators do not "weigh in" equally. Some will be stronger in some areas while others are weaker. Therefore, any one indicator by itself is "weak", however, it is the package, or suite of indicators that provides the strength to measure performance towards sustainable forest management.

3.1 Ecosystem Representation

Indicator Statement	Target Statement
Proportion of rare ecosystem groups (3, 6, 7, 10, 21) reserved from harvest	100% of rare ecosystems reserved from harvest
SFM Objective: We will conserve or restore ecosystem diversity within the natural range of variation within DFA over time. We will conserve genetic diversity of both wildlife and plant species.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

10 ha or 10% or area, which ever is greater for rare ecosystem groups if required for access purposes.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The following is adapted from Bunnell 2002 and Wells et. al. 2003a,b,c.

Habitat structures and patterns are "medium filters" that are monitored by the indicators of, forest type, seral stage, patch size, snags/cavity sites, coarse woody derbies, riparian, shrubs, and wildlife tree patches, and are designed to capture the habitat requirements of many species. There are, however, many more species about which we know little, but that may be restricted to particular ecosystem types or geographic localities. Most species, but especially those for which knowledge is sparse or absent, are best sustained by ensuring that some portion of each distinct ecosystem type is represented in a relatively unmanaged state.

Unmanaged stands also play an important role as a precautionary buffer against errors in efforts intended to sustain species in the managed forest. While we can develop management practices intended to keep many forest-dwelling species in managed forests, we also recognize that we have insufficient knowledge to ensure that proposed practices will meet all species' requirements in managed stands. That is particularly true of the many poorly known, or completely unknown, organisms. Unmanaged stands are an ecological safeguard against the inevitable errors that occur during management.

Poorly understood functions also will be sustained in unmanaged areas. For example, natural disturbances can occur that would otherwise be suppressed or reduced. While some aspects of natural disturbance can be mimicked in managed stands, other aspects cannot be (e.g., large patches of burned snags, or large areas attacked by spruce or balsam bark beetles). Some species benefit from or rely on these features of natural disturbance, so may not be productive in managed landscapes.

A final function of unmanaged areas in the landscape is to provide an ecological baseline against which the effects of human activities can be compared (Arcese and Sinclair 1997). This role as a benchmark is especially critical in the long-term monitoring required to assess effectiveness of forest practices.

It is preferable to conduct this type of representative management based on site series or clusters of site series or plant associations. An unmanaged condition for the purposes of this indicator is considered as areas not contributing to the long-term harvest level within the DFA or non-timber harvesting land base (Non-THLB).

For the purposes of this SFMP rare ecosystem groups are defined as those that make up less than 1,500 ha on TFL 48.

CURRENT STATUS

Table 5 below shows the ecosystem groups developed by Wells and Haag (2003c) for TFL 48. Those groups highlighted in green indicate the groups removed from the timber harvesting land base because they were rare or less than 1,500 ha within TFL 48.

Table 5: Ecosystem Representation Groups

Group #	Zone	Variant	Site Series	Description
1	BWBS	submesic mw/wk2	mw1-04	Sb - Lingonberry - Coltsfoot; submesic-subhygric, medium
			wk2-04	Sb - Lingonberry - Coltsfoot; submesic-subhygric, very poor-poor
			wk2-01	Sw - Huckleberry - Stepmoss; submesic-mesic, medium
2	BWBS	submesic-subhygric mw/wk2	mw1-03	Sw - Wildrye - Peavine; submesic-mesic, poor-medium
			mw1-01	Sw - At - Stepmoss; submesic-mesic, poor-rich
			mw1-05	Sw - Currant - Oak Fern; mesic-subhygric, rich
			mw1-06	Sw - Currant - Bluebells; mesic-subhygric, rich
3	BWBS	submesic-mesic wk2-03	wk2-03	Sw - Wildrye - Peavine; submesic-mesic, medium
4	BWBS	subhygric-hygric mw1/wk2	mw1-07	Sw - Currant - Horsetail; subhygric-hygric, medium-rich
			wk2-05	Sw - Currant - Bluebells; mesic-subhygric, medium-rich
			wk2-06	Sw - Currant - Horsetail; subhygric-hygric, medium-rich
5	BWBS	xeric mw1-02	mw1-02	Pl - Lingonberry - Velvet-leaved Blueberry; subxeric, poor-medium
6	BWBS	subhygric wk1	wk1-05	Sw - Currant - Bluebells; subhygric, medium-rich
			wk1-06	Sw - Currant - Horsetail; subhygric-hygric, medium-rich
7	BWBS	xeric wk2-02	wk2-02	Pl - Lingonberry - Feathermoss; xeric-subxeric, very poor-poor
8	BWBS	subxeric-mesic wk1	wk1-02	Pl - Lingonberry - Velvet-leaved Blueberry; subxeric, very poor-poor
			wk1-03	Sb - Lingonberry - Coltsfoot; submesic-subhygric, very poor-poor
			wk1-04	Sw - Wildrye - Peavine; submesic-mesic, poor-medium
9	BWBS	mesic wk1-01	wk1-01	Sw - Huckleberry - Stepmoss; submesic-mesic, medium
10	BWBS	subhydric wk1	wk1-07	Sb - Horsetail - Sphagnum; subhydric, very poor-poor
			wk1-08	Sb - Willow - Glow Moss; hygric-subhydric, poor-rich
11	BWBS	subhydric mw1/wk2	mw1-08	Sb - Labrador Tea - Sphagnum; hygric-subhydric, very poor-poor
			wk2-07	Subhydric (Sb - labrador tea - sphagnum)
			wk2-08	Subhydric (Sb - willows - step moss)
12	SBS	subhygric wk2	wk2-05	Sxw - Devil's Club; mesic-subhygric, medium-rich
			wk2-06	Sxw - Horsetail; subhygric-hygric, medium-rich
			wk2-07	Sb – Labrador tea, Sphagnum
13	SBS	mesic-submesic wk2	wk2-03	Sxw - Huckleberry - Highbush Cranberry; submesic, poor-medium
			wk2-01	Sxw - Oak Fern; submesic-mesic, medium
			wk2-04	Sb - Huckleberry - Clubmoss; submesic-subhygric, poor-medium
14	SBS	subxeric wk2	wk2-02	Pl - Huckleberry - Cladina; subxeric, poor
15	ESSF	submesic-mesic-hygric mv	mv2-01	Bl - Rhododendron - Feathermoss; submesic-mesic, poor-medium
			mv4-01	Bl - Rhododendron - Feathermoss; submesic-mesic, poor-rich
			mv4-04	Bl - Rhododendron - Horsetail; subhygric, medium-rich
16	ESSF	drier mv	mv2-02	Bl - Lingonberry; subxeric-submesic, poor-medium
			mv2-03	Bl - Sb - Labrador Tea; submesic, very poor-poor
			mv4-02	Bl - Pl - Crowberry - Cladina; subxeric-submesic, poor
			mv4-03	Bl - Sb - Labrador Tea; submesic, very poor-poor
17	ESSF	mesic-subhygric wk2	wk2-01	Bl - Oak Fern - Knight's Plume; submesic-subhygric, poor-rich
			wk2-04	Bl - Devil's Club - Rhododendron; subhygric-hygric, poor-medium
			wk2-05	Bl - Rhododendron - Lady Fern; subhygric, medium-rich
			wk2-06	Bl - Horsetail - Sphagnum; hygric, medium-rich
18	ESSF	mesic-subhygric mv2	mv2-04	Bl - Oak Fern - Knight's Plume; mesic-subhygric, medium-rich
			mv2-05	Bl - Devil's Club - Rhododendron; subhygric, rich
19	ESSF	subxeric wk2-02	wk2-02	Bl - Oak Fern - Sarsaparilla; subxeric-submesic, poor-medium
20	ESSF	mesic wk2-03	wk2-03	Bl - Oak Fern - Bluebells; mesic-subhygric, medium-rich
21	ESSF	subhygric-hygric mv	mv2-06	Bl - Alder - Horsetail; subhygric-hygric, medium-rich
			mv4-05	Bl - Alder - Horsetail; hygric, poor-rich
22	ESSF	wetter wc3	wc3-01	Bl - Rhododendron - Oak Fern; submesic-mesic, poor-medium
			wc3-03	Bl - Globeflower - Horsetail; mesic-hygric, medium-rich
23	ESSF	xeric wc3-02	wc3-02	Bl - Rhododendron - Queen's Cup; xeric-submesic, very poor-poor

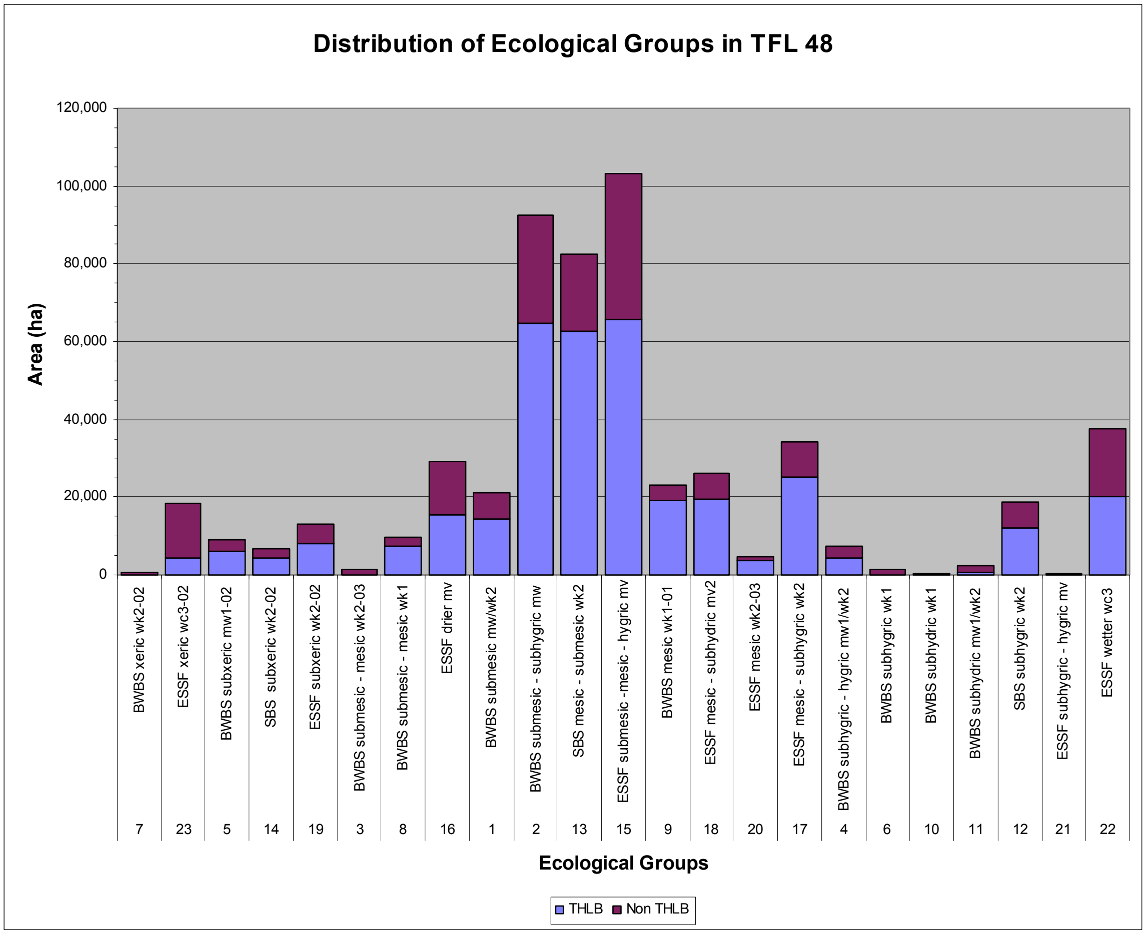


Figure 6: Ecosystem Representation by THLB vs. Non-THLB

The following Table 6 shows the status of blocks that have not had harvesting started to date that have had rare ecosystems identified within the block area based on the strategic level ecosystem mapping. Those blocks that are highlighted in yellow will have the presence or absence of the rare site confirmed and preserved from harvest if present.

Table 6: Current Status of Blocks not Harvested with Rare Ecosystems Identified

LICENCE	BLOCK ID	BLOCK STATE	Rare Sites Comments
SBFEP-TFL	A71867-002	CAT A APPR	Block laid out and field confirmed not to be rare site. Not ESSFmv2 06 but ESSFmv2 01 and 03
TFL48	T1001	CAT A APPR	Block not laid out
TFL48	T1002	CAT A APPR	Block not laid out
TFL48	T1005	CAT A APPR	Block not laid out
TFL48	T2013	CAT A APPR	Block laid out and rare sites within WTP
TFL48	T2014	CAT A APPR	Block laid out and rare sites within WTP
TFL48	T2015	CAT A APPR	Block laid out and rare sites within WTP
TFL48	T2022	CAT A APPR	Block laid out and field confirmed not to be rare site. Not ESSFmv2 06 but ESSFmv2 01 and 04
TFL48	T2031	CAT A APPR	Block not laid out
TFL48	T2034	INFORMATION	Block not laid out
TFL48	T4068	CAT A APPR	Block not laid out (area of rare site < 0.01 ha). Confirm at layout stage that rare site not present
TFL48	T4072	CAT A APPR	Block not laid out
TFL48	T5007	CAT A APPR	Block not laid out

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Setting aside a large percentage of the land base as unmanaged forest to ensure that biological richness is sustained is not compatible with economic and social objectives of managed forests. Fortunately, forest tenures in BC typically have 20% to 50% or more of the forest in an unmanaged state. This unmanaged area is of two types: 1) areas that are not harvested or are harvested only lightly because of concerns other than conserving biological diversity (e.g., operability, visual quality, watershed protection, favoured-species management[1]); and 2) areas intentionally set aside to protect biological diversity (e.g., wildlife tree patches, riparian buffers). This unmanaged proportion of the land base exceeds the objective for protected areas of most jurisdictions (typically 12%, following the Brundtland commission), and is comparable to many recommendations derived from principles of conservation biology (e.g., 33 to 50%; Noss 1993; Sætersdal and Birks 1993; Stokland 1997; Soulé and Sanjayen 1998) (Bunnell 2002).

On the TFL 48 DFA, wholly constrained areas represent 35.8% of the forest. Area identified as rare ecosystems (those ecosystem groups with less than 1,500 ha in total) within TFL 48 represent 4,080 ha or 0.7% of the total forested land base and have been removed from the timber harvesting land base.

All cut block layout completed after June 2005 will incorporate an assessment of rare ecosystems into the fieldwork stage of development.

MONITORING PROCEDURE

This indicator is analyzed at each TSR. Ecosystem groups undergo an extensive review to see whether and by how much they contribute to timber supply. Depending on how much area of each group exists the group is either included or excluded from the timber harvesting land base. The current status was derived from the base case analysis definition of the timber harvesting land base conducted in support of SFMP 4.

During development of Forest Development Plans (FDP) or Forest Stewardship Plans (FSP's) blocks are compared against the rare ecosystem data and activities identified where the presence of the rare ecosystem is confirmed. The results of the ground confirmation will be reported annually in the annual report.

LINKAGES TO OPERATIONAL PLANS

In order to ensure that 100% of the rare ecosystem groups are reserved from harvesting, the following actions will be undertaken.

- Prior to layout being conducted a map identifying the locations of rare ecosystems is compared to proposed road and block locations. The requirement to assess the block for absence or presence of rare ecosystems is tracked in Canfor's forest information management system Genus (Task window of Cut Block Management System).
- The requirement to reserve rare ecosystems from harvest is reviewed with layout contractors during the pre-work stage. This will enable the contractors to identify any of the rare ecosystem sites during their fieldwork.
- Where rare ecosystem groups are identified the areas will be preserved from harvest or road construction by either removing from block or incorporating in WTP's.

[1] Even though favoured species, such as caribou and Northern Goshawk, are a component of biological richness, such species-specific approaches can work against sustaining all of biological diversity. It is important to assess how areas set aside for a single species contribute to the broader goals of representation.

3.2 Forest Types

Indicator Statement	Target Statement
Percent distribution of forest type (deciduous, deciduous mixedwood, conifer mixedwood, conifer) >20 years old across DFA	100% of forest type groups will be within the target range (Conifer - 75-85%, Conifer Mixedwood - 4-6%, Deciduous - 9-15%, Deciduous Mixedwood - 2-4%)

SFM Objective:

We will conserve or restore ecosystem diversity within the natural range of variation within the DFA over time.

We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbance and stress.

We will sustain the natural range of ecosystem productivity to support naturally occurring species.

Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.

ACCEPTABLE VARIANCE

There is no acceptable variance for this indicator. Targets may need to be reviewed following large natural catastrophic events.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Forest type groups are the designation of stand types into one of 4 ecologically significant groups – pure deciduous, deciduous leading mixedwood, conifer leading mixedwood, and pure conifer. The classification is based on the British Columbia Land Classification System (BCLCS). For the purposes of this indicator the BCLCS code treed broadleaf (TB) is deciduous, treed mixed (TM) is mixedwood and treed conifer (TC) is conifer. Treed mixed is further delineated into either deciduous mixedwood or conifer mixedwood based on the leading species.

Table 7: Description of Forest Types

Forest Type	Description
Coniferous*	Greater than 75% of total tree cover is coniferous
Mixed-Coniferous*	Greater than 50% but less than 75% of total tree cover is coniferous
Mixed-Deciduous**	Greater than 50% but less than 75% of total tree cover is deciduous
Deciduous**	Greater than 75% of total tree cover is deciduous

* Contributes to coniferous timber harvesting land base
** Contributes to deciduous timber harvesting land base

This indicator monitors the change in the proportion of forest type groups (>20 years old) within each variant over time. Stands less than 20 years of age are not included because it is expected that 0 - 20 year-old stands will show significant fluctuations in tree species composition each year due to silviculture practices and rapid natural ingress of species in regenerating stands.

This indicator is important because forest operations, through harvesting and reforestation, have a dramatic influence over the composition of forest types across forested landscapes. This influence increases with the duration and intensity of management of regenerating stands. Since forest operations have a significant influence over the distribution of stand composition groups, it is important to monitor changes over time as harvest and reforestation activities are applied.

CURRENT STATUS

The following table (Table 8) indicates the MP 3 status, current status, FDP status and baseline targets for each forest type. Targets are established initially at plus or minus 20% of the MP 3 status and then adjusted to provide a range for groups that have either very low occurrences or where plus 20% would exceed 100%.

Table 8: Forest Type Distribution Current and FDP Status and Target Ranges

	Area by Forest Type					
Forest Type	**MP 3 %[2]**	**2005**	**%**	**2010**	**%**	**Target Range**
Coniferous	80%	407,906	80%	413,252	80%	75-85%
Mixed - Coniferous	5%	26,477	5%	26,858	5%	4-6%
Mixed - Deciduous	3%	17,723	3%	17,876	3%	2-4%
Deciduous	12%	62,437	12%	63,394	12%	9-15%
Grand Total		514,543	100%	521,380	100%	

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? Yes

The FDP is incorporated into the forest inventory and stands that are proposed to be harvested are removed from this calculation. This provides an assessment of which type of stands are being harvested and how this is effecting the distribution of the remaining stands and if the forest type distribution is moving away from the baseline targets. This provides direction on what reforestation strategies should be to maintain the percent distribution by landscape unit over time.

The timber supply review divides the land base into various analysis units based upon species composition and site index. Specific regeneration assumptions are then modeled over time, which approximate a similar species composition being re-established on each site (See Appendix 5 – Timber Supply Analysis Information Package).

STRATEGY AND IMPLEMENTATION SCHEDULE

The forest type strategy is to maintain the relative species composition by forest type group across the TFL within the ranges identified in Table 8. This supports two objectives, one to maintain the relative ecological function and habitats over time and the second is to sustain the harvest species and manufacturing facilities that rely on a portion of their harvest profile of either conifer or deciduous species.

Coniferous Strategy

Canfor's coniferous fibre supply strategy is to maximize the sustainable coniferous timber production from the TFL conifer sites.

The economic operability criteria developed for the different harvesting systems in use on the TFL determines the operable land base that supports the proposed AAC.

Minor components of commercial deciduous species that occur in conifer leading stands will be managed over the total land base to achieve a variety of landscape level objectives. Management regimes will range from maintaining mature deciduous stems on site to contribute to non-timber resource values (Indicator 3.36 – Visual, Indicator 3.5 – Snags/Live Tree Retention, Indicator 3.7 – Riparian, etc.) to removing all deciduous volumes where resource values will not be compromised and economic conditions permit. Deciduous that is harvested incidentally from conifer leading stands contributes to the conifer AAC and is accounted for accordingly.

Deciduous Fibre Strategy

Canfor's deciduous fibre supply strategy is to maintain the existing commercial deciduous production from the TFL operable deciduous land base. A maximum harvest of 101,300 m^3/year (to be determined by Chief Forester) can be maintained.

Deciduous leading stands that occur on non-conventional (mixed, cable and aerial harvesting systems) ground, or in the ESSF Biogeoclimatic Zone do not contribute to the proposed deciduous harvest level.

Canfor is currently operating an OSB plant in Ft. St. John as part of a 50/50 joint venture with Louisiana Pacific. It is expected that this will create additional demand for utilization of the deciduous fibre. The Peace Valley OSB plant is began production in the fall of 2005.

[2] MP 3 data is shown as a percent due to a slight change in the way this indicator is reported. The indicator has change to reporting only stands greater than 20 years old and there have been some changes to the area of TFL 48.

Our deciduous utilization policy will be to plan, permit and make available for sale, all commercial deciduous species from deciduous leading stands (as determined by the individual block cruise), up to the level of the deciduous harvest as determined by the Chief Forester.

Commercial deciduous volumes will be made available for purchase to the holders of Pulpwood Agreements 10 and 13 under a negotiated fibre supply agreement. In the absence of a fibre supply agreement, this fibre will be made available to any company or individual that wishes to purchase the timber. If no purchaser can be found, the deciduous component will be left standing and made available when economic conditions permit.

In 2001 Louisiana-Pacific Canada Ltd. and Canadian Forest Products Ltd. had signed a memorandum of understanding pertaining to the management of deciduous leading stands within the common boundaries of TFL 48 and PA's 10 and 13. Since that time Louisiana Pacific enacted their option to exit from the agreement to remove any encumbrances to the PA 13 licence as they were selling the pulp mill and tenure to Tembec. Tembec has since indicated that they would honour the intent of the MOU. The MOU contained a provision that they would develop and harvest some volume as part of the transition for areas that were already within the PA 13 FDP. Canfor is currently working with Tembec on an MOU to cover the management of deciduous leading stands on TFL 48.

All deciduous and conifer species cut from deciduous leading stands will be tracked separately (from the conifer AAC) and contribute to the deciduous harvest level. Any coniferous volumes that are harvested from deciduous leading stands will be utilized in Canfor's manufacturing facilities.

The Ministry of Forests and Range is responsible for providing TSL information such as regeneration success, post harvest assessments and volumes harvested to Canfor for incorporation into Forest Development Plans and Management Plans for those deciduous areas that have been harvested through the previous Small Business Forest Enterprise Program.

BCTS does not have a deciduous allocation on TFL 48.

Mixed Wood Fibre Strategy

The forested land base of TFL 48, although dominated by coniferous stands, is comprised of a variety of forest types, each of which contributes to the TFL's coniferous and/or deciduous fibre supply (Table 9).

Table 9: Forest Type Distribution Within TFL 48

Forest Type	Species Mix	% Landbase		Management Regime
		Forested	THLB	
Coniferous	Coniferous >75% Deciduous <25%	80%	82%	Manage for conifer sawlogs at 81-121 years minimum
Mixed Wood Coniferous leading	Coniferous >50% Deciduous >25%	5%	5%	Manage for conifer sawlogs at 81-121 years minimum
Mixed Wood Deciduous leading	Coniferous >25% Deciduous >50%	3%	3%	Manage for conifer sawlogs at 81 years minimum[3]
Deciduous	Coniferous <25% Deciduous >75%	12%	10%	Manage for deciduous sawlogs at 61 years minimum

Harvest planning will strive to blend mixed wood stands into the harvest profile. Operability constraints may have to be adjusted to reflect the equipment complement required to capture the value contribution of these stands.

Biological constraints must also be considered within a mixed wood management strategy. Mixed stands, although composed of different species, tend to be even aged as a result of forest succession following disturbance. In coniferous leading stands, the conifers may not have reached harvesting age while the deciduous is in decline.

It is not the intention to necessarily regenerate an area back to the same species composition as was harvested, however over the landscape and over time the forest type groups will be maintained within the baseline target range for each forest type group.

[3] The intention is to not manage for a mid rotation deciduous entry but to wait until the conifer will form a saw log. The management intent is to regenerate these sites back to a similar species composition to be tracked at the landscape level.

Long-term monitoring of species composition change within managed stands will occur through Change Monitoring Inventory (CMI) plots established over the DFA. These plots are systematically established across the DFA based on a 2-km grid in managed stands 15 years after harvesting. These plots will provide a representative sample of all managed stands over time. The first set of plots is to be established in 2006. Once the initial backlog of approximately 61 samples is established for stands that have been harvested greater than 15 years ago there will be an additional 3 to 5 samples established each year.

MONITORING PROCEDURE

Data sources include vegetation resource inventory (VRI) and GENUS data.

VRI information is updated by Canfor. These data sources are updated periodically to support FDP/FSP planning or TSR processes. The Genus system is a "real-time, or live" database that is maintained and updated by the Canfor staff as they carry out their daily activities. Genus data is used from the silviculture current status to update the VRI to account for depletion and silviculture activities.

The following formula documents the analysis methods for this indicator.

Formula:

$$\mathbf{FT\%}_{\text{species group}} = (\mathbf{FTA}_{\text{species group}} / \mathbf{PFA}_{\text{TFL}}) * 100$$

Variables:

$\mathbf{FTA}_{\text{species group}}$	Forest type area by species group for stands > 20 years old for TFL
$\mathbf{PFA}_{\text{TFL}}$	Productive forest area across TFL > 20 years old
$\mathbf{FT\%}_{\text{species group}}$	The resulting percent of each forest type group for TFL 48

To monitor this indicator, the report will be run at each SFMP and compared to the overall target.

LINKAGES TO OPERATIONAL PLANS

The data will be used at a strategic direction level to guide provide feedback on silviculture strategies and used by the silviculture staff to review long term trends in reforestation policies and to adjust practices where necessary.

3.3 Late Seral Forest

Indicator Statement	Target Statement
The minimum acceptable proportion (%) of late seral forest by Natural Disturbance Unit (NDU) and NDU by BEC	The minimum proportion (%) of late seral forest by NDU and NDU by BEC as shown in Table 11
SFM Objective: We will conserve or restore ecosystem diversity within the natural range of variation within DFA over time. We will conserve genetic diversity of both wildlife and plant species.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Harvesting can continue in late seral stands if at least 50% of the target is met and the time to reach the full target is not delayed by more than 10 years.

Where large natural disturbances occur within Natural Disturbance Units the minimum proportion of late seral may decline by 5% to relieve salvage pressures and allow young natural forests to persist on the landscape.

A variance of up to 50 ha in each NDU is acceptable to allow access location or small inclusions within larger blocks.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Forests occurring in different seral and structural stages over space and time are recognized as an important part of the landscape that provides distinct habitat elements for a variety of species. Late seral is defined as greater than 100 years for deciduous leading stands and greater than 140 years old for coniferous leading stands. DeLong (2002) has estimated the natural range of variation for different Natural Disturbance Units within the DFA.

Deciduous stands are typically a short lived early seral species and if left undisturbed for long periods of time (>150 years) will eventually convert to coniferous stands or die and cycle back to a similar species composition. Therefore it would be inappropriate to manage for the same distribution of ages for deciduous as for conifer species.

Deciduous stands greater than 100 years old are structurally distinct from young and mature stands (Stelfox 1995). These stands provide lower density stands and hence larger diameter trees, higher level of coarse woody debris and are therefore important to maintain some occurrence on the landscape over time. DeLong (personal communication) recommends that 10 to 15% of deciduous dominated landscapes be maintained in stands greater than 100 years old. As deciduous makes up approximately 30% of the forested land base in the Boreal Plains and Boreal Foothills Valley NDU's, targets are applied to both deciduous and coniferous in these NDU's. Deciduous makes up only 1.6% (1.1% is within the ESSF and excluded from the THLB) of the remainder of the TFL and as a result only one late seral target is applied to the entire forested land base in the Boreal Foothills Mountain, Omineca and Wet Mountain NDU's.

Additionally the Natural Range of Variation estimated by DeLong (2002) is based on very large areas. The proportion of each NDU within TFL 48 is considerably smaller, ranging from less than 1% to 43% of each larger NDU (See Table 10). Therefore it would be expected that the range of variation would be considerably larger at the smaller scale. While it may be within the natural range of variation to have almost no Late Seral forest in some of the smaller portions of TFL 48 when compared to the larger NDU it is still desirable to have some level of Late Seral distributed across representative disturbance units and at a finer biogeoclimatic ecological classification (BEC) units within managed forested landscapes. Subsequently targets are applied at two separate scales one target at the minimum natural range of variation at the NDU level and at 30% of the minimum natural range of variation at the NDU by BEC level (See Table 11). The exception to this is for the deciduous leading stands in the Boreal Plains and Boreal Foothills Valley where the target is the same at both the NDU and NDU by BEC levels. Units that have very small areas within TFL 48 such as the Boreal Plains – Conifer /SBSwk2 unit do not have targets applied at the NDU by BEC level.

Table 10: Proportion of NDU's within TFL 48

		Area Outside TFL48		Area within TFL48		Total ha
Natural Disturbance Unit	**NDU Subzone**	**ha**	**%**	**ha**	**%**	
Boreal Plains		9,638,065	99%	120,460	1%	9,758,525
Boreal Foothills	Mountain	529,623	72%	205,406	28%	735,029
	Valley	238,695	57%	178,219	43%	416,914
Omineca	Mountain	2,819,489	99%	15,031	1%	2,834,520
	Valley	2,150,533	100%	6,504	0%	2,157,037
Wet Mountain		1,369,048	92%	117,618	8%	1,486,666
Grand Total		16,745,452	96%	643,239	4%	17,388,691

Table 11: Late Seral Forest Targets

Natural Disturbance Unit	BEC	Late Seral Target >100 Yrs Decid >140 Yrs Conifer	Years to Meet Target
Boreal Plains - Deciduous	BWBSmw 1	10%	0
	BWBSwk 1	10%	0
	ESSFmv 2	10%	0
	SBS wk 2	N/A	N/A
Boreal Plains - Deciduous Total		10%	0
Boreal Foothills - Valley - Deciduous	BWBSmw 1	10%	0
	BWBSwk 1	10%	0
	BWBSwk 2	10%	0
	SBS wk 2	10%	0
Boreal Foothills - Valley - Deciduous Total		10%	0
Boreal Plains - Conifer	BWBSmw 1	5%	0
	BWBSwk 1	5%	0
	ESSFmv 2	5%	0
	SBS wk 2	N/A	N/A
Boreal Plains - Conifer Total		17%	20
Boreal Foothills - Valley - Conifer	BWBSmw 1	7%	0
	BWBSwk 1	7%	0
	BWBSwk 2	7%	0
	SBS wk 2	7%	0
Boreal Foothills - Valley - Conifer Total		23%	10
Boreal Foothills - Mountain	ESSFmv 2	10%	0
	ESSFmv 4	10%	0
	ESSFwc 3	10%	0
	ESSFwk 2	10%	0
Boreal Foothills - Mountain Total		33%	10
Omineca - Valley	BWBSmw 1	N/A	N/A
	SBS wk 2	7%	0
Omineca - Valley Total		23%	0
Omineca - Mountain	ESSFmv 2	17%	0
Omineca - Mountain Total		58%	40
Wet Mountain	ESSFmv 2	25%	0
	ESSFwc 3	25%	0
	ESSFwk 2	25%	0
	SBS wk 2	25%	0
Wet Mountain Total		84%	100
Grand Total			

CURRENT STATUS

The following Table 12 and Table 13 outline the status of TFL 48 in relation to the targets both currently and after the harvesting of all proposed blocks in the current FDP. As this indicator is a considerable departure from the current Landscape Planning Guide or the Old Growth Order this is the first time that this indicator has been reported for the new targets.

Table 12: Current and FDP Status of Late Seral Forest – Deciduous

		Deciduous Seral Age Groups															
						40-100				101+							
NDU	**BEC**	2005	%	2010	%	2005	%	2010	%	2005	%	Surplus (Deficit)	2010	%	Surplus (Deficit)	Total Forested Area (ha)	101+ Target
Boreal Plains - Deciduous	BWBSmw 1	3,157	8%	5,669	15%	21,403	57%	20,107	53%	13,304	35%	9,517	12,086	32%	8,300	37,863	10%
	BWBSwk 1	207	5%	283	7%	2,994	75%	2,956	74%	779	20%	381	741	19%	343	3,981	10%
	ESSFmv 2	13	3%	11	2%	369	85%	350	80%	53	12%	10	75	17%	31	436	10%
	SBS wk 2		0%		0%	11	28%	11	28%	29	72%	N/A	29	72%	N/A	40	N/A
Boreal Plains - Deciduous Total		3,377	8%	5,964	14%	24,777	59%	23,425	55%	14,165	33%	9,933	12,931	31%	8,699	42,319	10%
Boreal Foothills - Valley - Deciduous	BWBSmw 1	2,456	11%	2,868	13%	11,359	51%	10,673	48%	8,336	38%	6,121	8,611	39%	6,396	22,152	10%
	BWBSwk 1	28	2%	54	4%	1,065	72%	1,064	72%	380	26%	233	355	24%	208	1,473	10%
	BWBSwk 2	247	5%	480	9%	2,240	44%	2,004	39%	2,615	51%	2,105	2,619	51%	2,109	5,103	10%
	SBS wk 2	581	7%	604	7%	5,726	67%	5,375	63%	2,274	27%	1,416	2,601	30%	1,743	8,581	10%
Boreal Foothills - Valley - Deciduous Total		2,732	10%	3,402	12%	14,664	51%	13,741	48%	11,332	39%	8,459	11,585	40%	8,712	28,728	10%

Table 13: Current and FDP Status of Late Seral Forest – Coniferous

		Coniferous Seral Age Groups																			
						40-100								141+							
NDU	BEC	2005	%	2010	%	2005	%	2010	%	2005	%	2010	%	2005	%	Surplus (Deficit)	2010	%	Surplus (Deficit)	Total Forested Area (ha)	141+ Target
Boreal Plains - Conifer	BWBSmw 1	7,866	24%	9,168	28%	10,725	33%	9,973	31%	11,820	36%	10,267	32%	2,050	6%	427	3,053	9%	1,430	32,462	5%
	BWBSwk 1	2,315	10%	4,003	17%	6,783	29%	6,022	25%	12,555	53%	10,550	44%	2,117	9%	928		13%	2,006	23,770	5%
	ESSFmv 2	625	5%	895	7%	2,442	19%	2,021	16%	6,603	51%	6,311	48%	3,344	26%	2,693	3,789	29%	3,138	13,015	5%
	SBS wk 2	3	1%	3	1%	178	89%		89%	10	5%	10	5%	10	5%	N/A	10	5%	N/A	201	N/A
Boreal Plains - Conifer Total		10,809	16%	14,069	20%		29%	18,194	26%	30,989		27,137	39%	7,521	11%		10,047	14%	(1,759)	69,447	
Boreal Foothills - Valley - Conifer	BWBSmw 1	4,419	14%	5,226	16%	9,152	29%	8,606	27%	12,338	39%	10,593	33%	5,946	19%	3,716	7,430	23%	5,200	31,855	7%
	BWBSwk 1	655	12%	1,096	20%	1,809	33%	1,646	30%	1,298	24%	946	17%	1,665	31%	1,286		32%	1,359	5,427	7%
	BWBSwk 2	450	6%	655	9%	3,561	48%	3,528	47%	2,760	37%		35%	674	9%	153	683	9%	161	7,444	7%
	SBS wk 2	13,090	16%	17,343	21%	26,275	32%	21,550	26%	23,563	28%	21,755	26%	20,190	24%	14,371	22,469	27%	16,651	83,118	7%
Boreal Foothills - Valley - Conifer Total		18,614	15%	24,320	19%	40,797	32%	35,330	28%	39,958	31%	35,874	28%	28,475	22%	(929)	32,320	25%	2,916	127,844	23%
Boreal Foothills - Mountain	ESSFwc 3	2,479	10%	1,960	8%	4,900	20%	4,952	20%	9,827	40%	9,495	39%	7,321	30%	4,868	8,120	33%	5,667	24,527	10%
	ESSFwcp	318	21%	273	18%	427	28%	370	24%	753	49%	778	51%	40	3%	N/A	119	8%	N/A	1,539	N/A
	ESSFwk 2	3,636	14%	4,498	17%	7,314	28%	6,655	25%	9,340	35%	8,848	34%	6,116	23%	3,475	6,405	24%	3,765	26,406	10%
	ESSFmv 2	10,722	10%	11,667	11%	27,240	26%	25,493	24%	31,330	29%	29,578	28%	36,930	35%	26,308	39,485	37%	28,863	106,223	10%
	ESSFmv 4	740	6%	988	8%	5,801	49%	5,155	44%	3,876	33%	4,147	35%	1,320	11%	147	1,448	12%	274	11,738	10%
	ESSFmvp	736	13%	622	11%	1,819	32%	1,678	29%	1,899	33%	1,957	34%	1,255	22%	N/A	1,453	25%	N/A	5,709	N/A
Boreal Foothills - Mountain Total		18,632	11%	20,008	11%	47,502	27%	44,303	25%	57,025	32%	54,801	31%	52,983	30%	(5,144)	57,030	32%	(1,097)	176,141	33%
Omineca - Valley	BWBSmw 1		0%		0%	13	49%	13	49%	14	51%	14	51%		0%	N/A		0%	N/A	27	N/A
	SBS wk 2	683	11%	656	11%	658	11%	471	8%	3,394	55%	3,385	55%	1,441	23%	1,009	1,665	27%	1,233	6,177	7%
Omineca - Valley Total		683	11%	656	11%	672	11%	484	8%	3,408	55%	3,399	55%	1,441	23%	14	1,665	27%	238	6,204	23%
Omineca - Mountain	ESSFmv 2	857	7%	1,282	10%	1,863	14%	1,418	11%	6,498	49%	6,289	48%	3,968	30%	1,727	4,198	32%	1,956	13,186	17%
	ESSFmvp	47	9%	47	8%	108	19%	99	18%	268	48%	277	50%	132	24%	N/A	132	24%	N/A	556	N/A
Omineca - Mountain Total		904	7%	1,329	10%	1,971	14%	1,517	11%	6,766	49%	6,566	48%	4,101	30%	(3,870)	4,330	32%	(3,640)	13,742	58%
Wet Mountain	ESSFwc 3	1,938	6%	2,081	6%	4,290	13%	3,795	12%	5,904	18%	5,980	18%	20,215	62%	12,128	20,490	63%	12,404	32,347	25%
	ESSFwcp	491	11%	491	11%	1,296	28%	1,100	24%	1,724	38%	1,818	40%	1,075	23%	N/A	1,176	26%	N/A	4,586	N/A
	ESSFwk 2	4,064	15%	4,941	19%	4,036	15%	3,215	12%	3,133	12%	3,496	13%	15,006	57%	8,446	14,588	56%	8,028	26,240	25%
	ESSFmv 2	667	4%	831	5%	3,782	23%	3,428	21%	3,382	21%	3,297	20%	8,425	52%	4,361	8,702	54%	4,637	16,257	25%
	ESSFmvp	250	17%	250	17%	620	41%	547	37%	292	19%	322	22%	334	22%	N/A	377	25%	N/A	1,496	N/A
	SBS wk 2	2,254	20%	3,464	30%	3,376	29%	2,517	22%	1,920	17%	1,785	15%	4,006	35%	1,117	3,791	33%	902	11,556	25%
Wet Mountain Total		9,665	10%	12,058	13%	17,400	19%	14,602	16%	16,355	18%	16,698	18%	49,062	53%	(28,623)	49,124	53%	(28,561)	92,482	84%

Source: VRI – 2004 and Current TFL 48 FDP(2004 Major Amendment))

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? Yes

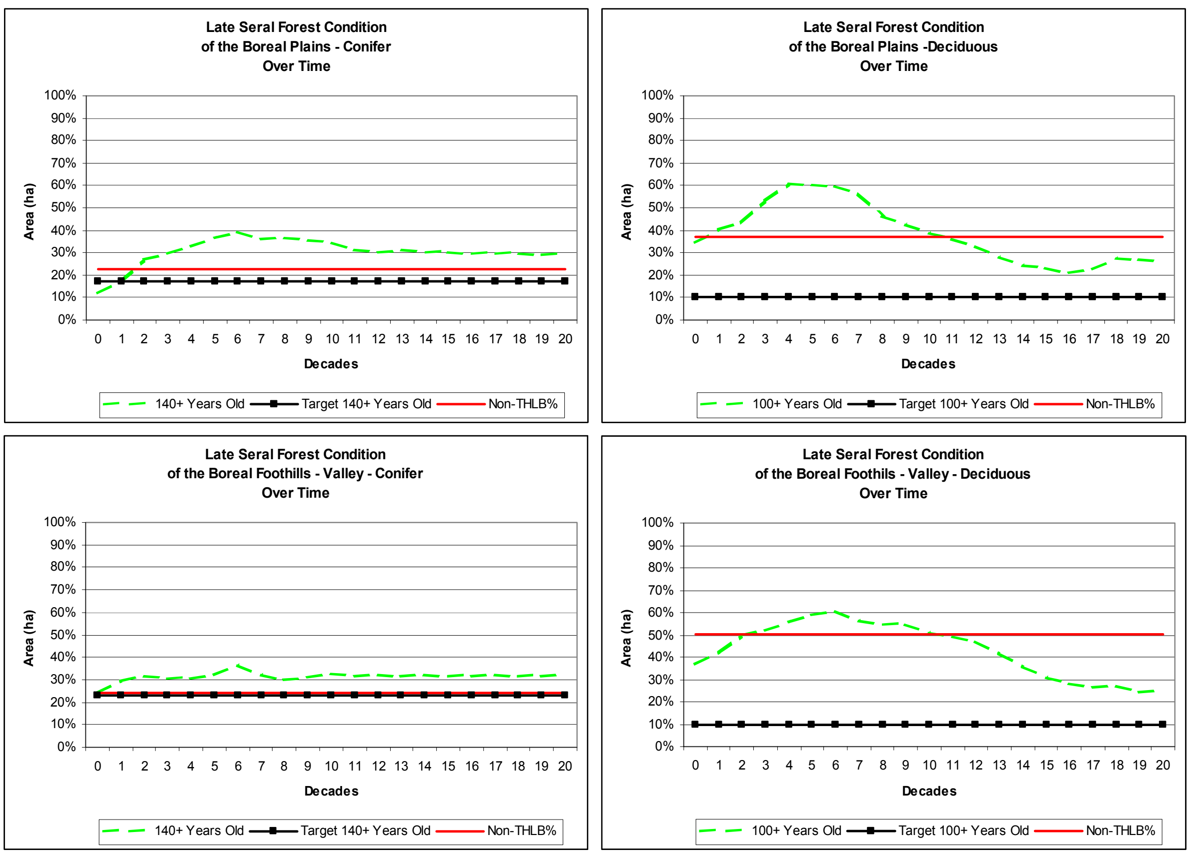
The Late Seral Forest targets are applied in timber supply analysis forecasts. The constraint is applied as an area target that must be greater than 140 years old for conifer or 100 years old for deciduous. Harvesting is allowed in the model from younger age classes as long as there is enough area reserved to allow recruitment to achieve the target.

STRATEGY AND IMPLEMENTATION SCHEDULE

Seral targets have been applied and monitored since 2000 on TFL 48. Seral targets as described earlier are based on ranges appropriate to a very large natural disturbance unit. On TFL 48 they are being applied at a smaller portion of the NDU. As a result of this, previous natural disturbances and harvesting, the targets are not always met initially in each NDU.

If sufficient amounts of late seral are not available then harvesting may only continue if the proposed harvesting of late seral does not lower the post FDP or FSP status to less than 50% of the late seral target. The proposed harvesting will not impact the forecasted timeline to achieve the target by more than 10 years. Harvesting of "mature" seral stages will be planned so as not to compromise recruitment of late seral stages. After replacement stands develop into late seral stages (from mature), then stands that were deferred are available for harvest.

The following graphs (Figure 7) indicate the change in status of the seral stage in relation to the target.



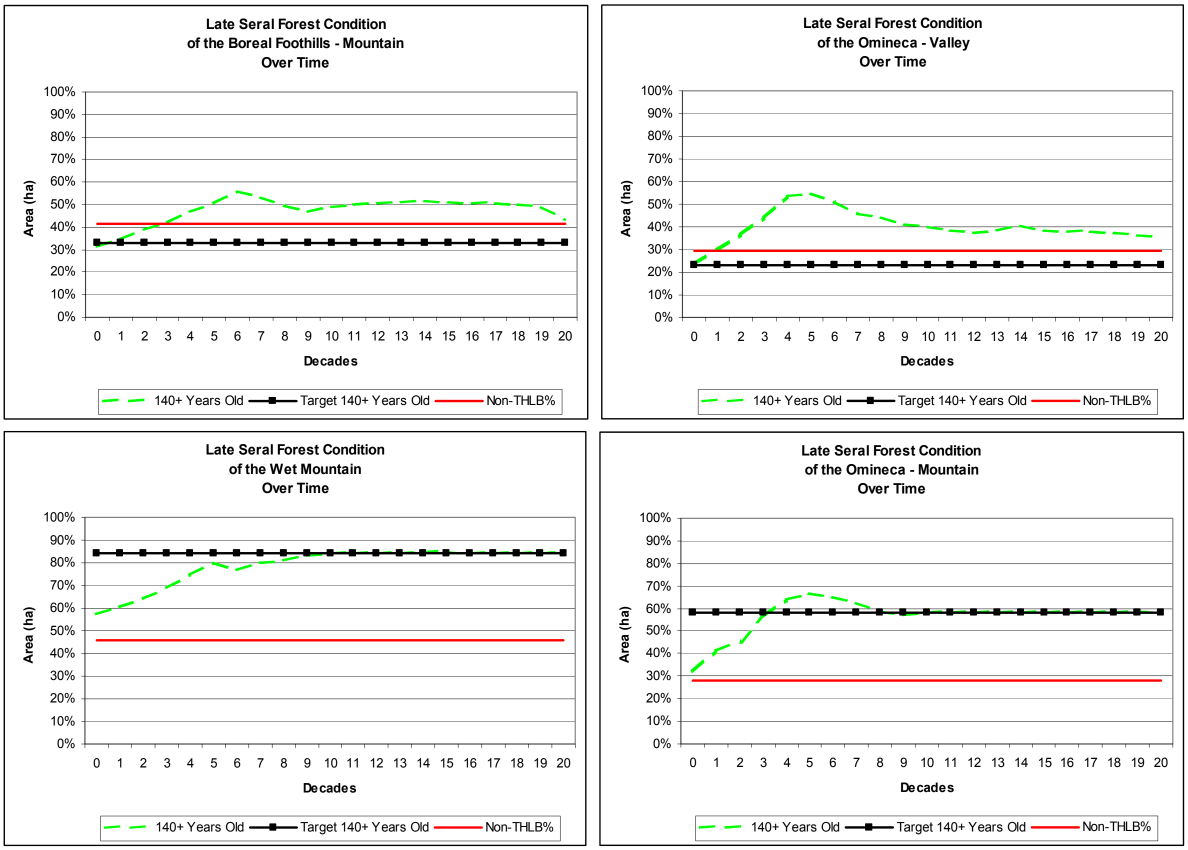


Figure 7: Change in Status of Late Seral Forest Over Time

<u>MONITORING PROCEDURE</u>

Data sources for this include forest cover, Genus data, Natural Disturbance Unit boundaries, BEC and DFA boundaries.

Forest cover will be updated with harvesting data from Genus as required to complete seral stage analysis. Disturbances due to fires and other industrial users are generally updated less frequently (approximately 5 year intervals).

There are two steps that are required to be completed for reporting this indicator. The calculations are described below:

The first step will be to update and project the forest cover for all disturbances to the current reporting period based on Genus data. Each stand is assigned to either the deciduous or coniferous group based on the leading species and a seral stage based on the age of the leading species for the rank 1 layer. The area of each stand is then summed for by NDU/LU and expressed as a percentage of the productive forested area within the NDU/LU.

The second step is to include all proposed harvesting, project ages to the end of the proposed development period and calculate the seral distribution as described above.

The monitoring of this indicator will occur coincident with the development of a FDP or FSP.

Formula:

$$\%\mathbf{S}_{\text{class, NDU}} = (\mathbf{S}_{\text{class, NDU}} / \mathbf{TFA}_{\text{NDU}}) * 100$$

$$\%\mathbf{S}_{\text{class, NDU,BEC}} = (\mathbf{S}_{\text{class, NDU,BEC}} / \mathbf{TFA}_{\text{NDU, BEC}}) * 100$$

Variables:

S $_{class, NDU}$	Amount of productive forest land (ha) within the Late Seral class by the specific NDU
S $_{class, NDU, BEC}$	Amount of productive forest land (ha) within the Late Seral class by the specific NDU by BEC
TFA $_{NDU}$	Total productive forest land (ha) within the specific NDU
TFA $_{NDU, BEC}$	Total productive forest land (ha) within the specific NDU by BEC
%S $_{class, NDU}$	Percentage of Late Seral class by the specific NDU
%S $_{class, NDU, BEC}$	Percentage of Late Seral class by the specific NDU by BEC

LINKAGES TO OPERATIONAL PLANS

FDP's or FSP's will be analyzed to ensure that they are consistent with targets and implementation schedule for seral stage prior to publication. Proposed development will be adjusted if necessary to ensure consistency with targets and recruitment strategies.

3.4 Patch Size Distribution

Indicator Statement	Target Statement
Percent area by Patch Size Class (0-50, 51-100 and >100 ha) by Natural Disturbance Unit (NDU) by early or mature and proportion of mature interior forest condition.	Targets by Patch Size Class by NDU by early or mature are shown in Table 14.
SFM Objective: We will conserve or restore ecosystem diversity within the natural range of variation within DFA over time.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCES

Natural disturbance events that shift the patch size distribution to such a level that it cannot be accommodated in a short (decade) time frame. An action plan will be created in this event to develop strategies to trend back to the targets over time.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

A patch is defined as a stand of similar-aged forest resulting from either a natural disturbance or created by timber harvesting. A patch may be composed of either a single disturbance event or an aggregate of events (natural, timber harvesting, or a combination of both). In forested landscapes patches represent a legacy or history of disturbances and as such may have a variety of species, stocking and ages contained within one patch. Forest patches are created naturally by disturbances such as fire, wind or pest outbreaks. In the absence of these natural disturbances forest management, through harvesting, affects the distribution and size ranges of forest patches. Over a rotation or more of the forest, harvesting can then lead to either inflating or fragmenting the landscape beyond the limits of the natural variability of the landscape, which has developed over centuries from natural disturbances. It is therefore important to establish target ranges for the size of patches that are consistent with the natural pattern of forested landscapes. This indicator will monitor the consistency of our harvesting patterns compared to the natural pattern of our landscapes.

With forest management it is then important to manage not only what is created through early patches but also what is left as mature forest patches. As such both early and mature patches are monitored over time. Mature patches are reported in two ways (Table 16), the distribution of each patch class by NDU and the relative proportion of each class that is in an interior forest condition. Interior forest condition is defined as that inner portion of a mature patch more than 100m from the edge.

The distribution of early and mature patches is monitored based on Natural Disturbance Units (NDU's). Natural disturbance units are used as they represent areas with similar disturbance patterns, and they are expected to have similar landscape level size distributions of young and mature patch sizes. The NDU's are based on natural disturbance regime research by DeLong (2002). There are approximately 21,500 ha or less than 1% of the Omineca NDU within TFL 48 (See Table 10). Due to the small amount of the Omineca NDU within TFL 48 and the similarity of the disturbance patterns the Omineca and Boreal Foothills NDU's are grouped together for the purposes of patch targets.

Targets are applied separately for early and mature patches and the overall proportion of mature in an interior forest condition. See Table 14 for the targets by NDU. Targets are applied to patches greater than 100 ha for early and mature patches and just to early for 50 – 100 ha patches. For early patches there are 2 main design consideration that are appropriate one is maintaining a minimum amount of large early patches and the second is minimizing the mid size patches as these are generally the least prevalent in a natural landscape. Generally targets are not applied to early patches less than 50 ha, the one variance to this is in the Wet Mountain NDU (See Table 14). The early patch target is applied as a maximum amount for patches greater than 100 ha. Long term forecasting indicates that early patches greater than 100 ha disappear within the Wet Mountains. This primarily is based on the seral constraint and the length of time to recruit mature into late seral forest has limited the amount of harvesting in some periods in this NDU.

While DeLong (2002) provides NDU guidance on the natural disturbance regimes and patterns, there are additional forest management constraints such as visual management (Section 3.36), and peak flow index or equivalent clear cut area for water quantity management (Section 3.29) that limit our ability to fully achieve a natural pattern. The targets in Table 14 reflect both our desire to manage a natural landscape pattern as well as the additional constraints that we manage for.

Table 14: Patch Size Class Targets

NDU	Patch Size Class Targets (%)				
	Early	Early	Early	Mature	
	< 50 ha	50-100 ha	100+ ha		% Mature Interior Forest
Boreal Plains	N/A	<15%	>50%	>70%	>30%
Boreal Foothills / Omineca	N/A	<20%	>40%	>80%	>35%
Wet Mountains	N/A	<25%	<60%	>85%	>60%

CURRENT STATUS

The following Table 15 and Table 16 show the current status the status after the current Forest Development Plan and the forecasted status for the next 100 years in 20-year increments.

Table 15: Early Patch Size Class Current and Future Status

NDU	Time Period from 2005 in Decades	Patch Size Class (ha)								Total ha
		<50		51-100			100+			
		ha	%	ha	%	Target	ha	%	Target	
Boreal Plains	0	1,918	16%	749	6%		9,340	78%		12,008
	Post FDP	2,172	10%	1,186	6%		17,888	84%		21,246
	2	3,349	25%	1,487	11%		8,583	64%		13,419
	4	3,823	23%	1,915	11%	<15%	10,918	66%	>50%	16,656
	6	3,425	21%	2,502	15%		10,539	64%		16,466
	8	4,173	29%	1,784	12%		8,498	59%		14,455
	10	4,230	35%	1,505	12%		6,318	52%		12,053
Boreal Foothills/Omineca	0	7,445	22%	6,262	18%		20,489	60%		34,197
	Post FDP	9,236	17%	7,836	14%		37,954	69%		55,027
	2	7,994	23%	5,957	17%		21,372	61%		35,323
	4	11,575	36%	5,573	17%	<20%	14,829	46%	>40%	31,977
	6	10,244	37%	5,738	20%		12,051	43%		28,033
	8	11,041	38%	6,163	21%		11,633	40%		28,836
	10	10,604	30%	5,312	15%		20,001	56%		35,917
Wet Mountain	0	1,222	23%	1,205	23%		2,840	54%		5,267
	Post FDP	3,325	31%	1,464	14%		5,914	55%		10,703
	2	1,298	29%	1,114	25%		1,991	45%		4,402
	4	0	0%	0	0%	<25%	0	0%	<60%	0
	6	770	88%	105	12%			0%		876
	8	449	89%	53	11%			0%		502
	10	836	78%	229	22%			0%		1,065

Table 16: Mature Patch Size Class Current and Future Status

NDU	Time Period from 2005 in Decades	Patch Size Class (ha)										Total ha	Total Interior Forest %	Interior Forest Target %
		<50			51-100			100+						
		ha	%	Int%	ha	%	Int%	ha	%	Target	Int%			
Boreal Plains	0	6,782	12%	6%	1,948	3%	23%	48,148	85%		54%	56,878	47%	
	Post FDP	9,009	17%	9%	3536	7%	28%	41,590	77%		52%	54,135	43%	
	2	5,882	15%	8%	2,322	6%	23%	29,840	78%		49%	38,045	41%	
	4	7,379	11%	7%	3,010	4%	22%	59,360	85%	>70%	51%	69,749	45%	>30%
	6	6,568	9%	6%	1,917	3%	19%	63,034	88%		47%	71,520	43%	
	8	6,610	10%	5%	2,471	4%	20%	57,620	86%		42%	66,702	37%	
	10	7,563	11%	5%	2,756	4%	23%	55,503	84%		37%	65,822	33%	
Boreal Foothill/ Omineca	0	15,322	7%	5%	5,448	2%	20%	197,640	90%		60%	218,409	55%	
	Post FDP	22,140	10%	7%	9,096	4%	28%	194,861	86%		55%	226,097	50%	
	2	10,405	6%	16%	3,367	2%	32%	159,807	92%		61%	173,578	57%	
	4	11,821	5%	5%	3,246	1%	20%	237,124	94%	>80%	53%	252,191	50%	>35%
	6	12,573	5%	4%	3,459	1%	19%	235,149	94%		50%	251,181	47%	
	8	11,934	5%	4%	3,074	1%	17%	237,987	94%		48%	252,995	45%	
	10	14,249	6%	4%	4,118	2%	13%	228,785	93%		41%	247,152	38%	
Wet Mountain	0	2,449	3%	5%	216	0%	13%	68,969	96%		61%	71,633	59%	
	Post FDP	3,210	4%	6%	645	1%	23%	68,014	95%		52%	71,870	50%	
	2	1,499	2%	18%	397	1%	22%	58,757	97%		64%	60,653	62%	
	4	1,670	2%	7%	126	0%	19%	80,299	98%	>85%	68%	82,095	66%	>60%
	6	1,543	2%	5%	273	0%	27%	80,616	98%		67%	82,432	65%	
	8	1,599	2%	4%	221	0%	16%	77,947	98%		63%	79,767	62%	
	10	1,586	2%	3%	111	0%	12%	79,418	98%		61%	81,115	60%	

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

Forecasting of this indicator was completed with two separate processes. The spatial timber supply model Woodstock/Stanley was used to forecast patches into the future for the first 100 years of the simulation. The second method was to incorporate the current Forest Development Plan and forecast the result of implementing the harvest areas and report the status in relation to the targets. The results are shown in Table 15 and Table 16. Actual patches due to proposed harvest will generally be less than that indicated because stand level reserves for riparian or WTP's have not yet been designed.

Early patches are defined as those patches of forest that are ≤40 years old. Recognizing that there could be great variability within the defined patch and that the patch may change over time and to ensure that a reasonable functional estimate of the size of early patches is reported, a 100m buffer is applied to early patches. Early Patches that fall within the 100m buffer, or are within 200m of each other have their areas summed and are reported as one patch.

Mature patches are defined as those forested areas greater than 100 years old. Interior forest condition is that portion of a patch that is not influenced by edges. Edge effect is thought to be minimized at 2-4 tree lengths from the edge (Biodiversity Guidebook 1995). Approximately 95% of the forests within the TFL 48 DFA are less than 30m tall and as such interior forest is defined as that portion of a mature patch that is greater than 100m from a forest edge. To simplify the analysis mature patches were buffered inside by 100m. It is likely that the amount of interior forest will be under estimated because there is likely no edge effect between a mid aged stand and a mature stand.

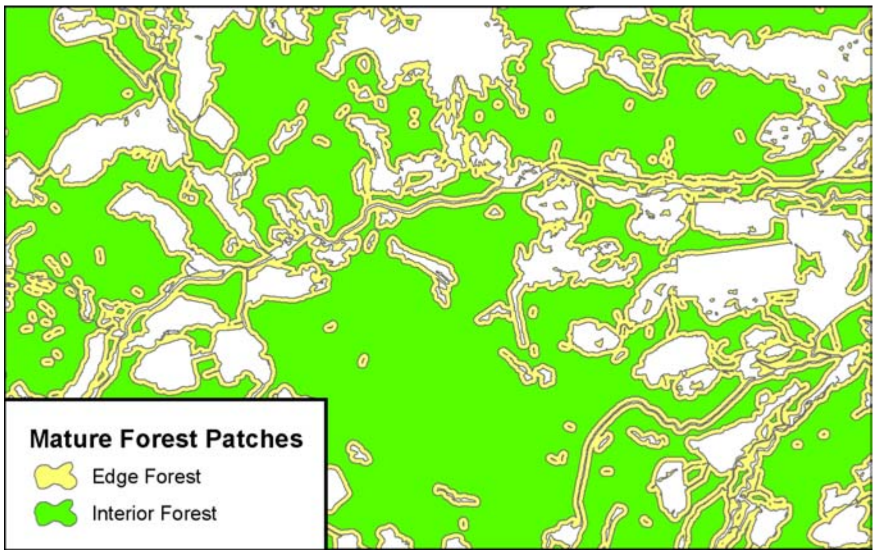


Figure 8: Mature Interior Forest Patches

STRATEGY AND IMPLEMENTATION SCHEDULE

If a natural disturbance event occurs that impacts the achievement of the targets then recruitment strategies will be developed and timelines identified to allow the patch targets to trend back to the desired condition.

In general smaller patches will be planned in more sensitive areas such as visually sensitive areas and may be restricted due to Peak Flow Index (see Section 3.29) constraints.

Patch sizes have been managed and reported on since MP 3. The refinement in SFMP 4 is due to the spatially explicit forecasting completed.

Subsequent FDP/FSP's will incorporate the design and reporting of this indicator.

MONITORING PROCEDURE

Data sources for this include forest cover, Genus data, NDU boundaries and DFA boundaries.

Forest cover will be updated with harvesting data from Genus as required to complete patch size analysis. Disturbances due to fires and other industrial users are generally updated less frequently (approximately 2-5 year intervals).

There are two steps that are required to be completed for reporting this indicator. The calculations are described below:

- The first step will be to update and project the forest cover for all disturbances to the current reporting period based on GENUS data. Contiguous areas are dissolved into each other based on age of the leading species for the rank 1 layer. Early patches are then grouped together if they are within 200m of each other. The area of an early patch is then summed and treated as one patch. Mature patches are reported as they occur no additional grouping is done. The area of each group is then summed by patch size class by NDU and expressed as a percentage of either early of mature area within the NDU. All stands less than 40 years old are included in the early patch classes. Mature patches are buffered inwards by 100m. This buffer is then overlaid on the mature patches and the area inside of this buffer is considered to be interior forest (see Figure 8).
- The second step is to include all proposed harvesting, project ages to the end of the proposed development period and calculate the post FDP condition patch size distribution as described above.

The monitoring of this indicator will occur coincident with the development of a FDP Forest Stewardship Plan (FSP).

LINKAGES TO OPERATIONAL PLANS

FDP's or FSP's will be analyzed and adjusted if necessary to ensure they are consistent with the targets for patch size prior to publication.

3.5 Snags/Live Tree Retention

Indicator Statement	Target Statement
Number of snags and/or live trees (>17.5cm dbh) per ha on prescribed areas	Retain annually an average of at least 2 snags and/or live trees (>17.5 cm dbh) per hectare on prescribed areas
SFM Objective: We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness. We will sustain a natural range of variability in ecosystem function, composition and structure which allows ecosystems to recover from disturbance and stress.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Blocks that are already under a site plan will not apply to this indicator.

Natural forces such as fire, wind, flooding will affect this indicator.

If leaving the tree creates a hazardous work environment, safety must be considered first, and the snag may be felled.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Snags refer to dead standing trees. Snags, or live trees greater than 17.5 cm diameter (i.e. merchantable sized trees) are capable of providing cavity and foraging sites now, or at some future point in the development of a stand.

The prescribed area refers to those portions of cut blocks to which the site plan prescribes the retention of snags or live trees to provide potential future cavity sites.

These elements can provide important habitats for at least portions of life cycles of a wide variety of animals. Snags or live trees retained within the perimeter of a block can provide cavity sites and other habitat values for several decades following disturbance, provided they remain standing. Hoyt and Hannon (2002), for example, note that trees averaging 16 cm and 23 cm dbh provide feeding and nesting habitat respectively for black backed and three toed woodpeckers in recent burns.

Snags and/or residual live trees are a common component of young stands following natural disturbance. Fires (the predominant natural disturbance in the DFA) burn at different intensities, depending on site and climatic conditions. This results in the natural retention of live trees and snags at variable densities across the landscape.

Retaining some dispersed snags or live trees in suitable portions of managed stands supplements sources of this habitat element from wildlife tree patches, unsalvaged natural disturbances, and from the non timber harvesting land base. All of these sources of this habitat element supports reestablishment of the many species dependent on this element.

Bunnell et al, (1997) states that primary excavators prefer trees that are easier to excavate. Generally hardwoods are the commonly preferred trees for cavity excavation. Decay prone hardwoods are more desirable than decay resistant hardwoods. When hardwood options are limited, birds will use conifers, but prefer those that have rotten heartwood.

While the retention of standing material in managed stands may be at relatively low levels, the duration of retention of the vertical structure is likely longer than average, due to the lack of fire damage. This indicator thereby contributes to maintaining ecosystem function, composition and structure that assists the ecosystem in recovering quicker from logging disturbance.

Harvested stands on the DFA tend to be relatively uniform, with smaller tree sizes, and fewer dead trees than similar stands in other parts of the province. This is apparently due to the frequency of fires on the landscape, and the relatively young age of the forest stands.

Relatively little research exists on desired levels of retention, particularly in the boreal forest. Bunnell (1999) reports that little use is gained by sustained provision of more than about 2 snags/ha.

CURRENT STATUS

Currently on the Defined Forest Area we are managing for snags and live tree retention. The following statement, or a similar derivative of this statement is included in our site plans where ground conditions exist:

> *"Where operationally feasible retain the larger clumps/islands of deciduous stems. Avoid leaving dispersed individual deciduous stems, as they will impede future silviculture operations. Large snags may be retained for wildlife trees if they meet with WCB regulations and do not compromise harvesting or silviculture activities; or they may be stubbed or felled."*

While harvesting supervisors assess conformance to SP measures during harvesting inspections, which includes prescribed snag or live tree retention, no information is currently available on actual densities of retained snags, live trees or stub trees following the completion of operations.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Subsequent to harvesting, with consideration for safety and economic limitations, dispersed snags or live trees are retained in some suitable areas within managed stands to provide potential cavity sites through time. The guidelines below describe where this indicator will be applied.

- This strategy is designed to encourage the retention of some snags or live trees capable of providing cavity sites, within the harvested portion of the timber harvesting land base.
- Snags or trees may be stubbed at 3-5 metres to meet safety requirements and ensure windfirmness. It is not required that retention be evenly distributed across an area, rather retention should be distributed in areas which minimize the risk of damaging the retained snags or trees.
- Operational Foresters will identify in site plans to which blocks, or specific portions of blocks, this indicator will be applied (i.e. the prescribed area), using the following guidelines:
- For blocks that have at least 10% of the gross area designated as wildlife tree patches, this indicator need not be applied, as the habitat element will be well represented within the WTP's.
- In salvage (e.g. beetle) operations, if forest health or worker safety is a potential concern, this indicator need not apply.

- In stands that average less than 17.5 cm DBH (e.g. height class two pine stands), this indicator need not apply, due to the lack of suitable candidate trees.
- This indicator need not apply on cable harvesting area.
- This indicator need not apply to areas where steep slopes (>30%) or in narrow fingers of harvested blocks (less than 40 metres wide) which restrict machine manoeuvrability. These factors may limit the capability to safely and economically stub snags or live trees, or limit the ability of skidding or site preparation equipment to avoid significantly damaging stubbed trees.
- For areas where shelterwood or partial cut systems are employed this indicator need not apply.
- For areas within the following ecosystem groups indicated by blue in Figure 9 and Figure 10 below, the indicator does not apply.

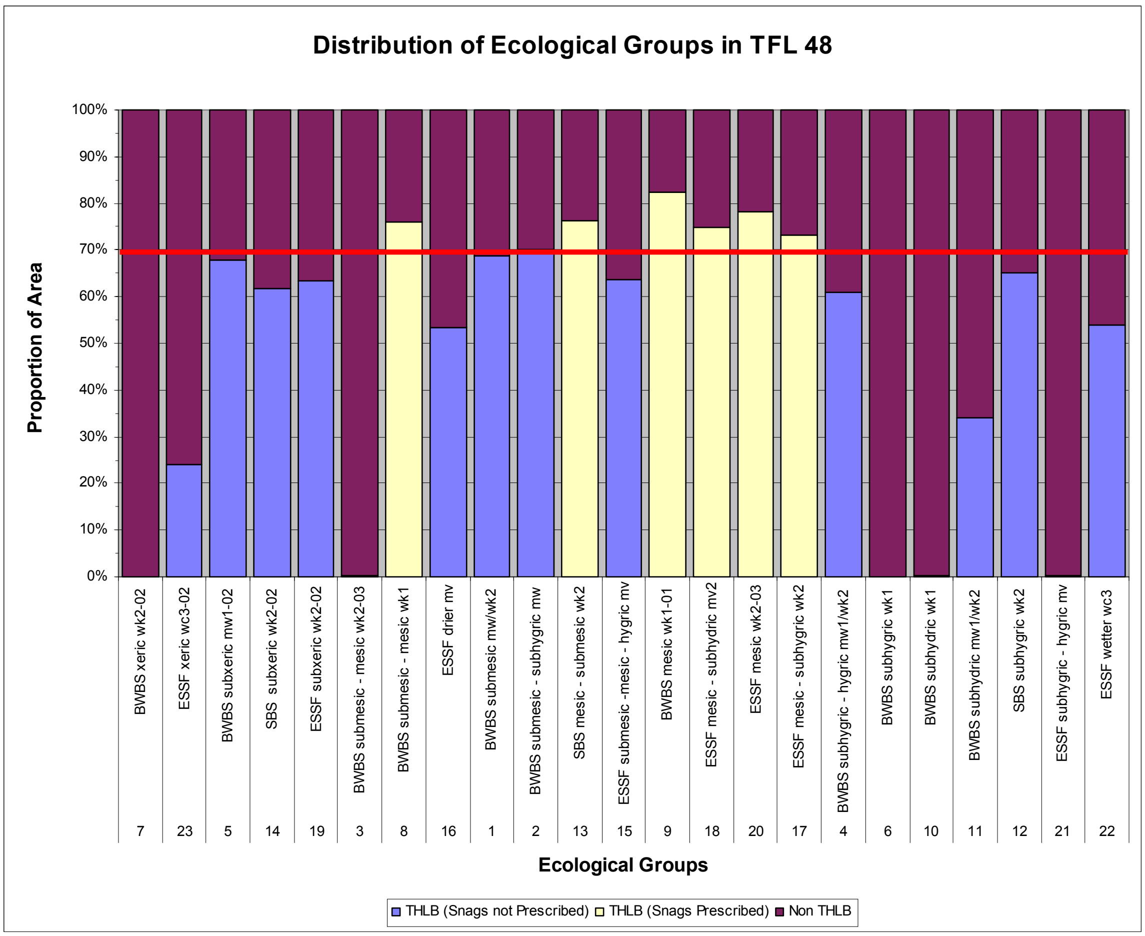


Figure 9: Distribution of Ecological Groups by THLB and Where Snags are Prescribed

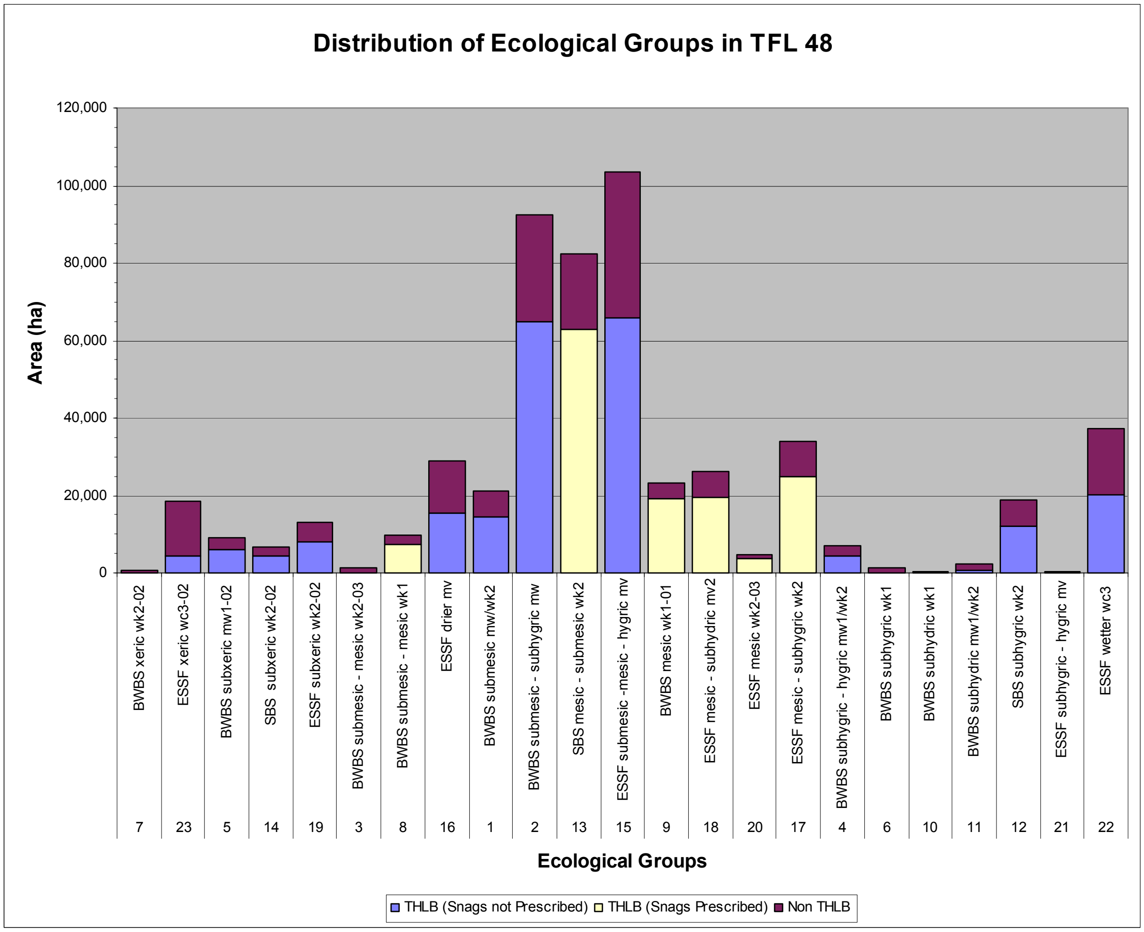


Figure 10: Ecological Groups Distribution between THLB and Non-THLB

Table 17 indicates those ecosystem groups and associated site series where the indicator will apply subject to the previous exceptions. The area where this applies is where the non-timber harvesting land base makes up less than 30% of the ecosystem group. Snags/live tree retention will be prescribed on up to approximately 38% of the timber harvesting land base.

Table 17: Ecosystem Groups where Snags/Live Tree Retention is Prescribed

Group #	Variant	Name	Site Series	Description
8	BWBS	subxeric-mesic wk1	wk1-02	Pl - Lingonberry - Velvet-leaved Blueberry; subxeric, very poor-poor
			wk1-03	Sb - Lingonberry - Coltsfoot; submesic-subhygric, very poor-poor
			wk1-04	Sw - Wildrye - Peavine; submesic-mesic, poor-medium
9	BWBS	mesic wk1-01	wk1-01	Sw - Huckleberry - Stepmoss; submesic-mesic, medium
13	SBS	mesic-submesic wk2	wk2-03	Sxw - Huckleberry - Highbush Cranberry; submesic, poor-medium
			wk2-01	Sxw - Oak Fern; submesic-mesic, medium
			wk2-04	Sb - Huckleberry - Clubmoss; submesic-subhygric, poor-medium
17	ESSF	mesic-subhygric wk2	wk2-01	Bl - Oak Fern - Knight's Plume; submesic-subhygric, poor-rich
			wk2-04	Bl - Devil's Club - Rhododendron; subhygric-hygric, poor-medium
			wk2-05	Bl - Rhododendron - Lady Fern; subhygric, medium-rich
			wk2-06	Bl - Horsetail - Sphagnum; hygric, medium-rich
18	ESSF	mesic-subhygric mv2	mv2-04	Bl - Oak Fern - Knight's Plume; mesic-subhygric, medium-rich
			mv2-05	Bl - Devil's Club - Rhododendron; subhygric, rich
20	ESSF	mesic wk2-03	wk2-03	Bl - Oak Fern - Bluebells; mesic-subhygric, medium-rich

Planning supervisors spatially identify in genus the area where snag/live tree retention will be retained and choose the appropriate harvesting strategy, i.e. clearcut with snag retention.

During the harvesting prework, prior to the commencement of operations, operational supervisors are advised if this indicator is applicable to a block, and if so specifically to which sections of the block it applies. This information will be identified on the logging plan maps.

Logging supervisors will consult with the silviculture forester on each block to determine if stubbing is the preferred method to meet the target for this indicator. Leaving live trees or snags can seriously impede the treatment options for brushing. For example, aerial herbicide requires snag/live tree removal, as the helicopter cannot adequately or safely maneuver around these standing trees. By carrying out stubbing in areas with poor access, or on sites where aerial herbicide is anticipated, the treatment options are left open.

Silviculture will have access to the layer where this data exists. They will be able to overlay this layer with their planned blocks, to determine in which areas of the blocks the indicator applies.

Supervisors will review the requirements pertaining to this indicator in preworks with harvesting and silviculture workers, and discuss methods and procedures to create and/or retain these habitat elements to the target levels.

MONITORING PROCEDURE

Monitoring and reporting procedures will be as follows:

On areas where this indicator applies, operations supervisors note in harvesting inspections whether or not operational activities are in general compliance with the indicator.

The reporting summary table will be similar to the following format.

Cutblock Number	Prescribed Area (ha)	Was indicator applied correctly?
700-005	32	Yes

Silviculture will also note in their inspections whether we are in conformance with this indicators, on blocks that they carry out snag falling.

LINKAGES TO OPERATIONAL PLANS

Site plans will identify whether cutblocks or portions thereof are candidate areas for dispersed snag or live tree retention.

Logging plan maps will show areas where the indicator is applied.

3.6 Coarse Woody Debris

Indicator Statement	Target Statement
Average Coarse Woody debris size and m^3/ha on blocks harvested on the TFL since Jan 1, 2004	Average retention level over the TFL since Jan 1, 2004 will be at least 92 m^3/ha of which a minimum of 46 m^3/ha will be greater than 17.5cm in diameter
SFM Objective: We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness. We will sustain a natural range of variability in ecosystem function, composition and structure which allows ecosystems to recover from disturbance and stress.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No less than 74 m^3/ha for average vol/ha over the TFL and no less than 28 m^3/ha will be greater than 17.5 cm in diameter.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Coarse woody debris is used by rodents, small carnivores and amphibians for cover, nesting, denning and foraging. Woody debris also provides substrate for non-vertebrates, lichen and fungi, and influences such ecosystem processes as nutrient cycling, water retention and stream morphology (Bunnell et al. 2003). Important attributes of downed woody debris include size, decay state and density or distribution (Bunnell et al. 2003). Large pieces of CWD persist longer, providing shelter to larger vertebrates and breeding substrates for amphibians. A range of decay states is essential to support the succession of organisms that require different decay levels. Variability in CWD density and distribution provides subnivean rest sites for mammals in the winter (Porter 2002) and foraging sites for species preferring low volumes of CWD, and supports fungi and bryophytes that favour high volumes of downed wood. Managing and monitoring for these attributes is critical, as downed wood is the most likely habitat element to appear abundant initially after harvest, but become limiting through time (Bunnell et al. 2003). The occurrence of CWD following harvesting, therefore, is also an indicator of the ability of the ecosystem to recover from disturbance.

Based on 131 phase 2 VRI plots located in natural stands 92 m^3/ha was the average amount of CWD, thus has become the target for average retention levels in the future. To address the need for ecologically valuable large CWD, 50% of the target (46 m^3/ha) will be greater than 17.5cm diameter. Due to the large variation of volumes of CWD occurring naturally over the TFL, the target amount reflects an average over the TFL land base and does not apply as a target to be achieved in all locations at all times.

CURRENT STATUS

Based on 131 phase 2 VRI plots located in natural stands from four biogeoclimatic (BEC) zones (BWBS, SBS, ESSF wet and ESSF moist) average CWD accumulations are 92.6 m^3/ha (SE $\pm$18.6 m^3/ha @ 99%). Actual CWD accumulations ranged from a low of 0 m^3/ha to 379.3 m^3/ha. See Figure 11 for a scatter plot of all CWD samples from natural stands within TFL 48. Figure 11 illustrates that CWD is highly variable and there is not a strong relationship between volume of CWD detected and age of the forest stand or BEC zone.

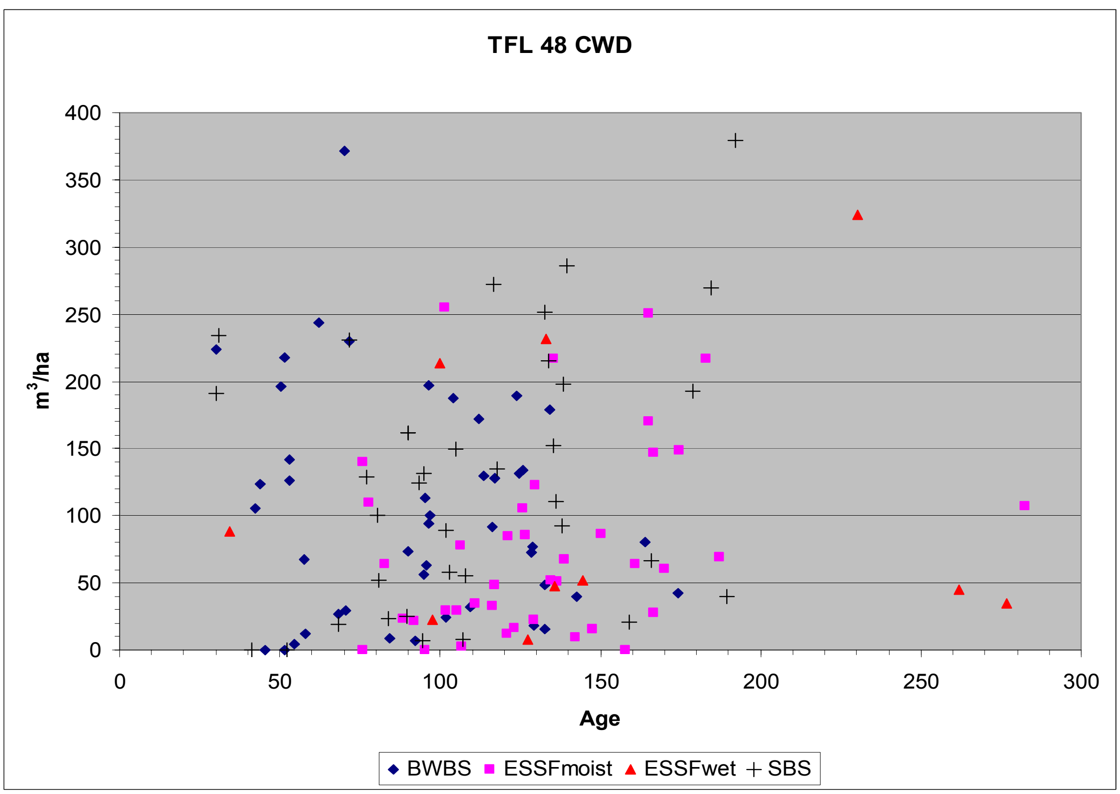


Figure 11: Range of CWD Accumulations (volume/ha) Over Age

Data based on 131 VRI phase 2 plots in natural stands across four biogeoclimatic groups.

NIVMA information from 15 year old (approximately) managed stands in the North Peace indicate average CWD volumes between 92 and 110 m^3/ha. While information specific to our blocks is not currently available, this information suggests that our targets should be achievable by volume.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Not applicable.

STRATEGY AND IMPLEMENTATION SCHEDULE

While volumes of CWD remaining after harvesting may approximate pre-harvest levels, the quality of the CWD may not meet our objectives. SP's will identify site specific management strategies to contribute to the maintenance of CWD levels at the TFL level. These strategies will complement the retention of recruitment of CWD from WTP's, riparian areas, un-salvaged burns, and the forests outside of the THLB.

The following principles will be considered when developing site specific SP strategies:

- Minimize the amount of ecologically valuable CWD being burned in roadside piles. These materials will be extracted and re-piled away from roadside where possible.
- Larger pieces of CWD are biologically more valuable than smaller pieces.
- Maintaining a wide range of decay and diameter classes is ecologically desirable.
- Retention of a variety of species is advantageous.
- Standing live and dead trees and/or stubs retained on cutblocks can provide important sources of CWD recruitment.
- CWD within riparian areas can be particularly beneficial ecologically.
- The retention of CWD should be harmonized with other silvicultural objectives.
- Maintain variability in the levels of CWD at the landscape level.
- Measures should include retention of CWD in both concentrations and dispersed patterns, as different organisms favour each of these strategies. Concentrating solely on one method could disadvantage some groups of species (Bunnell 1999).

Monitoring of CWD will begin during the 2006 field season and will include establishment of plots in stands harvested prior to 1991 as part of the managed stand monitoring (see section 2.8). Monitoring of current performance will also begin in 2006 with the establishment of a CWD plot in all areas harvested since Jan 1, 2004, which fall on a 2 km grid sample point.

MONITORING PROCEDURE

Average post harvest CWD will be estimated from measurements taken at the 2 km long-term monitoring points during a silviculture survey subsequent to harvesting of these sample locations. Sampling methodology will follow the Resource Inventory Committee standard described in the Vegetation Resource Inventory ground sampling procedures. The average CWD volume will be monitored annually, and depending on the results of this monitoring, revisions to the prescribed management practices within the SP's may need to be implemented to achieve the SFM targets.

The average CWD volume attained at all 2 km sample points in blocks logged from Jan 1, 2004 until the next SFMP will be reported in the next SFMP.

LINKAGES TO OPERATIONAL PLANS

Site plans or site level plans will identify site-specific management strategies to retain CWD. Annual reviews of CWD plot information will provide feedback on the suitability of SP CWD management measures, and changes to procedures can be made accordingly.

3.7 Average Minimum Width of RRZ and RMZ

Indicator Statement	Target Statement
Average minimum width of retention by Riparian Reserve Zone or Riparian Management Zone by appropriate stream, lake or wetland classification within cutblocks	We will meet or exceed the regulatory retention widths by Riparian Reserve Zone by appropriate stream, lake or wetland classification within cutblocks
SFM Objective: We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness. We will maintain water quality and quantity.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

The only acceptable variances will be where the district manager has approved removal within the Riparian Management Zone because of specific issues, such as removal of timber infested with Mountain Pine Beetle.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Riparian areas occur adjacent to wetlands or bodies of water such as rivers, streams, or lakes. Riparian habitats include the stream bank and flood plain area adjacent to streams or waterbodies. On larger streams particularly, riparian areas often provide productive, structurally diverse habitats. In addition to providing ready access to water, these areas also support important characteristics such as coarse woody debris, cavity sites, shrubs and broadleaf trees, which have been identified as key habitat elements necessary to support species richness.

Riparian reserve zones (RRZ's) are specific areas on larger fish bearing steams, in which harvesting is not normally permitted, in order to protect significant riparian and aquatic habitats. Maintaining RRZ's provides many of the habitat elements needed to support a diverse species mix across the landscape.

Minimum RRZ's do not apply to road right of ways of roads that cross streams.

CURRENT STATUS

In 2000, 2001, 2002, 2003, and 2004 no blocks were harvested adjacent to wetlands or lakes, only near rivers and streams.

In 2004, the district manager authorized a blanket exemption for harvesting within the Riparian Reserve Zone to remove wood infested by Mountain Pine Beetle. The total area logged in the RRZ was 0.33 ha.

Table 18: Summary of Riparian Reserve and Management Zones in 2000 – 2005

Year	Stream, Wetland or Lake Class	Total Stream Length (m)[b]	RRZ – Required Width (m)[c]	RRZ–Actual Width (m)[c]	RMZ Required Width (m) c	RMZ – Actual Width (m)[c]	RMA Required Width (m)[c]	RMA - Actual Width (m)[c]
2000	S1[a] (n=0)	**0**	50	0	20	0	70	0
	S2 (n=2)	**2,200**	30	30	20	50	50	80
	S3 (n=1)	**350**	20	20	20	60	40	80
	S4 (n=1)	**1,700**	0	0	30	30	30	30
	S5 (n=0)	**0**	0	0	30	0	30	0
	S6 (n=19)	**13,750**	0	0	20	32	20	32
2001	S1[a] (n=1)	**800**	50	78.7	20	0	70	78.7
	S2 (n=0)	**0**	30	0	20	0	50	0
	S3 (n=0)	**0**	20	0	20	0	40	0
	S4 (n=0)	**0**	0	0	30	0	30	0
	S5 (n=7)	**6,680**	0	46.3	30	4.8	30	51.1
	S6 (n=83)	**36,985**	0	9.1	20	15.3	20	24.4
2002	S1[a] (n=0)	**0**	50	0	20	0	70	0
	S2 (n=0)	**0**	30	0	20	0	50	0
	S3 (n=4)	**5,100**	20	61.4	20	5	40	66.4
	S4 (n=3)	**2,400**	0	0	30	30	30	30
	S5 (n=9)	**6,050**	0	0	30	34.2	30	34.2
	S6 (n=42)	**40,590**	0	0	20	26.7	20	26.7
2003	S1[a] (n=7)	**3,000**	50	50	20	20	70	70
	S2 (n=6)	**2,150**	30	30	20	20	50	74.4
	S3 (n=10)	**4,830**	20	61.8	20	3.6	40	65.5
	S4 (n=10)	**4,185**	0	6.7	30	30	30	34.2
	S5 (n=5)	**615**	0	0	30	30	30	30
	S6 (n=73)	**33,070**	0	1.6	20	18.7	20	20.3
2004	S1[a] (n=5)	**966**	50	61.4	20	10.4	70	71.8
	S2 (n=4)	**1,084**	30	102.9	20	9.1	50	112
	S3 (n=7)	**962**	20	33	20	6.7	40	39.7
	S4 (n=1)	**228**	0	21.1	30	9.9	30	31
	S5 (n=0)	**0**	0	0	30	0	30	0
	S6 (n=24)	**22,344**	0	17	20	6.2	20	23.2
2005	S1 (n=5)	**15,048**	50	67.2	20	2.8	70	70.0
	S2 (n=4)	**2,984**	30	125.6	20	2.1	50	127.7
	S3 (n=13)	**6,482**	20	79.2	20	3.7	40	82.9
	S4 (n=4)	**1,475**	0	20.0	30	10.4	30	30.4
	S5 (n=10)	**5,844**	0	27.8	30	6.2	30	34.0
	S6 (n=77)	**34,130**	0	15.9	20	12.4	20	28.4
	W3 (n=2)	**382**	0	29.6	30	0.4	30	30.0
Average	S1	**19,814**	50	64.8	20	5.6	70	70.4
	S2	**8,418**	30	73.3	20	20.1	50	93.4
	S3	**17,724**	20	65.7	20	5.3	40	71.0
	S4	**9,988**	0	6.2	30	26.7	30	32.9
	S5	**19,189**	0	24.6	30	15.3	30	39.9
	S6	**180,869**	0	7.3	20	18.1	20	25.3
	W3	**382**	0	29.6	30	0.4	30	30.0

a Channel widths for S1 streams are >20m, <100m.

b Streams that flow through, rather than adjacent to a block have had their lengths doubled to account for the application of RMA's to both sides. Therefore true stream length is less than reported in this table.

c RRZ and RMZ widths are applied to a single side of a stream. If stream flows through the block the length has been doubled (see footnote b) but the widths are not doubled.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? Yes.

Sustainable Forest Management Plan 4 describes a comprehensive approach for accounting for riparian net downs across the land base. Data collected on average reserve width is used during the Timber Supply Review and will ultimately reflect in the AAC calculation.

STRATEGY AND IMPLEMENTATION SCHEDULE

During the site plan phase, RRZ and RMZ details will be entered into Genus, to ensure tracking is kept current. Streams within and adjacent to block boundaries will be GPS traversed. All streams will be classified during the site plan phase, and stream classification information will be entered into Genus. Site-specific retention strategies are developed and prescribed for each stream. At a minimum the regulatory requirements are met although often these requirements are exceeded as indicated in Table 18.

MONITORING PROCEDURE

Pre-harvest inspections are conducted based on risk ranking described in Canfor's EMS. Logging foreman conduct preworks with the logging contractors to ensure that Riparian Management Areas are known and flagged. Post harvest inspections are conducted on all cutblocks.

The areas managed as Riparian Reserve Zone or Riparian Management Zone by appropriate stream, lake or wetland classification will be summarized in the annual report.

Analytical Method

Query the blocks data set from Genus to get a subset of the blocks that had harvesting completed for the year in question.

Measure all stream lengths within and adjacent to blocks.

Double lengths of streams that run through the blocks to account for the riparian management area on each side.

When measuring streams, include the ones within Wildlife Tree Patches as well. If the stream runs through the WTP then double the length. If the stream is adjacent to the WTP, then do not double. Determine the area of the WTP, then multiply by 10,000 to convert to square meters. Next, divide by the length of the stream. (WTP Area x 10,000)/stream length). The resultant number is the average reserve width. Tally this number with the summary for Riparian Reserve Zones.

Summarize the data by calculating total length, hectares and average widths, by stream class and reserve type.

LINKAGES TO OPERATIONAL PLANS

The location, classification and, where applicable, RRZ requirements of waterbodies will be included in SP's and/or operational maps used for timber harvesting, road construction and silviculture activities.

Field foresters will identify site specific requirements for the protection of reserve zones, and management practices will be included in SP's.

Preworks completed prior to harvesting, road construction or silviculture activities will review RRZ's size and location, and any site specific protection measures.

3.8 Shrubs/Early Forest

Indicator Statement	Target Statement
The minimum proportion of shrub habitat (%) by Natural Disturbance Unit	Each Natural Disturbance Unit will meet or exceed the baseline target (%) proportion of shrub habitat as indicated in Table 19
SFM Objective: We will sustain sufficient and appropriately distributed habitat elements to maintain native species richness.	
Linkage to TFL 48 Licence: N/A.	

ACCEPTABLE VARIANCE

Acceptable variance is ± 20% of the baseline target.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Shrubs are defined in the Vegetation Resource Inventory (VRI) BCLCS Level 4 as either shrub low (SL) or shrub tall (ST). Forest or harvested sites less than 30 years old are also considered to contribute to shrub habitat in the DFA.

Shrubs are common in riparian areas, and readily enter larger forest openings, especially on moist sites. As the stand closes they are suppressed by the taller trees, and remain uncommon until the stand naturally opens. Many species respond positively to shrub abundance, and shrub abundance is influenced by forest practices (Bunnell 1999).

In a review of the vertebrates known to be within TFL 48 Bunnell (2005) found that 41%, 42% and 35% were restricted to or favoured shrub or early seral habitat in the BWBS, ESSF and SBS biogeoclimatic zones respectively.

CURRENT STATUS

The following table (Table 19) indicates the current and post FDP condition of shrub habitat within the DFA. Targets were established for this indicator by reviewing the amount of naturally occurring shrub areas by natural disturbance unit as well as forested areas less than 30 years old. Natural disturbance units with low levels of naturally occurring shrubs generally have lower targets than areas with higher levels of shrubs.

Table 19: Shrub Habitat Current, FDP Condition and Targets

NDU	NDU Subunit	Total NDU Area	2005 Shrub		2010 Shrub		Baseline Target %
			Ha	%	Ha	%	
Boreal Plains		120,891	15,762	13%	21,507	18%	14%
Boreal Foothills	Valley	178,225	25,245	14%	30,653	17%	12%
	Mountain	205,406	20,936	10%	24,540	12%	11%
Omineca	Valley	6,504	727	11%	722	11%	7%
	Mountain	15,031	1,277	8%	1,705	11%	10%
Wet Mountain		117,618	12,634	11%	14,919	13%	7%
Grand Total		643,676	76,581	12%	94,045	15%	

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? Yes

Forecasting was completed for this indicator by tracking the proportion of forest stands that are less than 30 years old over the full 250-year planning horizon. There was no site conversion or brush rehabilitation to forest forecasted in the analysis.

STRATEGY AND IMPLEMENTATION SCHEDULE

Early forest less than 30 years old can provide important shrub habitat and this can be created through harvesting. Harvesting and silviculture practices can influence the abundance and distribution of shrubs over time.

Long-term monitoring of shrubs/early forest change within managed stands will occur through Change Monitoring Inventory (CMI) plots established over the DFA. These plots are systematically established across the DFA based on a 2-km grid in managed stands 15 years after harvesting. These plots will provide a representative sample of all managed stands over time. The first set of plots is to be established in 2006. Once the initial backlog of approximately 61 samples is established for stands that have been harvested greater than 15 years ago there will be an additional 3 to 5 samples established each year.

MONITORING PROCEDURE

Data sources include vegetation resource inventory (VRI), natural disturbance unit maps, and GENUS data.

Canfor periodically updates VRI information every two to five years. The GENUS system is a "real-time or live" database that is maintained and updated by Canfor staff as they carry out their daily activities.

The CMI plots will be re-measured on an approximately 10 year cycle and will allow comparisons of shrub composition and abundance among other things over time.

This information will feed back to operational practices overtime to determine which practices are adversely impacting the habitat element and corrective action will be taken if necessary.

To monitor this indicator, the report will be run at each SFMP and compared to the overall target. The following formula describes the calculation used to estimate shrub proportion by NDU.

Formula:

$$\mathbf{\%SH}_{NDU} = ((\mathbf{SH}_{NDU} + \mathbf{EF}_{NDU}) \,/\, \mathbf{AREA}_{NDU})*100$$

Variables:

$\mathbf{\%SH}_{NDU}$	Percent area in a shrub /early forest structural stage relative to the total area by Natural Disturbance Unit
$\mathbf{SH}_{NDU}$	Area classified as shrub in the VRI for TFL 48 (BCLCS Lv 4 = ST or SL by Natural Disturbance Unit
$\mathbf{EF}_{NDU}$	Area classified as Early Forest VRI for TFL 48 (BCLCS Lv 2 = T and Projected Age <30 years) by Natural Disturbance Unit
$\mathbf{AREA}_{NDU}$	Total Area of Natural Disturbance Unit within TFL 48

LINKAGES TO OPERATIONAL PLANS

The data will be used at the Forest Development or Forest Stewardship Plan level to guide future harvest planning and will be used by the silviculture staff to review long term trends in reforestation policies and to adjust practices where necessary.

3.9 Wildlife Tree Patches

Indicator Statement	Target Statement
Cumulative wildlife tree patch percentage in blocks harvested since 1995 by landscape unit by BEC sub zone	Cumulative wildlife tree patch % will be at least 8% by BEC sub zone
SFM Objective: We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness. We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbance and stress.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Where the target is not currently met new proposed harvesting must have the minimum proportion of WTP prescribed at the block level. Exceptions to this requirement is if the proposed harvesting is a non-clear cut system such as irregular shelterwood or partial cutting. No other variance is acceptable.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator will track the proportion of forest retained as WTP's within each biogeoclimatic subzone. WTP's provide sources of shrubs, large live trees, broadleaf trees, coarse woody debris (CWD), and snag/cavity sites. These elements can provide key habitat components that support the residual populations, the reintroduction of populations extirpated by the disturbance, and overall ecosystem function (Bunnell et al 1999).

WTP's within managed stands have been shown to be important in the reestablishment or maintenance of a variety of species, including moose (Gasaway and Dubois 1985), and birds (Seip 1997). Residual patches include both islands within the block (internal WTP's) and patches immediately adjacent to harvested areas that are also adjoined to unharvested areas (external WTP's). Both internal and external residual patches may be suitable for WTP's provided they can function as sources of habitat elements, which will depend on their site specific attributes. External WTP's connected to adjacent unharvested areas are typically more wind firm and may receive higher initial use by wildlife due to the proximity of adjacent unharvested habitats.

Maintaining habitat elements in wildlife tree patches contributes to enhancing species richness by providing the critical features needed to support a variety of species. Retaining WTP's with similar composition and structure to natural remnants, will contribute to maintaining a natural range of variability in ecosystem function, composition, and structure, which allows ecosystems to recover from disturbance and stress.

WTP's can also be used to protect site-specific habitats, such as mineral licks and raptor nesting sites and provide a source of local genetic material.

CURRENT STATUS

The table below summarizes current status of WTP retention levels for blocks on which harvesting has commenced since 1995. The WTP retention levels exceeds the target in all sub zones except the ESSFwc3, however 82% or 487 ha of the 592 ha under prescription has been harvested with an irregular shelterwood retention system. Typically 55% of the area is retained between the trails so 55% of the 487 ha is 268 ha plus the 25 ha of WTP prescribed is a total of 293 ha of retention or 49% of the total area under prescription.

Table 20: Summary of WTP's in Areas Harvested Since 1995 to 2005

BEC Sub Zone	Total Area Under Prescription	WTP Area	WTP %
BWBSmw	3,243	465	14%
BWBSwk	1,248	168	13%
ESSFmv	5,064	556	11%
ESSFwc	592	25	4%
ESSFwk	3,657	322	9%
SBS wk	6,840	1,092	16%
Grand Total	**20,644**	**2,626**	**13%**

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

WTP's are not spatially identified in the forecasting simulation conducted in support of SFMP 4. To account for the area that will be retained as WTP's a percent volume reduction is used as a proxy to identify volume and area retained as WTP's. See Appendix 5 – Timber Supply Analysis Information Package for a full description of analysis assumptions used to model WTP's.

STRATEGY AND IMPLEMENTATION SCHEDULE

Wildlife tree patches will be established across landscape units to act as sources of key habitat elements, provide stand level structural characteristics, and protect site-specific habitats. WTP retention levels will be assessed at the landscape level to reflect the natural variability in residual retention levels in natural disturbance patches.

New WTP's will be designed using the following guidelines:

- WTP minimum size will be 0.20 hectares. WTP's should be of various sizes, including some areas larger than 1 hectare in larger blocks particularly (i.e. greater than 100 ha), if possible. WTP's should contain proportional representation of the vegetation contained in the general cut block area, both merchantable and non-merchantable. General priorities for WTP placement will be as follows:
- Areas of key site specific habitat importance, such as eagle, or osprey nests, mineral licks, and riparian areas.
- Areas of operational concern, which can contribute significantly to the provision of, key habitat elements (riparian habitats, large live trees, snags or declining trees, large trees, broadleaf trees, CWD, or shrubs).
- Tree species, which are uncommon in the BEC sub zone (i.e. deciduous in the ESSF sub zones) and may provide some unique niche habitats.
- Other wind firm forested stands, which can provide these habitat elements.
- The retention of WTP's will generally be higher in ecosystem groups identified in Table 17 and less in other units. The overall sub zone target will still apply.

WTP's have been designated and retained as part of silviculture prescriptions or site plans since 1995. The requirement to track at the BEC sub zone level is a new requirement and as such it will take time as new harvesting is proposed to fully reach the target levels.

MONITORING PROCEDURE

The percentage of WTP's is calculated by overlaying the areas of WTP's over the Total Area Under Prescription within each BEC Sub zone. Status of this indicator will be reported annually in the annual report.

Formula:

$$\%\mathbf{WTP}_{\text{BEC Subzone}} = (\mathbf{WTP}_{\text{BEC Subzone}} / \mathbf{TAUP}_{\text{BEC Subzone}})*100$$

Variables:

$\%\mathbf{WTP}_{\text{BEC Subzone}}$	Percent area in wildlife tree patches relative to the total area under prescription by Biogeoclimatic Ecosystem Classification Sub zone.
$\mathbf{WTP}_{\text{BEC Subzone}}$	Area in wildlife tree patches by Biogeoclimatic Ecosystem Classification Sub zone.
$\mathbf{TAUP}_{\text{BEC Subzone}}$	Total Area Under Prescription by Biogeoclimatic Ecosystem Classification Sub zone.

LINKAGES TO OPERATIONAL PLANS

Silviculture prescriptions and site plans prescribe the areas to be retained as WTP's.

3.10 Habitat Supply for Species of Public Concern

Indicator Statement	Target Statement
Habitat supply for species of public interest (grizzly bear, wolverine, marten, fisher, elk, moose, caribou)	When habitat supply decreases by 20% over time beyond the natural range of variation baseline for species of public interest, stand level management strategies will be developed within one year
SFM Objective: We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Where target is not met due to natural disturbances then this is an acceptable variance. Should this occur then an action plan would be developed to manage habitat until the target can be achieved. This may include stand level management guidelines targeted at specific species.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Canfor is using indicators at coarse (3.1 Ecosystem Representation), medium (3.2 Forest Types, 3.3 Late Seral Forest, 3.4 Patch Size Distribution, 3.5 Snags/Live Tree Retention, 3.6 Coarse Woody Debris, 3.7 Average Minimum Width of RRZ and RMZ, 3.8 Shrubs/Early Forest, 3.9 Wildlife Tree Patches) and fine filter (3.11 Species of Management Concern) scales to ensure that biodiversity is maintained across the DFA over time. Habitat supply for specific species, as measured by habitat models, is a complementary system which attempts to model changes to specific wildlife species as a result of modifications at the coarse, medium and fine filters. This indicator acts as a cross-check at the species level to help determine the effectiveness of filters and to potentially direct stand level management actions.

Habitat supply will be no more than 20% less than the baseline natural range of variation for selected species over time. The degree of variance is relatively high for two reasons. As discussed in Section 2.6 (Natural Disturbance Unit Planning) the forest types within the DFA can experience a high range of natural variability. It is anticipated that the wildlife species within the DFA are adapted to experience fairly wide ranges of disturbance over periods of time. In addition, changes in habitat types for one species may be beneficial for another, e.g., grizzly bears prefer early seral habitat and an increase in this habitat type may result in reduced habitat for a species dependant on older seral stages (e.g., marten/caribou). By allowing fairly large variances natural and human induced changes can benefit one species without necessarily requiring a management action for the other species.

It may be argued that species habitat modeling is redundant to the filter method and Canfor will evaluate the efficiency of using both systems through the course of SFMP 4.

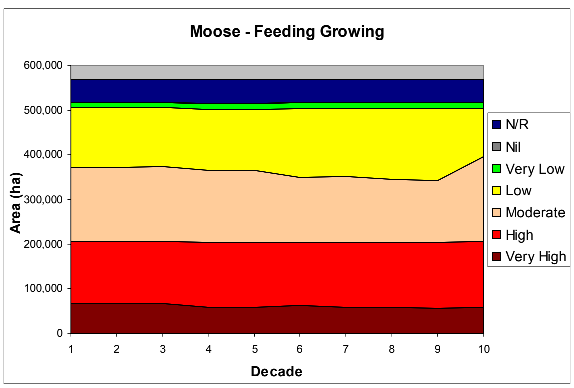
Canfor has modeled for several species since Management Plan 3 as summarized in Table 21.

Table 21: Species Selected for Wildlife Habitat Supply Analysis in MP 3 and SFMP 4

Species	MP 3	SFMP 4	Reason for change
Grizzly bear	yes	yes	n/a
Wolverine	yes	yes	n/a
Marten	yes	yes	n/a
Fisher	yes	yes	n/a
Moose	yes	yes	n/a
Elk	yes	yes	n/a
Caribou	yes	yes	n/a
Mountain Goat	yes	no	Species needs are too site specific to be modeled using ecosystem model in use
Black-throated Green Warbler	yes	no	This species is peripheral in northern BC and modeling is difficult to calibrate.
Three-toed Woodpecker	yes	no	This species is relatively rare and difficult to calibrate.
Trumpeter Swan	yes	no	Species needs are too site specific to be modeled using ecosystem model in use
Northern goshawk	yes	no	No longer an identified wildlife species in BC. Northern Goshawk is much more diverse than previously thought, it can use a wider range of habitats and occurs at low densities hence does not make a good species for monitoring.

CURRENT STATUS

Moose was modeled for the summer feeding period. TFL 48 represents excellent moose habitat with over 340,000 ha classified in very high, high and moderate categories of habitat supply.



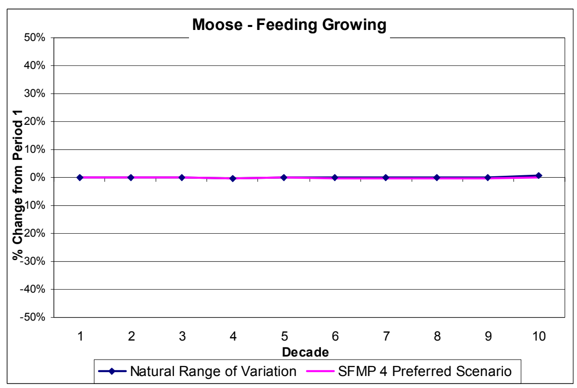
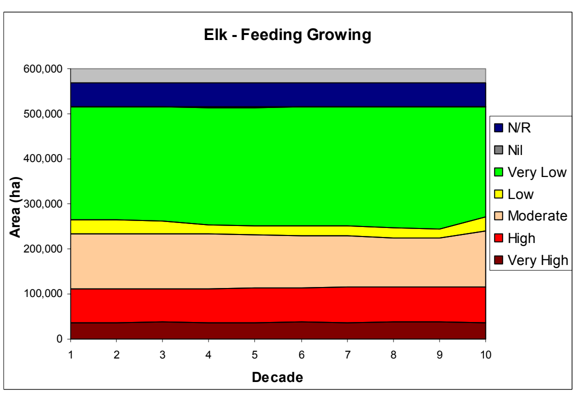


Figure 12: Moose Habitat Supply

Elk habitat was modeled as summer feeding habitat. TFL 48 represents excellent elk habitat with over 230,000 ha classified in very high, high and moderate categories of habitat supply.



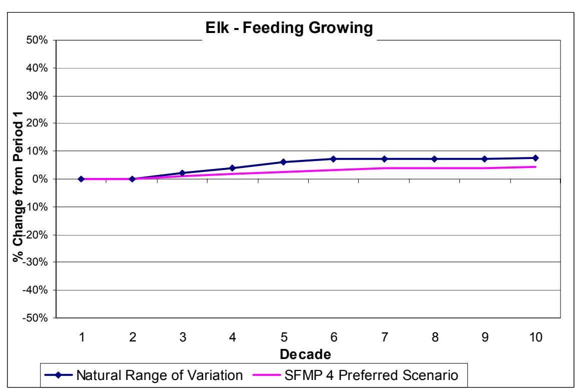


Figure 13: Elk Habitat Supply

Caribou was modeled for both late and early winter habitat types. In contrast to moose and elk there is comparatively little very high, high and moderate habitat for caribou, approximately 15,000 ha of early winter. (This is likely underrepresented with the current model.) Late winter habitat trends to a significantly less amount in the preferred scenario versus the natural range of variation baseline.

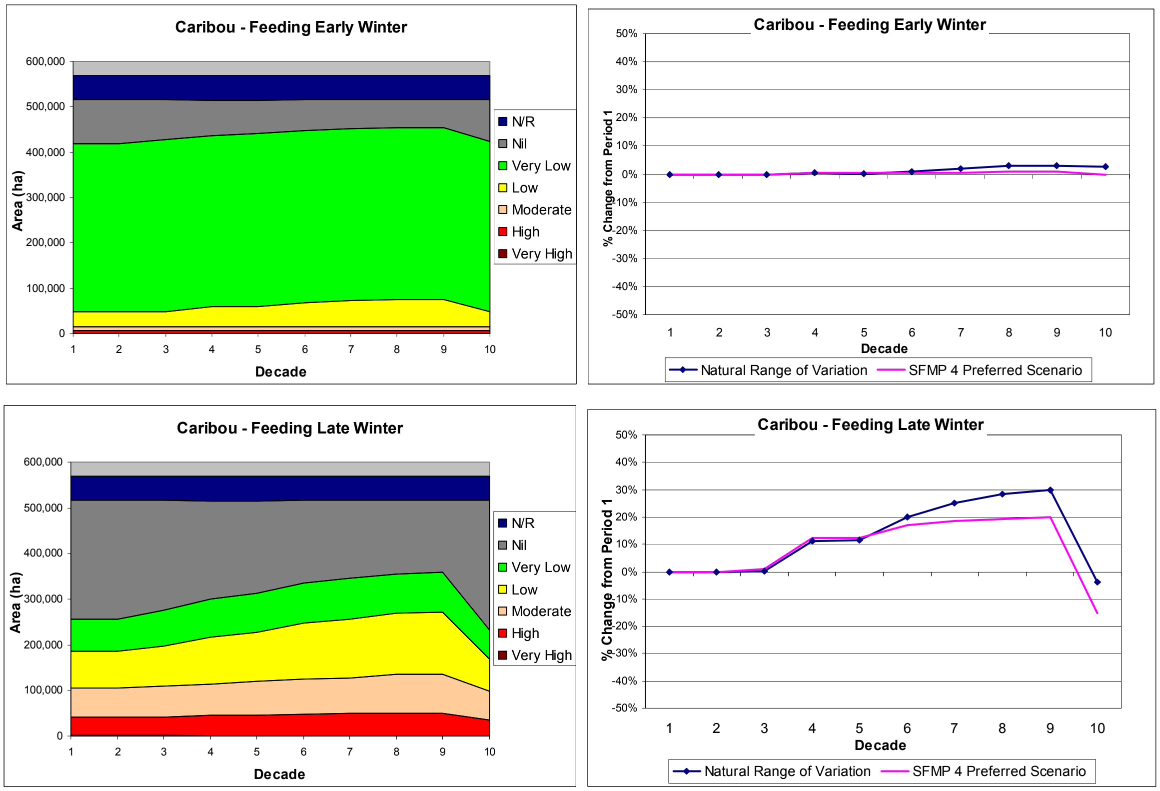


Figure 14: Caribou Habitat Supply

Marten habitat was modeled as general winter habitat. TFL 48 has a large amount of habitat (over 250,000 ha) modeled as very high, high and moderate. While habitat steadily declines over the 100 year simulation the preferred scenario has less of a decline than the natural range of variation simulation.

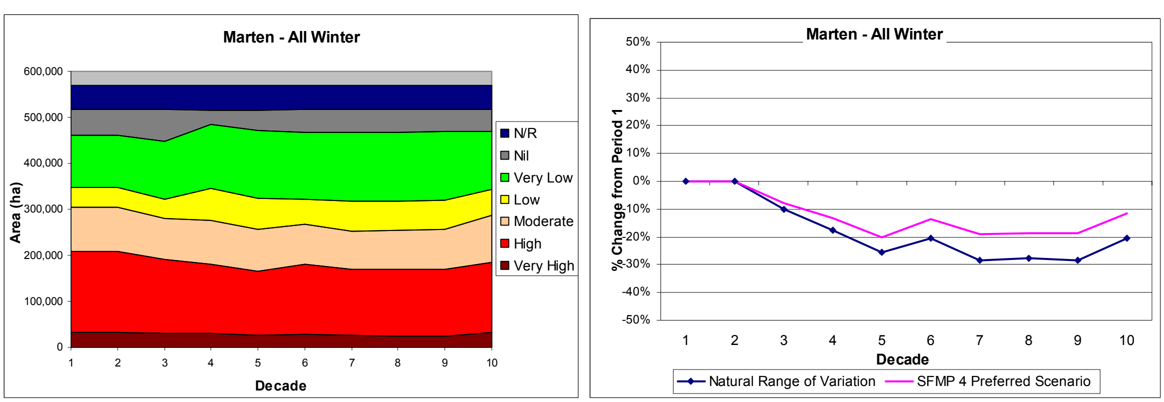


Figure 15: Marten Habitat Supply

Fisher habitat was modeled as general winter habitat. TFL 48 represents a large area of very high, high and moderate habitat with over 196,000 ha classified in these categories.

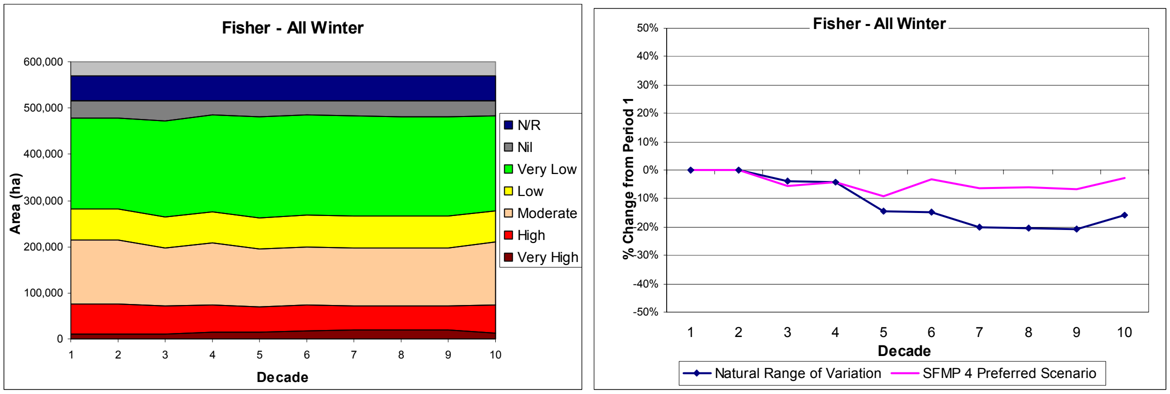


Figure 16: Fisher Habitat Supply

Grizzly bear habitat was modeled as spring feeding habitat. TFL 48 has a moderate amount of very high, high and moderate grizzly bear habitat with over 111,000 ha classified in these categories.

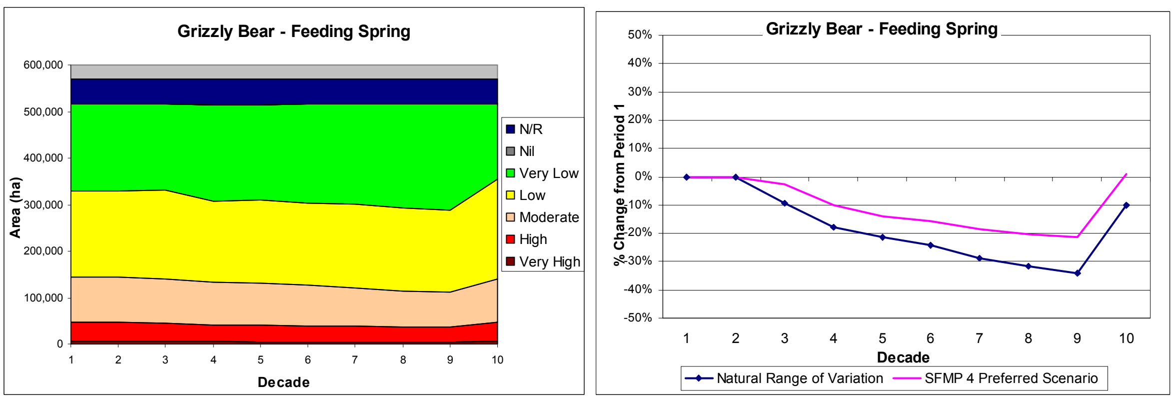


Figure 17: Grizzly Bear Habitat Supply

Wolverine habitat was modeled as winter feeding habitat. TFL 48 represents an excellent area for wolverine with over 440,000 ha modeled as high and moderate habitat quality. Again while the trend is for a decline in the overall amount of high quality habitat the preferred scenario shows less of a decline than the natural range of variation.

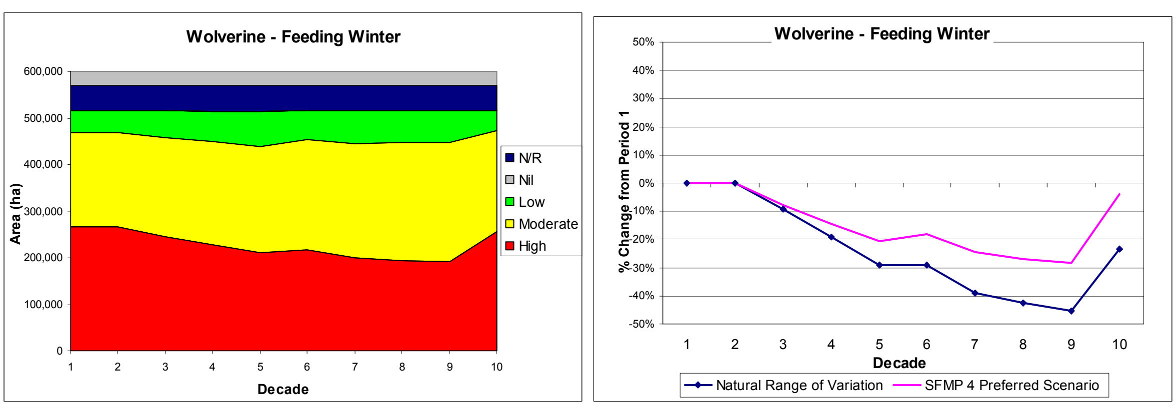


Figure 18: Wolverine Habitat Supply

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply? Yes.

Wildlife habitat models were developed for species using a qualitative model based on biogeoclimatic units in which each site series classification is given a qualitative rating based on a 1-4 or 1-6 rating scale (depending on the level of species knowledge). The number of hectares in each unit is calculated for each period of the timber supply cycle, thereby showing quantitative changes in the number of hectares of habitat quality over time. The baseline scenario was based on modeling natural disturbances in a no harvesting, no fire suppression scenario. The rate of disturbance applied was determined by natural disturbance unit as indicated in Table 22 or 0.68% or the TFL being disturbed per year versus an average disturbance of between 0.45% and 0.50% being disturbed per year in the preferred scenario.

Table 22: Natural Rates of Disturbance by NDU

NDU	Total Forest Area (ha)	Stand Replacement Disturbance Cycle	Annual Area% disturbed /year	Area Disturbed per Decade
Boreal Plains - Upland – Conifer	68,120	100	1.00%	6,812
Boreal Plains - Upland – Decid.	43,814	100	1.00%	4,381
Boreal Foothills – Mountain	177,423	150	0.67%	11,828
Boreal Foothills – Valley - Conifer	125,200	120	0.83%	10,433
Boreal Foothills – Valley – Decid.	39,669	120	0.83%	3,306
Omineca – Mountain	13,220	300	0.33%	441
Omineca – Valley	6,210	120	0.83%	518
Wet Mountain	92,738	900	0.11%	1,030
Total Area (ha)	566,394		0.68%	38,749

STRATEGY AND IMPLEMENTATION SCHEDULE:

Habitat supply modeling was started during the term of MP 3. Some analysis occurred during MP 3, which lead to changes in the species being modeled (see Table 21).

Moose, elk, caribou (early winter) and wolverine habitat supply all stayed relatively constant over the 100-year habitat supply modeling conducted with the timber supply analysis. No additional strategies are necessary.

Marten winter, fisher winter, grizzly bear spring feeding, and wolverine winter feeding all decreased over the 100 year period, however all are above the level of habitat indicated in the natural disturbance baseline so no additional strategies are necessary.

Caribou late winter habitat is modeled as increasing over the 100-year natural baseline however the preferred scenario does not increase to be within the acceptable variance. Canfor is continuing to work with BC Environment to implement Ungulate Winter Range strategies for caribou within TFL 48 (see Section 3.15). Ungulate winter ranges and wildlife habitat areas for caribou are expected to be completed by the end of 2006.

MONITORING PROCEDURE

Habitat models are run as new timber supply analysis is conducted through the management planning cycle, or when changes (e.g., large natural disturbance events) require changes in timber supply modeling.

LINKAGES TO OPERATIONAL PLANS:

If habitat supply is within the allowed range of variance no change in operational plans is required (however, site specific measures as driven by practice or other indicators may require change, e.g., road deactivation may be conducted for specific wildlife concerns). If habitat supply is not within the range of variance Canfor will investigate the causes and implement stand level management strategies consistent with section 3.11.

3.11 Species of Management Concern

Indicator Statement	Target Statement
Percent consistency with management strategies for species of management concern	On an annual basis, 100% of the management strategies for species of management concern are consistently being implemented as scheduled
SFM Objective: We will maintain sufficient habitats for species at risk.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Annually a 5% variance down to 95% of the management strategies for species of management concern are consistently being implemented as scheduled is acceptable.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Application of landscape, (coarse filter) and stand level (medium filter) biodiversity management measures contribute to the maintenance of most of the biodiversity needs in the planning area. However, coarse and medium filter guidelines may not be sufficient to ensure the conservation of all species. These species will require fine filter management to ensure that they are maintained within our ecosystems. This indicator will ensure that specific management strategies are in place to conserve and manage specific habitat needs for species of management concern.

The habitat requirements of most species of management concern are sufficiently known to prescribe activities that will minimize the impact to these species. The management strategies will be based on information already in place (e.g., National Recovery Teams of Environment Canada, Identified Wildlife Management Strategy) and on scientific literature. Management strategies will be implemented in operational plans to ensure the development/maintenance of species' habitats.

CURRENT STATUS

Canfor has tracked species of management concern since MP2, with increasing levels of awareness during the Term of MP 3. Canfor's current list of vertebrate species of management concern as listed in Table 23. Generally the number of species being tracked since MP2 has decreased as the level of species awareness has increased. Species selection was based one or more of the following criteria:

- COSEWIC Schedule 1 list;
- Provincially red and blue listed forest-dwelling species that are sensitive to forest practices; and
- Regionally rare species that may be sensitive to forestry operations (Sandhill Crane)

Table 23: Vertebrate Species of Potential Management Concern

Common Name	Scientific Name	COSEWIC[1]	BC CDC List 2005 [2]	IWMS 2004 [3]
Amphibian				
Western Toad	*Bufo boreas*	Special Concern (2002)	Yellow	
FISH				
Bull Trout	Salvelinus confluentus		Blue	
BIRDS				
Bay-breasted Warbler	Dendroica castanea		Red	
Cape May Warbler	Dendroica tigrina		Red	
Black-throated Green Warbler	Dendroica virens		Blue	
Connecticut Warbler	Oporornis agilis		Red	
Sandhill Crane	Grus canadensis	NAR (1979)	Blue	
Broad-winged Hawk	Buteo platypterus		Blue	
MAMMALS				
Northern Long-eared Myotis	Myotis septentrionalis		Blue	
Fisher	Martes pennanti		Blue	
Wolverine	Gulo gulo luscus	Special Concern (2003)	Blue	Yes
Grizzly Bear	Ursus arctos	Special Concern (2002)	Blue	Yes
Woodland Caribou (Northern ecotype)	Rangifer tarandus	Threatened (2002)	Blue	Yes

1 Committee on the Status of Endangered Wildlife in Canada: www.speciesatrisk.gc.ca
2 BC Conservation Data Centre's Species and Ecosystem Explorer http://srmapps.gov.bc.ca/apps/eswp/
3 IWMS - Identified Wildlife Management Strategy

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Management strategies for species of conservation concern have not been developed for TFL 48, but are expected by December 1, 2006. Once management strategies have been developed for each species, Canfor will provide training to key field personnel.

Canfor Chetwynd Division, in partnership with academia and the provincial government, is developing a new approach for identifying species of potential conservation concern based on stewardship responsibility, trend, threat and vulnerability (Fred Bunnell, pers comm August 17, 2005). The process to identify the species of conservation concern for TFL48 is as follows:

- List all terrestrial vertebrates, vascular plants and freshwater fish in TFL 48;
- Extract species of conservation concern based on stewardship responsibility, trend, threat and vulnerability (Squires 2005);
- Determine which species are forest-dwelling based on previous list;
- Determine which species are sensitive to forest practices based on the previous list; and
- Determine if the habitat needs of the species that are sensitive to forest practices are adequately addressed by coarse (i.e., ecosystem representation) and/or medium (i.e., retention of habitat elements) filters. If not, fine scale management strategies will be developed.

Interim Measures

Until management strategies for species listed in Table 23 are available and being fully implemented, species of management concern will be managed by:

- Implement Fort St. John management guidelines developed for a similar list of species for harvest area layout initiated after October 31, 2005
- Consult with internal and external wildlife specialists as required when preparing plans
- Maintain riparian reserve zones as required around water bodies adjacent to forest operations (see Section 3.7)
- No harvest or road construction within Protected Areas (see Section 3.14)

- Develop Wildlife Habitat Areas and Ungulate Winter Ranges for the Graham caribou herd in partnership with MoE
- 100% consistency with the objectives of Wildlife Habitat Areas and Ungulate Winter Ranges (see Section 3.15)
- Anchor wildlife tree patches on site-specific habitat features (i.e. dens, mineral licks, nests, etc.) (See Section 3.9)

MONITORING PROCEDURE

Identified wildlife will be monitored via the BC Provincial Government's Listing of Identified Wildlife.

Management strategies will be updated depending on changing circumstances and status of species.

All wildlife tree patch areas are documented and tracked in Genus.

All site-level plans are subject to internal and external inspections. Non-conformances and non-compliances in relation to the plan are communicated to Canfor's planning foresters, who will take actions to remedy the particular situations. Monitoring for consistency is summarized in the SFM annual report.

LINKAGES TO OPERATIONAL PLANS

Silviculture prescriptions or site plans prescribe the areas to be retained as WTP's and describe wildlife habitat areas found adjacent to cutblocks.

3.12 Coniferous Seeds

Indicator Statement	Target Statement
The proportion of seeds for coniferous species collected and seedlings planted in accordance with the regulation	All coniferous seeds will be collected and seedlings will be planted in accordance with the regulations
SFM Objectives: Conserve genetic diversity of tree stock.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

The acceptable variance is zero unless the Chief Forester authorizes a variance that differs from the transfer rules outlined in the Chief Forester's Standards for Seed Use.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Genetic diversity of seedlings used for reforestation is ensured through the ministry's seedlot registration policies and standards. Cones and seed obtained from wild forest stands must be collected from a minimum of 10 trees. The ministry licences tree seed orchards to ensure that their design and management practices maintain genetic diversity. Seed derived from licensed orchards must also contain a minimum level of genetic diversity - or effective population size (Ne) – as measured by the quantity of pollen and cones from each contributing tree in the orchard. Orchard seedlots must have a minimum Ne of 10. Similar registration requirements also apply to vegetatively propagated reforestation materials. These rules ensure that planted forests contain sufficient genetic diversity so they are able to withstand any biotic (e.g. insect or disease) or abiotic (e.g. wind, snow, frost, or climate change) event as well as a naturally regenerated forest."

Transfer guidelines minimize the risks of maladaptation or growth loss associated with moving seed or vegetative material from its source to another location. Exceeding the transfer limits may decrease productivity or increase susceptibility to frost, insects or disease. Poor survival or outright mortality may occur when seed is transferred past its ecological tolerance; however, losses in productivity can be substantial even over relatively short distances, particularly where elevation is concerned (Ministry of Forests and Range Tree Improvement Branch publication).

CURRENT STATUS

All (100%) seedlots grown and planted within the DFA are registered in accordance with the Forest Planning and Practices Regulation and the Chief Forester's Seed Use Standards effective April 1, 2005.

All seeds have been registered with and tracked by Tree Improvement Branch of the Ministry of Forests and Range.

In 2004 all coniferous seeds were collected and seedlings were planted in accordance with the regulations (The Tree Cone, Seed and Vegetative Material Regulation (BC Reg 164/95)).

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Seeds will be collected and planted in accordance with the Forest Planning and Practices Regulation and the Chief Forester's Seed Use Standards effective April 1, 2005. Based upon the seedlot registration information, seeds are planted only where they are genetically and ecologically appropriate for the site.

MONITORING PROCEDURE

All reforestation activities are documented and tracked in Genus. Seedlots are tracked and recorded for every area planted.

LINKAGES TO OPERATIONAL PLANS

Silviculture prescriptions and site plans prescribe the areas to be reforested. Silviculture staff uses this information to allocate the appropriate seedlots to conform to the transfer guidelines.

3.13 Deciduous Seeds and Vegetative Material

Indicator Statement	Target Statement
The proportion of seed or vegetative material for deciduous species collected and planted in accordance with the regulation	All deciduous species will be collected and planted in accordance with the regulations
SFM Objectives: We will conserve genetic diversity of tree stock.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

The acceptable variance is zero unless the Chief Forester authorizes a variance that differs from the transfer rules outlined in the Chief Forester's Standards for Seed Use.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Genetic diversity of seedlings used for reforestation is ensured through the ministry's seedlot registration policies and standards. Seed and vegetative material obtained from wild forest stands must be collected from a minimum of 10 trees. The ministry licences tree seed orchards to ensure that their design and management practices maintain genetic diversity. Seed and vegetative material derived from licensed orchards must also contain a minimum level of genetic diversity - or effective population size (Ne) – as measured by the quantity of pollen and cones from each contributing tree in the orchard. Orchard seedlots must have a minimum Ne of 10. Note: There are currently no orchards producing deciduous seed or vegetative propagates for TFL 48 operating area. These rules ensure that planted forests contain sufficient genetic diversity so they are able to withstand any biotic (e.g. insect or disease) or abiotic (e.g. wind, snow, frost, or climate change) event as well as a naturally regenerated forest.

Transfer guidelines minimize the risks of maladaptation or growth loss associated with moving seed or vegetative material from its source to another location. Exceeding the transfer limits may decrease productivity or increase susceptibility to frost, insects or disease. Poor survival or outright mortality may occur when seed is transferred past its ecological tolerance; however, losses in productivity can be substantial even over relatively short distances, particularly where elevation is concerned (Ministry of Forests and Range Tree Improvement Branch publication).

CURRENT STATUS

Canfor has not planted any deciduous seedlings or vegetative propagates on TFL 48. Any (100%) seedlots grown or planted within TFL 48 will be registered in accordance with the Forest Planning and Practices Regulation and the Chief Forester's Seed Use Standards effective April 1, 2005.

All seeds will be registered with and tracked by Tree Improvement Branch of the Ministry of Forests and Range.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Seeds and vegetative material will be collected and planted in accordance with the Forest Planning and Practices Regulation and the Chief Forester's Seed Use Standards effective April 1, 2005. Based upon the seedlot registration information, seeds and vegetative materials are planted only where they are genetically and ecologically appropriate for the site.

MONITORING PROCEDURE

All reforestation activities are documented and tracked in Genus. Seedlots are tracked and recorded for every area planted.

LINKAGES TO OPERATIONAL PLANS

Silviculture prescriptions and site plans prescribe the areas to be reforested. Silviculture staff uses this information to allocate the appropriate seedlots to conform to the transfer guidelines.

3.14 Class A Parks, Ecological Reserves and LRMP Designated Protected Areas

Indicator Statement	Target Statement
Hectares of forestry related harvesting or road construction within Class A parks, protected areas, ecological reserves and LRMP designated protected areas	Zero hectares of forestry related harvesting or road construction within Class A parks, protected areas, ecological reserves or LRMP designated protected areas
SFM Objective: We will implement management strategies appropriate to the long-term maintenance of protected areas and sites of special biological significance.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

There will be no acceptable variances to this target.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator identifies whether the values protected within Class A parks, protected areas, ecological reserves and LRMP designated protected areas are going to be impacted by forestry related harvesting and road construction. Targeting for no forestry related harvesting or road construction will contribute to the protection of these ecosystems.

CURRENT STATUS

In order to avoid operating in these areas, forestry activities need to clearly identify the status and location of Class A parks, protected areas, ecological reserves and LRMP designated protected areas.

Protected areas and sites of special biological significance within or adjacent to the DFA have been identified through a variety of processes.

LRMP Protected Areas and Parks

Goal 1 protected areas are established primarily for ecological representation to protect viable examples of natural diversity such as major terrestrial, marine, and freshwater systems, characteristic habitats, hydrology and landforms and/or characteristic backcountry recreational or cultural and heritage features.

Goal 2 protected areas represent special features such as cultural, heritage and recreation sites, rare and endangered species and critical habitats, outstanding or unique botanical, zoological, geological and palaeontological features, outstanding or fragile culture and heritage features, and outstanding outdoor recreational features such as trails.

Potential protected areas were initially identified through a technical team formed from government agencies (RPAT). This group delineated Areas of Interest, which met the above criteria. The Dawson Creek LRMP then used this information to finalize proposed Protected Area (PA) boundaries.

Following is a summary of the classified protected areas in or adjacent to the DFA, and their major characteristics.

Bocock Peak (1,133 ha)

Bocock Peak is located along the northwestern boundary of the planning area, south of the Peace Arm of Williston Lake and adjacent to Eleven Mile Creek in the Hart Ranges ecosection.

PAS Values:

- contains three significant karst caves (White Hole, Short Straw Cave and Lesser Sink)

Butler Ridge (6,694 ha)

The Butler Ridge Protected Area is located 20 kilometres northwest of the District of Hudson's Hope. It incorporates the easternmost portion of the Dunlevy Creek watershed north of Williston Lake and the west side of Butler Ridge. The area includes a portion of the shoreline adjacent to the east side of Dunlevy inlet on Williston Lake that is adjacent to the Dunlevy Recreation Area.

This area represents a portion of the Peace Foothills ecosection. It encompasses three biogeoclimatic zones, namely the moist, very cold Engelmann Spruce-Subalpine Fir, the Sub-Boreal Spruce, and the Black and White Boreal Spruce zones. The area provides good examples of the forests of the Rocky Mountain Foothills, and valley bottom to alpine ecosystem connectivity.

The Butler Ridge area provides critical winter range for caribou, Stone's sheep habitat as well as moose and elk winter range. These attributes contribute to the Protected Area's regionally significant value as a wildlife viewing area.

Butler Ridge has historically supported a number of recreational activities including hiking, cross-country skiing, hunting and fishing. The area is also recognized as a traditional use area for First Nations, and continues to support First Nation's cultural values.

Hole-in-the-Wall (131 ha)

Hole-in-the-Wall spring is located adjacent to the Sukunka River near Windfall Creek in the Hart Foothills ecosection.

PAS Values:

- unique underground stream appearing from the base of a limestone cliff near the Sukunka River
- unique and relatively constant water quantity and quality parameters

Klin-se-za (Twin Sisters/Beattie Peaks, 2,671 ha)

The Klin-se-za Protected Area is an area of profound spiritual significance and traditional use value to the First Nations people of northeastern B.C. It is the centre of spiritual prophecies that shape the belief systems and culture of the First Nations. The need to protect these values led to the Twin Sisters Special Management Committee Recommendations (October 21, 1997). More details regarding this protected area can be found within the Dawson Creek LRMP document. These details are not to be extracted from the LRMP document, and are therefore not within this management plan.

Peace River/Boudreau Lake (19,738 ha)

The Peace River/Boudreau Lake Protected Area is located between Hudson’s Hope and Fort St. John. It incorporates a major portion of the southerly bank of the Peace River valley; the lower Moberly River valley and the Peace River islands between Maurice Creek and the Moberly River.

This Goal 1 Protected Area is shared between the Fort St. John and Dawson Creek LRMP’s. The islands located within the Peace River that are adjacent to the Fort St. John LRMP boundary are within the Fort St. John LRMP planning area while the balance of the islands within the Protected Area are within the Dawson Creek planning area.

The Protected Area represents a portion of the moist, warm Boreal White and Black Spruce biogeoclimatic zone within the Peace Lowlands ecosection. Within it are captured the typical mixed forest types of the Peace River valley along with stands of alluvial cottonwood and spruce ecosystems.

The area provides habitat for a number of wildlife species including critical trumpeter swan nesting sites around Boudreau Lake. High value winter range is provided for moose, deer and elk. The area also contains a number of cultural heritage sites of First Nations' and European settlements and uses. These include the first site of European settlement on mainland B.C. at Rocky Mountain Fort (1794-1804), and a historic travel corridor for First Nations, early European explorers and fur traders. This area has traditionally supported a number of recreational activities, both public and commercial, including boating, canoeing, bird watching, hunting and fishing.

Pine/LeMoray (32,975 ha)

The Pine/LeMoray Protected Area is located 70 kilometres southwest of Chetwynd in the Hart Ranges ecosection of the Rocky Mountains. It includes the Link and Mountain Creek watersheds and is bordered in the southwest by the planning area boundary and by the Pine River on the northwest and north boundaries. Heart Lake lies within the area.

This area provides good representation of the wet, cool Engelmann Spruce-Subalpine Fir biogeoclimatic zone found within the Hart Ranges of the Rocky Mountains. Located primarily on the east slope of the continental divide, it is a mountainous area of high elevation spruce-subalpine fir forest and rugged alpine terrain.

The area provides important habitat for many fish and wildlife species including Arctic grayling, high elevation caribou, moose, and wolverine; and includes high capability habitat areas for grizzly bear. The Protected Area is also significant for its fossil sites and examples of karst topography and alpine areas. Traditional use by First Nations is also recognized in this area.

The high value backcountry and wilderness recreation values associated with relatively easy access make this area a regionally significant recreation area. Hiking, hunting, fishing, and snowmobiling, as well as commercial recreation activities have traditionally occurred in the area. A Forest Service recreation site exists at Heart Lake.

Adjacent to this proposed Protected Area is an Area of Interest located within the Mackenzie LRMP area.

A few parks also exist within or adjacent to TFL 48. The parks are described below.

Butler Ridge Provincial Park (6,145 ha) is located in the Peace Foothill ecosection just east of the Rocky Mountains. The area provides important winter range for caribou and stone sheep habitat in the higher elevations as well as moose and elk winter range in the lower elevations. A blue-listed species, the Arkansas rose, has been recorded in the park.

Gwillim Lake Provincial Park (32,458 ha) is located in the Hart Foothills ecosection. Gwillim Lake Provincial Park houses a diverse array of both coniferous and deciduous tree species. Lodgepole pine, white spruce, trembling aspen, paper birch and balsam poplar are found along the lakeshore intermixed with low wetlands of black spruce, willow and alder. Forests at higher elevations consist of Engelmann spruce and subalpine fir that open up into parklands and alpine meadows higher up.

Sukunka Falls Provincial Park (423 ha). Boreal white and black spruce is characteristic of the valley bottom with stands of aspen, cottonwood, and poplar. The Sukunka valley has been identified as key winter range for moose and deer.

Monkman Provincial Park (62,896 ha) Lower elevations in the park are dominated by mature sub-alpine fir, white spruce and lodgepole pine. The higher elevations support growths of Engelmann spruce, sub-alpine fir and white spruce. Above the tree line, only plants adapted to the conditions are to be found. Monkman Provincial Park conserves representative areas of the Central Rocky Mountains and Foothills. Lower elevations in the park are dominated by mature sub-alpine fir, white spruce and lodgepole pine. The higher elevations support growth of Engelmann spruce, sub-alpine fir and white spruce. Above tree line, the trees become dwarfed and twisted. Alpine meadows of heathers, grasses and wildflowers, such as white rhododendron, arctic lupine, glacier lily and Indian paintbrush cover large areas and are intermixed with shrubs.

Ecological Reserves

Ecological reserves are areas selected to preserve representative and special natural ecosystems, plant and animal species, features and phenomena. The key role of ecological reserves is to contribute to the maintenance of biological diversity and the protection of genetic materials. Scientific research and educational purposes are the principle uses of ecological reserves. The benefits of these areas are the provide for the maintenance of biological diversity, they provide outdoor laboratories and classrooms for studies, and they can act as benchmarks against which environmental changes can be measured.

Currently there are no Ecological Reserves within or adjacent to the TFL.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Within one month of the identification and declaration of a new area for protection, detailed location and management information will be requested from the government by the Planning Superintendent.

Map information will be digitally stored by the GIS Supervisor within 1 month of this information being made available by the government, and planning maps will display this information, provided the data is not considered sensitive (e.g. Some WHA's will not be shown on public maps).

Applicable management information will be circulated to affected staff by the Planning Supervisor for consideration in all planning activities within 1 month of receipt of this information from government.

MONITORING PROCEDURE

Changes to protected areas will be reported in future annual reports.

LINKAGES TO OPERATIONAL PLANS

Staff members will refer to base maps to locate protected areas when preparing operational plans. When planned activities are in the general vicinity of the identified areas, staff members will ensure operational plans are consistent with any management guidelines for these protected areas.

3.15 Wildlife Habitat Areas, Ungulate Winter Ranges and Dunlevy Creek Management Plan

Indicator Statement	Target Statement
Proportion of activities consistent with objectives of Wildlife Habitat Areas (WHA), Ungulate Winter Ranges (UWR), and Dunlevy Creek Management Plan	All forest management activities will be consistent with objectives of Wildlife Habitat Areas (WHA), Ungulate Winter Ranges (UWR), and Dunlevy Creek Management Plan
SFM Objective: We will implement management strategies appropriate to the long-term maintenance of protected areas and sites of special biological significance.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

No variances unless authorized by the Regional Manager Ministry of Environment.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Consistency with the objectives of WHA's and UWR's ensures the protection of specific features and critical habitat. The objectives designed for these areas generally allow activities provided that protection of the special features of these areas is maintained.

Wildlife Habitat Areas are mapped areas of habitat that are biologically limiting to a species or are remaining examples of identified plant communities. They are established by MWLAP to protect critical habitat elements for one or more species of Identified Wildlife. Identified Wildlife are considered to be sensitive to habitat alteration associated with forest and range practices and are considered to be at risk (i.e. endangered, threatened, vulnerable, or regionally important).

Ungulate Winter Range refers to an area that is identified as being necessary for the winter survival of an ungulate species.

Dunlevy Creek Management Plan (DCMP) refers to a special management plan for the Dunlevy block of the TFL developed and prepared during the term of MP 3 by the Ministry of Sustainable Resource Management (2002). The Plan divides the Dunlevy into several subzones (See Figure 19) and identifies specific operational guidelines around how and when harvesting and mineral extraction may occur.

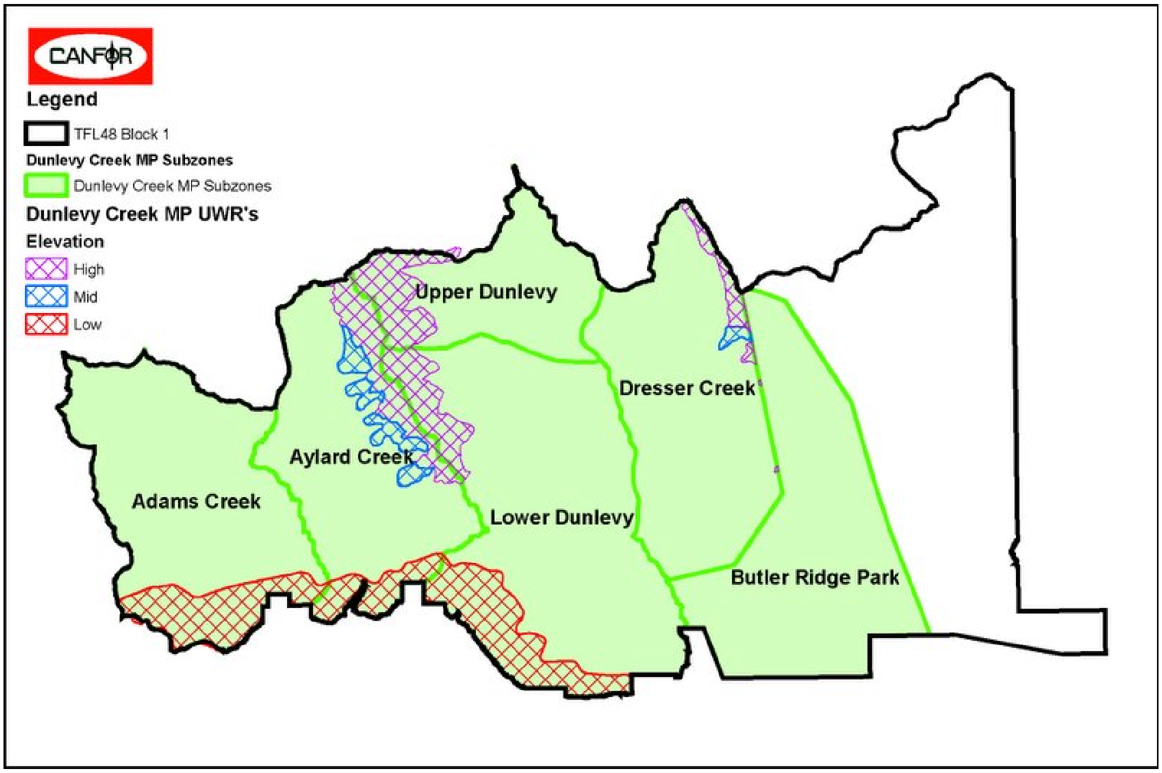


Figure 19: Dunlevy Creek Management Plan Subzones and UWR's

CURRENT STATUS

Wildlife Habitat Areas

Currently within the TFL, one wildlife habitat area (WHA's) has been identified and approved for bull trout (101 ha). This area has general wildlife measures established. There has not been any activity in this area and no activity is planned. This area has been removed from the timber harvesting land base for SFMP 4.

Ungulate Winter Ranges

Ungulate winter ranges have been identified as part of the Dunlevy Creek Management Plan in addition to those included in MP 3. See Table 24 for a summary of areas managed as WHA or UWR and their corresponding contribution to the timber harvesting land base. Work is currently under way to identify other UWR's within TFL particularly for caribou. When this work is completed those areas will be incorporated into this indicator.

Dunlevy Special Management Zone

During the term of MP 3, 216 ha of harvesting (CP 275 and 276) occurred within the Lower Dunlevy subzone in 2001 and 2002. The harvesting and subsequent deactivation is consistent with the Dunlevy Creek Management Plan.

Table 24: WHA and UWR Area's Incorporated in SFMP 4

WHA / UWR	Location	Gross Area (ha)	Forest Area (ha)	Net Area Contributing to THLB
WHA - Bull Trout		105	86	0
Ungulate Winter Range	Aylard	2,461	1,661	0
	Butler Ridge	301	199	0
	Williston	2,982	2,620	0
	Sukunka / Graveyard	3,036	2,873	1,804
	Total UWR	8,780	7,353	1,804
Total All Wildlife		8,885	7,439	1,804

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? Yes

The existing WHA for Bulltrout and the UWR's within the DCMP area have been removed from the THLB.

The information used to determine that amount of harvesting in each compartment of the DCMP was based upon the MP 3 THLB. Since the THLB has changed in the SFMP 4 analysis, the area targets are adjusted accordingly and in keeping with the relative amount of harvest area to THLB area. The timing of harvest has not changed; however, additional periods were included to cover the entire planning horizon.

Table 25: Area Targeted for Harvest by Decade within the Dunlevy Creek Plan Area

Period	THLB Areas and Decade Targeted	Compartment				
		Adams	Aylard	Lower Dunlevy	Upper Dunlevy	Dresser Creek
	2001 THLB	**3,621**	**2,261**	**6,379**	**1,891**	**2,704**
	2005 THLB	**2,903**	**2,619**	**3,781**	**1,270**	**2,503**
1	2005			189	317.5	
2	2015	1,016				
3	2025			189		
4	2035				317.5	
5	2045		524	189		
6	2055			378		1,001
7	2065	581				
8	2075			378		
9	2085					
10	2095	726				
11	2105			567		
12	2115		786			
13	2125			567		1,001
14	2135		786			
15	2145				381	
16	2155	1,016		189		
17	2165					
18	2175			189	317.5	
19	2185		524			501
20	2195	581		189		
21	2205					
22	2215			378		
23	2225		786			
24	2235			378		
25	2245	726				1,001

STRATEGY AND IMPLEMENTATION SCHEDULE

The locations of the WHA's and UWR's are maintained within Canfor's GIS. No activities are proposed for WHA's or UWR's within the Dunlevy. Harvesting within the Dunlevy is conducted as per the schedule outlined in Table 25.

Harvesting in the Sukunka/Graveyard UWR's will be conducted only when a maximum of 20% of the forested land base is less than 3m tall and 50% of the forested land base must be greater than 100 years old.

MONITORING PROCEDURE

When activities are proposed and/or implemented within the Dunlevy Creek Management Plan area or Ungulate Winter Ranges where harvesting is an acceptable activity a summary of these activities will be presented in the annual report.

LINKAGES TO OPERATIONAL PLANS

FDP's or FSP's and SP's will be developed in accordance to the objectives of the WHA's, UWR's and Dunlevy Creek Management Plan.

3.16 Forest Health

Indicator Statement	Target Statement
% of significant detected forest health damaging events which have treatment plans prepared	100% of significant detected forest health damaging events will have treatment plans prepared within 1 year of initial detection
SFM Objective: We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbances and stress.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

A variance of 1 year is permissible to provide for additional information collection and consultation with forest health specialists.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator describes the effectiveness of the forest health management strategy in addressing identified problems. This indicator will identify that treatment plans are developed and implemented in a timely manner to address significant forest health issues.

- Significant forest health damaging events are defined as those identified as:
- medium or high risk from the risk management classification system (see Strategy and Implementation Schedule, below), or
- forest health events identified as significant by the MoFR, or
- damage which threatens the achievement of silviculture stocking standards within a plantation, or
- damage which threatens the survival of 10% or more of the trees in a merchantable stand greater than 50 hectares.

CURRENT STATUS

Managed Stands

The table below was created from data extracted from Genus to determine the current incidence of forest health issues on the TFL. This data is entered into the stocking status tab in Genus, which is the record of the most recent silviculture survey. Free-growing damage (health) standards are used to assess stand health in managed stands during silviculture surveys.

This data shows that the most common forest health concern on the TFL in managed stands is caused by abiotic factors, followed by insects, then disease. The primary abiotic factor is frost. Eriophyid Mites and pine stems rusts are the most common disease and insect concerns on the DFA.

Table 26: Summary of Forest Health Concerns on TFL 48

Forest Health Class	Pest Damage Agent Grouping	Percent of Managed Stands on TFL Affected
Abiotic	Abiotic: Frost	0.5
	Abiotic: Snow-press	0.4
	Wildlife Browse	0.3
	Abiotic: Competition	0.3
	Other Abiotic	0.2
	Abiotic: Sunscald	Less than 0.1 %
	Abiotic: Livestock Damage	Less than 0.1 %
	Abiotic: Windthrow	Less than 0.1 %
	Abiotic: Winter Desiccation	Less than 0.1 %
	Abiotic: Flooding	Less than 0.1 %
	Abiotic: Fire	Less than 0.1 %
Sum of Abiotic Injuries		**1.9**
Insect	Eriophyid mites	0.2
	Warren's rootcollar weevil	0.1
	Spruce Weevil	Less than 0.1 %
	Other Insect	Less than 0.1 %
Sum of Insect		**0.3**
Disease	Pine Stem Rusts	0.2
	Other Disease	Less than 0.1 %
	Foliar Diseases of deciduous	Less than 0.1 %
	Conifer foliar diseases	Less than 0.1 %
Sum of Disease		**0.3**
Managed stands with known forest health issues		**2.5**

Unmanaged Stands

Insects, disease, and abiotic factors have been routinely identified from field information and overview flights, and salvage programs developed as required. The following table describes the current status for forest health issues on unmanaged stands on TFL 48. There were no wild fires on TFL 48 in 2004.

Table 27: 2000-2004 Summary of Forest Health Issues on Unmanaged Stands

Factor	Volume (m^3)	Area (ha)	Comments
Blow Down	10,665	38.8	Derived area from volume /275.
Mountain Pine Beetle	9,450	34.4	Derived volume based on .35 m^3 per tree. Derived area from volume /275.
Spruce Bark Beetle	1,800	6.5	Derived area from volume /275.
Fire	60	45.5	One 38 ha burn not in a forested area.
Balsam Bark Beetle	0	0	Very light incidence in mountain areas.
Spruce Budworm	0	0	Possible incidence in 2000 – may have been misclassified.
Forest Tent Caterpillar	0	0	Scattered levels in 2000.
Environmental	0	0	Incidental and scattered snow damage – not quantifiable.
Total	**21,975**	**125.2**	

Although blow down has the highest volume affected in the table above, currently the most critical forest health issue on the TFL's unmanaged stands is the Mountain Pine Beetle. The table above shows only one year of affected volume, as it was first detected on the TFL in February 2004.

Canfor Chetwynd utilizes the forest health management expertise in the Canadian Forestry Service and the BC Ministry of Forests and Range as needed. The Canadian Forestry Service holds extensive historical information (old Forest Insect and Disease Survey), and it also houses expert diagnostic services, and conducts research relevant to forest health management. The Ministry of Forests and

Range also has leading experts in diagnostics, management and training. Canfor Chetwynd contacts the CFS and the Canadian Food Inspection Agency (CFIA) in the event of an alien invasive pest found on the DFA.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

We will establish, and maintain a summary of damaging agents and their estimated incidence, current status and their potential impacts. Table 28 is the initial estimate of incidence and severity of damaging agents in the DFA. Each pest damage agent is rated as high, medium or low. Agents that have a risk management class of high or medium will have the risk rating completed. Agents that have a low risk ranking will not have the risk rating completed unless their severity changes to medium or high.

Table 28: Estimated Incidence, Severity, Current Conditions and Potential Impact of Damage Agents in the TFL 48 DFA

Pest Damage Agent	Estimated Incidence (area affected of DFA) by Severity Class (Low, mid & high)			Severity Class Breakpoints (Low, Mid & High)	Distribution	Potential Impact	Risk Management Class	Landscape & Stand Hazard, and Risk Management Activities
	Low	Mid	High	denote classification is under development	Estimated extent of pest damage in the DFA, and type of damage	Type of damage, and seral stage affected	HIGH or Low	Description & Source
Mountain pine beetle	99.5%	0.5%	0	E.g., <2%, 2-10%, >10%	Common	Stand destroying (mid-to-late-mature)	High	Stand Hazard Rating: As per the procedure outlined in the Bark Beetle Management Guidebook (BBMgmtGB) p. 19-20. We have run a stand hazard rating; producing a spatial map for the DFA. Stand hazard conditions have been re-assessed & mapped. Risk Rating: The Shore – Safranyik Beetle Model will be used to assess susceptibility.
Spruce beetle	98.5%	1.5%	0	E.g., <2%, 2-10%, >10%	Uncommon, stem mortality; central, western and northern areas of DFA	Stand destroying (mature)	Moderate	Stand Hazard Rating: Conduct as per Table 11 of Bark Beetle Mgmt Guidebook (BBMgmtGB) Stand hazard ratings as per Table 11 (BBMgmtGB). Canfor will run a 2005 stand hazard rating; producing a spatial map for the DFA. Stand hazard conditions will be re-assessed & mapped prior to SFMP renewal dates. Risk Rating: Assessments (aerial or ground) will be conducted by Canfor as per Strategy & Implementation Pt 3, Indicator 3.16. Susceptible stands within 2 km of spruce bark beetle infestations are defined as HIGH Risk.
Pine stem rusts	<800m a.s.l. 70%	800 – 1100m a.s.l. 25%	<1100m a.s.l. 5%	<10%, 10-20%, >20% & >1100m a.s.l. 0% (Pers comm., R.W. Reich, 2003)	Ubiquitous/common, localized mid-high severity	Stem mortality, reduces stand density (early seral)	Moderate	Stand Hazard Rating: Hazard rating by elevation band indicates <800m is LOW, and between 800 to 1100m is LOW to HIGH. Note, one or more of the rust species alternate (herbaceous or woody plant) species hosts present on/near the site. Alternate rust hosts are as follows: None for DSG (Endocronartium harknessii); Bastard toad-flax (Geocaulon lividum) for DSC (Cronartium comandrae); and Indian paint-brush (Castelleja spp.) for DSS (Cronartium coleosporioides) Revision of Rust Stand Hazard Rating: Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard). Risk Rating: Risk assessments will be conducted as per the MoFR Standard Operating Procedure 7.1-1 for Ground Detection and Assessment Procedures for lodgepole pine stem rust (May 24, 2000).
Abiotic: Fire	99%	<1%	<1%	<5% mortality-5-30% mortality; >30% mortality	Uncommon to common, localized to widespread damage, highly variable occurrence annually	Stem quality to stem and stand mortality	Moderate	Fuel Hazard Rating: MoFR is currently working on a provincial coverage of fuel loading. When available, it will be assessed for guiding forest operations for strategic planning. Provisions under the Wildfire Act (2005) guide Canfor's forest and stand (cutblock) level risk management procedures.
Wildlife browse (hares, elk moose, etc)	90%	10%	0%	E.g., <10%, 10-30%, >30%	Ubiquitous but localized both conifer & deciduous	Low to severe growth reduction (early seral)	Moderate	Stand Hazard Rating: No known relationships; cannot be risk rated at this time. Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).

Pest Damage Agent	Estimated Incidence (area affected of DFA) by Severity Class (Low, mid & high)			Severity Class Breakpoints (Low, Mid & High)	Distribution	Potential Impact	Risk Management Class	Landscape & Stand Hazard, and Risk Management Activities
	Low	Mid	High	denote classification is under development	Estimated extent of pest damage in the DFA, and type of damage	Type of damage, and seral stage affected	HIGH or Low	Description & Source
Tomentosus root rot	98%	2%	<1%	<6, 6-15, 15+ % (Pers comm., R.W. Reich)	Common below 700m a.s.l. (I.e., ~ 5000 ha in DFA)	Low to severe growth reduction, limited mortality & windthrow (early to mature)	Moderate	Stand Hazard & Risk Rating: High-risk stands are defined as predominantly spruce-leading, mesic & dry sites AND at elevations below 700 m a.s.l. No mapping is required for this damage agent, as 4,880 ha of conifer or 1.55% of the THLB fall below 700m. Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Abiotic: Frost	90%	5%	5%	E.g., <1% 1-10%, >10%	Common, localized to widespread damage	Growth reduction, sometimes stem deformity or stem mortality (early seral is most severely affected)	Low	Stand Hazard Rating: Conifer reforested areas up to 20yrs, particularly in low-lying areas Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Livestock damage	90%	10%	0%	E.g., <10%, 10-30%, >30%	Localized to range tenures on both conifer & deciduous	Low to severe growth reduction & mortality (early seral)	Low	Stand Hazard Rating: Aspen-leading mesic and dry sites that are primary (& possibly secondary) native pasture grazing areas in a Range Use Plan (RUP) are defined as high hazard. Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk). Risk Rating: High Risk - Deciduous and coniferous plantations on historic primary native range on actively grazed Range tenures Moderate Risk – Deciduous and coniferous plantations on historic secondary native range on actively grazed Range tenures Low Risk – Deciduous and coniferous plantations on historic tertiary native range and on non-Range tenured forest lands.
Insect defoliators of deciduous	80%	10%	10%	E.g., <10%, 10-30%, >30%	Periodical, wide range of severity; growth reduction	Limited stem mortality, growth reduction (early to mature seral)	Low	Stand Hazard Rating: Use Imre Otvos' (NRCAN-CFS PFC) hazard & risk mapping work from 2003 when available later in 2005. Risk Rating: A proximity based risk classification similar to that used for spruce bark beetle will be used; e.g., High hazard deciduous stands <2km from an infestation are classed as High risk.
Foliar diseases of deciduous (Venturia sp.)	93%	5%	2%	E.g., <10%, 10-30%, >30%	Ubiquitous/common, annual moist-weather condition dependant, often severe growth impact	Severe growth reduction, reduces stand density (early seral)	Low	Stand Hazard Rating: No known relationships exist; foliar diseases cannot be risk rated at this time. Their variable effects are thought to be clonally controlled, and may require making observations of adjacent mature stand tree crowns to ascertain potential incidence and severity of future Venturia sp. outbreaks. Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).

Pest Damage Agent	Estimated Incidence (area affected of DFA) by Severity Class (Low, mid & high)			Severity Class Breakpoints (Low, Mid & High)	Distribution	Potential Impact	Risk Management Class	Landscape & Stand Hazard, and Risk Management Activities
	Low	**Mid**	**High**	**denote classification is under development**	**Estimated extent of pest damage in the DFA, and type of damage**	**Type of damage, and seral stage affected**	**HIGH or Low**	**Description & Source**
Spruce weevil	97%	2%	1%	E.g., <2%, 2-10%, >10%	Uncommon, localized attack; stem deformity and growth reduction	Stem deformity and growth reduction (early seral)	Low	Stand Hazard Rating: Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard).
Warren's root collar weevil	99%	1%	0	E.g., <2%, 2-10%, >10%	Ubiquitous but localized stem mortality	Scattered stem mortality (early seral, <10yrs)	Low	No known relationships; cannot be risk rated at this time. Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Eriophyid mites (Petrova sp., Northern pitch twig moth, Adelges sp.)	99%	0%	1%	E.g., <1% 1-10%, >10%	Very uncommon, localized attack; little growth reduction	Growth reduction (early seral, predominantly on conifer)	Low	Stand Hazard Rating: Conifer reforested areas up to 20yrs, particularly in low-lying areas Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Wood decay fungi	70%	20%	10%	E.g., <10%, 10-30%, >30%	Ubiquitous, variable by stand	None to severe wood quality effects (mature)	Low	Stand Hazard Rating: No known relationships relating to stand hazard or risk that can be used for managing the effects of wood decay fungi on wood quality or productivity; other than the positive correlation increasing stand age and other decay predisposing damage agents such as windthrow, frost and breakage.
Conifer foliar diseases	90%	5%	5%	E.g., <10%, 10-20%, >10%	Uncommon, localized attack; growth reduction	Growth reduction (early to mature seral)	Low	Stand Hazard Rating: Reforested areas up to 20yrs, particularly lodgepole pine in low-lying areas Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Western balsam bark beetle	90%	10%	0%	E.g., <2%, 2-10%, >10%	Common but variable attack intensity	Stand destroying (mature)	Low	Stand Hazard Rating: Balsam-leading mature & overmature high-elevation stands Risk Rating: Not required, mostly in inoperable areas and protected areas
Abiotic: Snow-press	90%	5%	5%	E.g., <1% 1-10%, >10%	Common, localized to widespread damage	Stem deformity to breakage (early to mid seral)	Low	Stand Hazard Rating: Deciduous reforested areas up to 30yrs old, with no known relationship to topography or aspect. Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Abiotic: Hail	99%	0%	1%	E.g., <1% 1-10%, >10%	Common, localized damage; most affects deciduous species	Stem damage or forking (early)	Low	Stand Hazard Rating: Deciduous reforested areas up to 30yrs old, with no known relationship to topography or aspect. Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).

Pest Damage Agent	Estimated Incidence (area affected of DFA) by Severity Class (Low, mid & high)			Severity Class Breakpoints (Low, Mid & High)	Distribution	Potential Impact	Risk Management Class	Landscape & Stand Hazard, and Risk Management Activities
	Low	**Mid**	**High**	**denote classification is under development**	**Estimated extent of pest damage in the DFA, and type of damage**	**Type of damage, and seral stage affected**	**HIGH or Low**	**Description & Source**
Abiotic: Winter Desiccation (Red belt)	90%	5%	5%	E.g., <1% 1-10%, >10%	Common, localized mid – high elevation bands or plantations at any elevation; on conifer species	Foliage mortality on mature, or seedling mortality in plantations	Low	Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Abiotic: Sunscald	99%	1%	0%	E.g., <1% 1-10%, >10%	Uncommon, localized to widespread damage	Stem mortality (early to mid seral)	Low	Records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk).
Abiotic: Windthrow	85%	10%	5%	E.g., <1% 1-10%, >10%	Uncommon, localized to widespread damage associated with wet soils	Stem breakage (mature)	Low	For managed stands, records of silviculture surveys, stored in GENUS, will be queried for every Management Plan to assess damage agent incidence & intensity relationships (e.g., hazard and risk). For unmanaged stands, overview flights will be used for detection.
Abiotic: Flooding	95%	4%	1%	E.g., <1% 1-10%, >10%	Uncommon, localized to widespread damage	Stem mortality (early to mature)	Low	Stand Hazard Rating: Low-lying areas and riparian areas. Risk Rating: High for riparian areas identified as floodplains, and areas upstream from active beaver huts.
Abiotic: H2S et& SO2c gas	99%	<1%	<1%	E.g., <1% 1-10%, >10%	Uncommon, localized near energy operations	Growth reduction to mortality (early to mature)	Low	Stand Hazard Rating: Conifer stands are more susceptible to H2S or SO2 damage. Risk Rating: Conifer stands within 1km of energy operations that may release gases

This table will be updated as new information becomes available.

We will maintain a detection and monitoring program for damaging agents that are not at epidemic levels or at pre-epidemic[4] levels over the land base by:

- continuing to conduct aerial and ground surveys in management zones in which forest operations will be proposed during the term of this plan if there is an identified forest health issue
- utilizing data from pest surveys conducted by the MoFR and Forestry Canada
- continue to operate a spruce beetle detection program
- following MoFR standards and guidelines for the prevention and control of Warren's Root Collar Weevil, planting of alternate species and other control measures where required
- following accepted cultural practices in the control or eradication of root disease (e.g., Tomentosus root rot) as part of our silviculture program
- monitoring any increase in spruce weevil infestations
- developing models to identify high risk areas
- annually fly the DFA to determine where forest health concerns exist. A GPS coordinate will be taken of these points, so that they can be later mapped, and incorporated into our treatment plans
- where models are available, carry out hazard rating analysis to determine which stands are at the greatest risk for forest health disturbances
- ensure appropriate forest workers, consultants and industry staff, are competent at identifying specific forest health concerns within the DFA
- maintain a record of agent incidence and intensity

We will develop treatment plans for significant forest health events. Treatment plans will identify the location of the significant concern, and an implementation schedule for the proposed treatments. Treatment plans will be developed using forest health specialists as needed. Plans will consider the risk presented by the damaging agent, and the cost: benefits of a range of available options. Some of the more common options which may be employed are:

- relocating harvesting activities to meet forest health management requirements,
- pheromone baiting and lethal trap programs (trap trees in forested conditions, and lethal traps in mill yard conditions),
- incorporating forest health requirements into cutblock designs where necessary to prevent the development of forest health problems (e.g., cold air drainage for frost potential, or block design to minimize potential for windthrow),
- fill-planting or species conversion for plantation related problems,
- maintain natural ecological processes, if so warranted by the level of risk and cost/benefit analysis (the latter to be developed, as part of treatment plans).

The strategy of maintaining natural processes will be applied in some areas where there is little risk to adjacent stands. In these areas suppression (not including fire) and salvage activities will not occur in order to allow for natural stand initiating events to take place. Stand-initiating disturbances are those processes that largely terminate the existing forest stand and initiate secondary succession in order to produce a new stand. The disturbance agents are mostly wildfires, windstorms and, to a lesser extent, insects and landslides (Ministry of Forests, 1995). Disturbance and succession are the foundation for more complex processes that occur at higher levels of organization where interactions among organisms, and between organisms and their environment occur (Lindgren and Lewis, 1997). Many human activities have disrupted the way that natural disturbances help maintain healthy, sustainable ecosystems (Rocky Mountain Research Station, 1999). By allowing some natural disturbances to run their cycle on the Defined Forest Area, we are contributing to maintaining healthier, sustainable ecosystems.

General measures to be implemented for potential significant problems, for endemic and pre-endemic populations of disease and pests, depending on site conditions, are summarized in Table 29.

[4] Pre-epidemic levels are defined as levels where without aggressive suppression activities, an epidemic may occur

Table 29: Detection & Monitoring, and Treatment Groupings for Damage Agents

	Damage Agents			
Forest Health Management Groupings	Spruce beetle Mountain pine beetle Fire	Western balsam bark beetle Red-belt desiccation	Tomentosus root rot Wildlife browse Pine stem rusts Windthrow	Foliar diseases of deciduous & coniferous species Spruce weevil Warren's root collar weevil Eriophyid mites Frost, snow-press, hail, sunscald, flooding
Detection and Monitoring	Detect and Monitor via aerial surveys, and pre-harvest operations surveys and assessments	Detect and Monitor via aerial surveys (for areas classified as high risk, or anecdotal observations)	Detect and Monitor during pre-harvest, and reforestation success survey operations.	Detect and Monitor during silviculture surveys
Treatment or Control	Implement containment sanitation and salvage harvesting strategies	Fill planting	Prescribe pest control or salvage strategies at pre-harvest phase; for pine stem rusts; genetically resistant stock types and/or fill-planting	Fill-planting

Fire Management

We will address fire management issues in fire preparedness plans that outline objectives, duties and responsibilities related to minimizing fire risk, and responding to fire occurrence.

Prevention and Suppression

We will protect the forest from fire by:

- Preparing an annual Fire Pre-organization Plan. This Plan outlines our commitment to fire prevention, detection and suppression. Our objective is to control all wildfires by 10:00 A.M. on the day after discovery. A copy of this plan is provided to the MoFR.
- Obtaining accurate weather data and monitoring fire weather indices.
- Maintaining an adequate inventory of fire fighting equipment.
- Ensuring that company and contract personnel are properly trained to report fires and safely and efficiently use fire tools and equipment.

Prescribed Fire

Burning of residue from harvesting will be carried out in accordance with District and Regional smoke management guidelines. Prior to any prescribed burning we will evaluate the risk factors. Broadcast burning is not typically prescribed due to unpredictable winds across the TFL. Operational controls include our Forest Management System Procedures including the Emergency Preparedness and Response Plans contained therein.

Fuel Management

We conduct post harvest fire hazard assessments for each cutblock.

Fuel management will be addressed by burning landing and roadside debris piles. Additional slash accumulations that are assessed as hazardous may be prescribed for piling and burning. Disposal will normally occur within twelve months of harvest.

Exceptions may include:

- horse logging where limbing and topping in the bush are prescribed to help meet social objectives, and
- coarse woody debris piles that provide habitat for small mammals and furbearers,
- helicopter logging.

MONITORING PROCEDURE

Canfor retains records of all significant forest health damaging agents detected. Forest health information on areas or damage agents of broad concern effecting or potentially effecting other forest managers (e.g., mountain pine beetle, spruce bark beetle) will be forwarded to the MoFR. Canfor will notify the MoFR following treatment action on high-risk damage agents. A summary of significant pest conditions and treatment plans will be presented in each annual report.

LINKAGES TO OPERATIONAL PLANS

Site level plans will identify significant forest health concerns and proposed treatment options. Forest Development Plans/Forest Stewardship Plans are modified as needed to relocate harvesting to address forest health issues.

3.17 Proportion of Completed Forest Health Action Plans

Indicator Statement	Target Statement
Proportion of required actions completed as per forest health treatment plans	100% of required actions will be completed as per forest health treatment plans
SFM Objective: We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbances and stress.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Environmental constraints such as road/bridge wash outs may make action plans unachievable.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator will ensure that treatment plans are implemented in a timely manner to address significant forest health issues.

CURRENT STATUS

Managed Stands

The following activities are applied on the TFL to minimize negative impacts from forest health factors:

- Fill-planting is the most commonly applied treatment for damage to plantations from forest health factors.
- During brushing and spacing activities, crews are advised to remove crop trees at a level that prevents them from being free growing.
- For blocks with known Tomentosus issues, planting crews are advised keep trees away from stumps to avoid inoculation.

Unmanaged Stands

Mountain Pine Beetle is currently the greatest forest health threat to our unmanaged stands. Detection was in February 2004. All actions taken to date to suppress the population are as follows:

- Aerial detection (Blocks 4 and 5 of the TFL)
- Probing
- Fall and burn (2917 trees)
- Shifting harvesting plans to ensure infested wood and susceptible wood is targeted for harvest
- Emergence study to determine peak flight, so that appropriate hauling arrangements can be made
- Log yard pheromone studies to determine the amount of beetle that flies from the log decks
- Baiting to concentrate Mountain Pine Beetle in areas that are scheduled for harvest
- Joint effort with other licensees to suppress populations

Blowdown, Spruce Bark Beetle and fire are the next significant forest health factors affecting the DFA. Harvesting is currently the most commonly applied treatment and control for protecting mature timber inventories from these factors, as it is the most effective and economical means of management.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Managed stands

The extent of forest health damaging agents will be determined during Silviculture surveys. Surveys will occur by the schedule set out in Genus by the Silviculture Forester. Fill planting will be used to restock sites that fall below acceptable stocking levels. Fill planting activities will be scheduled in Genus by the Silviculture Forester.

Brushing or thinning treatments will be determined during the silviculture survey. The survey will note any rust issues, and will be recorded in Genus. Depending on the extent of the forest health factor, the Silviculture Forester will decide if sanitation will be done in conjunction with the brushing or thinning treatments.

Unmanaged Stands

Once significant forest health factors are detected in unmanaged stands, they will be recorded in our forest health treatment plan database. This database will be started in the fall of 2005 after the overview flights for Mountain Pine Beetle are complete.

MONITORING PROCEDURE

The status of implementation will be monitored annually to ensure that we meet our 100% obligation for treatment plan actions.

LINKAGES TO OPERATIONAL PLANS

Site plans will identify significant forest health concerns and prescribed treatment plans.

3.18 Regeneration Declaration

Indicator Statement	Target Statement
Area weighted average time delay from harvesting starting and initial restocking of harvest area by DFA	Average delay will be no more than 2 years
SFM Objectives: We will sustain a natural range of variability in ecosystem function, composition and structure which allows ecosystems to recover from disturbances and stress	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

To allow for variations in site preparation requirements, access and delays in harvest the acceptable variance for regeneration delay is one half year.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Regeneration delay is the period from the start of harvest on the area to be reforested to the completion of initial regeneration of future tree species as required in the SP (site plan or silviculture prescription).

The regeneration delay is usually within two years where planting is prescribed and five years where the stand is expected to reforest naturally. Ensuring that harvested stands meet the prescribed regeneration delay is an indication that the harvested area has maintained the ability to recover from a disturbance and thereby maintaining its resiliency and productive capacity. Delays in the replacement of harvested species negatively impact future growth and harvest levels

CURRENT STATUS

1.177 years for conifer (Canfor; calculated to August 1, 2005)

1.7 years for conifer (BCTS to May 26, 2005)

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

The timber supply analysis for SFMP 4 will use a 2-year regeneration delay.

The regeneration delay is reviewed annually by summarizing data from Genus on all unstocked cutblocks and calculating the area weighted average age of unstocked area. Calculations will be based on the month of completion of surveys and entire cutblock net reforestable area will be used in the calculations if any or all of the cutblock NAR is unstocked.

Records of harvesting activity and silviculture treatments are made in Genus.

STRATEGY AND IMPLEMENTATION SCHEDULE

We carry out basic silviculture activities to:

- Establish and tend new stands that suit the ecological characteristics and productivity estimates of each site,
- Optimize the timing of management activities that positively influence the stand's development, and
- Produce a diverse and sustainable flow of species and products.

Our basic silviculture strategy incorporates the following standards:

- Preferred species are those tree species that are ecologically suited to the site and management activities are primarily aimed at their establishment and growth. The characteristics of these species are consistent with the desired timber and non-timber objectives for the site.
- Stocking standards set out target numbers of trees per hectare to ensure full site occupancy. Minimum standards are set in accordance with legislation. Stocking method outlines recommended treatments to achieve target stocking.
- Minimum inter-tree distance sets out the prescribed inter-tree spacing which in combination with average spacing will result in target stocking with a good distribution. During planting operations, plantable spot decisions will be based on microsite quality rather than measured distances to ensure maximum seedling survival and production. On difficult sites, inter-tree spacing may be reduced to take advantage of limited plantable spots.
- Regeneration delay sets the allowable delay or "fallow period" for a given area measured from commencement of primary harvesting operations. The regeneration delay specified in the tables sets the administrative period which allows for completion of harvest, restocking, surveys and reporting. The vast majority of areas are restocked within 1 year of harvest completion (i.e. cutblocks are fallow for no more than one growing season).
- Free-growing age defines the period measured from commencement of primary harvesting where a stand must meet free-growing requirements and is usually defined as a range (earliest to latest). (See section 3.19 for description of Free Growing Strategies)
- Free-growing height defines for each species on a site, the minimum height that must be attained for a given tree to be considered free growing.

Blocks planted will have a survey of well spaced carried out during the same growing season as establishment to confirm stocking levels meet the requirements of the appropriate SP. A further survey of well spaced will be carried out within three growing seasons to confirm stocking is maintained above minimum levels.

Although 100% of cutblocks harvested on TFL 48 are planned to be planted, natural regeneration may be prescribed where the post harvest assessment indicates that it is a suitable treatment option. A survey of well spaced will be carried out during the three growing seasons post harvest to confirm stocking levels meet the requirements of the appropriate SP.

All surveys will follow current "Stocking and Free Growing Procedures Manual - May 2002" guidelines. Site plans/silviculture prescriptions (SP) identify silviculture stocking standards and timelines on a standard unit level. Genus records harvesting activity and future treatments based on the SP's and post harvest block reviews.

MONITORING PROCEDURE

All reforestation activities are documented and tracked in Genus. The silviculture forester reviews regeneration delay annually by summarizing data from Genus on all unstocked cutblocks and calculating the area weighted average age of unstocked area. Calculations will be based on the month of completion of surveys and entire cutblock net reforestable area will be used in the calculations if any or all of the cutblock NAR is unstocked.

Survey Requirements

A free growing survey will be carried out between the early and late free growing dates to confirm stocking levels meet the requirements of the appropriate SP. The surveys will meet current standards at the time of writing for measuring free growing and total trees.

LINKAGES TO OPERATIONAL PLANS

Silviculture prescriptions and site plans detail timing and stocking requirements.

3.19 Free Growing Stands

Indicator Statement	Target Statement
Proportion of area harvested that has free growing stands re-established	100% of the area harvested will meet the free growing requirements identified in the silviculture prescriptions/site plans
SFM Objectives: We will sustain a natural range of variability in ecosystem function, composition and structure which allows ecosystems to recover from disturbances and stress	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Canfor is obligated to establish free growing stands on all areas harvested in accordance with the regulations and site plans/silviculture prescriptions. The standards for which a free growing stand must be established are defined in the site plans/silviculture prescriptions. For blocks exempted from site plans under the Bark Beetle Regulations, the requirements for free growing stands are defined in the regulation. A free growing stand is established on a standard unit and will meet the requirements for acceptable species, minimum specie tree heights, and minimum well spaced density. The individual trees accepted as free growing will also be healthy and be free of deleterious competition.

The net area to be reforested (NAR), as defined in the site plan or silviculture prescription, will describe the proportion of area harvested that will have a free growing stand re-established.

Establishing free growing stands is an important indicator because it ensures healthy and productive forests are being replaced after harvesting. Ensuring that harvested stands meet the prescribed free growing requirements is an indication that the harvested area has maintained the ability to recover from a disturbance and thereby maintaining its resiliency and productive capacity. Failure or delays in establishing a free growing stand will negatively impact future growth and harvest levels as well as impact other ecosystem processes that rely on forest replacement.

CURRENT STATUS

100% of the blocks have achieved their free growing requirements within the timeframe identified in the Silviculture Prescription/Site Plans (Canfor and BCTS; calculated to December 31, 2005).

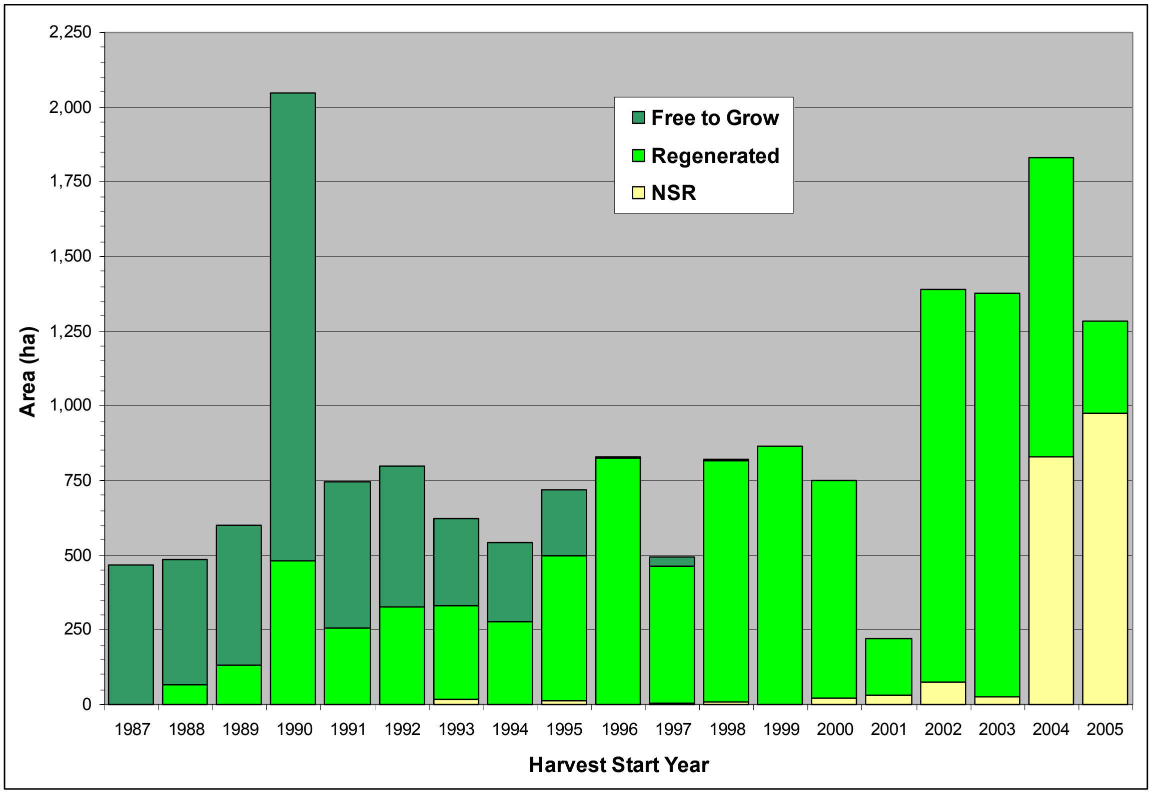


Figure 20: Free Growing Status by Year of Harvest Start

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

Records of harvesting activity, silviculture treatments and current stocking status are made in Genus. On an annual basis these records are reviewed and all harvested area that is not free growing is identified.

STRATEGY AND IMPLEMENTATION SCHEDULE

Site plans/silviculture prescriptions (SP) identify silviculture stocking standards and timelines on a standard unit level. Genus records harvesting activity and future treatments based on the SP's and post harvest block reviews. Surveys are scheduled to review the current status of the standard units at regular intervals between harvest completion and the late free growing date. The Silviculture Forester will make adjustments to the planned silviculture regime in Genus based on the results of the surveys to ensure the requirements for a free growing stand will be met.

MONITORING PROCEDURE

All reforestation activities are documented and tracked in Genus. Silviculture surveys are usually scheduled to occur between 2 to 3 years after crop establishment, 7 to 9 year after crop establishment and within 4 years of the late free growing date. Additional surveys may be conducted within 2 to 3 years of a silviculture treatment such as fill planting or brushing to measure the effectiveness of the treatment and to make any necessary adjustments to the planned silviculture treatment regime. Late free growing dates are recorded in Genus and reports are run annually to ensure all standard units have achieved free growing within the set timeframe.

Survey Requirements

A free growing survey will be carried out between the early and late free growing dates to confirm stocking levels meet the requirements of the appropriate SP. The surveys will meet current standards at the time of writing for measuring free growing and total trees.

LINKAGES TO OPERATIONAL PLANS

Silviculture prescriptions and site plans detail timing and stocking requirements.

3.20 Permanent Access Corridors

Indicator Statement	Target Statement
Percent of area of the DFA occupied by permanent access corridors associated with forest management activities	We will limit impacts on the land base due to the presence of permanent access corridors to less than 2.4% of the gross land base of the DFA

SFM Objective:

We will sustain the natural range of ecosystem productivity to support naturally occurring species.

We will protect soil resources to sustain productive forests.

We will sustain forests within the DFA.

Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.

ACCEPTABLE VARIANCE

Acceptable variance to a maximum of 3.0%.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Permanent Access Corridors (PAC) is defined as those access corridors that are not planned to be returned to a forested state. Some of these roads or corridors may be managed to meet access strategies but are still classed as a permanent reduction in forest area.

PAC include roads, landings, trails borrow pits, quarry or other similar structure within a cut block or provides access to cutblocks. These permanent access corridors are also used to provide access to other tenure holders and industrial uses as well as providing access for public recreation and fire protection activities. The PAC use and/or construction material (e.g. hard gravel substrate) precludes the production of a commercial crop of trees. This indicator measures the proportion of area across the TFL that is removed for long periods of time from the productive forest land base. These permanent access corridors do not contribute to the health of global ecological cycles. As these corridors are constructed they reduce from the productive forest land base some of the essential elements deemed necessary for a health forest ecosystem. It is therefore important to minimize the amount of area that is removed from the forested land base and converted to permanent access corridors.

CURRENT STATUS

Permanent access corridors currently occupy approximately 1.17% of the TFL as identified in Table 30.

Table 30: Permanent Access Corridors in TFL 48 (Existing)

Road Type (RoW width in metres)	Total Area (ha)	% of Gross TFL Area (653,576 ha)
Undistinguished Road type but delineated in VRI	4,709	0.72%
1 - ML (25m)	96	0.01%
2 - ML Sec (20m)	329	0.05%
3 - Operational (15m)	760	0.12%
4 - Block Perm (8m)	1,676	0.26%
Gravel Sec (30m)	52	0.01%
Grand Total	7,623	1.17%

Source VRI 2004

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

During MP 3, Canfor undertook a process that used the MP 3 THLB and terrain information to develop a classified future road network for the entire TFL. The road class derived differed slightly from the existing road class system used on TFL 48. To ensure a conservative estimate operational roads are assumed to have a 20 m right of way width for future roads.

Due to improved inventory estimates the timber harvesting land base is estimated to be larger than that used in MP 3. To account for the difference the amount of future road was prorated to be consistent with the larger land base needing to be access in SFMP 4. The total amount of area estimated to be required for future permanent access corridors is 7,886 ha (see Table 31) or an additional 1.21% for a total of 2.38% of the gross area of TFL 48 in permanent access corridors.

Table 31: Forecasted Future Permanent Access Corridors

Road Type	Width (m)	Total Length (km)	Total Area (ha)
1 – Mainline	25	448	1,121
2 – Operational	20	1,138	2,276
3 – Block	8	5,611	4,489
Grand Total		7,198	7,886

STRATEGY AND IMPLEMENTATION SCHEDULE

Permanent access corridors constructed are anticipated not to increase beyond 2.4% of the gross land base of TFL 48. Strategies to ensure future permanent access corridors are minimized are as follows:

- Prescribing temporary road/trails (road/trail that is reclaimed to productive forest) within site plans where the road/trail will not be used for future access;
- Using roadside harvesting methods or intermediate sort yards (as opposed to landings) as a preferred method of access development.

Construction

- Roads constructed and maintained on Crown lands by Canfor will comply with the Forest Planning and Practices Regulation of the Forest and Range Practices Act and Road Permit documents.
- Road standards will reflect the expected volume and season of harvest. All right-of-way logging and road construction activities will be conducted under appropriate field conditions to minimize the impact on other resources.
- Maintaining road widths to a minimum while providing for safe and effective access;
- Coordinating access development with other industrial users to minimize total access development. This is achieved through referrals received by other users and providing comments concerning status and standard of access construction to make access useable to multiple users.

Maintenance

- Road maintenance will be conducted on a regular schedule on all roads where we have maintenance responsibilities.
- All maintenance activities will be carried out in a timely manner to minimize risk to the road, its users and the environment.
- Required maintenance activities will be determined from information documented during regular inspections as well as from information reported by users of the road.

Deactivation

- Deactivation of all inactive roads and logging trails will be conducted in a timely manner to protect the integrity of the road or structures and to protect non-timber values.
- Measures will be taken to stabilize roads during periods of inactivity, including the control of runoff, the removal of sidecast where necessary, and the re-establishment of vegetation for semi-permanent and permanently deactivated roads.

Road Rehabilitation

- We rehabilitate temporary roads to maximize the land base available for timber production.

MONITORING PROCEDURE

All roads constructed on TFL 48 are tracked in Genus. Information about road class, construction date, deactivation status etc. is tracked. This information is used to buffer and remove area from the productive forest land base and assign it to a road designation. Permanent access corridors are identified in our VRI database as having a Non Veg Cover Type of “RP” greater than 15% or a polygon type of one of the road types described in Table 30.

The percent of the TFL land base occupied by permanent access corridors is described by the following formula. This indicator is reported on at each Management Plan.

Formula:

% PACor = (PACor / DFA) * 100

Variables:

PACor Amount of area within permanent access corridors on TFL 48

DFA Gross area of TFL 48

% PACor Percent of gross land base within permanent access corridors on TFL 48

LINKAGES TO OPERATIONAL PLANS

Forest Development Plans/Forest Stewardship Plans consider the overall forest resource and long term timber harvesting land base and the need for permanent access corridors. Site plans identify which roads are permanent and which are temporary and will be rehabilitated.

3.21 Site Index

Indicator Statement	Target Statement
Area weighted average Site Index by ecological site series by leading species	The area weighted average Site Index by leading species by site series at free growing will not be less than the SIBEC predicted site index
SFM Objective: We will sustain the natural range of ecosystem productivity to support naturally occurring species. We will protect soil resources to sustain productive forests.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

A maximum negative variance of 10% post harvest site index versus SIBEC.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Site index is a relative measure of forest site quality. It is a measure of the height growth that can be expected 50 years after trees reach 1.3 metres in height for a tree species on a given site. Site index is highly sensitive to changes in ecological site conditions including soil nutrients, moisture and other variables, and is generally considered one of the most reliable indicators of site quality. Site index allows the comparison of productive potential between sites across a broad range of stand conditions. Conducting activities in a manner that decreases a sites potential capability to produce timber will be reflected in reduced post harvest site index.

Soil productivity is one of the main factors impacting site productivity. Site index will be negatively affected if soil productivity were significantly reduced due to harvesting activities. A relative comparison of a strata's average site index when well growing compared to the predicted site index potential based on an ecological classification is therefore an appropriate method for evaluation if the resiliency and productive capacity of the forest stands and forest soils has been maintained.

This indicator is assessed when the trees are a minimum of 3 years old at 1.3 m in height during free growing surveys. The growth intercept method of assessing site index is used.

The predicted site index estimates are based on the Site Index Biogeoclimatic Ecological Classification database provided and maintained by the Ministry of Forests and Range. The site index estimates provided in these reports are second approximations as they report mean plot site index and its standard error for each BEC site series/species combination that have a minimum sample size of 7. This new estimate replaces the first approximation (1997) site index class estimate only if the minimum sample size criterion is met. As more data become available, subsequent approximations will be produced and named by year, e.g., 2005 approximation.

CURRENT STATUS

The following Table 32 shows the current status for stands declared free growing on TFL 48 in 2005 or earlier and site productivity assessed using the growth intercept methodology. The area declared free growing is 3,853 ha that have had surveys completed which have collected growth intercept data during free growing surveys.

The ESSFmv2 04 Lodgepole Pine and the SBSwk2 06 White Spruce units are currently below the predicted site index. They both however are within the 10% allowable variance. There are currently 1.4 ha and 6.0 ha in each unit respectively.

Table 32: Site Index by Leading Species for Free Growing Stands

		Species								
		Alpine Fir			White Spruce			Lodgepole Pine - Interior		
BEC	Site	Ha	Actual SI	Predicted SI[5]	Ha	Actual SI	Predicted SI	Ha	Actual SI	Predicted SI
BWBSmw	01	37.0	21.7	N/A	173.4	21.4	17.8	90.3	24.6	18.0
	02	3.9	22.0	N/A	8.1	21.9	9.0	3.5	27.9	12.0
	03	1.6	22.1	N/A	17.8	22.3	17.0	0.3	24.9	18.0
	04	0.0	25.0	N/A	26.5	24.1	12.0	6.2	25.1	15.0
	05	0.3	22.2	N/A	16.2	23.3	18.0	19.2	26.1	18.0
	06			N/A	0.0	28.0	17.9			18.0
	07			N/A	0.1	22.0	18.0	0.0	20.0	18.0
BWBSmw1 Total		42.8	21.8	N/A	242.1	21.9	16.8	119.5	25.0	17.7
BWBSwk1	01			N/A	102.6	21.1	12.0	99.2	17.8	15.0
	02			N/A	15.3	20.0	9.0	10.3	16.3	12.0
	03			N/A	14.2	19.2	9.0	15.3	16.5	12.0
	04			N/A			12.0	0.5	16.0	15.0
	05			N/A	0.0	20.0	15.0	0.0	21.0	15.0
	06			N/A	0.0	21.0	15.0			15.0
BWBSwk1 Total				N/A	132.1	20.8	11.3	125.3	17.5	14.4
BWBSwk2	01	4.3	19.0	N/A	76.8	18.9	12.0			15.0
	02			N/A	1.9	18.0	9.0			12.0
	03			N/A	1.3	18.0	12.0			15.0
	04			N/A	2.5	18.0	9.0			12.0
	05			N/A	2.6	18.0	15.0			15.0
BWBSwk2 Total		4.3	19.0	N/A		18.8				0.0
ESSFmv2	01	258.3	19.8	12.0	437.5	18.1	15.0	156.1	20.2	15.0
	02	9.3	21.8	9.0	38.2	19.7	9.0	2.7	22.0	12.0
	03	6.5	21.8	6.0	19.3	17.4	6.0	22.6	22.0	9.0
	04	15.0	21.8	15.0	154.3	19.0	15.0	1.4	17.8	18.0
	05			15.0	0.1	20.0	15.0	0.4	22.0	15.0
	06			15.0	0.8	19.9	15.0	0.0	24.0	15.0
ESSFmv2 Total		289.0	20.0	11.9	650.2	18.4	14.4	183.2	20.4	14.2
ESSFmv4	01			12.0	45.8	18.0	15.0			15.0
	02			9.0	0.2	18.0	9.0			12.0
	03			6.0	0.0	18.0	6.0			9.0
	04			15.0	0.5	18.0	15.0			18.0
ESSFmv4 Total				0.0	46.5	18.0	15.0			0.0
ESSFwk2	01	19.2	15.1	15.0	89.4	17.8	15.0			N/A
	02	0.8	15.0	9.0	17.7	17.7	9.0			N/A
	03	20.6	19.2	12.0	20.7	20.8	12.0			15.0
	04	29.8	18.7	15.0	5.7	21.2	15.0			N/A
	05			15.0	1.2	21.2	15.0			N/A
ESSFwk2 Total		70.4	17.8	14.1	134.8	18.4				0.0
SBSwk2	01	254.5	22.4	15.0	627.7	20.8	18.0	62.9	21.3	21.0
	02	24.3	20.1	12.0	35.4	21.3	15.0	1.6	19.7	15.0
	03	45.2	21.0	12.0	228.3	21.4	18.0	39.7	19.1	18.0
	04	98.4	20.0	N/A	65.6	21.1	15.0	1.2	20.4	18.0
	05	74.8	23.5	18.0	115.6	21.3	21.0	17.4	22.5	21.0
	06	8.8	26.2	18.0	6.0	23.0	24.0	2.2	21.8	21.0
	07	9.1	22.4	N/A	6.3	19.5	N/A	2.2	15.0	N/A
SBSwk2 Total		515.1	21.9	12.0	1,085.0	21.0	18.0	127.3	20.6	19.6
Grand										

[5] Based on SIBEC March 2005 Version

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Practices are conducted to protect soil productivity such as assessment of soil and moisture conditions. Site plans are prepared which provide guidance for operations on levels of acceptable disturbance. Sites have harvesting or site preparation conducted during times that are appropriate to the site conditions such as frozen soils, dry soils, or using low ground pressure equipment.

Growth intercept SI data is collected from all stands that meet the growth intercept standard. These stands must be at least 2 to 3 years old at breast height (1.3 m) to be eligible. This data has been collected consistently since 2001 on TFL 48.

MONITORING PROCEDURE

The site index information will be compiled for each stratum in each well growing block surveyed. The area weighted averages SI for free growing stratums by leading species by site series is compared to the predicted site series based on the latest SIBEC compiled data, and reported in the annual report.

This information is stored in Canfor's Genus system and is compared to the TFL site series inventory information. The following formula is used to calculate the area weighted site index by leading species by site series.

The status of this indicator is reported in each annual report.

Formula:

$$\mathbf{FGSI}_{\text{leading species, site series}} = (\mathbf{SI}_{\text{leading species, ss, stratum}} * \mathbf{SA}_{\text{leading species, ss, stratum}}) / \mathbf{SSA}_{\text{leading species, ss}}$$

Variables:

$\mathbf{SI}_{\text{leading species, ss, stratum}}$	Site index by leading species by site series by stratum
$\mathbf{SA}_{\text{leading species, ss, stratum}}$	Area of stratum by leading species by site series
$\mathbf{SSA}_{\text{leading species, ss}}$	Total area by leading species by site series
$\mathbf{FGSI}_{\text{leading species, site series}}$	Area weighted site index at free growing by leading species by site series

LINKAGES TO OPERATIONAL PLANS

Site plans describe acceptable strategies or practices to achieve the objectives. Indicators 3.23 and 3.24 track the adherence to these plans. This indicator provides a long-term assessment that soil productivity has not been compromised and provides feedback to management over time.

3.22 Allowable Annual Cut

Indicator Statement	Target Statement
Allowable Annual Cut (AAC)	We will ensure that the Allowable Annual Cut will not adversely impact Long Term Harvest Level
SFM Objective: We will sustain the natural range of ecosystem productivity to support naturally occurring species. We will balance annual growth rate and harvest rate.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

AAC increases as a result of natural disturbances (e.g. Mountain Pine Beetle) are an acceptable variance.

Canfor proposes an AAC however, the Chief Forester (Ministry of Forests and Range) determines the AAC for the management unit.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The LTHL is the harvest level that can be maintained indefinitely given a specified timber harvesting land base and associated management regime within the TFL. The analysis that accompanies the timber Supply Review (TSR) is based on the best available information and provides a timber supply forecast for the next 250 years. Timber Supply Reviews are generally conducted every five years during which the assessment of the long term sustainable harvest level can be reviewed in the context of current socio-economic condition, ecological consideration and also with updated inventory and forest management information.

It is Canfor's responsibility to prepare and conduct the Timber Supply Analysis information for review by the MoFR. The AAC determination is conducted by the Chief Forester of BC and is generally within the long-term harvest level forecasts in order to ensure sustainable forest productivity.

Since the impacts of forest utilization that occur today will affect future generations, it is necessary to be able to plan for sustainable forest management over centuries. The short and medium term harvest projections are directly linked to the long-term sustainable harvest levels. Incorporating new (best available) information and changing social values into the periodic timber supply analysis, provides an opportunity to fine tune short-term and long-term harvest levels throughout time and be responsive to changing conditions while still considering the long term sustainability of the forest ecosystem.

CURRENT STATUS

The latest TSR Analysis Report was completed and submitted in August 2006 and the AAC Rationale is due in September 2006.

See Table 33 for a history of the AAC's for TFL 48 and a summary of the proposed AAC for SFMP 4.

Table 33: Annual Allowable Cut and Long-Term Harvest Level

Partition	MP 1	MP 2	SFMP 3	SFMP 4
	AAC	AAC	AAC	Proposed AAC
Coniferous	410,000	460,000	525,000	744,000
Deciduous	0	54,000	55,000	101,300
Total	**410,000**	**514,000**	**580,000**	**845,300**

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

Forecasting of this indicator is completed as part of the TSR process and completed every 5 years. The next timber supply analysis is scheduled to be completed by September 20, 2006.

Timber supply is usually considered within the context of three relative timeframes — short term, medium term and long term. The short term is typically represented by the first two decades of the harvest forecast and reflects the period in which the scheduled harvest level is defined by immediate concerns of achieving socio-economic objectives and maintaining non-timber values. The medium term corresponds to the transition from harvesting mostly old growth to harvesting managed stands. The long term is the period that begins approximately when the harvest reaches the LTHL.

STRATEGY AND IMPLEMENTATION SCHEDULE

During the term of MP 3 a significant threat from mountain pine beetle (MPB) to the lodgepole pine forests has occurred within TFL 48. In 2004 the first occurrences of MPB were detected on TFL 48. Currently there are approximately 25 million m^3 of mature lodgepole pine greater than 80 years old within the timber harvesting land base. This equates to approximately 36% of the timber harvesting growing stock greater than 80 years old. Figure 21 shows the distribution of lodgepole pine volume within the THLB.

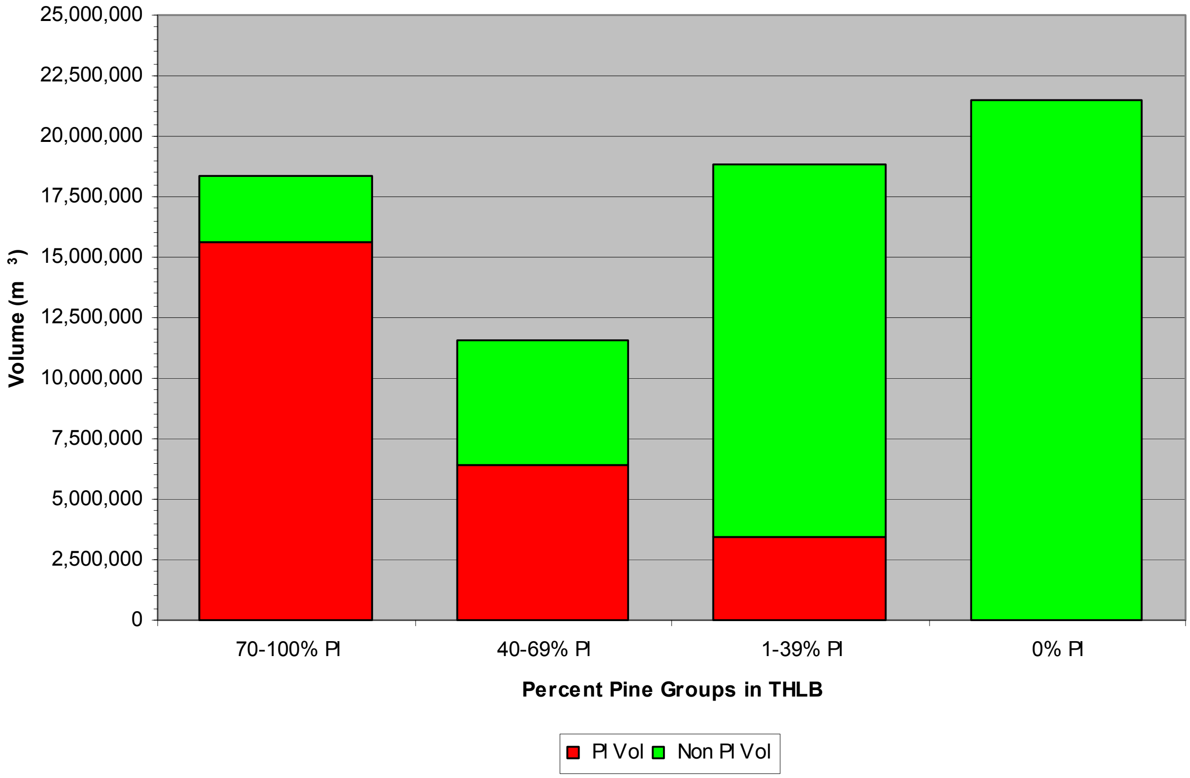


Figure 21: Distribution of Pine Volume in Stands Greater than 80 Years Old within THLB

To test some of the risks to TFL 48 some sensitivity assessments were conducted. The analyses conducted are as follows (See Figure 22):

1. Assume 80% of the lodgepole pine on TFL 48 was to be killed within the next decade and model a non-declining harvest flow (MPB 80% Mortality NDHF).
2. Assume 80% of the lodgepole pine on TFL 48 was to be killed within the next decade and model a 30% increase in harvest level for the 1st decade and then declining to the max non-declining harvest level (Accelerated Harvest 80% MPB Mortality).
3. Model no increase in AAC for MPB and use the minimum natural range of variation as the late seral forest constraint (Base Case Min NRoV).
4. Increase AAC above the base case minimum natural range of variation AAC by 30% per year for one decade and then drop back to the highest long range sustainable level (Base Case Min NRoV).
5. Incorporate site productivity improvements for managed stands, direct 70% of harvest towards pine and use the minimum natural range of variation as the late seral forest constraint (Preferred Strategy Conifer).

The current coniferous AAC is also shown for comparison purposes.

The preferred strategy accepted by the PAC indicates that the long-term non-declining harvest level can be increased to 744,000 m^3/year an increase of 219,000 m^3/year higher than the current AAC. The implementation strategy is to direct the harvest towards delivering 70% pine from the coniferous land base for the next 10 years. This harvest level is currently achievable within the current manufacturing capacity of the Chetwynd facilities. This level of harvest should be sufficient to address the current MPB infestations on TFL 48 in the short term. Should the level of infestation increase beyond the scope that can be addressed with this AAC then Canfor may seek an additional uplift from the Chief Forester to maximize the value recovery from TFL 48.

The deciduous harvest rate proposed for the period of SFMP 4 is 101,300 m^3/year approximately 46,300 m^3 higher than the current deciduous harvest level. This increase is primarily attributable to improvements in forest inventory (see Section 3.55) and improvements in site productivity estimates of future managed stands (SIBEC)

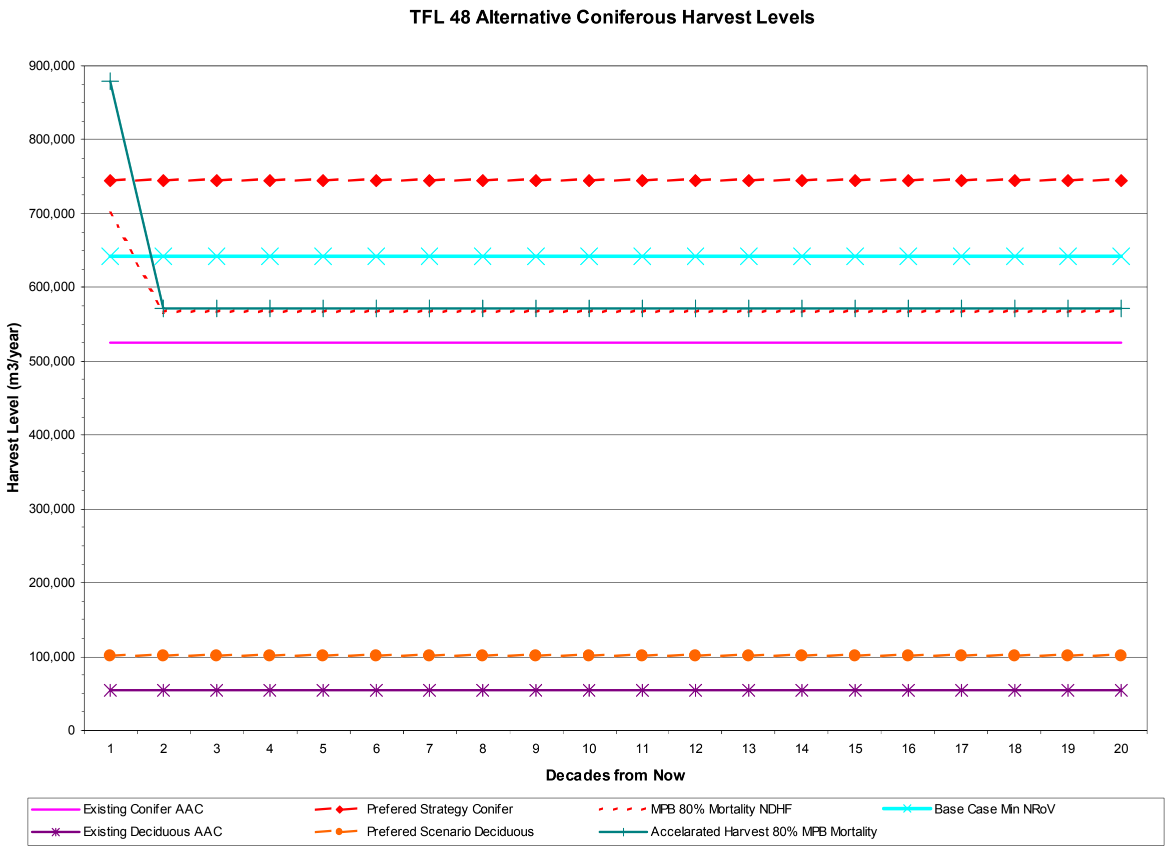


Figure 22: TFL 48 Alternative Coniferous Harvest Levels

MONITORING PROCEDURE

The data needed to monitor and forecast this indicator includes but is not limited to:

- VRI (Vegetation Resources Inventory) forest cover
- Timber supply information package; current management assumptions
- Growth and yield curves/tables
- Social-economic parameters (employment, taxes, government revenues etc.)

See Appendix 5 – Timber Supply Analysis Information Package and Appendix 6 – Timber Supply Analysis Report for detailed descriptions of the processes scenarios and results of the AAC calculations.

LINKAGES TO OPERATIONAL PLANS:

The TSR forecasts short, medium and long-term harvest levels for the DFA. The Chief Forester determines an AAC for both deciduous and coniferous timber harvesting land bases. Canfor then develops operational harvest plans (Forest Development Plans, or Forest Stewardship Plans) using the AAC as a key driver for development.

3.23 Soil Degradation

Indicator Statement	Target Statement
Soil degradation	We will not exceed site degradation guidelines as defined in site plans
SFM Objective: We will protect soil resources to sustain productive forests.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None. Limits and exceptions will be already identified in site plans.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Soil degradation refers to the reduction of the capacity of the soil to productively grow trees. The majority of soil degradation results from the construction of permanent access structures (PAS) required to harvest the block. PAS include roads, landings, trails, borrow pits, quarry or other similar structure in a cutblock that are developed for timber harvesting or other forest management activities, and whose use and/or construction material precludes the production of a commercial crop of trees. Roads are also used to provide access to other tenure holders and industrial users as well as providing access for public recreation and fire protection activities. This indicator measures the proportion of area that is removed for long periods of time from the productive forest land base within harvested cutblocks. These PAS do not contribute to maintaining forest ecosystem condition and productivity nor do they contribute to the health of global ecological cycles. As these structures are constructed they reduce from the productive forest land base some of the essential elements deemed necessary for a healthy forest ecosystem.

CURRENT STATUS

The limits as set in the site plans have been met for all blocks harvested in 2000 – 2004 inclusive.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

The forest development plan, the twenty year plan, and the timber supply analysis for the TFL consider and evaluate future requirements for permanent roads. Areas occupied by permanent access structures do not contribute to the THLB.

STRATEGY AND IMPLEMENTATION SCHEDULE

Disturbed road surface widths are actively monitored for compliance to the plan during road construction operations. The road widths are measured again following completion and a total disturbed area is calculated and compared against the plan. Compliance to the plan is then tracked and reported. This monitoring and tracking occurs constantly with the active operations.

MONITORING PROCEDURE

Road and harvest inspections and post-harvest assessments are conducted to ensure operations are within the prescribed limits.

LINKAGES TO OPERATIONAL PLANS

Operational plans as prepared by forest planners will continue to prescribe the most appropriate methods to reduce the losses to the forest landbase and will be responsible to ensure that over all planned road and landing development will not be disproportionate to the area to be harvested. In other words, the prescribing forester will only plan what is necessary to get the entire block harvested, typically larger blocks require less overall development percentage wise as opposed to smaller blocks.

3.24 Soil Disturbance Surveys

Indicator Statement	Target Statement
Soil disturbance surveys	We will not exceed soil disturbance limits within cutblocks as defined in site plans
SFM Objective: We will protect soil resources to sustain productive forests.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None. Limits and exceptions will be already identified in site plans.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The following are types of soil disturbance possible on a cutblock as a result of harvesting

- Mass wasting from road and trail cut and fill failures
- Surface soil erosion
- Soil displacement
- Soil compaction
- Forest floor displacement

It is important to minimize soil disturbance as it may have a direct impact on the capacity of the soil to sustain a productive forest. While some disturbance is natural and even required to regenerate certain species, excessive unnatural disturbance is not desirable. When soil disturbance is excessive, some of the essential elements deemed necessary for a healthy forest ecosystem are removed.

CURRENT STATUS

All 2000-2004 harvested areas were within allowable soil disturbance limits. Sensitive sites are either harvested with low ground pressure equipment, cable yarders or helicopters. Table 34 outlines soil disturbance guidelines.

Table 34: Recommended Allowable Soil Disturbance Within the Net Area to be Reforested (NAR)

Leading soil disturbance hazard	Soil sensitivity rating[a]	Allowable dispersed soil disturbance (% NAR)
Mass wasting[b]	VH, H	5
Surface soil erosion	VH	5
Soil displacement	VH	5
Soil compaction	VH	5
Mass wasting	M, L	10
Surface soil erosion	H, M, L	10
Soil displacement	H, M, L	10
Soil compaction	H, M, L	10
Forest floor displacement	VH, H, M, L	10

a VH = Very High; H = High; M = Moderate; L = Low

b Mass wasting hazard refers to the potential for cut and fill failures, and should not be confused with terrain stability, which refers to the likelihood of landslides.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

Winter conditions for harvesting may be prescribed to minimize impact on soil.

STRATEGY AND IMPLEMENTATION SCHEDULE

Cutblocks are assessed at the layout stage for disturbance sensitivity. The site plan will then identify the various soil sensitivities and will prescribe a harvest method and season that will be appropriate to meet the disturbance limits. Common practices used to minimize soil disturbance include:

- Limiting operations to frozen ground or sufficiently deep snow pack

- Using low ground pressure tires on skidders, or using tracked machines to skid wood
- Cable yarding
- Limiting harvesting to dry soil conditions only

Active operations are monitored for site disturbance. If there is evidence or apparent risk of exceeding the soil disturbance allowance, operations are suspended until soil conditions improve or an alternate harvesting method is employed that will result in acceptable levels of disturbance. Following harvest completion, a final ocular survey determines the actual amount of soil disturbance present. The actual is compared to the allowable amount, and the compliance is tracked

MONITORING PROCEDURE

Harvest inspections are conducted on each cut block to ensure operations are within the prescribed limits.

LINKAGES TO OPERATIONAL PLANS

Site disturbance limits are set in the site plan based on the preceding table based on the soil sensitivity hazard rating. Based on the likelihood of staying below the soil disturbance limit, alternate harvest methods or harvest seasons may be prescribed in the site plan.

3.25 Use of Environmentally Friendly Lubricants

Indicator Statement	Target Statement
Use of environmentally friendly lubricants	We will research and identify environmentally friendly lubricants bi-annually
SFM Objective: We will protect soil resources to sustain productive forests.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

Not applicable.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Oil spills from the variety of machinery that operates on the land base are detrimental to the sustainability of productive forest. While these typically happen on very small scales, potential for an even smaller impact exists with the use of natural vegetable base lubricants. Research has developed a few of these lubricants, but so far they are not appropriate for use in the equipment that operates in this area. As time passes, these lubricants will likely improve so they should be reviewed on a regular basis.

CURRENT STATUS

The lubricant options were reviewed in 2001 and at that time were deemed to be inappropriate for local use. Our work force continues to use conventional and synthetic lubricants.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Not applicable.

STRATEGY AND IMPLEMENTATION SCHEDULE

FERIC research information will be generated over time. We will check for any new research material at least biannually and will evaluate it for use locally. This is due to be completed by the end of 2005.

MONITORING PROCEDURE

Results of this review will be reported bi-annually in the annual report.

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.26 Spills Entering Water bodies

Indicator Statement	Target Statement
Number of reportable spills or misapplications entering water bodies	Zero reportable spills or misapplications entering water bodies
SFM Objective: We will maintain water quality and quantity	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

A reportable spill is any spill that enters a waterbody or is greater than the levels indicated in Table 35 below.

Table 35: Spill Reporting Levels

Material	Reportable Levels
Antifreeze	5 kg
Diesel Fuel	100 l
Gasoline (auto & chainsaw)	100 l
Greases	100 l
Hydraulic Oil	100 l
Lubricating Oils	100 l
Methyl Hydrate	5 kg
Paints & Paint Thinners	100 l
Solvents	100 l
Pesticides	1 kg
Explosives	Any

CURRENT STATUS

There were zero reportable spills entering water bodies since the initial tracking of this indicator in 2000.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

All reportable spills will be investigated to minimize future occurrences.

STRATEGY AND IMPLEMENTATION SCHEDULE

Applicable operational controls are within the Environmental Management Systems including: Work Instructions, Emergency Preparedness and Response Plan, and spill response training.

MONITORING PROCEDURE

Regular audits and inspections of our activities will be conducted. All reportable spills will be entered into the Issue Tracking System.

We will annual review and summarize our performance towards this target.

LINKAGES TO OPERATIONAL PLANS

Preworks are conducted prior to commencement of operations.

3.27 Stream Crossing Quality Index

Indicator Statement	Target Statement
Maximum Stream Crossing Quality Index (SCQI) by watershed	The maximum SCQI score is 0.40 by watershed
SFM Objective: We will maintain water quality and quantity.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

There is no acceptable variance for this indicator.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Sediment from forestry practices is generated mainly from the following three sources: roads, landslides and stream bank instability. Significant increases in sediment concentration in streams over natural levels can have a negative effect on fish and fish habitat (Slaney et al. 1977; Government of BC 1995; Hall et al. 1987; Hartman and Scrivener1990; Phillips 1971; Scrivener and Tripp 1998.). Sediment can also reduce the value of water for domestic and agricultural use (Government of BC 1995).

Sediment yields from logging roads can show a 2 to 50-fold increase over historical levels (Reid 1993). The main point of road sediment delivery to streams is at crossings such as culverts and bridges (Brownlee et al. 1988; Government of BC 1995). While it is recognized that roads are not the only source of sediment related to forestry practices, they are considered to be the most significant causes of increased sedimentation (Beschta 1978; Brownlee et al. 1988; Government of BC 1995; Reid and Dunne 1984). Through the proper layout, construction, deactivation and use of erosion and sediment control (ESC) measures, the impact that roads have on water quality can be significantly reduced (Beaudry 1998; Government of BC 1995). In an effort to assess the impact that stream crossings are having on the water quality within TFL 48, a field based assessment, known as the Stream Crossing Quality Assessment (SCQA) was developed.

The SCQA method is a subjective type of assessment, yet it is systematic in its approach. There are no detailed quantitative measures that must be made (e.g. length and depth of erosion rills). The SCQA method was designed with the assumption that it is better to assess a much larger number of crossings in a qualitative way (i.e. a significant proportion of the crossings within a watershed), than it is to assess only a few crossings in a very detailed, quantitative way. A balance between effectiveness and efficiency has been developed when performing the SCQA field assessments. The SCQA method was designed to be conducted relatively quickly (10 to 15 minutes per crossing) so that a maximum number of crossings can be assessed within an area of interest.

CURRENT STATUS

Table 36: SCQI and Water Quality Concerns for Three Sub-Basins within TFL 48 – Sampling Completed 2001 to 2004

Watershed Name	n	Erosion Indices			Water Quality Concern Ratings				
		Stream Crossing Density Index	Sum of Stream Crossing Quality Scores	Stream Crossing Quality Index	Stream Width Class[1]	None[2] % (#streams/ #streams sampled)	Low[3] % (#streams/ #streams sampled)	Medium[4] % (#streams/ #streams sampled)	High[5] % (#streams/ #streams sampled)
Gaylard	47	0.30	14.9	0.10	1	0.0	0.0	0.0	0.0
					2	33.3	66.7	0.0	0.0
					3	40.0	20.0	26.7	13.3
					4	46.7	13.3	26.7	13.3
					5	36.4	18.2	9.0	36.4
Lower Peace	61	0.44	18.7	0.14	1	0.0	0.0	0.0	0.0
					2	33.3	33.3	33.3	0.0
					3	12.5	75.0	12.5	0.0
					4	31.3	50.0	0.0	18.7
					5	23.5	41.2	11.8	23.5
Gething	70	0.38	28.3	0.15	1	60.0	40.0	0.0	0.0
					2	0.0	0.0	66.7	33.3
					3	36.4	27.2	36.4	0.0
					4	24.0	40.0	4.0	32.0
					5	19.2	23.1	19.2	38.5
Wolverine	51	0.28	16.2	0.09	1	0.0	0.0	0.0	0.0
					2	25.0	75.0	0.0	0.0
					3	60.0	0.0	0.0	40.0
					4	46.7	33.3	13.3	6.7
					5	18.5	44.5	33.3	3.7
Middle Wolverine	22	0.13	3.96	0.02	1	0.0	0.0	0.0	0.0
					2	66.7	0.0	0.0	33.3
					3	72.7	9.1	0.0	18.2
					4	50.0	50.0	0.0	0.0
					5	75.0	25.0	0.0	0.0
Hasler	119	0.63	71.23	0.37	1	0	0	0	0
					2	0	66.7	33.3	0
					3	5.9	17.7	29.4	47.1
					4	3.3	26.7	26.7	43.3
					5	0	29.7	35.1	35.1
Brazion	90	0.28	31.26	0.1	1	0	0	0	0
					2	20.0	40.0	0	40.0
					3	5.9	41.2	23.5	29.4
					4	27.1	45.8	18.8	8.3
					5	20.0	50.0	20.0	10.0
Highhat	108	0.68	30.27	0.19	1	0	0	0	0
					2	0	0	100.0	0
					3	20.0	50.0	10.0	20.0
					4	21.3	42.6	23.0	13.1
					5	36.1	44.4	16.7	2.8
Lower Carbon	61	0.46	23.32	0.17	1	0	100.0	0	0
					2	100.0	0	0	0
					3	16.7	25.0	33.3	25.0
					4	13.8	44.8	37.9	3.5
					5	11.1	33.3	38.9	16.7
Seven Mile	28	0.36	15.1	0.19	1	0	0	0	0
					2	100.0	0	0	0
					3	0	100.0	0	0
					4	0	27.8	38.9	33.3
					5	0	80.0	20.0	0

Watershed Name	n	Erosion Indices			Water Quality Concern Ratings				
		Stream Crossing Density Index	Sum of Stream Crossing Quality Scores	Stream Crossing Quality Index	Stream Width Class[1]	None[2] % (#streams/ #streams sampled)	Low[3] % (#streams/ #streams sampled)	Medium[4] % (#streams/ #streams sampled)	High[5] % (#streams/ #streams sampled)
Eleven Mile	37	0.17	5.31	0.02	1	0	0	0	0
					2	33.3	66.7	0	0
					3	42.9	57.1	0	0
					4	35.0	55.0	10.0	0
					5	14.3	57.1	28.6	0
East and West Carbon	39	N/A[6]	N/A[6]	N/A[6]	1	0	0	0	0
					2	0	0	0	0
					3	0	50.0	37.5	12.5
					4	0	32.0	48.0	20.0
					5	0	66.7	33.3	0
Lower Sukunka	114	0.22	78.4	0.15	1	0.0	0.0	0.0	0.0
					2	0.0	100.0	0.0	0.0
					3	0.0	0.0	12.5	87.5
					4	24.2	40.9	12.1	22.7
					5	20.5	46.2	17.9	15.4
Lower Pine	44	0.27	17.44	0.11	1	0.0	0.0	0.0	0.0
					2	0.0	0.0	0.0	0.0
					3	0.0	50.0	50.0	0.0
					4	16.7	46.7	13.3	23.4
					5	41.7	25.0	25.0	8.3

1. 1 = greater than 20m, 2 = 5 to 20m, 3 = 1.5 to 5m, 4 = 0.5 to 1.5m, 5 = less than 0.5m
2. SCQI scores of 0.00
3. SCQI scores between 0.01 and 0.39
4. SCQI scores between 0.40 and 0.79
5. SCQI scores greater than 0.80
6. Erosion indices cannot be calculated because these areas are not true watersheds.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Forecasting not applicable.

STRATEGY AND IMPLEMENTATION SCHEDULE

Our strategy for protecting water quality is through sound road construction, maintenance and deactivation practices including but not limited to the following:

- Terrain Stability Assessments
- Temp work crossings to facilitate right of way falling and construction
- Additional cross drains to offload ditch water either side of stream crossings during construction
- Grass seeding crossing location upon completion of construction
- Rip Rap inlets and outlets of structures
- Removal of crossing structures and rehabilitation of site during deactivation
- Cross ditches 10-15m upslope of crossings during deactivation
- Grass seeding upon completion of deactivation
- Straw blanket on rehabilitated bridge sites

The SCQA system is a semi-quantitative method of assessing the effectiveness of our road construction, maintenance and deactivation practices. The SCQA system was implemented on the TFL in 2001. Continuation of the SCQA system is slated as follows:

- Annually, Canfor will select drainages for survey by area on the TFL. The TFL will be surveyed in a cyclical manner until the all areas have been covered, the surveys will then recommence with the first area. The result will be a recurring survey on an approx 5-year cycle.
- Annually, stream-crossing surveys will be conducted and the resulting data analyzed.
- Results from the annual evaluation process of WQCR survey data will determine the need for development of recommendations and subsequent Action Plans. If required, plans will be

formulated to meet target goals and promote continuous improvement over time in the areas of road construction, maintenance, and deactivation practices.

MONITORING PROCEDURE

SCQI scores for individual crossings range between 0 and 1, depending on the impact the crossing is having on water quality. A score of 1 indicates that the crossing has a substantial impact on water quality. As the impact is reduced the score decreases until it eventually reaches 0. Adding the individual crossing scores and dividing this value by the watershed area to calculate watershed level SCQI's. Time, sediment control, erosion control and drainage control techniques can improve a crossing's SCQI score which provides an incentive to implement appropriate construction and deactivation techniques.

Example Calculation of SCQI (Table 37):

Watershed name: **Bogus watershed**

Watershed size: **30 km^2**

Table 37: Stream Crossing Inventory for Bogus Watershed

Culvert ID	Field Comments	Score	Sum of Score
#1	Not checked	1	
#2	No erosion	0	
#3	Severe erosion	1	
#4	Mild erosion	0.2	
#5	Not checked	1	
#6	De-activated and stable	0	
#7	Not checked	1	
#8	Moderate erosion	0.5	
#9	Not checked	1.0	
#10	Severe erosion	1.0	
Equivalent Stream Crossing Number =			**6.7**

Stream crossing density = 10/30 km^2 = 0.33 crossings/km^2

The SCQI score for the Bogus watershed = 6.7/30 km^2 = 0.22 crossings/km^2

The overall watershed score is calculated as indicated above and reported in each annual report or SFMP.

Scores for each individual crossing assessed is stored in Genus and high WQCR crossings are identified for production of action plans (see Indicator 3.28). The results of each years surveys are circulated to the applicable supervisor to review and complete action plans where required.

LINKAGES TO OPERATIONAL PLANS

Once data is compiled and evaluated for the surveyed area within the DFA, corrective action will be taken as necessary to meet or exceed targets. Achieving targets will support the overall objective by completing site-specific remediation as required and providing feedback to operations on construction, maintenance and deactivation practices.

3.28 Action Plans for High Water Quality Concern Rating (WQCR)

Indicator Statement	Target Statement
Number of crossings with a High Water Quality Concern (WQCR) with actions plans prepared within one year of discovery	100% of High WQCR crossings will have action plans prepared within one year of discovery
SFM Objective: We will maintain water quality and quantity.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

A 10% variance is accepted to allow for the one off situations due to access issues or site conditions (i.e. unable to access/assess before snow fall) preventing the preparation of an action plan within one year. The 10% variance refers to the time line of completion only; the action plan must still be completed.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator will ensure the follow up evaluation and subsequent action plans for High WQCR crossings are consistently implemented, tracked, and completed, thus improving the SCQI score and reducing environmental impact. The data set developed can provide the basis for analysis to identify trends and opportunities to improve sediment control; erosion control and drainage control techniques, thus providing the means and incentive to implement appropriate construction and deactivation techniques as a proactive precaution rather than reaction. This indicator provides the closed loop feed back required for continuous improvement of SCQI results and operational practices.

CURRENT STATUS

From 2001 to present 97% of High WQCR crossings had action plans prepared within one year of discovery. Of 148 inspections 4 remain outstanding and will have action plans completed prior to the 2005 winter season.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Forecasting is not applicable.

Analytical Methods

This indicator is intended to be a measure of the level of completion expressed as a percentage (No. High crossings with action plans completed / No. High crossings discovered).

STRATEGY AND IMPLEMENTATION SCHEDULE

Upon receiving the SCQI report the data is loaded on our Genus system. The high sites are assigned to the logging supervisor by area and followed up on during the summer season. All associated action plans and resulting scheduled works are tracked through to completion in the Genus structures interface, linked to the corresponding WQCR inspection. Priority for remedial projects shall be in the following order: streams used for domestic water supply, fish bearing streams, and others.

MONITORING PROCEDURE

The statuses of follow up inspections and associated action plans for high sites will be reported out as a percentage of highs completed in the annual SFM report.

LINKAGES TO OPERATIONAL PLANS

The data will highlight opportunities for improved sediment control, erosion control and drainage control techniques to implement in the design, construction, and deactivation phases of our business. This indicator provides a closed loop for continuous improvement of operational practices.

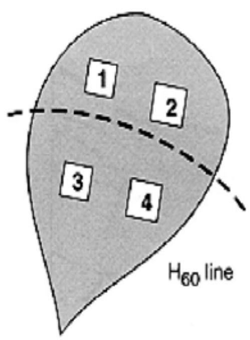
3.29 Peak Flow Index

Indicator Statement	Target Statement
The percentage of watersheds within TFL 48 achieving baseline thresholds for Peak Flow Index	A minimum of 95% of the watersheds within TFL 48 will be below the baseline threshold
SFM Objective: We will maintain water quality and quantity.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

No acceptable variance.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?



Block no.	Area (ha)	Stand height (m)	ECA (ha)	Weight factor	Weighted ECA
1	20	4	15.0	1.5	22.5
2	30	6	15.0	1.5	22.5
3	20	1	20.0	1.0	20.0
4	30	8	7.5	1.0	7.5

Weighted Total ECA = **72.5**

$$\text{Peak Flow Index} = \frac{72.5}{1000} = \mathbf{0.0725}$$

Figure 23: Peak Flow Index – Example Calculation

Most changes to stream channel stability and fish habitat occur during large runoff events, or peak flows (Beaudry and Gottesfeld 2001). In the interior of British Columbia most peak flows occur during spring snowmelt. Large disturbances in a forested watershed, such as extensive forest harvesting or wildfires, can have a negative impact on peak flows by increasing the flows above stability thresholds. This can accelerate streambed and stream bank erosion, damage fish habitat and result in an unstable fluvial system. After forest harvesting or wildfires have disturbed an area, both winter snow accumulation and spring snow melt rates increase (Winkler 2001). However, the impact of disturbances on peak flows is not equal throughout a watershed. Disturbances that are located at higher elevations in a watershed have a greater impact on peak flows than do those located at lower elevations (Gluns 2001). Consequently, it is important that a good water quantity index take this fact into consideration. The Peak Flow Index (PFI) considers this by providing a greater weight factor to the disturbances that occur at higher elevations. The "higher elevation" is defined as the upper 60% of the watershed. This "upper watershed area" is defined individually for each watershed or sub-basin by using the concept of the "H60 line".

The Peak Flow Index also considers that the forest will re-grow over time within a disturbed area. As re-growth occurs, the negative impact of accelerated snow accumulation and melt is reduced and consequently so are the impacts to increased peak flows. The PFI considers stand height as the indicator of re-growth (See Table 38) (BC MoF 2001). The PFI value decreases as the stand height increases. The PFI provides an objective method to forecast and evaluate the potential effects of past disturbances and future plans. By providing conservative target values, it ensures that rates of forest harvesting do not contribute to the degradation of the water resource Figure 23 provides an example of how PFI is calculated for a 1000 ha watershed.

Table 38: Hydrological Recovery for Fully Stocked Stands That Reach a Maximum Crown Closure of 50%-70%

Average Ht of main canopy (m)	% Recovery
0 - <3	0
3 - <5	25
5 - <7	50
7 - <9	75
9+	90

CURRENT STATUS

There are 33 out of 34 watersheds (97%) currently meeting the PFI target (see Table 39). The Johnson watershed is currently not meeting the PFI target. This is due to the RAN fire (1985), which covered a large portion of the watershed. There is no new harvesting proposed within the Johnson watershed.

In the Medicine Woman Creek watershed there is an ECA area of 784 ha proposed which results in a post FDP PFI of 41.8 exceeding the max PFI of 35. No fieldwork has been completed in the Medicine Woman Creek watershed. The intent of harvest areas proposed within this watershed is a system of reserves, patches and retention. The original analysis completed for this assessment assumed that all areas would be harvested with no retention. When harvest areas are defined in the field the total harvest area will be reduced through the inclusion of reserves, patches or other retention to ensure compliance with the maximum peak flow index threshold.

Table 39: Peak Flow Index Current Status and Post FDP Status

TFL Block	Watershed	Watershed or Residual	H60 Elevation	Watershed Area	Disturbance Area (ha)	Current ECA (ha)	Current PFI (%)	Post FDP ECA (ha)	Post FDP PFI (%)	Max PFI
1	Adams Creek	W	1107	5,458	0	0	0	0	0	43
1	Aylard Creek	W	1036	5,456	25	37	0.7	37	0.7	37
1	Basin "862"	W	853	4,884	767	953	19.5	953	19.5	43
1	Beany Creek	W	958	3,899	54	55	1.4	858	22.0	37
1	Dunlevy Creek	W	1047	17,007	307	401	2.4	1,171	6.9	31
1	North Peace Residual	R	929	9,462	22	24	0.3	24	0.3	50
1	Ruddy Creek	W	922	6,445	81	84	1.3	422	6.6	31
2	Cameron Creek	W	783	3,613	0	0	0	0	0	50
2	Eleven Mile	W	1326	21,603	585	583	2.7	1,549	7.2	43
2	Gaylard	W	1029	15,638	2,408	2,850	18.2	3,947	25.2	31
2	Gething	W	996	18,505	2,514	2,658	14.4	3,548	19.2	31
2	Johnson		891	21,153	7,241	7,967	37.7	7,967	37.7	37
2	Lebleu Creek	W	874	1,999	0	0	0	40	2.0	50
2	Lower Carbon	W	1057	13,167	1,038	1,199	9.1	1,766	13.4	50
2	Lower Peace Reach	R	955	14,347	2,485	2,951	20.6	2,951	20.6	50
2	Woman Creek	W	975	1,876	0	0	0	784	41.8	35
2	Seven Mile	W	1257	7,878	254	288	3.7	690	8.8	43
2	Upper Carbon	W	1291	46,258	1,943	1,849	4.0	2,332	5.0	37
4	Brazion Creek	W	1220	32,375	8,067	4,034	12.5	5,014	15.5	37
4	Burnt Creek	W	1185	62,161	8,594	6,397	10.3	9,482	15.3	37
4	Gwillim	W	1066	4,488	173	147	3.3	557	12.4	43
4	Hasler Creek	W	1077	19,010	2,335	2,305	12.1	3,016	15.9	37
4	Highat Creek	W	1037	15,647	2,719	2,632	16.8	3,578	22.9	43
4	LeMoray Creek	W	1291	11,190	425	340	3.0	340	3.0	37
4	Lower Pine Residual	R	923	16,228	1,255	1,844	11.4	3,139	19.3	43
4	Lower Sukunka	W	904	54,089	4,436	4,771	8.8	6,050	11.2	43
4	Trapper Creek	W	1179	7,571	1	0	0.0	0	0	37
4	Upper Pine Residual	R	1082	40,084	1,967	2,235	5.6	4,456	11.1	37
4	Upper Sukunka	W	1075	23,444	2,149	2,201	9.4	3,442	14.7	43
5	Lower Murray	W	1066	17,398	104	112	0.7	1,562	9.0	37
5	Lower Wolverine	W	1161	23,241	1,826	2,157	9.3	2,157	9.3	37

TFL Block	Watershed	Watershed or Residual	H60 Elevation	Watershed Area	Disturbance Area (ha)	Current ECA (ha)	Current PFI (%)	Post FDP ECA (ha)	Post FDP PFI (%)	Max PFI
5	Middle Wolverine	W	1205	17,585	5,017	3,372	19.2	3,372	19.2	43
5	Upper Murray	W	1294	17,858	1,310	1,343	7.5	3,582	20.1	37
5	Upper Wolverine	W	1378	18,032	2,444	1,525	8.5	1,841	10.2	37

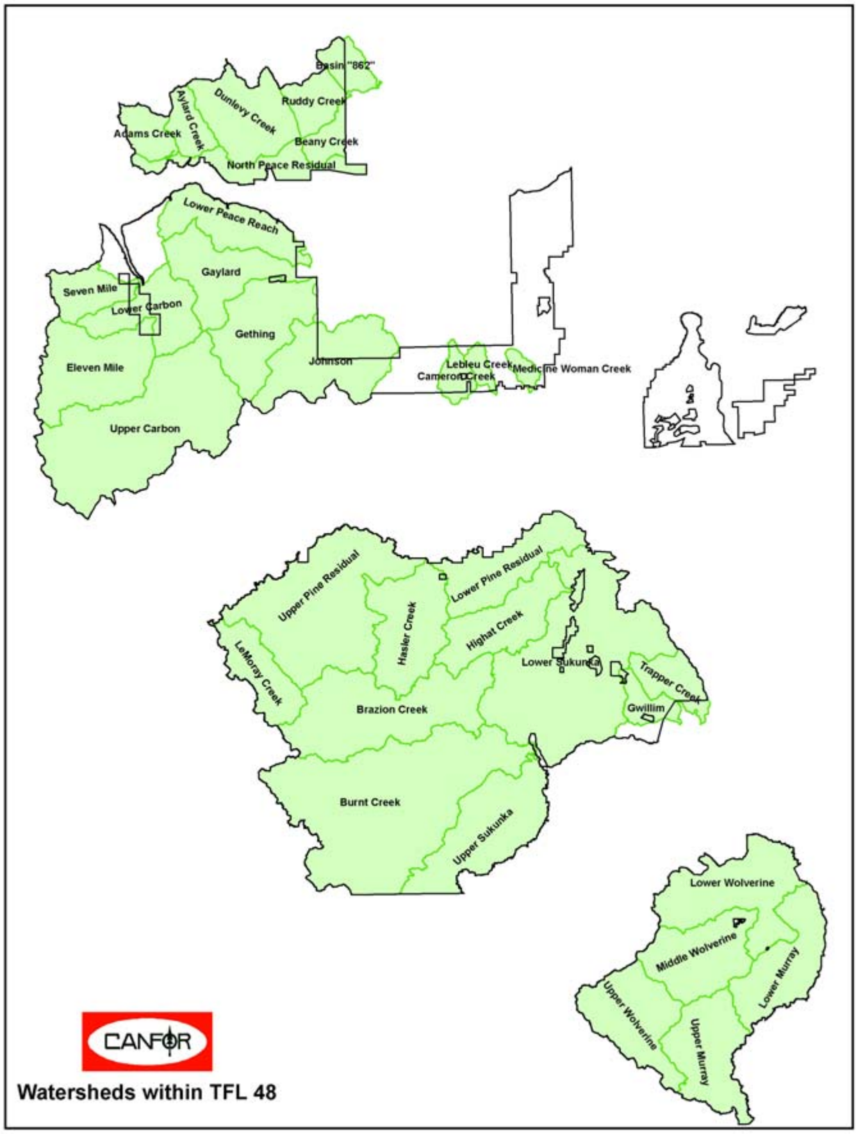


Figure 24: PFI Watersheds Within TFL 48

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

The watersheds and baseline target PFI's were developed by Pierre Beaudry, (P. Beaudry & Associates Ltd. Watershed Management Services). The watersheds are based on the BC Provincial Watershed Atlas. The following principles were applied when delineating watersheds:

The watershed boundaries are based on the concept of hydrologic watersheds (water draining through a single point) as opposed to political watersheds. Modifying the true hydrological watershed to fit within the political landscape was avoided wherever possible. Also, small watersheds, known as "residual areas" were not "lumped" or aggregated into a single unit. The PFI concept is most relevant if it monitors a single hydrologic watershed.

The size of sub basins in this plan range from approximately 19 to 620 square kilometres. Very small watersheds and very large watersheds are not included because the PFI concept is most applicable at the sub basin level.

Watersheds were delineated where the TFL covered at least 50% of the watershed area. Therefore some watersheds extend beyond the TFL. Alternatively, the TFL is not completely covered by watersheds. Despite these physical limitations the majority of the planning area is covered by watersheds (90.3%).

Watersheds were named according to the local name of the water body, where applicable. A basin name was also added to provide a geographic reference.

Once all watersheds were delineated, a baseline target was determined for each of the watersheds. The setting of an absolute PFI target is very difficult and can lead to significant controversy. Although there is no single widely accepted threshold value, conservative targets are suggested. Although we don't know what the physical and biological impacts from increased peak flows will be, we do know that there will be increased flows caused by the removal of a large percentage of the forest canopy. Consequently, a maximum target is set with the overall goal of maintaining the sustainability of the aquatic resource without being overly conservative. The targets must consider the type of watershed and type and stability of the fluvial system. The idea behind setting a baseline target is not to prevent changes in peak flows to occur, but to maintain flows within levels that will not unduly accelerated rates of streambed and stream bank erosion and degrade fish habitat. The suggested target PFI values are partly subjective and are based on a combination of professional opinion, scientific literature and 20 years of personal involvement in research projects investigating peak flows by Pierre Beaudry. Further details on the development of peak flow indices can be found in the report provided to Canfor by Pierre Beaudry, "Peak Flow Index (PFI) Targets for TFL 48 DFA Canadian Forest Products Ltd. Chetwynd Division, November, 2001".

Long term forecasting was completed over the full 250 year planning horizon for this indicator. Due to complexities in modeling the direct PFI index because of difficulties in tracking the area above and below the H60 line and applying the constraints a simplified forecasting was done using Equivalent Clearcut Area (ECA) targets. ECA targets were developed by Pierre Beaudry as well as PFI targets. The ECA targets are set lower to reflect the lack of consideration for increased flows coming from above the H60 line within a watershed. All targets were met over the 250-year planning horizon.

STRATEGY AND IMPLEMENTATION SCHEDULE

As stated above, the PFI is intended to be a coarse filter so that if we are planning to exceed the baseline target we take a closer look at the specific watershed to ensure that water values are maintained. The indicator for Peak Flow Index is established to provide the number of watersheds with PFI's that may exist above the baseline PFI at any point in time. The target was determined from a review of the number of watersheds currently above the baseline target and the number that are expected to be above the baseline target after the Forest Development Plans or Forest Stewardship Plans are implemented.

MONITORING PROCEDURE

The status of this indicator is reported during each Management Plan. Assessments are made at each FDP/FSP to ensure that the targets will be met.

Formula:

$$\mathbf{PFI\%} = (\mathbf{WS}_{met} / \mathbf{WS}_{tot}) * 100$$

Variables:

- $\mathbf{WS}_{met}$ Number of watersheds where the peak flow index is below the maximum
- $\mathbf{WS}_{tot}$ Total number of watersheds assessed.
- **PFI%** Percentage of watersheds where the peak flow index is below the maximum threshold.

For details on the calculation of the PFI for each watershed see Figure 23: Peak Flow Index – Example Calculation.

LINKAGES TO OPERATIONAL PLANS

When new harvesting is proposed in a FDP or FSP an assessment is made to determine if the new activity is consistent with the targets for PFI.

3.30 Watershed Reviews

Indicator Statement	Target Statement
The percentage of watersheds reviews completed where the baseline threshold is exceeded	100% of watersheds that exceed the baseline threshold will have a watershed review completed when new harvesting is planned
SFM Objective: We will maintain water quality and quantity.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No acceptable variance.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Although the Peak Flow Index is a good index, it is only that "an index". It is not intended to be a detailed quantitative modeling of increased volumes of flows. The Peak Flow Index will be used as a "coarse-filter" to identify where a more detailed review of the watershed is required when new harvesting is planned i.e. if the PFI for the watershed is below the baseline target when new harvesting is planned then no further review is required, however, if the current PFI is above the baseline target when new harvesting is planned then a more detailed review of the watershed is required.

This indicator and target is established to ensure that where new harvesting is planned within watersheds that exceed the baseline PFI a watershed review is completed. The watershed review will be preformed by a professional hydrologist and will make specific recommendations for further development in the watershed. These recommendations will then be implemented within our operational plans.

CURRENT STATUS

Currently there are no watershed reviews required.

There are 2 watersheds where the PFI is currently exceeded or proposed to be exceeded, the Johnson and Medicine Woman Creek watersheds (see Table 39 and Figure 24). No new harvesting is proposed in the Johnson watershed so a review is not required. If new harvesting is proposed then a watershed review will be conducted to ensure that there are no detrimental effects created through the additional harvesting.

In the Medicine Woman Creek watershed there is an ECA area of 784 ha proposed which results in a post FDP PFI of 41.8 exceeding the max PFI of 35. No fieldwork has been completed in the Medicine Woman Creek watershed. The intent of harvest areas proposed within this watershed is a system of reserves, patches and retention. The original analysis completed for this assessment assumed that all areas would be harvested with no retention. When harvest areas are defined in the field the total harvest area will be reduced through the use of reserves, patches or other retention to ensure compliance with the maximum peak flow index threshold. Should the PFI still be exceeded then a detailed review will be conducted prior to harvest commencement consistent with this indicator.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

As stated above, the PFI is intended to be a coarse filter so that if we are planning to exceed the baseline target we take a closer look at the specific watershed to ensure that water values are maintained. This strategy was implemented during MP 3.

MONITORING PROCEDURE

The requirement to conduct watershed reviews and the results of these reviews will be summarized in the SFM plan or annual reports. The calculation of the performance on this indicator is as follows:

Formula:

$$\mathbf{WSR\%} = (\mathbf{WSR}_{com} / \mathbf{WSR}_{req}) * 100$$

Variables:

$\mathbf{WSR}_{com}$	Number of watersheds reviews completed
$\mathbf{WSR}_{req}$	Total number of watersheds reviews required
WSR%	Percentage of watershed reviews completed

LINKAGES TO OPERATIONAL PLANS

The requirement to conduct watershed reviews will be determined following new harvest proposals in FDP's/FSP's. Harvest plans and site plans will be produced to be consistent with recommendations from watershed reviews.

3.31 Carbon Sequestration

Indicator Statement	Target Statement
DFA Average Carbon (C) sequestration rate (Mg C/year)	Maintain DFA average carbon sequestration rates that are no more than 15% less than those achieved using the minimum natural range of variation
SFM Objective: We will maintain the processes for carbon uptake and storage within the natural range of variation.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No variances due to Canfor management. Variances due to large catastrophic natural disturbances (e.g. wildfires, mountain pine beetle etc.) will be acceptable.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

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 $CO2$ emissions. The capacity of forest ecosystems to sequester carbon can thus be considered an environmental value and should therefore be included as one aspect of sustainable forest management practice. For carbon sequestration to be effectively represented within an ecosystem-level management plan, however, it must be considered within the context of timber production, wildlife conservation, and visual aesthetics. Presently, there are few forest-level decision support tools available to managers for assessing carbon sequestration as part of an integrated suite of indicators of SFM (Seely and Nelson, 2002).

Sequestration is defined as the net amount of C removed from the atmosphere and stored in the ecosystem each year. The calculation of average net C sequestration rates within a timber supply area allows for a long-term evaluation of effects of management activities and/or natural disturbance on the rate at which the forested landscape is sequestering C. Average sequestration rates are based on changes in ecosystem carbon storage over time without accounting for C removed in harvested biomass. The rationale is that the carbon in harvested materials will be stored in wood products following harvest. An assessment of the sequestration rate provides a measure of the rate and direction of carbon exchange between the forest ecosystem and the atmosphere.

CURRENT STATUS

Following are two graphs, which provides an example of the average C sequestration rate for both an individual stand (Forecast AU 3 – Natural and Forecast AU 34 – Managed) and shows the average C sequestration rate over the whole DFA over time.

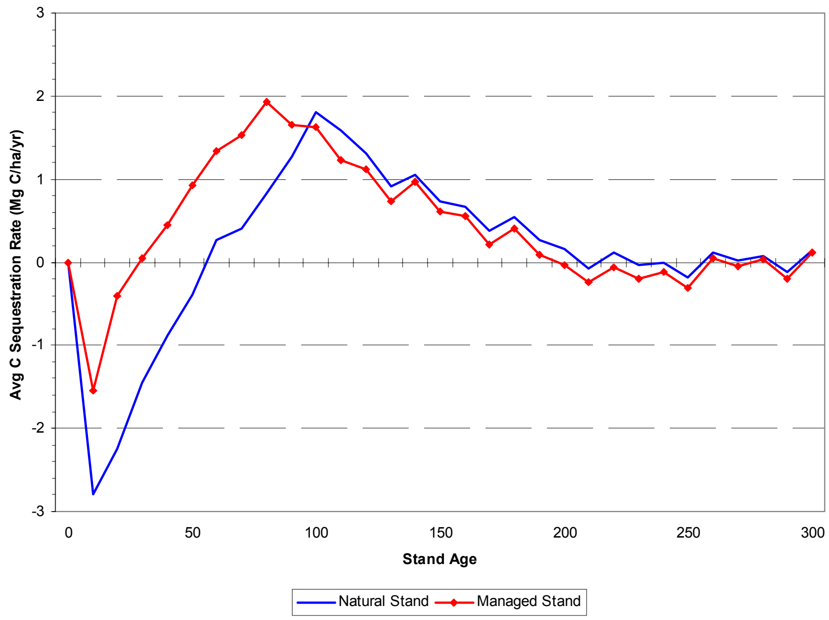


Figure 25: An Example of Average C Sequestration Rates for a Natural Spruce Leading BWBS Mesic Site Stand (Forecast AU 5) and an Associated Managed Stand (Forecast AU M3)

At the stand level there is a greater release of C to the atmosphere following the decomposition of the larger pool of dead organic matter (snags and CWD) in the natural stand which results in a lower sequestration rate during the first several decades of stand development (Figure 25). In the example provided, the average sequestration rate takes longer to return to positive values in the natural stand versus the managed stand. This is partly related to the fact that the harvested wood removed from the site during harvesting does not contribute to ecosystem C release to the atmosphere. Rather, it is assumed to be stored in wood products.

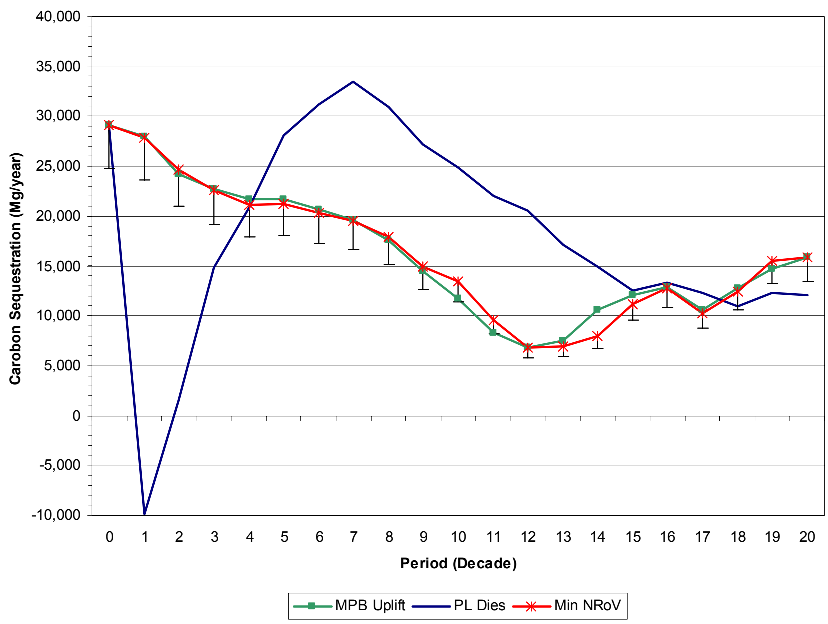


Figure 26: Carbon Sequestration (Mg C/year) within TFL 48 Over Time

At the DFA level the average sequestration rate declines from the present level of about 29,000 Mg C/yr over the next 120 years and stabilizes between 10,000 and 15,000 Mg C/yr in the long term. The decline from the current situation is due to the large amount of area (approximately 62%) that is between 40 and 140 years old and only 29% greater than 140 years old versus in 100 years the projection is that there will be only 31% of the land base between 40 and 140 years old and 58% greater than 140 years old. Over time the age class distribution is more evenly distributed with more area in younger stands and older stands with lower sequestration rates therefore the DFA level sequestration rate declines. For comparison purposes an estimate of the rate of C sequestration is provided for both the proposed AAC the sequestration rates using the minimum natural range of variation and the scenario where all pine is assumed to be killed in a mountain pine beetle outbreak.

There is no significant difference between the proposed harvest level and the minimum natural range of variation except for periods 10 and 11 in the simulation. After this point in time the sequestration rate is above or equivalent for the proposed harvest level.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

Stand level C curves were generated for the TFL 48 on both the THLB and the NHLB using the FORECAST model.

A carbon curve database was subsequently prepared by summarizing the results for total ecosystem C storage on 10-year time steps for each of the FORECAST carbon AU's. In addition, average rates of C sequestration were calculated for each time step based on the following equation:

$$\text{Avg. Sequestration Rate}_t = \frac{\text{Ecosystem C}_t - \text{Ecosystem C}_{t-10}}{10}$$

These curves were incorporated into the forest estate model used to do forecasting in support of this SFMP.

STRATEGY AND IMPLEMENTATION SCHEDULE

The strategy to manage sequestration rates is through prompt reforestation (Section 3.18) and maintaining acceptable levels of stocking in order to provide a free growing stand (Section 3.19).

Fire suppression as well contributes to maintaining the sequestration rates by controlling age class distributions. Fire management strategies are described in Section 3.16.

The process described for this indicator is a first approximation of the effects of forest management on sequestration rates over time. The models used to predict C sequestration rates are still rudimentary at this point and as new knowledge is gained this indictor will be assessed to determine if this data and methods are appropriate and methods will be adjusted if necessary.

MONITORING PROCEDURE

During TSR processes sequestration rates will be calculated for both the Timber Harvesting Land Base and the Non-Timber Harvesting Land Base and compared to the targets.

LINKAGES TO OPERATIONAL PLANS

The most direct link to operational plans is prompt reforestation and ensuring that sufficient stocking is on the harvested and regenerated sites. This is monitored through Indicators 3.18 and 3.19 respectively.

Results from the monitoring plots and estimates of MAI influences harvest levels and long-term harvest levels. This indicator is reviewed and incorporated into Timber Supply Review process, which influences actual harvest levels within the DFA.

3.32 Ecosystem Carbon Storage (Mg) in the DFA

Indicator Statement	Target Statement
Ecosystem Carbon (C) Storage (Mg) in the DFA	Minimum of 95% of minimum natural range of variation disturbance levels of Ecosystem Carbon Storage
SFM Objective: We will maintain the processes for carbon uptake and storage within the natural range of variation.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No acceptable variance.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT

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 CO2 emissions. (Seely and Nelson, 2002).

C storage is contained 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 is C storage in tree biomass is the dominant factor regulating temporal patterns in total ecosystem C storage (Seely and Nelson, 2002).

CURRENT STATUS

There is an estimated 122 million Mg of C currently stored in the TFL 48 ecosystem declining in the long term to approximately 76 million Mg of C (Figure 28). Both the C storage levels based on the proposed AAC and the minimum and maximum range of variation decline over the next 180 years and then stabilize for the remainder of the simulation. There is no significant difference between the different alternate strategies and the proposed strategy in ecosystem carbon storage over time.

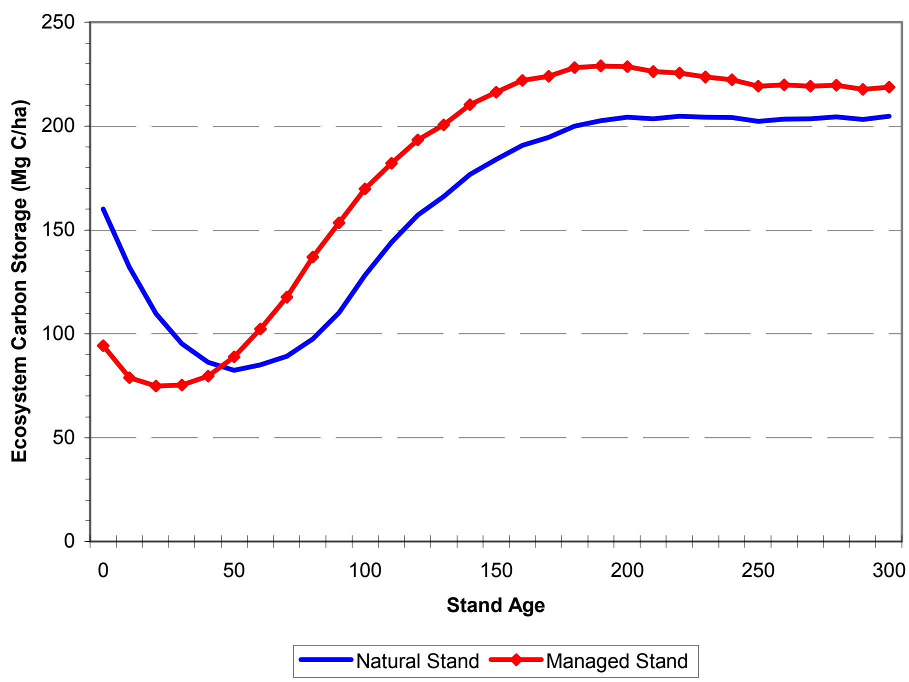


Figure 27: An Example of C Storage for a Natural Spruce Leading BWBS Mesic Site Stand (Forecast AU 5) and an Associated Managed Stand (Forecast AU M3)

For comparison a stand level graph (Figure 27) is provided which demonstrates a natural stand and its associated managed stand C storage levels over time. Note that while the natural stand started with more C remaining on the site after the disturbance the managed stand catches up in about 40 years.

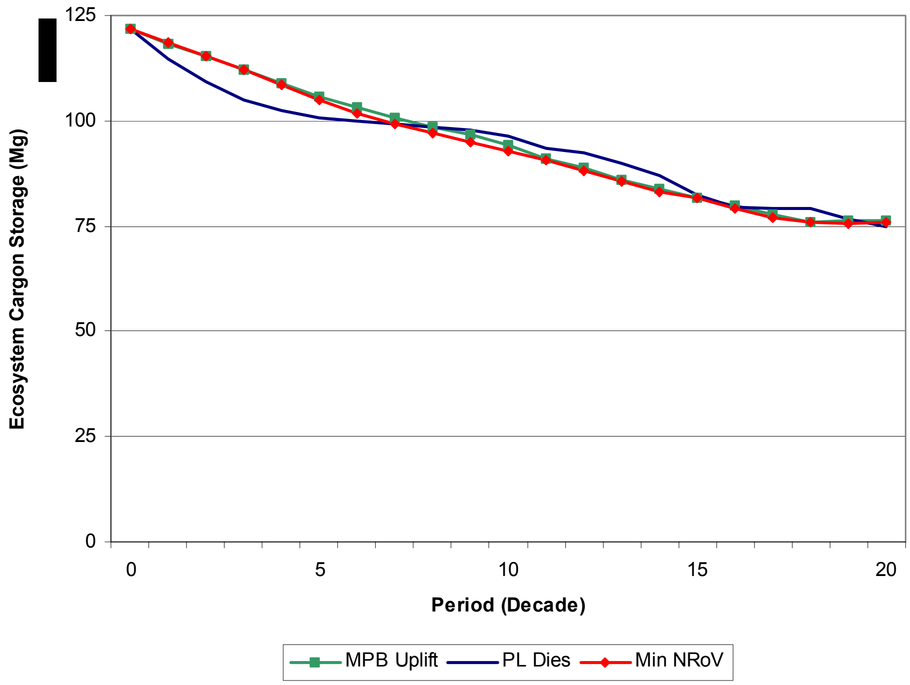


Figure 28: Total Ecosystem Carbon (Mg) Storage in the DFA Over Time

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

See Indicator 3.31 for details on how the C indicators were forecasted and analyzed. The exception being for Indicator 3.32 that total ecosystem C storage is tracked rather than sequestration rates.

STRATEGY AND IMPLEMENTATION SCHEDULE

The strategy to manage C storage is through prompt reforestation (Section 3.18) and maintaining acceptable levels of stocking over the landscape on previously harvested and regenerated sites (Section 3.19).

Fire suppression as well contributes to maintaining C storage by controlling age class distributions and minimizing C release into the atmosphere through wildfires. Fire management strategies are described in Section 3.16.

The process described for this indicator is a first approximation of the effects of forest management on C storage in comparison to a natural disturbance regime. The models and inventory used to predict C storage are still rudimentary at this point and as new knowledge is gained this indictor will be assessed to determine if this data and methods are appropriate and methods will be adjusted if necessary.

MONITORING PROCEDURE

During TSR processes C storage will be calculated for both the Timber Harvesting Land Base and the Non-Timber Harvesting Land Base and compared to the targets.

LINKAGES TO OPERATIONAL PLANS

Forestry activities influence total C storage through fire prevention policies, prompt reforestation, and harvest levels, which are, monitored through Indicators 3.16, 3.18,and 3.39.

3.33 Area of Forested Land Lost to Non-forest Industry

Indicator Statement	Target Statement
Area of forested land lost due to non-forest industry	We will track and monitor losses to other non-forest industry uses and incorporate these losses into AAC calculation every 5 years
SFM Objective: We will sustain forests within the DFA.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Omissions would have less than a 1% impact on AAC calculations.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Forests provide important ecological functions and contributions to global ecological cycles. Forests may be turned into a variety of non-forested ecosystems through both SFM activities as well as those that are outside of the control of Canfor or other forest management activities such as the oil and gas, mining, transmission utilities, and urban development. The intent of this indicator is to ensure that activities that permanently remove area from the forested land base are identified and accounted for in our SFM planning and analysis.

CURRENT STATUS

During the term of MP 3 Canfor developed a spatial tracking system to identify what and where non-forest related activities were occurring within TFL 48. All activities proposed within TFL 48 are referred to Canfor and comments are provided which stress the objective of minimizing permanent removal of area from the forested land base. The following table (Table 40) shows reductions to the land base due to other uses.

Table 40: Reductions to Land Base Due to Other Uses (Excluding Roads[6])

Feature	Total Area (ha)
Well sites[7]	258
Mines [8,9]	1,723
Pipelines	388
Cutlines	1,793
Trails	485
Transmission Lines	201
Grand Total	4,848

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

No forecasting is completed for this indicator with the exception of planned activities that have not yet been initiated. This is completed as a sensitivity analysis as part of the timber supply analysis (See Appendix 5 – Timber Supply Analysis Information Package).

STRATEGY AND IMPLEMENTATION SCHEDULE

Where applicable existing cutlines or trails are upgraded for forestry access in an attempt to minimize the amount of land base permanently removed from the forested land base. Referrals stress the requirement

6 Roads are captured in Indicator 3.20 Permanent Access Corridors and are not easily separated as to which are only used by other industries or which are used by only the forest industry.

7 Includes Camps, Decking areas, Borrow Pits, and Sumps

8 Includes Mines where clearing had started prior to December 2004 (Quintette, Pine Valley Coal and Dillon Mine). Other proposed mines are included as a sensitivity analysis.

9 Includes roads within mine-cleared areas.

to ensure road alignments and grades are suitable for forest management purposes as well to reduce the amount of additional roads to constructed. This indicator has been tracked since MP 3.

MONITORING PROCEDURE

These features will be identified and incorporated into the vegetation update and removed from the timber harvesting land base in each timber supply analysis in support of the Management Plans. The identification methods will be through a combination of sources including but not limited to remote sensing, GPS, or data exchange with other industries or agencies. The status will be reported in conjunction with each Management Plan or Timber Supply Analysis.

LINKAGES TO OPERATIONAL PLANS

Where applicable existing cutlines or trails are upgraded for forestry access in an attempt to minimize the amount of land base permanently removed from the forested land base. Referrals stress the requirement to ensure road alignments and grades are suitable for forest management purposes as well to reduce the amount of additional roads to constructed.

3.34 Range Opportunities

Indicator Statement	Target Statement
Annual minimum number of Animal Unit Months opportunity	We will maintain an annual minimum of 1000 Animal Unit Months (excludes brush control by sheep grazing)
SFM Objective: We will provide opportunities for a feasible mix of timber, recreational activities, visual quality, and non-timber commercial activities.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

An animal unit month (AUM) is the quantity of forage consumed by a 450-kg cow (with or without calf) in a 30-day period. The AUM is the metre-stick we use to gauge forage consumption by herbivores.

The ranching industry is a significant non-timber resource user, which overlaps portions of the TFL. The intention of this indicator is to ensure that there is a base minimum opportunity for grazing within TFL 48. There may be times when demand is below the 1000 AUM level however Canfor is committed to maintaining the opportunity of a minimum level of AUM's.

CURRENT STATUS

There are currently range tenures issued by the Ministry of Forests and Range within the TFL totalling approximately 1,340 AUM's (see Table 41). The main area of range use is in the Boucher Lake rehabilitation areas. In 2004 fields on the Rice property were removed from the TFL this resulted in a reduction of approximately 1,163 AUM's that are issued on the TFL in 2005.

Table 41: Animal Unit Months on TFL 48

Grazing Tenure	Total AUM's	% Area TFL	AUM's TFL
Grazing Lease	47	100.00%	47.0
RAN075680	268	98.90%	265.1
RAN075680	263	11.30%	29.7
RAN075991	174	99.60%	173.3
RAN073021	437	58.20%	254.3
RAN073876	1080	34.90%	376.9
RAN074239	50	50.00%	25.0
RAN074307	400	40.20%	160.8
RAN076293	16	50.00%	8.0
Total			**1,340.1**

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

These range tenures in most cases overlap and are not fully contained within the TFL. The methodology to determine the amount applicable to just the TFL was to simply prorate by area the number of AUM's attributable to the TFL.

STRATEGY AND IMPLEMENTATION SCHEDULE

The commitment to have not less than 1000 AUM's available on the TFL was made in Management Plans since MP 1.

Trails, roads and landings within range use areas are seeded to the appropriate approved range seed mix following deactivation.

Grazing opportunities may also arise once the new coniferous seedlings are well established and are tall enough to withstand cattle grazing in the remainder of the area. Range Use Plans may be developed for these areas in co-ordination between Canfor, the Ministry of Forests and Range and the range licensee. These Range Use Plans may include cross fencing, cattle guards, AUM constraints and water development to ensure that seedling damage is kept to less than 5 percent.

MONITORING PROCEDURE

The number of AUM's issued in range tenures for the TFL will be requested from the Ministry of Forests and Range to be included in the annual SFM report. The information gathered during this annual review will be used to assess whether range improvement plans need to be implemented to ensure a minimum of 1000 AUM's are maintained.

LINKAGES TO OPERATIONAL PLANS

Site Level Plans, Forest Operations Schedules and all other short-term operational plans will be consistent with strategies and recommendations regarding range improvements agreed to with the range tenure holders.

3.35 Maintenance of Visual Landscape Inventory

Indicator Statement	Target Statement
Maintenance of Visual Landscape Inventory	We will maintain and update an approved visual landscape inventory
SFM Objective: We will provide opportunities for a feasible mix of timber, recreational activities, visual quality, and non-timber commercial activities.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

None

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This Visual Landscape Inventory will identify visually sensitive areas visible from communities, public use areas, travel corridors and viewpoints that have been identified through a visual landscape planning process.

Visual quality objectives are the extent to which the visual or scenic resources of a landscape may be altered compared to the pre-existing or natural condition. VQO's are resource management objectives established by the district manager or contained in a higher level plan that reflect the desired level of visual quality based on the physical characteristics and social concern for the area. The five VQO Classes are listed below:

- Preservation – alterations result in no visible change
- Retention – alterations are not visually apparent
- Partial Retention – alterations remain visually subordinate to the characteristic landscape
- Modification – alterations are visually dominant, but have characteristics that appear natural
- Maximum Modification – alterations are dominant, and out of scale, but appear natural in the background

CURRENT STATUS

During the term of MP 2 (1994), an inventory of visual portions of the TFL landscape was completed by Canfor. In 1999 this visual landscape inventory was added to and updated to the 1997 standard. In 2005 the Ministry of Forests consolidated all visual landscape inventories within the previous Dawson Creek Forest District (TFL48 and Dawson Creek TSA). During this process it was discovered that some areas that had been declared and made known were not part of the TFL 48 visual inventory used in MP3. The 2005 consolidated inventory that was provided by the MoFR, and identifies polygons having an existing VQO (EVQO) on the file, is used in the base case for TFL 48.

The areas added during the 1999 inventory are represented in the 2005 consolidated inventory with recommended VQO's (RVQO). Sensitivity analysis was carried out that added 'Recommended' VQO's to the 2005 consolidated visual landscape inventory. The sensitivity analysis is the cumulative amount of established and recommended VQO's from the 2005 consolidated inventory. Based on the results of the sensitivity analysis Canfor has included the recommended VQO's in the preferred management scenario for TFL 48 and is reflected in the proposed AAC (See Indicator 3.22)

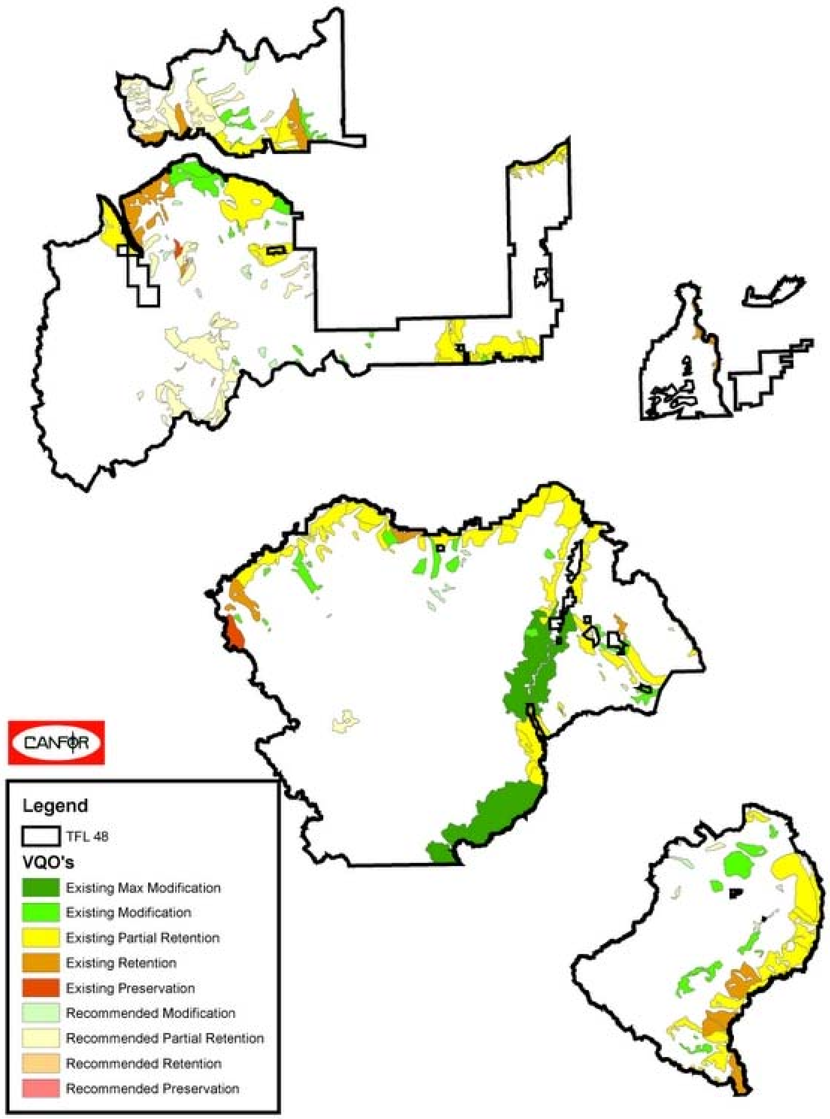


Figure 29: Existing and Recommended VQO's for TFL 48

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Periodically Canfor will assess the currency of the Visual Landscape Inventory and determine if there have been significant changes to the uses or values for the visual resource with TFL 48. Should there be significant changes an update to the VLI will be initiated. Errors or omissions may also be addressed or reassessed using qualified professionals to update the inventory and provide recommendations to the Ministry of Forests and Range for changes to the inventory and subsequent Visual Quality Objectives.

MONITORING PROCEDURE

The VLI is maintained in Canfor's GIS system. Changes to VLI polygons and VQO classifications will be reported in future annual reports.

LINKAGES TO OPERATIONAL PLANS

The VLI is used to determine where Visual Impact Assessments are required for operation activities. Silviculture prescriptions and site plans identify the visual polygons and describe visual quality objectives.

3.36 Proportion of Harvesting Consistent with Visual Quality Objective

Indicator Statement	Target Statement
Proportion of harvesting within known visual areas that are consistent with the Visual Quality Objective (VQO)	100% of harvesting within visual areas will be consistent with the Visual Quality Objective
quality, and non-timber commercial activities.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Variances to achieving the established Visual Quality Objectives (VQO's) that have a supporting rationale and are approved by the District Manager are acceptable.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The Visual Landscape Inventory will identify visually sensitive areas visible from communities, public use areas, travel corridors and viewpoints that have been identified through a visual landscape planning process. The Visual Quality Objective is a resource management objective established by the district manager or contained in a higher-level plan; these objectives reflect the desired level of visual quality based on the physical characteristics and social concern for the area.

Being consistent with the visual quality objective is important in order to maintain the visual values of the landscape.

CURRENT STATUS

Canfor has conducted Visual Impact Assessments for all areas identified in the 1994 and 1999 inventories. Since 2005 the consolidated inventory completed by the MoFR is being used to determine where VIA's will be conducted.

All blocks harvested to date are consistent with VQO's and VIA's.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? Yes. Harvest levels are constrained based on the VQO constraints applied in the timber supply analysis. This ensures that harvest levels are achievable within the visual or scenic objects for TFL 48.

STRATEGY AND IMPLEMENTATION SCHEDULE

Pre-harvest visual impact assessments and landscape design processes are done within areas identified as being visually sensitive in the 2005 consolidated VLI. Where variances to achieving the VQO are necessary to achieve other forest management objectives (e.g. salvage of damaged timber), a rationale for the variance is submitted and a variance is requested from the district manager. A copy of the variance and the district manager approval is kept.

Post-harvest reviews are conducted within one year of harvest completion and compared to the VIA to ensure that the completed development is consistent with the VQO.

MONITORING PROCEDURE

Post-harvest reviews and their results kept on file and are tracked in Genus.

LINKAGES TO OPERATIONAL PLANS

Staff members will refer to base maps to locate visual polygons when preparing plans. When planned activities are in the general vicinity of the identified areas, staff members will ensure plans are consistent with visual quality objectives or acceptable variances.

Silviculture prescriptions or site plans identify the visual polygons and describe visual quality objectives and measures to achieve the objectives.

3.37 Back Country Condition

Indicator Statement	Target Statement
Proportion (%)of back country areas (ha) that are in a semi-primitive recreation opportunity spectrum (ROS) class	We will maintain or increase semi-primitive ROS in Klin-se-za, Bocock, Butler Ridge, Pine/Lemoray, Peace River/Boudreau and Elephant Ridge/Gwillim Protected Areas and manage Special Management Zones (Klin se za, North Burnt, Dunlevy) as per LRMP (See Table 42 for baseline)
SFM Objective: We will provide opportunities for a feasible mix of timber, recreational activities, visual quality, and non-timber commercial activities.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

New road construction will be open for the duration of the season in which the forest management activity occurs (eg. road construction, harvesting, primary silviculture). Seasonal deactivation and access restrictions will be completed by the end of the active season. Upon completion of primary silviculture activities (planting) the road will be deactivated and motorized access restricted.

Access management and deactivation can be used as tools to achieve the desired ROS classification.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

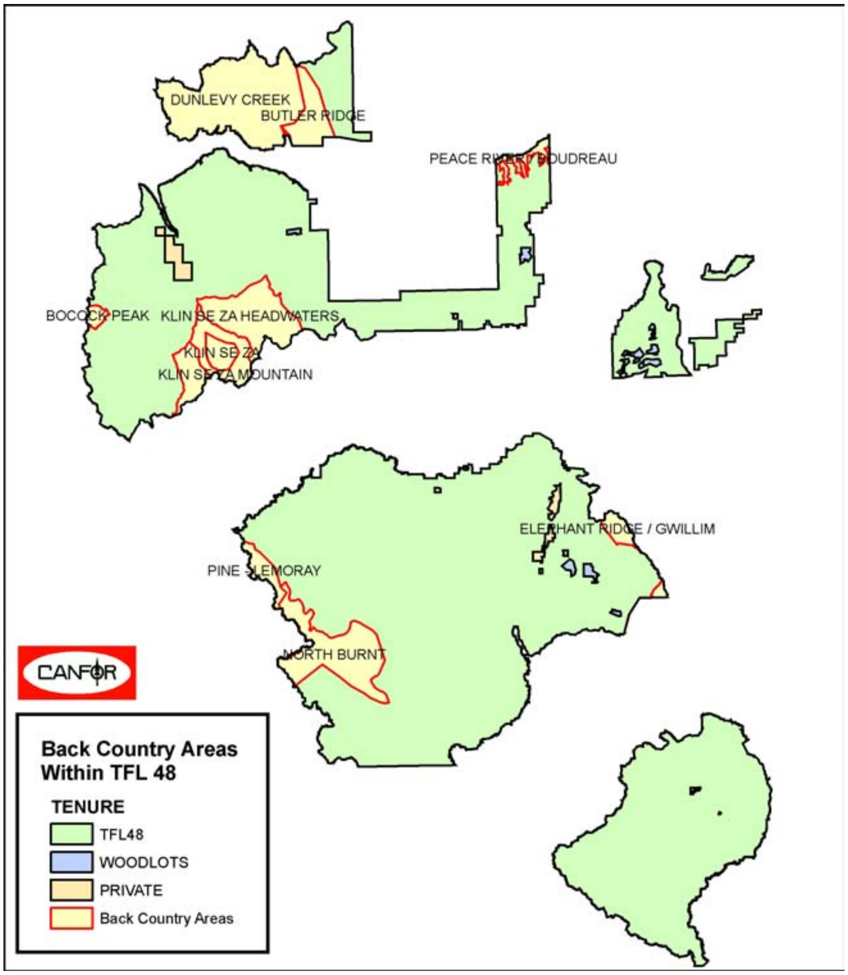


Figure 30: Back Country Areas Within TFL 48

This indicator is a measure of the amount of semi-primitive forest land that has been classified under the Ministry of Forests Recreation Opportunity Spectrum (BC MoF 1998) within each back country area that will provide a full range of wilderness recreational opportunities for the general public.

The Dawson Creek LRMP has identified the importance of maintaining and providing a wide range of public and commercial outdoor recreational opportunities. The specifically identified backcountry protected areas or special management zones provide an additional recreational opportunity in the retention of the “wilderness recreation experience” that can be found in these areas. This can be described as a moderate to high probability of experiencing solitude, closeness to nature, high degree of self reliance, natural appearing environment, low interaction with people and little to some on-the-ground evidence of other people.

Access management and deactivation can be used as tools to achieve the desired ROS classification.

Canfor may use roads developed and maintained by other non-forest industry industrial users (eg. oil/gas, mining). If Canfor assumes responsibility for the road due to no other industrial user having long term interests in the road then it will be assessed as a change in ROS attributable to forest management activities.

Photo 1: Back Country Conditions Exist Throughout the TFL

CURRENT STATUS

The baseline (2001) and current (2005) recreational opportunity spectrum for the stated Backcountry areas are shown on the following tables (Table 42 and Table 43). Over the term of MP 3 there has been harvesting and road building activity in both the Dunlevy and North Burnt back country areas. Primary road construction, harvesting, silviculture activities and deactivation have been completed. The change in condition has moved approximately 945 ha in the Dunlevy and 1,798 ha in the North Burnt areas from semi-primitive non-motorized to the semi primitive motorized classification. This change is acceptable within this indicator as the deactivation and removing bridges in the Dunlevy, and North Burnt and de-constructing the road access to CP 722 in the northern portion of the North Burnt area have maintained motorized access barriers.

Table 42: Baseline Condition – ROS Inventory

Back Country Area	ROS Class Baseline Condition – (2001)							
	Roaded			Roaded Total	Semi Primitive		Semi Primitive Total	Grand Total
	Rural	Modified	Natural		Motorized	Non Motorized		
BOCOCK PEAK						1,126	1,126	1,126
BUTLER RIDGE			1,133	1,133	1,309	4,151	5,460	6,593
DUNLEVY CREEK			5,283	5,283	5,001	21,564	26,565	31,848
ELEPHANT RIDGE / GWILLIM		12		12		2,801	2,801	2,813
NORTH BURNT		53		53	6,076	10,683	16,759	16,813
PEACE RIVER / BOUDREAU	990			990		1,219	1,219	2,209
PINE - LEMORAY					882	2,260	3,142	3,142
KLIN SE ZA			0	0		2,668	2,668	2,669
KLIN SE ZA HEADWATERS			7,140	7,140	137	10,581	10,718	17,857
KLIN SE ZA MOUNTAIN			1,711	1,711		4,639	4,639	6,350
Grand Total	990	65	15,266	16,321	13,404	61,694	75,098	91,419

Table 43: Current Condition – ROS Inventory Updated to June 2005

Back Country Area	ROS Class (2005))							
	Roaded			Roaded Total	Semi Primitive		Semi Primitive Total	Grand Total
	Rural	Modified	Natural		Motorized	Non Motorized		
BOCOCK PEAK						1,126	1,126	1,126
BUTLER RIDGE			1,133	1,133	1,309	4,151	5,460	6,593
DUNLEVY CREEK			5,283	5,283	5,946	20,619	26,565	31,848
ELEPHANT RIDGE / GWILLIM		12		12		2,801	2,801	2,813
NORTH BURNT		53		53	7,874	8,886	16,759	16,813
PEACE RIVER / BOUDREAU	990			990		1,219	1,219	2,209
PINE - LEMORAY					882	2,260	3,142	3,142
KLIN SE ZA			0	0		2,668	2,668	2,669
KLIN SE ZA HEADWATERS			7,140	7,140	137	10,581	10,718	17,857
KLIN SE ZA MOUNTAIN			1,711	1,711		4,639	4,639	6,350
Grand Total	990	65	15,266	16,321	16,147	58,951	75,098	91,419

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS:

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE:

Forest management activities will not occur in the Protected Areas unless otherwise requested. Forest management will be consistent with the objectives of the SMZ. Access will be managed under the Sensitive Access Management direction given in the LRMP in the SMZ's. This may involve access control, road deactivation, accelerated harvesting or alternative silvicultural techniques. Access control and or deactivation may be completed for existing roads adjacent to or within backcountry areas to remove areas from the roaded classification and move to the semi-primitive. These works and strategies are subject to agency approvals and do not include oil/gas or mining activities. All deactivation measures and other mitigating measures will be implemented as soon as feasibly possible following harvesting and primary silviculture activities.

New road construction will be open for the duration of the season in which the forest management activity occurs (e.g. road construction, harvesting, primary silviculture). Seasonal deactivation and access restrictions will be completed by the end of the active season. Upon completion of primary silviculture activities (site preparation and planting) the road will be deactivated and motorized access restricted.

This indicator has been tracked and managed since 2000 on TFL 48.

MONITORING PROCEDURE:

Activities occurring within the back country areas will be reported in each annual report. The ROS classification will be updated and reported in each SFM plan.

LINKAGES TO OPERATIONAL PLANS

Operational plans as prepared by the forest planners will have to carefully evaluate the impact of any access management plans in the preparation of a Forest Development Plan or Forest Stewardship Plan to ensure that the amount of semi-primitive ROS is not adversely affected. It is expected that the amount may fluctuate over time and that deactivation strategies will be developed to mitigate any short term impacts.

3.38 Recreational Sites

Indicator Statement	Target Statement
Number of recreational trails and campsites maintained by Canfor	Canfor will provide and/or maintain 1 backcountry trail and 3 campsites on TFL 48
SFM Objective: We will provide opportunities for a feasible mix of timber, recreational activities, visual quality and non-timber commercial values.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

No less than the target.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

To provide backcountry recreational opportunity with focus on remote but locally popular areas. This will help meet local demand for recreational and spiritual pursuits in a natural setting.

CURRENT STATUS

Canfor currently maintains the Gething Creek, Carbon Lake and Wright Lake campsites. The Gething and Carbon are road access sites. Wright Lake campsite is a remote wilderness site with off highway vehicle or hiking access.

The 11 Mile Lake trailhead is road accessible, with a gentle hike you can be in the alpine in just a few hours. All of these recreational values provide a number of outdoor activities (hunting, fishing, hiking and canoeing). All of the above recreational sites can be accessed from the Johnson Creek FSR.

Canfor committed in 2000 to assume management and maintenance of all 4 recreational areas. Some of the work that has been done to the sites since 2000 is listed below:

- snag falling around campsites and access trails
- replace outdoor pit toilet (Carbon Lake)
- fire ring placement (Carbon and Gething)
- picnic table repair
- general site clean up (annually)

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Annual maintenance and inspections are scheduled each year for the various recreational sites. Work is prioritized and completed as required. Public safety is the main goal in our yearly plan. Some of the work to be completed is listed below:

- trail marking
- trail brushing
- location signage
- toilet repairs (Wright Lake)

MONITORING PROCEDURE

The maintenance, inspections and work completed will be recorded and reported out annually. Work is generally completed in the spring/summer by Canfor staff, summer staff or contractor personnel.

LINKAGES TO OPERATIONAL PLANS

The recreational sites and surrounding values are considered when any industrial activity is planned in their vicinity. Carbon Lake and Wright Lake are both inside visual quality polygons. The 11 Mile Lake trail starts in an area of merchantable timber and some day could be logged, if this happened the trail would be moved or the trail location re-established. All industrial activities will take precautions to mitigate any damage to these recreational values.

3.39 Harvest Levels/Volumes

Indicator Statement	Target Statement
Harvest levels/volumes	Harvest volumes will not exceed 110% of the 5 year periodic cut control volume for the DFA
SFM Objective: We will ensure that harvest levels do not adversely impact the long-term harvest level.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The allotted periodic cut control is the five-year AAC volume assigned to the licence. Harvesting at levels that do not significantly exceed that volume supports the assumptions used in assigning annual allowable cuts in the Chief Foresters AAC determination, and is consistent with supporting ongoing sustainable timber supplies. Harvesting volumes up to 110% is permissible, as cut control target volumes for subsequent 5 year periods is reduced according to the amount harvested in excess of 100% of AAC.

While the AAC may change over time due to new analysis or information, changing social expectations from our forests or large catastrophic natural disturbances the target to not exceed 110% of the 5 year periodic cut will remain.

CURRENT STATUS

The five year cut control period ended December 31, 2002. Periodic cut control for TFL48 was 92.7% of the adjusted AAC for the period 1997-2001.

Table 44: Actual Recorded and Allowable Annual Cut Summary

Year	Canfor Annual Cut Summary				BCTS Summary[10]			Deciduous Harvest Summary
	Allowable Annual Cut (m^3)	Adjustment (m^3)	Actual Recorded Cut (m^3)	Cut Control (%)	Allowable Annual Cut (m^3)	Actual Recorded Cut (m^3)	Cut Control (%)	
1987	348,500.0		319,871.0	91.8				
1988	348,500.0		277,930.0	79.8				
1989	348,500.0		183,330.0	52.6				
1990	348,500.0		456,600.0	131.0				
1991	348,500.0		555,001.0	159.3				
1987-1991 Total	**1,742,500.0**		**1,787,732.0**	**102.6**				
1992	348,500.0	-8,315.0	280,820.0	82.5				
1993	348,500.0	-8,315.0	389,447.9	114.5				
1994	348,500.0	-8,314.0	284,526.6	83.6				
1995	348,500.0	-8,314.0	313,409.0	92.1				
1996	348,500.0	-8,314.0	391,717.0	115.1				
1992-1996 Total	**1,742,500.0**	**-41,572.0**	**1,659,920.5**	**97.6**				
1997	401,370.0	16,516.0	343,587.6	82.2				
1998	401,370.0	16,516.0	435,088.2	104.1				
1999	401,370.0	16,516.0	532,574.3	127.4				
2000	401,370.0	16,516.0	302,668.0	72.4				
2001	419,713.0	16,516.0	339,306.1	77.8				
1997-2001 Total	**2,025,193.0**	**82,580.0**	**1,953,224.2**	**92.7**				
2002	466,370.0	0.00	499,000.0	107.0	55,350.0	57,400.7	103.7	0
2003	466,370.0	14,393.76	320,971.0[11]	66.8	55,350.0	93,978.1	169.8	0
2004	466,370.0	14,393.76	546,512.7	113.7	55,350.0	0.0	0.0	0
2005	466,370.0	14,393.76	525,673.5	109.3	55,350.0	6,104.3[12]	11.0	0
2006	466,370.0	14,393.76			55,350.0			
Running Total	**2,331,850.0**	**57,575.04**	**1,892,157.21**	**79.2**	**276,750.0**		**56.9**	**0**

Source: MoF Annual Cut Control Letters (1987-2005)

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Not applicable.

STRATEGY AND IMPLEMENTATION SCHEDULE

We will prepare harvest plans that are consistent with the licenses five year cut control volumes. The cut control volumes are monitored annually and revisions to plans made if needed to ensure the five-year targets are attainable.

MONITORING PROCEDURE

Harvest plans use the best available information to project volumes logged, for comparison to target cut levels. Scale information is used to monitor the actual deliveries compared to planned deliveries. The Ministry of Forests and Range provides annual summaries of actual cut control performance to the licencees.

Annual harvested volumes, and progress towards five-year periodic cut control levels will be reported in annual reports.

LINKAGES TO OPERATIONAL PLANS

The FDP use periodic cut control volumes to determine the approximate areas and volumes that need to be included in these plans to meet cut control targets.

[10] BCTS volumes were reported using the MoFR Harvest Billing System reports.

[11] Note that this value represents the Ministries official billed volume. However based on Canfor's records the volume delivered to Canfor's scale was 431,324 m^3 or 89.7% of the AAC. The difference is due to some problems with the Ministry's billing of stumpage at the end of the cut control annual period. The MoF reported this volume in 2004.

[12] This value represents the volume delivered from A77788 in 2005 as reported in the MoFR Harvest Billing System (HBS).

SP's and cruise compilations are used for annual harvest plans to more accurately project the volumes to be delivered in the next year.

3.40 Waste

Indicator Statement	Target Statement
The percentage of blocks and roads assessed in which avoidable waste and residue levels are within the target range	Annually, 100% of cutblocks and roads will fall within the target avoidable waste and residue range
SFM Objective: We will ensure that harvest levels do not adversely impact the long term harvest level.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Maximum acceptable annual variance is 2% less than the target.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator is a measure of actual waste and residue compared to acceptable waste and residue ranges.

Timber utilization levels can impact the long-term sustainability of the timber harvest level by impacting the volume per hectare delivered. Lower utilization levels may result in more area being harvested to provide the same volume deliveries to mills, and therefore are a potential source of concern for maintaining sustainable harvest levels. Operations that are not consistent with the utilization specifications as defined in Schedule C – Felling, Bucking and Utilization Specifications of the TFL 48 Licence – Instrument 4 document dated April 1, 2000 are classified as waste and residue.

The following range of avoidable merchantable waste and residue, derived from guidelines in the Logging Residue and Waste Procedures Manual (Section 3), will be the basis for evaluating this indicator.

Table 45: Avoidable Waste and Residue Guidelines

Biogeoclimatic Zone	Avoidable Waste &Residue range (m^3/ha)
ESSF	0- 20 m^3/ha
BWBS/SBS	0-10 m^3/ha

CURRENT STATUS

In 2004, 25 separate blocks had a waste and residue survey completed, and 100% of these were within the acceptable range. 100% of the waste levels in blocks harvested since 1998 have been within acceptable levels.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Not applicable.

STRATEGY AND IMPLEMENTATION SCHEDULE

Harvesting operations are inspected during and following operations, and inspections note whether waste and residue levels are acceptable. Where activities are noted as unacceptable during operations, contractors are required to rework areas to achieve acceptable results if practical.

An ocular assessment of waste and residue levels will be made by qualified assessors on all blocks and operational roads the first summer following completion of harvesting. If the waste level is potentially near the threshold a full survey procedure will be completed to more accurately determine the waste level.

MONITORING PROCEDURE

Information on waste levels is reported periodically to the MoFR, and a summary of performance is included in the annual report.

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.41 Harvest Method

Indicator Statement	Target Statement
Proportion (%) of coniferous harvesting area completed with conventional ground based methods by 5 year cut control period	A maximum of 81% of the coniferous harvesting area (ha) will be completed with conventional ground based methods by 5 year cut control period
SFM Objective: We will ensure that harvest levels do not adversely impact the long-term harvest level.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

An acceptable variance will be a maximum of 88% conventional ground based harvest methods in a 5 year cut control period.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator measures the percentage of coniferous area harvested using conventional ground based harvesting methods. The indicator applies only to the coniferous land base portion of TFL 48 as non-conventional or cable harvesting areas were removed from the deciduous portion of the timber harvesting land base.

Based on the physical operability mapping completed for TFL 48 and subsequent merchantability net downs to the timber harvesting land base the conifer THLB distribution between conventional, mixed and cable systems is 81%, 7% and 12% respectively. To ensure that long term economically viable harvesting is maintained on the TFL it is preferable to be addressing the harvest method profile over some reasonable periods of time. To be not over addressing the conventional portion of the land base within a 5-year cut control period is a reasonable time frame to achieve this indicator. The variance is provided to provide some flexibility to accommodate logistical cost concerns such as mobilization and demobilization or forest health salvage concerns which may be disproportionately shifted to conventional areas in any one 5-year period.

CURRENT STATUS

The following Figure 31 shows the status over the current cut control period 2002 – 2006. It should be noted that the data for 2006 is not complete for the whole year (current to August 24, 2006). The status for the 5-year period is 64% of the harvesting has been completed using conventional ground based methods with the remainder 36% being conducted with cable methods.

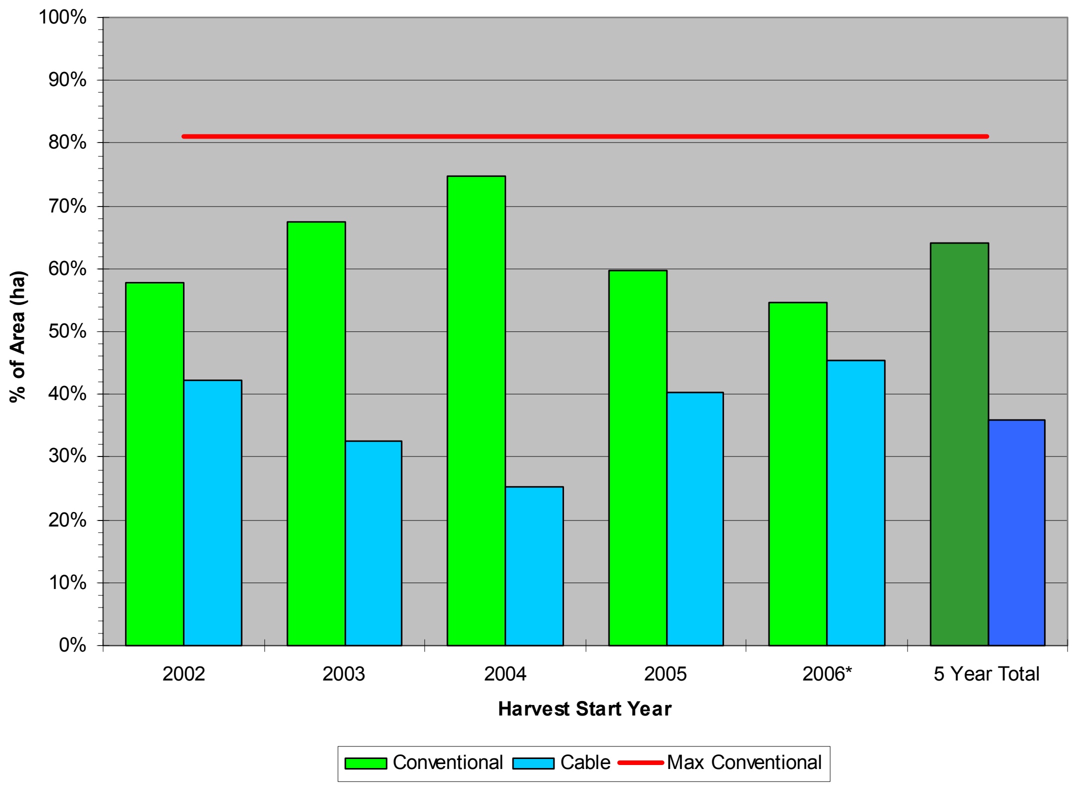


Figure 31: Proportion of Conventional Harvest Systems Used 2002-2006

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Not applicable.

STRATEGY AND IMPLEMENTATION SCHEDULE

We employ a range of financially feasible timber harvest methods and practices to mitigate any negative impacts to other forest resources. Cable harvesting methods have been used on TFL 48 since management plan 2. A brief description of each method is as follows:

Conventional (Ground-based)

This method is generally utilized on stable to quasi-stable soils with slopes ranging from 0 to 45% and a minimum of 120 m^3/ha. On mixed operability transitioning to cable a minimum of 150 m^3/ha is required.

Conventional harvesting is the primary harvest method employed on the TFL. Generally, feller bunchers, grapple skidders, processors are used. Roadside log loading capability limits the need for landing construction. Low ground pressure skidding equipment is used in all but the winter season.

Cable Yarding

This method is generally utilized on quasi-stable to lower-threshold soils with slopes ranging from 10 to 70% and a minimum of 200 m^3/ha

This harvest method consists primarily of a mobile swing yarder utilizing grapple and skylining techniques. It is used for harvesting timber on steep and sensitive terrain for distances up to 300 meters. Operations are mechanized as much as possible. Handfelling and choker setting are used 20 - 30% of the time.

Aerial

This method is generally utilized on lower-threshold soils with slopes ranging from 70 to 100%.

Helicopter logging is planned where cable yarders are not feasible and road access is economically or environmentally prohibitive. Helicopters generally require large landings for safe operations. Helicopter logging has only been employed on a very limited basis, as we can successfully harvest most of our operable timber using ground-based and cable systems. We will continue to evaluate the feasibility of helicopter logging on a site-specific basis. While aerial systems have been used on the TFL it's use has been very limited and as such these areas have not been included in the timber harvesting land base.

MONITORING PROCEDURE

Harvest method is tracked for each harvest unit within Genus. Annually the proportion of conventional ground based harvesting area will be reported for blocks, which had harvesting start in the year in question. Determination of meeting the target is made at the end of the cut control period for blocks, which had harvesting start within the period. The following formula describes how the proportions are calculated.

Formula:

$$\mathbf{CON\%} = (\mathbf{CON}_{area} / \mathbf{HARV}_{area}) * 100$$

Variables:

$\mathbf{CON}_{area}$	Area of conventional harvesting started within 5 year cut control period.
$\mathbf{HARV}_{area}$	Total area of harvesting started within 5 year cut control period.
CON%	Percentage of conventional harvesting started within 5 year cut control period.

LINKAGES TO OPERATIONAL PLANS

Harvest method is determined through detailed on ground assessments, which consider safety, costs, harvest system limitations, soil conditions, and slope stability. The harvest method is indicated in silviculture prescriptions / site plans and on logging maps.

3.42 Summer and Fall Deliveries

Indicator Statement	Target Statement
Volume (m^3) of timber delivered annually to Canfor Chetwynd mill between May 1st and October 31st	Minimum of 150,000 m^3 coniferous delivered to Canfor Chetwynd mill
SFM Objective: We will maintain a local, up to date timber processing facility and infrastructure.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

Allowable variances for minimum deliveries will be proportional to the number of actual operating weeks, divided by the normal fifty operating weeks of the facilities per year.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator is the volume of logs delivered during the summer and fall months. These deliveries are essential to providing an uninterrupted fibre supply to run major timber processing facilities. Providing for deliveries between May 1st and October 31st (the frost free period) to major facilities reduces the amount of wood that must be decked in mill yards at breakup (i.e. the end of March). This substantially reduces carrying costs, and minimizes fibre value losses associated with excessive drying, which significantly improves the cost competitiveness of the local forest industry.

These deliveries provide summer employment opportunities, which increase the length of the work season for harvesting and road contractors. This improves the contractor's efficiency, and supports more stable employment, thereby also contributing to the stability of local communities.

Variances to the target are required to reflect situations where facilities may be closed for reasons other than lack of fibre supply.

CURRENT STATUS

In 2004, the volume delivered between May 1 and October 31 was 207,851m^3.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Not applicable.

STRATEGY AND IMPLEMENTATION SCHEDULE

Areas that are suitable for harvesting operations during frost free conditions are relatively limited within the TFL. Harvest planning therefore needs to emphasize the identification and development of these areas.

Implementing this strategy will require careful assessment of all areas that may have potential for summer or fall logging, the identification of potential constraints, and development scheduling to support this strategy accordingly. Management practices on areas planned for summer harvesting will be implemented to ensure site productivity is not compromised by this strategy. Proposed blocks will be assessed to determine if moisture regime, soil conditions, and access opportunities are potentially conducive to operations during frost free periods. In potential summer or fall harvest areas, the following measures will be implemented to minimize environmental risks.

Careful monitoring of ongoing operations will determine when ground conditions become unfavourable due to excessive moisture, at which time harvesting operations will cease until conditions dry out.

Low ground pressure equipment will be used on fine textured soils to reduce compaction risks. This requirement will not apply when sufficient frost conditions or a compressible snow pack exists to prevent compaction.

“Boot survey” ocular site degradation assessments will be implemented where and when needed to monitor site degradation and provide guidance on when to cease operations.

Streams and wet areas will be identified, and measures identified in SP’s to protect these areas during summer harvest conditions will be implemented.

If the access conditions are favourable, but site conditions preclude summer harvesting activities on the block, timber may be winter logged and decked in the block on landings or at roadside for summer load and haul.

MONITORING PROCEDURE

The volume delivered to the mills from May 1 to October 31 of each year will be determined from company scale information and reported in annual reports, along with information on the number of weeks of mill operations.

LINKAGES TO OPERATIONAL PLANS

The location of blocks identified in the FDP will, among other criteria, be based on the potential for summer harvesting. The proposed target volumes will provide guidance to the development of these plans.

SP’s will note site conditions and the relative opportunities for summer harvesting or hauling in cutblocks, as well as identify potential issues to consider when determining if summer harvesting is feasible.

Annual harvesting plans will utilize information in these plans to assign season and year of harvest to blocks.

3.43 Local Employment

Indicator Statement	**Target Statement**
The proportion of dollars spent on local versus non-local contractors	A 5 year rolling average of 65% of local vs. non-local contractors and an annual minimum of 50% local versus non-local
SFM Objective: We will ensure local communities and contractors have the opportunity to share in benefits such as jobs, contracts and sales.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

None. This indicator is applicable only to Canfor operations on the TFL.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Woodlands operations purchase a wide variety of products and services to produce timber and to manage its forestry activities. This indicator is a measure of the proportion of dollars attributed to forestry activities that are spent locally which indirectly is a measure of the local forest employment opportunities associated with forest industry activities, the SFM objective for this element. For the purposes of this objective, local has been defined as those residences or businesses that have mailing addresses or known established businesses located in the legacy Dawson Creek Forest District.

CURRENT STATUS

See Figure 32 for current status of this indicator. For the year 2004, not including stumpage, Canfor paid \$38,581,582 to all vendors. Local vendors were paid \$27,712,270, which represents 72% of total expenditures. The five-year rolling average from 2000 to 2004 saw 70% of expenditures made to Local vendors.

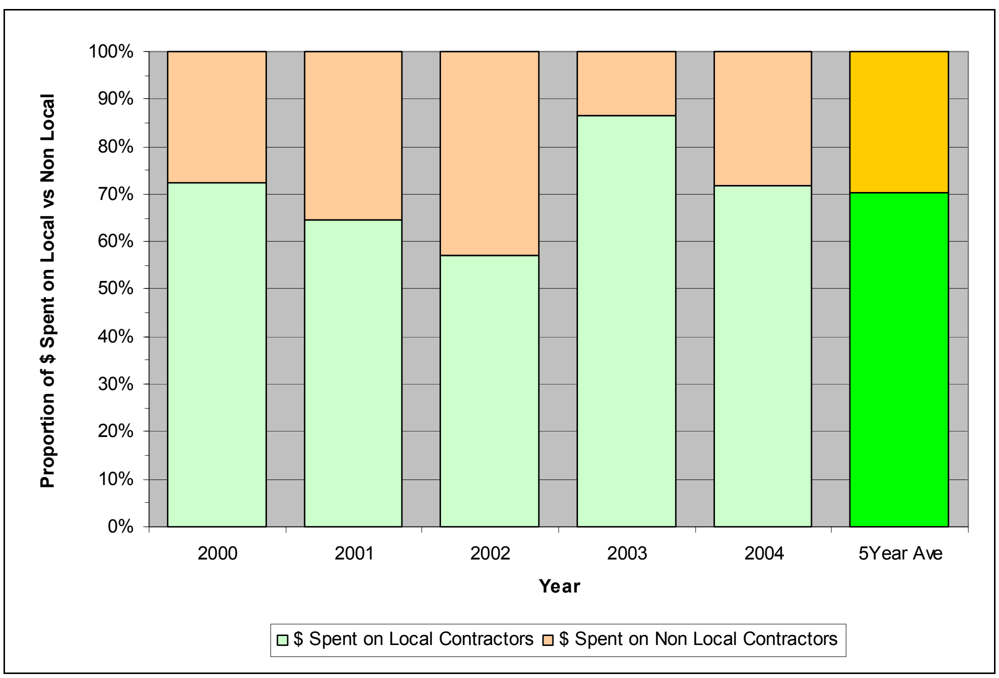


Figure 32: Proportion of Dollars Spent on Local versus Non-Local Contractors

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- No forecasting assumptions for this indicator as the dollars to be spent fluctuate annually, depending on the amount of harvesting activity.

STRATEGY AND IMPLEMENTATION SCHEDULE

All woodlands costs will be tracked annually and a query will be done identifying the amount of these dollars that are expended in contracts to local contractors. Although this indicator will not ultimately identify local forest employment opportunities directly attributable to our activities it does provide a certain measure of assurance of the amount of dollars that are spent in the local economy, which ultimately leads to employment opportunities. Stumpage has been removed from the calculation, as the expenditure is hard to quantify for local returns. The proportion of local vs. non-local has been tracked since 2000.

MONITORING PROCEDURE

To better define this indicator we must clearly identify those forestry activities that will be defined as a woodland phase. We have included the following activities as an individual phase for the purposes of defining what contributes towards being a woodlands phase.

- Logging and hauling costs
- Road construction and road maintenance, including deactivation
- Reforestation, including seedling cost, site preparation, planting, brushing and all surveys
- Planning and administration, including wages, office overhead, forest development costs, taxes, leases and rentals

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.44 Community Donations

Indicator Statement	Target Statement
Canfor community donations per year	A minimum of $7,000/year will be made available for community donations
SFM Objective: We will ensure contributions and benefits to the community (ie. donations, training).	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No less than 95% of the target will be achieved. This indicator is only applicable to Canfor.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

At Canfor, we have a long tradition of investing in the communities that we call home. Canfor's Corporate Sponsorship and Donation Program serves as the principal funding entity for the company's charitable contributions. The program approves and allocates funding for organizations and events in an equitable manner in communities where we operate.

Canfor's Sponsorship & Donations program funds charitable organizations that deliver innovative community programs focusing on:

- Youth and Education
- Community Enhancement
- Forestry and Environment
- Amateur Sports
- Health and Wellness

The amount of money donated to local causes, scholarships and charities is a quantifiable measure of the amount of financial support provided to a community outside of the major contributions of employment and taxes.

In addition to those locally quantifiable donations that Canfor makes there are other larger though less quantifiable donations that Canfor makes at the regional level which provide a benefit to the residents of the region as a whole however is not reported on in this indicator. These include donations or sponsorship of things like the Medical facility at UNBC or larger corporate donations through the United Way and the Salvation Army – BC North and Yukon.

CURRENT STATUS

In 2004, Canfor donated 98.5% of the minimum allotted for the year.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Not applicable

STRATEGY AND IMPLEMENTATION SCHEDULE

As individuals receive requests, or have ideas for donations, requests are made to the plant manager for approval.

The target level is reviewed and may be adjusted annually.

MONITORING PROCEDURE

Once approved, a record of the donation is made and tracked. Progress towards the target is monitored periodically through out the year to ensure the target is achieved by year end.

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.45 Consistency with Third Party Action Plans

Indicator Statement	Target Statement
Consistency with mutually agreed upon action plans for guides, trappers, range tenure holders, and other non-timber commercial interests	Operations 100% consistent with the resultant action plans
SFM Objective: To help ensure distribution of benefits, cooperative relationships, across local stakeholders and First Nations.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

Variances are permissible only on reaching mutual agreement between the affected tenure holders and Canfor.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Diversity in commercial resource activities within a limited landbase is important to the sustainability of communities. Extensive overlap of forest tenures with guide, trapping, and other non-timber commercial interests may necessitate mutually agreed upon action plans to address site specific issues. This indicator measures Canfor's implementation success in addressing these actions.

CURRENT STATUS

Canfor currently notifies trappers, guides and others that may be affected by proposed activities during the preparation of the FDP, as part of the regulatory public review and comment period. Prior to the commencement of approved forest activities, further notification is provided to those stakeholders that will be affected by the activity. In the event site specific comments are received, Canfor's attempt to come to agreement with the stakeholder on reasonable actions that may mitigate the impacts. Canfor tracks comments, responses, and actions arising from this consultation with stakeholders. Currently there are no mutually agreed on action plans prepared.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No.

STRATEGY AND IMPLEMENTATION SCHEDULE

During the referral period for each SFMP, FDP/FSP or PMP Canfor will provide opportunities to meet with affected guide, trapper, and known non-timber commercial interest stakeholders to:

- Provide a review of the current SFMP, FDP/FSP, PMP's, and/or Site Plans (if available) as applicable,

- Seek site specific information from tenure holders and known non-timber commercial interests regarding tenure improvements, tenure use timing, and other issue pertinent to the overlap of forest and guide, trapping tenures and non-timber commercial interest activities, and
- Where possible, develop, review and implement a mutually agreed action plan to address site-specific issues.

While it is Canfor's objective to identify issues and areas where action plans are required during the review and comment process mutually agreeable action plans can be developed outside of the review and comment periods.

MONITORING PROCEDURE

An annual review and summary of conformance to action plans will be conducted, and reported in annual reports.

LINKAGES TO OPERATIONAL PLANS

FDP's/FSP's, site plans, and all other short-term operational plans will be consistent with any agreements between Canfor and guides, trappers and other known non-timber commercial interests.

3.46 Known Values and Uses Addressed in Operational Planning

Indicator Statement	Target Statement
Percentage of known traditional site-specific aboriginal values and uses identified during SFMP, FDP, FSP, or PMP referrals addressed in operational plans	100% of known traditional site-specific aboriginal values and uses identified during SFMP, FDP, FSP, or PMP referrals will be addressed in operational plans
SFM Objective: To help ensure distribution of benefits, cooperative relationships, across local stakeholders and First Nations. We will respect known traditional aboriginal forest values and uses.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The indicator is a measure of Canfor's recognition and response to the traditional aboriginal values and uses that are made known in a timely manner during referral processes. The requirement for site-specificity enables both Canfor and First Nations to best qualify and/or quantify the effects of forest development and the strategies required to manage for the development.

This indicator contributes to respecting the social, cultural, heritage and spiritual needs of aboriginal people who traditionally and currently use the DFA for the maintenance of traditional aspects of their lifestyle. Working with aboriginal peoples to identify, define and develop management strategies for traditional values and uses is an important component of the forest industry's sustainable forest management plans.

This indicator does not apply to values, which may otherwise be well represented in the same general area, or sites where information cannot be validated through traditional or scientific knowledge sources from both within and outside of the First Nations.

CURRENT STATUS

Following a review of FDP or FSP blocks, the District Manager currently directs Canfor to conduct Archaeological Impact Assessments (AIA) on areas with high potential, as determined from an Archaeological Overview Assessment. In addition to MoFR direction, Canfor has initiated contracts with a third-party archaeologist to further evaluate a number of proposed FDP cutblocks using a detailed risk-rating process for archaeological potential. The process adds resolution to the older AOA, and will assist in providing direction regarding cultural heritage resources.

In 2004 Canfor conducted an AIA on the access road to T4007. No issues were found that required an adjustment to the operational plans. This would have been previously tracked in the discontinued indicator 44 Archaeological Impact Assessments in SFMP 3.

Canfor has an obligation to not damage any resource feature, including cultural heritage features. Canfor has made a number of adjustments to operational plans for local First Nations values brought to their attention. For example, WTP's have been amended to include CMT's, riparian and lake buffers have been widened to accommodate traditional use areas, and vegetation management buffers have been extended to avoid berry-picking patches.

A 1998 report summarizes a number of Traditional Use Studies (TUS's), which were carried out by First Nations in the DFA. Canfor and government currently do not have any access to the information or data due to the confidential nature of much of the information. Canfor's ability to effectively manage for traditional values and uses may be dependent upon the First Nation(s) providing access to some levels of confidential information.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Forecasting does not apply to this indicator.

STRATEGY AND IMPLEMENTATION SCHEDULE

- Canfor will continue with ongoing relationship building processes with First Nations, to encourage meaningful engagement and input to the development of SFMP, FDP, FSP and PMP's.
- Canfor will engage in and record all communications and meetings with First Nations (including attempts) to garner input on the development of operational plans
- Canfor will seek to gain access to site-specific information about traditional values and uses (subject to confidentiality agreements) at the SFMP, FDP, FSP and PMP stages.
- Canfor will work with First Nations in an attempt to develop joint agreement on operational strategies to manage for site-specific traditional values and uses.
- Canfor will implement strategies in operational plans to address all site specific known values and uses included in the scope of this indicator that are identified during referrals of these major plans.
- Detailed planning will occur after referral comment periods for major plans expire. Information provided subsequent to these referral review and comment periods will be considered and addressed to the extent Canfor is able to without unduly disrupting ongoing operations.

MONITORING PROCEDURE

Canfor will record the number of opportunities for communication, meetings and input into each plan.

Canfor will record the adoption of all strategies used to manage for known site-specific traditional values and uses in operational plans (and will be adopted for strategic plans as required). This information will be summarized in operational planning processes subject to confidentiality agreements.

Information from Archaeological Impact Assessments (AIA) required by the District Manager, will be monitored through Canfor's GIS system, also subject to confidentiality agreements.

LINKAGES TO OPERATIONAL PLANS

Operational plans will be consistent with jointly agreed upon strategies between Canfor and First Nations. Information from AIA's will guide the development of operational plans.

3.47 Conformance to Elements Pertinent to Treaty Rights

Indicator Statement	Target Statement
% conformance to SFM elements pertinent to treaty rights (i.e., hunting, fishing and trapping) defined in Treaty 8	100% conformance to the SFM indicators and targets of the SFM Elements pertinent to sustaining hunting, fishing and trapping, as follows: • Element 1.1 Ecosystem Diversity (Indicators 3.1, 3.2, 3.3, and 3.4), and Element 1.2 Species Diversity (Habitat Elements) Indicators (3.5, 3.4, 3.6, 3.7, 3.8, 3.9 and 3.10), and • Element 3.2 Water Quality and Quantity Indicators (3.26, 3.27, 3.28, 3.29, and 3.30)
We will respect known traditional aboriginal forest values and uses.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

Variances provided in the specific indicators will apply.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The DFA is within a larger area of Treaty 8 of 1899, which established hunting, fishing and trapping as treaty rights for the local aboriginal First Nations communities. The rights as such are available across the treaty area and have no site specificity or quantum. The following four First Nations have known traditional territory in the DFA whose treaty rights are protected under Treaty 8, Halfway River, West Moberly, Saulteau, and McLeod Lake.

Aboriginal rights are affirmed in the Canadian Constitution (S. 35), but have not been proven through judicial processes in the DFA.

The indicator identifies and measures Canfor's effectiveness in recognizing and respecting existing treaty rights. In doing so Canfor can demonstrate its role of recognizing and respecting societies commitment to sustain core traditional values and ways of life for First Nations in the DFA, as follows:

- **Hunting and trapping rights** are generally upheld by meeting Criterion 1 – Conservation of Biological Diversity, Element 1.1 Ecosystem Diversity – specifically ecosystem representation, forest type, late seral forest, and patch size, and Element 1.2 Species Diversity more specifically by meeting the objective of suitable habitat elements and its relevant indicators: snags/live tree retention, coarse woody debris, riparian, shrubs, wildlife tree patches and habitat supply.
- **Fishing rights** are generally upheld by meeting Criterion 3 – Conservation of Soil and Water Resources, Element 3.2 Water Quality and Quantity, and more specifically by meeting the objectives and indicators of maintaining water quality and water quantity.
- Canfor desires good working relationships and communications with the First Nations in the DFA in order to meaningfully consider and plan for site-specific information related to treaty or aboriginal rights in forest development (and stewardship) plans. This aspect is further covered in Indicator 3.46.

CURRENT STATUS

Canfor refers Forest Development Plans (FDP's), Forest Stewardship Plans (FSP's) and Pest Management Plans (PMP's) to First Nations for comment and input on planned development. Canfor often calls for a meeting to provide clarification and answer questions. Capacity is often cited as a reason that First Nations cannot better address the effect of forest development on treaty (or aboriginal) rights. Government has a fiduciary obligation and carries out the role of meeting consultation requirements. Currently there is an expectation of Canfor to carry a greater role in the consultation and accommodation process, as noted in recent judicial decisions although this is being challenged.

Canfor also has a developing relationship, capacity building and consultation processes underway with the local First Nations, in particular the Dunne-za joint venture agreement that includes a small-pine license for 100,000 cubic metres per year for 20 years in the Dawson Creek TSA.

See also Indicators (3.1 through 3.10) for current status about the ecosystem diversity and species diversity (habitat element) indicators.

See also Indicators (3.26 through 3.30) for current status about the water quality and quantity indicators.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Forecasting does not apply to this indicator.

STRATEGY AND IMPLEMENTATION SCHEDULE

- Continue with the relationship, capacity building and consultation processes as noted above.
- Continue to engage with First Nations in the development of strategic and operational plans.
- Report annually on the performance of the Indicators noted for SFM Elements 1.1, 1.2 and 3.2, as noted above.
- Review legal compliance to aboriginal rights as duly established in law and accepted by government and summarize for each annual report.

MONITORING PROCEDURE

Canfor will maintain an annual record of performance.

LINKAGES TO OPERATIONAL PLANS

Operational plans will be consistent with the strategies to manage for the indicators and targets for SFM Element 1.1 (Ecosystem Diversity), SFM Element 1.2 (Species Diversity), and SFM Element 3.2 (Water Quality and Quantity).

3.48 LRMP Implementation Meetings Attended by Canfor

Indicator Statement	Target Statement
Proportion of LRMP implementation or update meetings attended by Canfor and BCTS	100% of meetings will be attended by Canfor and BCTS and information provided as required
SFM Objective: We will support land use processes including the LRMP implementation.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No variances.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The Dawson Creek Land and Resource Management Plan was approved on March 30, 1999 and Cabinet provided direction to the participating ministries to implement the plan.

The LRMP is intended to guide ongoing resource management activities including designation of new provincial parks and planning for forest development. The Omineca-Peace Interagency Management Committee (IMAC) is charged with ensuring that the plan is implemented, monitored and reviewed.

The IMAC periodically holds meetings to review and monitor progress on implementation of the LRMP.

CURRENT STATUS

The following Table 46 indicates Canfor's performance in attending LRMP implementation and monitoring meetings.

Table 46: LRMP Meetings

Year	Number of LRMP Meetings	Number Attended by Canfor
1999	2	2
2000	4	4
2001	4	4
2002	1	1
2003	0	0
2004	1	1
2005	1	1

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

As part of the ongoing implementation and monitoring Canfor is committed to participating in the LRMP meetings and providing input when and where the IMAC schedules meetings.

MONITORING PROCEDURE

Performance will be reported in each annual report or SFM plan.

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.49 *Public Advisory Committee*

Indicator Statement	Target Statement
Public Advisory Committee	We will establish and maintain Public Advisory Committee and hold at least one meeting annually
SFM Objective: We will have an effective and satisfactory process that enables public participation of stakeholders and First Nations.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

No variances.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

"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. Through their participation in the process, citizens can expect to enhance their knowledge of SFM in general and of other interests and values related to local forests. They also gain a valuable opportunity to be involved in the decision making for the local forests.

Implementation of a public participation process as specified in this Standard (CSA Z809-02) gives the public an opportunity to be involved proactively in the management of a DFA. Interested parties are invited to have input in the major steps of SFM, and the organization has a obligation to heed such input, either by accepting it and revising management accordingly or by responding with specific reasons for not accepting it." (CSA 2002)

CURRENT STATUS

The Chetwynd Public Advisory Committee was formed and had its first meeting on February 4th, 2000. The following Table 46 summarizes the number of meetings held per year since then.

The target was met in all years except 2003. Due to scheduling conflicts an originally scheduled meeting for the fall of 2003 was postponed and held in January 2004. In 2004 there were more than 2 meetings held.

Table 47: Public Advisory Committee Meetings

Year	Number of PAC Meetings
2000	8
2001	3
2002	3 (+1 field trip)
2003	1
2004	4
2005	4 (to Aug 11)

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

There are typically 2 separate business objectives that the PAC serves. One is the providing input on the Values, Objectives, Indicators and Targets and development of the SFM plan for the DFA. This work typically is more intensive and requires more work as is indicated by the number of meeting in Table 47 for 2000 and 2004/05. The second role is that of a monitoring performance and implementation through review of annual reports and providing suggestions for improvements where appropriate. This activity was conducted in 2001 through the first part of 2004.

MONITORING PROCEDURE

Performance will be reported in each annual report or SFM plan.

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.50 Public Advisory Committee Terms of Reference

Indicator Statement	Target Statement
Terms of reference (TOR) for the Chetwynd TFL 48 DFA public participation process	Obtain PAC acceptance of TOR for public participation process bi-annually (every 2 years)
SFM Objective: We will have an effective and satisfactory process that enables public participation of stakeholders and First Nations.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No variances.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Canfor is committed to provide ongoing opportunities for the public to be involved in the TFL 48 planning and monitoring activities. A key element in the public oversight component is the establishment of a public advisory committee.

This is a demonstration that the public participation process is designed and functioning to the satisfaction of the PAC.

CURRENT STATUS

The first TOR was agreed to with the PAC on March 7, 2000. The last review was on July 7, 2004; minor changes have been made to the ToR between 2000 and 2004.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No.

STRATEGY AND IMPLEMENTATION SCHEDULE

The PAC has accepted the TOR. PAC members may recommend revisions at any time. The TOR will be reviewed bi-annually (2 years).

MONITORING PROCEDURE

A bi-annual review of the TOR will be a regular agenda item for PAC meetings. Meeting summaries will be distributed to the PAC and summarized in the annual report.

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.51 Open Houses

Indicator Statement	Target Statement
Number of open houses held to solicit broad public input	We will hold a minimum of one annual open house to review SFM plan performance.
SFM Objective: We will have an effective and satisfactory process that enables public participation of stakeholders and First Nations.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

No variances.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Canfor is committed to provide ongoing opportunities for the public to be involved in the TFL 48 planning and monitoring activities. A key opportunity for the public not involved with the public advisory committee to become informed on our management and practices is by providing an open house.

CURRENT STATUS

An open house has been held each year between 2000 and 2004.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No

STRATEGY AND IMPLEMENTATION SCHEDULE

Canfor will hold an open house to review the annual report annually and the SFM plan completed.

MONITORING PROCEDURE

Performance will be reported in each annual report.

LINKAGES TO OPERATIONAL PLANS

Not applicable.

3.52 Response to Public Inquires

Indicator Statement	Target Statement
Percentage of timely responses to public inquires	We will respond to 100% of public inquiries concerning our forestry practices within one month of receipt and provide summary to PAC annually
SFM Objective: We will have an effective and satisfactory process that enables public participation of stakeholders and First Nations.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

There is no acceptable variance for responding to public inquiries, and variance should not exceed 10% of the target for responding within one month.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

This indicator tracks the level and timeliness of response to public communications received by Canfor related to forest management activities. It will be the responsibility of Canfor to track comments received through communications, and also track the response to these comments in order to monitor and report on this indicator.

Public participation and communication in SFM are important means by which to incorporate public values in long-term SFM planning. The SFM process encourages open and effective communication of values from a diversity of interests. As such, it is important to ensure that communication from individuals and/or groups representing various interests directed towards forest management plans and activities received by Canfor 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 SFM process.

The indicator performance is reported to the PAC annually to ensure that performance is available to the Public.

CURRENT STATUS

In 2004 Canfor received four public comments. Three of the four comments (75%) were responded to within one month. As this was a non-conformance to the SFM plan a review of this was completed with the cause being identified that a staff member did not follow the proper procedure. The recommendation was for the staff member to review the procedure to ensure familiarity with commitment.

Table 48: % of Comments Receiving Response Within One Month of Receipt

Licensee	Response type	Current Status (2004)	Target	Variance	Achieve Target
Canfor	Written	100% response however it is unknown at this time as to whether or not all responses were achieved within 1 month. Was not tracked.	100%	none	Annually

Table 49: Summary of Comments from 2004

Issue Identifier	Issue Description	Issue Timing	Response	Response Timing
APN-CH2004-ITSOP 0005	Person phoned to ask what Canfor has done regarding identifying pine beetle populations and why we didn't discover it last year. Public member thought Canfor should be doing more beetle probes.	2004/05/11	Canfor response was that we unaware as nobody had seen it. Canfor responded that we assess during normal work (ground and air) and do follow up when pest outbreaks detected.	2004/06/15
APN-CH2004-ITSOP 0006	Person called regarding the Wolverine Forest Service Road. Incomplete bridge repairs have made the road impassable for his car. (Person lives at the Terry Ranch on the Wolverine FSR. Recent breakdowns to his truck have resulted in him using his car, which can't get across the bridge at Perry Creek.)	2004/06/11	Canfor explained that rains have prevented the fills from being established, as we can't use mud or saturated gravels in the approaches. Person responded that they wanted the bridge fixed. Canfor completed repairs by June 15, 2004	2004/06/15
APN-CH2004-ITSOP 0007	Trapper received a fax dated May 28 04 as a response to Canfor's beetle letters and FDP referrals, as they pertain to the family trapline. Requesting any info on forest activities and any beetle updates.	2004/06/11	Faxed response outlining that Canfor has deferred all operations on this line until 2005, or later, and that no beetle has yet been found on the trapline. Response on above letter requesting a map and FDP. Will respond with map and make FDP text available in Chetwynd office. Map, text and letter sent June 17.	2004/06/17
APN-CH2004-ITSOP 0008	Environmental organization has requested information about the TFL SFMP.	2004/03/29	Provide response to environmental organization re TFL SFMP info request.	2005/06/06

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Does forecasting apply (y/n)? No.

Analysis Comments/Discussion

Response type (examples):

- Written (letter, fax, e-mail)
- 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
    - includes First Nations and other interest groups
    - excludes government communications

STRATEGY AND IMPLEMENTATION SCHEDULE

A description of the chosen strategy, including all significant actions to be undertaken and their associated implementation schedule.

Table 50: Indicator Monitoring Implementation Schedule

Activity	Actions required	Responsibility	Schedule (date/interval)
Set up system to document response	Ensure a system is organized to document comments and responses (ITS)	Woods Manager	July 2005
Monitor and update data	Ensure data is updated	Woods Manager	Annually Month of July
Analysis	Not applicable	Not applicable	Not applicable
Report	Indicator Performance Management for Management Adjustment Purposes (review updated data only)	Woods Manager	Annually since July 2000
Report	Report to Public Advisory Committee Include Indicator Performance in Annual Report	Woods Manager	Annually

MONITORING PROCEDURE

The information provided under this heading summarizes the sources of monitoring information, timing and frequency of monitoring to ensure that Canfor meets the targets.

Table 51: Inventories Needed to Monitor and Analyze Indicator

Inventory	Source	Updating required for future analysis?	Date/interval required
Communication records data will be tracked in ITS	Canfor ITS database. Persons receiving comments will be responsible for entering them into ITS.	Yes	As communications are received and communications are sent

Calculation of Indicator

Formula:

$$\%C_{\text{, Canfor Chet}} = (R_{\text{type, Canfor Chet}} / C_{\text{Canfor Chet}}) \times 100$$

Variables:

$\%C_{\text{Canfor Chet}}$	% of comments receiving response by licensee within one month
$R_{\text{Canfor Chet}}$	Number of responses to comments received by Canfor Chetwynd that were responded to within one month of receipt
$C_{\text{Canfor Chet}}$	Number of comments received by Canfor Chetwynd

LINKAGES TO OPERATIONAL PLANS

Action Plans resulting from public comments to be incorporated into operational planning processes.

3.53 Distribution/Access to SFM Plan, Annual Reports and Audit Results

Indicator Statement	Target Statement
Distribution/access to SFM Plan, Annual Reports and Audit Results	All SFM plans, annual reports, and audit reports will be made available during open houses, on Canfor's website (http://www.canfor.com/sustainability/certification/csa.asp), others upon request and distributed to PAC members and advisors
SFM Objective: We will provide information to public and First Nations about forest ecosystem values and management.	
Linkage to TFL 48 Licence: For the purposes of sections 2.27(f) and (g) of the TFL 48 Licence this SFM Objective(s), Indicator Statement, Target Statement, Acceptable Variance, and Strategy and Implementation Schedule are submitted to the MoFR for approval.	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Public participation is a vital component of SFM in Canada (CSA 2002). To ensure meaningful public participation members of the public advisory committee and others need to have access to SFM plans, annual reports and audit reports. This ensures that the public is kept informed and knowledgeable about Canfor's commitments and third party audited results.

CURRENT STATUS

The SFM plan for TFL 48 is available on Canfor's website at the following location (http://www.canfor.com/sustainability/certification/csa.asp). Also included are copies of annual reports and summaries of the 3rd party external audits completed on TFL 48. Copies of the above have been circulated to members of the PAC and advisors as well.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Forecasting does not apply to this indicator.

STRATEGY AND IMPLEMENTATION SCHEDULE

Copies of the SFM plan, annual reports and audit reports have been available since Canfor first developed a SFM plan registered to the CSA standard in 2000.

MONITORING PROCEDURE

This indicator is documented through the meeting summaries and Canfor's Genus Environment system, which tracks public enquiries. The results will be summarized in each annual report

LINKAGES TO OPERATIONAL PLANS

This indicator is a process monitoring indicator related to the SFM plan and does not directly link to operational plans.

3.54 Spatial Forecasting and Analysis

Indicator Statement	Target Statement
Spatial forecasting and analysis models	We will use spatial forecasting and analysis models to develop strategic SFM analysis and rotation length plans for SFMP 4
SFM Objective: We will improve and apply knowledge of forest ecosystems, values and management.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

Spatial forecasting and analysis is completed using models that are spatially explicit over both space and time. These models have the ability to track and model proposed harvesting over very long periods of time, typically is excess of 100 years into the future. By using spatial forecasting and analysis models allows a forest practitioner to project management scenarios into the future and determine if solutions are operationally feasible and also test the solution against other values and objectives such as projecting seral stages, patch sizes and habit for species into the future. This provides a valuable tool to communicate the results of SFM planning with member of the public, government agencies and independent third party auditors.

CURRENT STATUS

Canfor has chosen to use the Remsoft Spatial Planning System (Woodstock v3.2, Spatial Woodstock and Stanley v5) for the timber supply analysis completed in support of this SFM plan.

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

- Forecasting does not apply to this indicator.

STRATEGY AND IMPLEMENTATION SCHEDULE

The strategies modeled in support of this management plan are documented in each individual indicator as well as in Appendix 5 – Timber Supply Analysis Information Package.

MONITORING PROCEDURE

This is a process-monitoring indicator and will be reported on in each SFM plan

LINKAGES TO OPERATIONAL PLANS

The results obtained from spatial forecasting and analysis provide directions for the development of FDP's/FSP's and the 20-year plan developed in support of the TFL 48 Licence document requirements.

3.55 Currency of Vegetation Resource Inventory

Indicator Statement	Target Statement
Currency of vegetation inventory	We will use up-to-date vegetation inventory
SFM Objective: We will improve and apply knowledge of forest ecosystems, values and management.	
Linkage to TFL 48 Licence: N/A	

ACCEPTABLE VARIANCE

None.

WHAT IS THIS INDICATOR AND WHY IS IT IMPORTANT?

The Vegetation Resource Inventory (VRI) for TFL 48 is one of the key inventories used to provide a basis for the timber supply analysis and reporting on the status of the forest resource. The VRI is designed to achieve 2 objectives, where is the resource located and how much of it is there.

The Vegetation Resources Inventory is carried out in two phases. The photo interpretation (Phase I) involves estimating vegetation polygon characteristics, from existing information, aerial photography, or other sources. No sampling is done in Phase I.

The ground sampling phase (Phase II) provides the information necessary to determine how much of a given characteristic is within the inventory area. Ground samples alone cannot be collected in sufficient numbers to provide the specific locations of the land cover characteristics being inventoried.

Net Volume Adjustment Factor (NVAF) sampling collects data on a number of selected trees to account for errors in the estimates of net tree volume. The NVAF is calculated from the ratio of actual to estimates of sample tree volumes and is applied as a correction to VRI ground sample volumes. This data, used in conjunction with the original ground sampling data, provides an unbiased estimate of the net volume in the project area.

The ground measurements are used to estimate the proper total for the population. The relationship between the polygon estimates and ground samples is used to adjust the photo-interpreted polygon estimate. The total for the population is then distributed into the adjusted description for each polygon.

To ensure that the results of key SFM plan components and other planning processes are accurate and reflect the current situation it is important to maintain an accurate and up to date VRI.

CURRENT STATUS

Phase I for TFL 48 was completed in 2000 and Phase II including NVAF was completed in 2004. The VRI was updated to account for activities and depletion to the end of 2004 due to harvesting, road construction and uses by other industrial users. This is the information that formed the basis for the analysis of this SFM plan and the associated timber supply analysis (see Appendix 5 – Timber Supply Analysis Information Package).

Height, age, and net merchantable volume were adjusted as a result of the Phase II and NVAF sampling completed on TFL 48. TSR volume is defined as the net merchantable volume at the 12.5cm+ utilization level in lodgepole pine leading stands and the 17.5cm+ level in all other stands. After adjustment, the average height increased by 5%, age decreased by 7% and TSR volume increase by 34%. The TSR volume increased by 18% in the high priority sample areas (those mature areas most likely to contribute to the timber harvesting land base) (JS Thrower & Associates 2005).

FORECASTING ASSUMPTIONS AND ANALYTICAL METHODS

In support of the SFM plan and timber supply analysis the VRI is projected throughout the simulation timeline. The procedures and assumptions are documented in Appendix 5 – Timber Supply Analysis Information Package.

STRATEGY AND IMPLEMENTATION SCHEDULE

The VRI is kept current for depletion through the spatial tracking of our activities, which are spatially maintained in Canfor's information management system (Genus). Since 2000 the VRI has been periodically updated to support indicator analysis and timber supply analysis processes.

MONITORING PROCEDURE

This is a process-monitoring indicator and will be reported on in each SFM plan.

LINKAGES TO OPERATIONAL PLANS

The updated VRI is used to report on various indicators throughout the SFM plan. The process and procedures are documented in each indicator which use the VRI as a source data layer.

4 REGULATORY MANAGEMENT OBJECTIVES

Canfor is required under sections 2.27(f), and (g) of the TFL licence document to propose certain management objectives and measures to be taken for meeting those proposed management objectives. Those management objectives indicated in section 4 of this document and the means to meet the objectives are covered by the SFM Objectives in section 3 of this document and the Strategy and Implementation identified for those management objectives. The Indicators, Targets and Acceptable Variance for each of the SFM Objectives are used to determine how the proposed objective has been met.

This section 4 lists the proposed management objectives required under sections 2.27(f) and (g) of the TFL licence document and the relationship between those required objectives and the SFM objectives addressed in section 3.

Approval of the management objectives and measures to meet those objectives under Section 2.27(g) and (f) of the TFL licence document is requested for the SFM Objective, Indicator Statement, Target Statement, Acceptable Variance and Strategy and Implementation Schedule portion of each referenced indicator.

4.1 Management and Utilization of Timber Resources

The management objectives regarding management and utilization of the timber resources in the Licence area, including harvesting methods, and utilization suitable to the types of timber and terrain on the TFL are the SFM Objectives listed below:

Table 52: Management and Utilization of the Timber Resource Linkages to the SFMP

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(i) Objective for management and utilization of the timber resources		
We will sustain the natural range of ecosystem productivity to support naturally occurring species. We will balance annual growth rate and harvest rate. We will ensure that harvest levels do not adversely impact the long-term harvest level.	3.2	Forest Types
	3.22	Allowable Annual Cut
	3.39	Harvest Levels/Volumes
	3.40	Waste
	3.41	Harvest Method

4.2 Protection and Conservation of Non-timber Values and Resources

The management objectives regarding protection and conservation of non-timber values and resources in the Licence Area regarding visual quality, biological diversity, soils, water, recreation resources, cultural heritage resources, range land and wildlife and fish habitats are the SFM Objectives described below:

Table 53: Protection and Conservation of Non-timber Values and Resources Linkages to the SFMP

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(ii) Objective for visual quality, recreation resources, and range land		
We will provide opportunities for a feasible mix of timber, recreational activities, visual quality, and non-timber commercial activities.	3.34	Range Opportunities
	3.36	Proportion of Harvesting Consistent with Visual Quality Objective
	3.37	Back Country Condition
	3.38	Recreational Sites
TFL 48 Licence Sec 2.27(f)(ii) Objective for biological diversity		
We will conserve or restore ecosystem diversity within the natural range of variation within DFA over time. We will conserve genetic diversity of both wildlife and plant species. We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness. We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbance and stress. We will maintain sufficient habitats for species at risk.	3.1	Ecosystem Representation
	3.2	Forest Types
	3.3	Late Seral Forest
	3.4	Patch Size Distribution
	3.5	Snags/Live Tree Retention
	3.7	Average Minimum Width of RRZ and RMZ
	3.9	Wildlife Tree Patches
	3.10	Habitat Supply for Species of Public Concern
	3.11	Species of Management Concern
TFL 48 Licence Sec 2.27(f)(ii) Objective for soils		
We will protect soil resources to sustain productive forests.	3.23	Soil Degradation
	3.24	Soil Disturbance Surveys
TFL 48 Licence Sec 2.27(f)(ii) Objective for water		
We will maintain water quality and quantity	3.26	Spills Entering Water bodies
	3.27	Stream Crossing Quality Index
	3.29	Peak Flow Index

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(ii) Objective for cultural heritage resources		
To help ensure distribution of benefits, cooperative relationships, across local stakeholders and First Nations. We will respect known traditional aboriginal forest values and uses.	3.46	Known Values and Uses Addressed in Operational Planning
TFL 48 Licence Sec 2.27(f)(ii) Objective for fish and wildlife habitat		
We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness. We will maintain sufficient habitats for species at risk. We will implement management strategies appropriate to the long-term maintenance of protected areas and sites of special biological significance.	3.7	Average Minimum Width of RRZ and RMZ
	3.10	Habitat Supply for Species of Public Concern
	3.11	Species of Management Concern
	3.15	Wildlife Habitat Areas, Ungulate Winter Ranges and Dunlevy Creek Management Plan

4.3 Integration of Harvesting Activities with Non-timber Uses

The management objectives regarding the integration of harvesting activities in the Licence Area for purposes other than timber production are the SFM Objectives described below:

Table 54: Integration of Harvesting Activities with Non-timber Use Linkages to the SFMP

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(iii)(A) Objective for integration of harvesting activities with trappers, guide outfitters, range tenure holders, and other licensed resource users		
We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness. We will provide opportunities for a feasible mix of timber, recreational activities, visual quality, and non-timber commercial activities. We will sustain forests within the DFA To help ensure distribution of benefits, cooperative relationships, across local stakeholders and First Nations. We will have an effective and satisfactory process that enables public participation of stakeholders and First Nations.	3.10	Habitat Supply for Species of Public Concern
	3.33	Area of Forested Land Lost to Non-forest Industry
	3.34	Range Opportunities
	3.45	Consistency with Third Party Action Plans
	3.49	Public Advisory Committee

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(iii)(B) Objective for integration of harvesting activities with aboriginal people		
To help ensure distribution of benefits, cooperative relationships, across local stakeholders and First Nations. We will respect known traditional aboriginal forest values and uses. We will have an effective and satisfactory process that enables public participation of stakeholders and First Nations.	3.46	Known Values and Uses Addressed in Operational Planning
	3.49	Public Advisory Committee

4.4 Forest Fire

The management objectives regarding forest fire prevention and suppression, prescribed fire, and fuel management is the SFM Objective described below:

Table 55: Forest Fire Objectives Linked to SFMP

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(iv) Objective for forest fire prevention and suppression, prescribed fire, and fuel management		
We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbances and stress	3.16	Forest Health
	3.17	Proportion of Completed Forest Health Action Plans

4.5 Forest Health

The management objectives regarding forest health, including disease and pest management is the SFM Objective described below:

Table 56: Forest Health Objectives Linked to SFMP

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(v) Objective for forest health including disease and pest management		
We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbances and stress	3.16	Forest Health
	3.17	Proportion of Completed Forest Health Action Plans

4.6 Silviculture

Silviculture is defined as managing forest vegetation by controlling stand establishment, growth, composition, quality and structure, for the full range of forest resource objectives. On TFL 48, we practice a wide range of silviculture activities designed to improve the productivity and value of our future forests.

We carefully site prepare cutover lands where required, reforest utilizing nursery stock grown from native seed, and control brush and weed species. Superior planting stock will be used when available.

The management objectives regarding silviculture are the SFM Objectives described below:

Table 57: Silviculture Objectives Linked to SFMP

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(vi) Objective for silviculture		
We will conserve or restore ecosystem diversity within the natural range of variation within the DFA over time. We will sustain a natural range of variability in ecosystem function, composition and structure, which allows ecosystems to recover from disturbance and stress. We will sustain the natural range of ecosystem productivity to support naturally occurring species Conserve genetic diversity of tree stock	3.2	Forest Types
	3.12	Coniferous Seeds
	3.13	Deciduous Seeds and Vegetative Material
	3.18	Regeneration Declaration
	3.19	Free Growing Stands

4.6.1 Pre-82 Backlog

Section 21.00 of the TFL licence agreement requires Canfor to eliminate all pre-1982 backlog NSR areas prior to November 30, 2008.

Over the period of Management Plan 3, Canfor was able to complete all of its pre-82 backlog NSR commitments included in the TFL 48 licence document.

- Canfor met with the District Manager regarding the outstanding pre-82 backlog NSR commitments contained within the TFL 48 license document.
- A plan to complete Canfor's pre-82 backlog NSR obligations was approved by the district manager on January 19, 2004.
- The last of the outstanding silviculture treatments were completed in June 2004.
- In a letter dated January 20, 2005, the District Manager confirmed that Canfor has completed all of its outstanding silviculture obligations on the pre-82 backlog NSR sites.
- As part of Canfor's commitment to the District Manager, yield curves for these backlog areas are included in the information package as Analysis Units 131 and 132.

4.7 Roads

The management objectives regarding roads are the SFM Objective described below:

Table 58: Road Objectives Linked to SFMP

SFM Objective	SFMP Section	Indicator
TFL 48 Licence Sec 2.27(f)(vii) Objective for road construction, maintenance and deactivation		
We will sustain the natural range of ecosystem productivity to support naturally occurring species. We will protect soil resources to sustain productive forests. We will sustain forests within the DFA.	3.20	Permanent Access Corridors

5 SUMMARY OF CHANGES AND IMPACTS

5.1 Comparison between MP 3 and SFMP 4

Under section 2.27(k) of the TFL 48 licence agreement, Canfor must highlight the key similarities and differences between this SFM plan 4 and the management plan currently in effect, MP 3. The summaries are organized below.

5.1.1 Land Base

Table 59 summarizes the key land base similarities and differences between MP 3 and SFMP 4. Details explaining these differences are provided in the information package (Appendix 5 – Timber Supply Analysis Information Package). Generally, the area changes result from two issues: a) During the term of MP 3, the TFL agreement was revised through Instrument 5 to remove fields on the Rice property from the TFL and add forested land in the Stewart Lake area (see Table 60), and b) completion of the VRI Phase II inventory which improved volume and merchantability estimates of existing natural stands (see Section 2.7 and Appendix 9 – TFL 48 Vegetation Resource Inventory Statistical Adjustment).

Table 59: Land Base Comparisons between MP 3 and SFMP 4

	MP 3	SFMP 4	Difference
Total Area	643,511	643,239	100.0%
Productive Forest Area	570,744	566,393	99.2%
Current Net Operable Area (Conifer)	280,804	314,829	112.1%
Current Net Operable Area (Deciduous)	40,774	48,536	119.0%
Initial Net Operable Area	321,578	363,365	113.0%
Long-term Net Operable Area	307,828	356,756	115.9%

Table 60 summarizes the changes to the gross land base of the TFL.

Table 60: Changes to TFL 48 Gross Area between MP3 and SFMP 4

Description	Area (ha)
Total Area MP 3	**643,511**
Removals	
Rice fields	1,231
Woodlots	795
Total Removals	**2,026**
Additions	
Stewart Lake	1,753
Total Additions	**1,753**
Total Area SFMP 4	**643,239**

5.1.2 Inventories

The most significant change for inventories was the completion of the VRI Phase II ground sampling including Net Volume Adjustment Factor.

Height, age, and net merchantable volume were adjusted as a result of the Phase II and NVAF sampling completed on TFL 48. TSR volume is defined as the net merchantable volume at the 12.5cm+ utilization level in lodgepole pine leading stands and the 17.5cm+ level in all other stands. After adjustment, the average height increased by 5%, age decreased by 7% and TSR volume increase by 34%. The TSR volume increased by 18% in the high priority sample areas (those mature areas most likely to contribute to the timber harvesting land base) (JS Thrower & Associates 2005). See Appendix 9 – TFL 48 Vegetation Resource Inventory Statistical Adjustment.

5.1.3 Planning

During the term of MP 3, Canfor has implemented three significant planning initiatives:

- Implementation of the Dunlevy Creek Management Plan which sets allowable amounts of harvest and timing of entries by decade for each sub unit within the DCMP area (see Section 2.4.2 and 3.15
- Implementation of a more structured and scientifically credible approach to sustaining biological richness as described in Section 2.5
- Adoption of Natural Disturbance Units strategies (see Section 2.6) is a significant change in the way seral constraints and patch targets are developed and implemented in comparison to the MSRM Old Growth Order.
- CSA Sustainable Forestry System Standard CAN/CSA Z809-02 (see Section 2.2.2).

5.1.4 Mountain Pine Beetle

During the term of MP 3 a significant threat from mountain pine beetle (MPB) to the lodgepole pine forests has occurred within TFL 48. In 2004 the first occurrences of MPB were detected on TFL 48. Currently there are approximately 25 million m^3 of mature lodgepole pine greater than 80 years old within the timber harvesting land base. The impact of rapid expansion of the MPB in other parts of the province draws attention to the potential for a similar situation on TFL 48.

As a result of the incidence of MPB on TFL 48 a short-term increase in the harvest level is proposed to allow more management flexibility to reduce MPB infested and susceptible mature lodgepole pine forests. See Section 3.22 for a detailed discussion on the impacts and strategies associated with this proposal.

5.2 Impact Summary of Implementing MP 3

5.2.1 Harvest Levels

The harvest rate increased for the period of MP 3 by 65,000m^3 higher for conifer stands and 1,000m^3 higher for deciduous stands than the harvest level during MP 2.

5.2.2 Economic Opportunities

Economic opportunities provided from TFL 48 are partly related to the allowable annual cut determined by the provincial Chief Forester. Certainly, economic opportunities are more a function of the costs associated with manufacturing, marketing and delivering products to our customers and the sales price these customers are willing or able to pay.

By preparing MP 3 and fulfilling the requirements of our TFL 48 agreement, the stability of this tenure has supported shareholder confidence, assisted in securing long-term contracts with customers and provided a basis from which to explore new markets.

In developing MP 3, we improved several inventories, which have allowed us to refine our estimates of, monitor and incorporate the economic operability of timber resources within our timber supply analysis. This has helped us to identify and explore new opportunities.

5.2.3 Employee and Contractor Opportunities

The number of persons directly and indirectly employed from TFL 48 operations is partly related to the allowable annual cut determined by the provincial Chief Forester. The approved harvest rate for MP 3 has supported a stable employee and contractor workforce during the term of MP 3.

5.2.4 Non-timber Values

The approved AAC incorporated spatial constraints for timber harvesting and protecting non-timber resources. The improvements in forest resource inventories have helped us to plan and ensure that non-timber values are protected. This is further expanded and improved with the draft SFMP 4. The AAC approved in MP 3 have not precluded the protection of non-timber values within TFL 48.

5.3 Impact and Summary of Implementing SFMP 4

Forest law, all relevant legislation, standards and procedures, and the objectives proposed in the Dawson Creek LRMP are fundamental to management practices and standards on TFL 48. Constraints imposed by these references are considered within our proposed Sustainable Forest Management Plan. Consequently, changes to these constraints may, in turn, affect the expected impacts on these factors.

5.3.1 Harvest Levels

The conifer harvest rate proposed for the period of SFMP 4 (Section 3.22) is 744,000 m^3/year approximately 219,000m^3 higher than the current coniferous harvest level. This increase is primarily attributable to improvements in forest inventory (see Section 3.55) and improvements in site productivity estimates of future managed stands (SIBEC). It is proposed that 70% of the total coniferous harvest level will be targeted towards pine in the first 10 years to address the growing mountain pine beetle infestation.

The deciduous harvest rate proposed for the period of SFMP 4 (Section 3.22) is 101,300 m^3/year approximately 46,300 m^3 higher than the current deciduous harvest level. This increase is primarily attributable to improvements in forest inventory (see Section 3.55) and improvements in site productivity estimates of future managed stands (SIBEC)

5.3.2 Economic Opportunities

Economic opportunities provided from TFL 48 are partly related to the allowable annual cut determined by the provincial Chief Forester. Certainly, economic opportunities are more a function of the costs associated with manufacturing, marketing and delivering products to our customers and the sales price these customers are willing or able to pay.

The short term (10 year) strategy is to aggressively attack the MPB infestation on TFL 48, the intent is to protect the long-term economic opportunity offered by TFL 48 to the communities in the Peace area as well as employees and contractors. The increase in AAC will provide more flexibility within the harvest levels to aggressively attack mountain pine beetle infestations while protecting the long-term sustainable harvest levels.

5.3.3 Employee and Contractor Opportunities

The number of persons directly and indirectly employed from TFL 48 operations is partly related to the allowable annual cut determined by the provincial Chief Forester. The proposed harvest rate for SFMP 4 will support an increase of employment in the short-term and in the long-term.

5.3.4 Non-timber Values

SFMP 4 includes a comprehensive and balanced approach to protecting non-timber values (see Sections 2.5, 2.6 and Section 3). The proposed AAC (Section 3.22) does not require a compromise in non-timber values in the short or long term.

6 PUBLIC REVIEW OF SFMP 4

6.1 Chetwynd Public Advisory Committee

In February 2000 Canfor formed a Public Advisory Committee (PAC) to develop sustainable forest management indicators and objectives for Tree Farm Licence (TFL) 48.

The PAC helps ensure that sustainable forest "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 decisions". The PAC represents the diverse range of interests in the TFL and:

- provides input on:
  - values, objectives, indicators and targets as related to CSA
  - design of Sustainable Forest Management (SFM) system, monitoring system, and evaluation process
- reviews performance evaluations and make recommendations for improvement
- provides input to the communication strategy to provide feedback to interested parties about the defined forest area, particularly the results of performance evaluations related to the critical elements of the Canadian Council of Forest Ministers (CCFM) criteria
- refines and implements the public involvement program

The PAC was comprised of the following interests during the term of development of the draft Sustainable Management Plan 4 (2004/2005):

- Communities, Environment, Forest Workers, Independent Forest Operators, McLeod Lake Indian Band, Oil and Gas, Recreation, Saulteau First Nation, and West Moberly First Nation

In addition, the following acted as advisors to the Committee:

- BC Timber Sales, Canfor, Ministry of Forests and Range, Ministry of Agriculture and Lands, BC Environment, Northern Lights College, Tembec, Louisiana-Pacific

Members of the public were welcome to attend each PAC meeting, and provisions were made for public comment at the meetings. Notices of each PAC meeting were sent to the PAC members, advisors, the Chetwynd Echo, Chetwynd Coffee Talk Express, and members of the public who expressed interest.

During the development of the draft Sustainable Forest Management Plan 4, seven PAC meetings were held between October 2004 and September 2005 to work on updated values, objectives, indicators and targets within the context of the new CSA Standard CAN/CSA-Z809-02. A significant positive development since MP 3 has been the ongoing involvement of two First Nations groups with local interests, West Moberly First Nation and Moberly Lake Indian Band. With the exception of Saulteau First Nation, all PAC interests attended at least 3 meetings, with most interests being represented at 4 or more meetings.

Input by the PAC on the values, objectives, indicators and targets as related to CSA have been directly incorporated into the Sustainable Forest Management Plan. The PAC will remain active by meeting at least once annually to be kept apprised of progress on values, objectives, indicators and targets, and to provide input on key forest management activities within the TFL. Canfor will continue to develop news releases so that the general public is aware of the progress in relation to sustainable forest management.

See Appendix 3 – Chetwynd Public Advisory Committee Terms of Reference for the current terms of reference for the Chetwynd Public Advisory Committee.

6.2 Summary of Public Review Opportunities

Our objective was to solicit public input regarding the draft SFMP 4 and incorporate results into SFMP 4 submitted to the provincial Chief Forester.

In addition to the extensive public involvement with the Chetwynd Public Advisory Committee as described above we invited the public to comment on our draft SFMP 4 by advertising in local newspapers in the fall of 2005. As well, individual notification letters were sent to stakeholders and special interest groups. The draft Management Plan was available for public viewing at Canfor's Chetwynd and Vancouver offices as well as posted to our company external website (http://www.canfor.com/sustainability/certification/csa.asp).

The Chetwynd Public Advisory Committee reviewed the Draft Sustainable Forest Management Plan on September 20, 2005.

6.3 Summary of Comments Received from Review of SFMP 4

There were no public comments specific to the content of draft SFMP 4 that required any revisions to the Management Plan.

A thorough review of draft SFMP 4 by MoFR district, regional and branch staff identified several wording problems and pointed out several items that required clarification in the text. Correspondence from the Regional Manager identified some issues to be addressed. Where appropriate, these issues were incorporated into the proposed MP.

6.4 First Nations

First Nations with a defined area of interest within TFL 48 include West Moberly First Nation (WMFN), Saulteau First Nation (SFN) and McLeod Lake Indian Band (MLIB). WMFN and MLIB Band participated in the Chetwynd Public Advisory Committee (PAC) and attended meetings dealing with the development of SFMP 4.

Written and verbal invitations to all PAC meetings followed with meeting summaries documenting the results from each meeting were sent to each First Nation. A copy of the draft SFMP 4 was sent to each First Nation and comments and recommendations are encouraged. A meeting was arranged with First Nations to review the draft SFMP 4 on October 3, 2005 prior to the public review and comment process. This meeting was attended by WMFN. A second meeting was organized for November 4, 2005. This meeting was attended by MLIB and WMFN. No written comments were received as a result of these meetings or through the review and comment period. Canfor is pleased to provide an overview of the SFMP at any time with First Nation groups.

Annual reports are provided which report on the conformance and implementation of the SFMP. Opportunities to provide input during this annual review are also encouraged.

7 REFERENCES

Beaudry P and A. Gottesfeld 2001. Effects of Forest-Harvest rates on Stream Channel Changes in the Central Interior of British Columbia. In. Toews, D. and S. Chatwin (editors). 2001. Watershed Assessment in the Southern Interior of British Columbia. Res. Br., B.C. Min For., Victoria B.C. Work Pap. 57/2001.

Bunnell, F.L., L.L. Kremsater and E. Wind. 1999. Managing to Sustain Vertebrate Richness in Forests of the Pacific Northwest: Relationships Within Stands. Environmental Review 7: 97-146.

Bunnell, F.L. 2002. Establishing objectives and evaluating success. Chapter 2 in Sustaining biological diversity on TFL-48. Review draft prepared for Canfor TFL-48. Chetwynd, B.C. 19pp.

Bunnell, F.L. 2005. A Species Accounting System for Northeastern British Columbia. Prepared for Canadian Forest Products Ltd. February 1, 2005. 15pp

Canadian Standards Association. 2002 CAN/CSA-Z809-02 Sustainable Forest Management: Requirements and Guidance. Canadian Standards Association, Mississauga, Ont. pp78 URL: http://www.csa.ca/.

Cooper, J.M., K.A. Enns, and M.G. Sheppard (1997) Status of the Black-throated Green Warbler in British Columbia. Ministry of Environment, Lands and Parks, Wildlife Working Report No. Wr-80 Victoria, BC 24 pp.

Delong, C. 2002. Natural Disturbance Units of the Prince George Forest Region: Guidance for Sustainable Forest Management. Ministry of Forests. Prince George Forest Region. Prince George, B.C.

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

DeLong, S. Craig. (unpublished manuscript) Natural Disturbance Strategic Plan- Background Document. 15 pp.

DeLong, S.C. and D. Tanner. (1996) Managing the Pattern of Forest Harvest: Lessons from Wildfire. Biod. and Cons. 5: 1191-1205.

Canadian Standards Association. (2002) CAN/CSA-Z809-02 Sustainable Forest Management: Requirements and Guidance. Canadian Standards Association, Ontario, Canada 51 pp.

Grindal, S.D., Weir, R.D., and A. de Vries. In Review. Winter Habitat use by Martens in Young Aspen Stands in British Columbia. Proceedings of the 3rd International Martes Symposium, Cornerbrook, NF, Canada.

Harper, Fred E. 1988. Regional Wildlife Plan for the Peace Sub-region, Northern Region. Wildlife Branch, Ministry of Environment and Parks. March 1988. 212 pp.

Heard, D.C. and K.L. Vagt. 1998. Caribou in British Columbia: a 1996 Status Report Rangifer, Special Issue No. 10.

Hoyt, J.S. and Hannon, S.J. 2002. Habitat association of black-backed and three-toed woodpeckers in the boreal forest of Alberta, Canadian Journal of Forest Research. 32: 1881-1888. URL http://cjfr.nrc.ca/

JS Thrower & Associates (2005) Tree Farm Licence 48 Vegetation Resources Inventory Statistical Adjustment. Prepared for Canadian Forest Products Ltd. J.S. Thrower and Associates Ltd. 25 pp.

Lindgren and Lewis, 1997. Ecological Processes in the McGregor Model Forest: Interactions with Insects and Pathogens. Unpublished http://www.mcgregor.bc.ca/publications/InteractionsWithInsectsAndPathogens.pdf

McElligott., Paul. (1998) Studies of the Biology of Harlequin Ducks in Tree Farm Licence 48, Northeastern British Columbia. Prepared for Canadian Forest Products Ltd. by Aquatic Resources Limited. 89 pp.

Ministry of Forests, 1995. Biodiversity Guidebook Government of British Columbia, Crown Publications.

Ministry of Forests (BC MoF). 1998. Recreation Opportunity Spectrum Inventory – Procedures and Standards Manual. The Province of British Columbia, Resources Inventory Committee Victoria, BC 30 pp URL: http://srmwww.gov.bc.ca/risc/pubs/culture/ros/index.htm

Ministry of Forests (1998) TFL Management Plan Guidelines. Victoria, BC. 147 pp.

Ministry of Forests and Ministry of Environment, Lands and Parks (1999) Landscape Unit Planning Guide. Victoria, British Columbia. 101 pp.

Ministry of Forests (BC MoF). 2001. Watershed Assessment Procedure Guidebook. 2nd ed., Version 2.1. For. Prac. Br. Mon. For., Victoria, BC. Forest Practices Code of British Columbia Guidebook.

Ministry of Forests, 2003. Assigning Strategies to Beetle Management Units. Unpublished http://www.for.gov.bc.ca/hfp/forsite/fhdata/bmucriteria.htm

Ministry of Sustainable Resource Management (2002). Dunlevy Creek Management Plan. Prince George, British Columbia. January 24, 2002. 72pp

Porter, Aswea Dawn, 2002. Habitat selection by American Marten (*Martes americana*) at the Element, Patch and Stand Scales in a Young Deciduous Forest in Northern British Columbia. Thesis, University of Alberta, Edmonton Alberta.

Rocky Mountain Research Station. (1999, February 24). Homepage of Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture, [Online]. Available: http://www.fs.fed.us/rm/main/themes/disturb.html

Schuetz, Robert (2005) Tree Farm Licence #48 Timber Supply Analysis Report in Support of Sustainable Forest Management Plan 4 (Version 1b). Prepared for Canadian Forest Products Ltd. by Industrial Forestry Service Ltd. 82 pp.

Setterington, M and A. de Vries. Yellow Rail Sighting in BC, Rare Birds in Canada in 1997. Birders Journal Vol 7 (5): 257.

Setterington, M. and J. Boulanger (2000) Bird Use of Group Selection Harvested Riparian Management Areas in the Halfway River Watershed, Northeastern British Columbia - The Horseshoe Creek Project – 1999 Report-. Prepared for Canadian Forest Products Ltd. by Axys Environmental Consulting Ltd. and Integrated Ecological Research, April 2000. 78 pp.

Wells, R.W., Houde, I., Kellner, M., and Haag, D., (2003a). Local Level Indicators for Biodiversity: A preliminary evaluation of the McGregor Model Forest. Report prepared for the McGregor Model Forest Association, Prince George, BC.

Wells, R. W., Isabelle, I., Mandy, M. and Haag, D. (2003b). Local Level Indicators for Biodiversity: A preliminary evaluation of the Prince George TSA (McGregor Model Forest).

Wells, Ralph W. and Haag, Devon (2003c) Ecological Representation in TFL 48. Prepared for Canadian Forest Products Ltd. by Center for Applied Conservation Research, Department of Forest Sciences, University of British Columbia, Vancouver, BC. 22 pp.

8 ABBREVIATIONS AND DEFINITIONS

AAC	Annual Allowable Cut
AOA	Archaeological Overview Assessment
AIA	Archaeological Impact Assessment
AUM	An animal unit month (AUM) is the quantity of forage consumed by a 450-kg cow (with or without calf) in a 30-day period.
BEC	Biogeoclimatic Ecological Classification
BWBS	Boreal White and Black Spruce BEC zone
CMI	Change Monitoring Inventory plots used to assess long term performance of managed stands
CMT	Culturally Modified Tree
COSEWIC	Committee on Status of Endangered Wildlife in Canada
DCMP	Dunlevy Creek Management Plan
DFA	Defined Forest Area. Used interchangeably with TFL or TFL 48
ESSF	Engleman Spruce Subalpine Fir BEC zone
FDP	Forest Development Plan
FSP	Forest Stewardship Plan. Replaces FDP under the Forest and Range Practices Act
Genus	Canfor's forest information management system. Includes both spatial and attribute information for our operational data including harvest areas, roads, and silviculture.
GPS	Global Positioning System
GY	Growth and Yield
LRMP	Land and Resource Management Plan
LTHL	Long Term Harvest Level
LTSY	Long Term Sustained Yield
LU	Landscape Unit
MoFR	Ministry of Forests and Range
NDU	Natural Disturbance Units
NVAF	Net Volume Adjustment Factor
OSB	Oriented Strand Board
PAC	• Permanent Access Corridors (also Permanent Access Structures is used) • Public Advisory Committee
Phase 2 plots	Unbiased ground sample plots completed as part of the Vegetation Resource Inventory for TFL 48. http://srmwww.gov.bc.ca/vri/standards/index.html - vri
ROS	Recreation Opportunity Spectrum
RMZ	Riparian Management Zone

RRZ	Riparian Reserve Zone
SBS	Sub Boreal Spruce BEC zone
SFM	Sustainable Forest Management
SP	Site Plan/Silviculture Prescription (Forest and Range Practices Act/Forest Practices Code Act of BC)
TFL	Tree Farm Licence
TSA	Timber Supply Area
TSR	Timber Supply Review
TUS	Traditional Use Study
VQO	Visual Quality Objective
VIA	Visual Impact Assessment
VLI	Visual Landscape Inventory
VRI	Vegetation Resource Inventory
VSC	Visual Sensitivity Class
WCB	Workers Compensation Board
WTP	Wildlife Tree Patch

9 APPENDICES

Appendix 1 – Sustainable Forest Management Matrix

TFL 48 SFM Matrix August 31, 2006 Version Z809-02.09.00.0	Matrix Updated to Reflect PAC Input and Agreement as of August 31, 2006 PAC Meeting CSA Z809-02 Standard				
6.0 The SFM Performance Requirements: CCFM Criteria and CSA SFM Elements	**Value**	**Objective**		**Indicator**	**Target**
The organization, in conformance with the public participation process requirements set out in Section 5, will identify DFA-specific values, objectives, indicators and targets for each of the CSA SFM Elements described in Clauses 6.1-6.6, as well as any other values associated with DFA.	Value - a DFA characteristic, component or quality considered by an interested party to be important in relation to a CSA SFM Element or other locally identified element.	Objective - a broad statement describing a desired future state or condition for a value.		Indicator - a variable that measures or describes the state or condition of a value.	Target - a specific statement describing a desired future state or condition of an indicator. Targets should be clearly defined, time-limited, and quantified, if possible.
CCFM Criterion 1 – Conservation of Biological Diversity					
Conserve biological diversity by maintaining integrity, function and diversity of living organisms and the complexes of which they are part.					
Element 1.1 Ecosystem Diversity Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that naturally occur on the DFA.	Ecosystem Diversity	We will conserve or restore ecosystem diversity within the natural range of variation within DFA over time.	1	Proportion or rare ecosystem groups (7, 3, 6, 10, 21) reserved from harvest	100% of rare ecosystem groups reserved from harvest
			2	Percent distribution of forest type (deciduous, deciduous mixed wood, conifer mixed wood, conifer) > 20 years old across DFA	100 % of forest type groups will be within the target range (Conifer - 75-85%, Conifer Mixedwood - 4-6%, Deciduous - 9-15%, Deciduous Mixedwood - 2-4%)
			3	The minimum acceptable proportion (%) of late seral forest by Natural Disturbance Unit (NDU) and NDU by BEC	The minimum proportion (%) of late seral forest by NDU and NDU by BEC as shown in Table 11
			4	Percent area by Patch Size Class (0-50, 51-100 and >100 ha) by Natural Disturbance Unit (NDU) by early or mature and proportion of mature interior forest condition.	Targets by Patch Size Class by NDU by early or mature are shown in Table 14.
Element 1.2 Species Diversity Conserve species diversity by ensuring that habitats for the native species found on the DFA are maintained through time.	Native Species Richness	We will sustain sufficient and appropriately distributed suitable habitat elements to maintain native species richness	5	Number of snags and / or live trees (>17.5 cm dbh) per ha on prescribed areas	Retain annually an average of at least 2 snags and / or live trees (>17.5 cm dbh) per ha on prescribed areas. (Ecological Representation will be used to guide where snags and / or live trees will be prescribed)
			6	Average Coarse Woody debris size and m^3/ha on blocks harvested on the TFL since Jan 1, 2004	Average retention level over the TFL since Jan 1, 2004 will be at least 92m^3/ha of which a minimum of 46m^3/ha will be greater than 17.5cm in diameter.
			7	Average Minimum width of retention by Riparian Reserve Zone or Riparian Management Zone by appropriate stream, lake or wetland classification within cutblocks	We will meet or exceed the regulatory retention widths by Riparian Reserve Zone or Riparian Management Zone by appropriate stream, lake or wetland classification within cutblocks
			8	The proportion of shrub habitat (%) by Natural Disturbance Unit	Each Natural Disturbance Unit will meet or exceed the baseline target (%) proportion of shrub habitat (Table 19)
			9	Cumulative Wildlife Tree Patch Percentage in blocks harvested since 1995 by BEC sub zone	Cumulative Wildlife Tree Patch % will be at least 8% by BEC sub zone
			10	Habitat supply for species of public interest. (grizzly bear, wolverine, marten, fisher, elk, moose, caribou,)	When habitat supply decreases 20% over time beyond the natural range of variation baseline for species of public interest, stand level management strategies will be developed within one year.
		We will maintain sufficient habitats for species at risk	11	Percent consistency with management strategies for species of management concern	On an annual basis, 100% of the management strategies for species of management concern are consistently being implemented as scheduled
Element 1.3 Genetic Diversity Conserve genetic diversity by maintaining the variation of genes within species.	Genetic Diversity	We will conserve genetic diversity of tree stock	12	The proportion of seeds for coniferous species collected and seedlings planted in accordance with the regulations	All coniferous seeds will be collected and seedlings will be planted in accordance with the regulations
			13	The proportion of seed or vegetative material for deciduous species collected and planted in accordance with the regulations	All deciduous species will be collected and planted in accordance with the regulations.
		We will conserve genetic diversity of both wildlife and plant species	1	See Indicator #1 - Proportion or rare ecosystem groups (7, 3, 6, 10, 21) reserved from harvest	
Element 1.4 Protected Areas and Sites of Special Biological Significance Respect protected areas identified through government processes. Identify sites of special biological significance within the DFA and implement management strategies appropriate to their long term maintenance.	Protected areas and sites of special biological significance	We will implement management strategies appropriate to the long term maintenance of protected areas and sites of special biological significance	14	Hectares of forestry related harvesting or road construction within Class A parks, ecological reserves, and LRMP designated protected areas	Zero ha of forestry related harvesting or road construction within Class A parks, ecological reserves, and LRMP designated protected areas
			15	Proportion of activities consistent with objectives of Wildlife Habitat Areas (WHA), Ungulate Winter Ranges (UWR), and Dunlevy Creek Management Plan	All forest management activities will be consistent with objectives of Wildlife Habitat Areas (WHA), Ungulate Winter Ranges (UWR), and Dunlevy Creek Management Plan

Yellow Highlighted Indicators indicate that Indicator and Target submitted to MoFR for approval

TFL 48 SFM Matrix August 31, 2006 Version Z809-02.09.00.0	Matrix Updated to Reflect PAC Input and Agreement as of August 31, 2006 PAC Meeting CSA Z809-02 Standard				
6.0 The SFM Performance Requirements: CCFM Criteria and CSA SFM Elements	**Value**	**Objective**	**Indicator**		**Target**
The organization, in conformance with the public participation process requirements set out in Section 5, will identify DFA-specific values, objectives, indicators and targets for each of the CSA SFM Elements described in Clauses 6.1-6.6, as well as any other values associated with DFA.	Value - a DFA characteristic, component or quality considered by an interested party to be important in relation to a CSA SFM Element or other locally identified element.	Objective - a broad statement describing a desired future state or condition for a value.	Indicator - a variable that measures or describes the state or condition of a value.		Target - a specific statement describing a desired future state or condition of an indicator. Targets should be clearly defined, time-limited, and quantified, if possible.
CCFM Criterion 2 – Maintenance and Enhancement of Forest Ecosystem Condition and Productivity					
Conserve forest ecosystem condition and productivity by maintaining the health, vitality, and rates of biological production.					
Element 2.1 Forest Ecosystem Resilience Conserve ecosystem resilience by maintaining both ecosystem processes and ecosystem conditions.	Ecosystem resilience	We will sustain a natural range of variability in ecosystem function, composition and structure which allows ecosystems to recover from disturbance and stress	**2**	See Indicator #2 - Forest Type	
			3	See Indicator #3 - Late Seral Forest	
			5	See Indicator #5 - Snags	
			6	See Indicator #6 - Coarse Woody Debris	
			9	See Indicator #9 - WTP	
			16	% of significant detected forest health damaging events which have treatment plans prepared	100% of significant detected forest health damaging events will have treatment plans prepared within 1 year of initial detection
			17	Proportion of required actions completed as per forest health treatment plans	100% of required actions will be completed as per forest health treatment plans
			18	Area weighted average time delay from harvesting starting and initial restocking of harvest area by DFA	average delay will be no more than 2 years
			19	Proportion of area harvested that has free growing stands re-established	100% of area harvested will meet the free growing requirements identified in silviculture prescriptions / site plans
Element 2.2 Forest Ecosystem Productivity **C**onserve ecosystem productivity and productive capacity by maintaining ecosystem conditions that are capable of supporting naturally occurring species.	Ecosystem productivity	We will sustain the natural range of ecosystem productivity to support naturally occurring species.	**2**	See Indicator #2 - Forest Type	
			3	See Indicator #3 - Late Seral Forest	
			20	Percent of area of the DFA occupied by permanent access corridors associated with forest management activities.	We will limit impacts on the land base due to the presence of permanent access corridors to less than 2.5% of the gross land base of the DFA.
			21	Area weighted average Site Index by ecological site series by leading species.	The area weighted average Site Index by leading species by site series at free growing will not be less than the SIBEC predicted site index.
			22	Allowable Annual Cut	We will ensure that the Allowable Annual Cut will not adversely impact Long Term Harvest Level.
CCFM Criterion 3 – Conservation of Soil and Water Resources					
Conserve soil and water resources by maintaining their quantity and quality in forest ecosystems.					
Element 3.1 Soil Quality and Quantity Conserve soil resources by maintaining soil quality and quantity.	Soil Productivity	We will protect soil resources to sustain productive forests	**20**	See Indicator #20 - Permanent Access Structure	
			21	See Indicator #21 - Site Index	
			23	Soil degradation	We will not exceed site degradation guidelines as defined in site plans
			24	Soil disturbance surveys	We will not exceed soil disturbance limits within cutblocks as defined in site plans
			25	Use of environmentally friendly lubricants	We will research and identify environmentally friendly lubricants biannually
Element 3.2 Water Quality and Quantity Conserve water resources by maintaining water quality and quantity.	Water quality and quantity	We will maintain water quality and quantity	**7**	See Indicator #7 - Riparian	
			26	Number of reportable spills or misapplications entering water bodies	Zero reportable spills or misapplications entering water bodies
			27	Maximum Stream Crossing Quality Index (SCQI) by watershed	The maximum SCQI score is 0.40 by watershed
			28	Number of crossings with a High Water Quality Concern (WQCR) with actions plans prepared within one year of discovery	100% of High WQCR crossings will have action plans prepared within one year of discovery
			29	The percentage of watersheds within TFL 48 achieving baseline thresholds for Peak Flow Index	A minimum of 95% of the watersheds within TFL 48 will be below the baseline threshold
			30	The percentage of watersheds reviews completed where the baseline threshold is exceeded	100% of watersheds that exceed the baseline threshold will have a watershed review completed when new harvesting is planned.

Yellow Highlighted Indicators indicate that Indicator and Target submitted to MoFR for approval

TFL 48 SFM Matrix August 31, 2006 Version Z809-02.09.00.0	Matrix Updated to Reflect PAC Input and Agreement as of August 31, 2006 PAC Meeting CSA Z809-02 Standard				
6.0 The SFM Performance Requirements: CCFM Criteria and CSA SFM Elements	**Value**	**Objective**	**Indicator**		**Target**
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CCFM Criterion 4 – Forest Ecosystem Contributions to Global Ecological Cycles					
Maintain forest conditions and management activities that contribute to the health of global ecological cycles.					
Element 4.1 Carbon Uptake and Storage Maintain the processes that take carbon from the atmosphere and store it in forest ecosystems.	Carbon Uptake and Storage	We will maintain the processes for carbon uptake and storage within the natural range of variation	**31**	DFA average Carbon (C) sequestration rate (Mg C / year)	Maintain DFA average carbon sequestration rates that are no more than 15% less than those achieved using the minimum natural range of variation
			32	Ecosystem Carbon Storage (Mg) in the DFA	Minimum of 95% of minimum natural range of variation disturbance levels of Ecosystem Carbon Storage
Element 4.2 Forest Land Conversion Protect forestlands from deforestation or conversion to non-forests.	Forested land base	We will sustain forests within the DFA.	**20**	See Indicator #20 - Permanent Access Structure	
			33	Area of forested land lost due to non-forest industry	We will track and monitor losses to other non-forest industry uses and incorporate these losses into AAC calculations every five years.
CCFM Criterion 5 – Multiple Benefits to Society					
Sustain flows of forest benefits for current and future generations by providing multiple goods and services.					
Element 5.1 Timber and Non-Timber Benefits Manage the forest to produce an acceptable and feasible mix of both timber and non-timber benefits.	Timber and Non-Timber Multi-use Benefits	We will provide opportunities for a feasible mix of timber, recreational activities, visual quality, and non-timber commercial activities.	**34**	Annual minimum number Animal unit months opportunity	We will maintain an annual minimum of 1000 Animal Unit Months (excludes brush control by sheep grazing)
			35	Maintenance of visual landscape inventory.	We will maintain and update an approved visual landscape inventory.
			36	Proportion of harvesting within known visual areas that are consistent with the Visual Quality Objective	100% of harvesting within visual areas will be consistent with the Visual Quality Objective
			37	Proportion (%)of back country areas (ha) that are in a semi-primitive recreation opportunity spectrum (ROS) class	We will maintain or increase semi-primitive ROS in Klin-se-za, Bocock, Butler Ridge, Pine/Lemoray, Peace River/Boudreau and Elephant Ridge/Gwillim Protected Areas and manage special management zones (Klin se za, North Burnt, Dunlevy) as per LRMP. See table 40 for baseline.
			38	Number of recreation trails and campsites maintained by Canfor.	We will provide and/or maintain a minimum of one trail and three recreation sites on the DFA
Element 5.2 Communities and Sustainability Contribute to the sustainability of communities by providing diverse opportunities to derive benefits from forests and to participate in their use and management.	Sustainable harvest levels	We will ensure that harvest levels do not adversely impact the Long Term Harvest Level	**39**	Harvest levels / volumes	Harvest volumes will not exceed 110% of the 5 year periodic cut control volume for the DFA
			40	The percentage of blocks and roads assessed in which avoidable waste and residue levels are within the target range	Annually, 100% of cutblocks and roads will fall within the target avoidable waste and residue range
			41	Proportion (%) of coniferous harvesting area (ha) completed with conventional ground based methods by 5 year cut control period	A maximum of 81% of the coniferous harvesting area (ha) will be completed with conventional ground based methods by 5 year cut control period
	Sustainable yield of timber	We will balance annual growth rate and harvest rate.	**22**	See Indicator #22 - Allowable Annual Cut	
	Economic viability for Canfor	We will maintain a local, up to date timber processing facility and infrastructure.	**42**	Volume (m3) of timber delivered annually to Chetwynd mill between May 1st and October 31st	Minimum of 150,000 m3 coniferous delivered to Canfor Chetwynd Mill
	Local employment	We will ensure local communities and contractors have the opportunity to share in benefits such as jobs, contracts and sales.	**43**	The proportion of $ spent on local vs. non-local contractors	A 5 year rolling average of 65% of local vs. non-local contractors and an annual minimum of 50% local vs. non-local
Element 5.3 Fair Distribution of Benefits and Costs Promote the fair distribution of timber and non-timber benefits and costs.	Community Benefits	We will ensure contributions and benefits to the community (i.e.. Donations, training)	**44**	Canfor community donations per year	A minimum of $7,000 /year will be made available for community donations.
	Distribution of Benefits and cooperation with stakeholders and First Nations	To help ensure distribution of benefits, cooperative relationships, across local stakeholders and First Nations	**45**	Consistency with mutually agreed upon action plans for guides, trappers, range tenure holders, and other non-timber commercial interests	Operations 100% consistent with the resultant action plans
			46	Percentage of known traditional site-specific aboriginal values and uses identified during SFMP, FDP, FSP, or PMP referrals addressed in operational plans	100% of known traditional site-specific aboriginal values and uses identified during SFMP, FDP, FSP, or PMP referrals will be addressed in operational plans

Yellow Highlighted Indicators indicate that Indicator and Target submitted to MoFR for approval

TFL 48 SFM Matrix August 31, 2006 Version Z809-02.09.00.0	Matrix Updated to Reflect PAC Input and Agreement as of August 31, 2006 PAC Meeting CSA Z809-02 Standard				
6.0 The SFM Performance Requirements: CCFM Criteria and CSA SFM Elements	**Value**	**Objective**	**Indicator**		**Target**
The organization, in conformance with the public participation process requirements set out in Section 5, will identify DFA-specific values, objectives, indicators and targets for each of the CSA SFM Elements described in Clauses 6.1-6.6, as well as any other values associated with DFA.	Value - a DFA characteristic, component or quality considered by an interested party to be important in relation to a CSA SFM Element or other locally identified element.	Objective - a broad statement describing a desired future state or condition for a value.	Indicator - a variable that measures or describes the state or condition of a value.		Target - a specific statement describing a desired future state or condition of an indicator. Targets should be clearly defined, time-limited, and quantified, if possible.
CCFM Criterion 6 – Accepting Society's Responsibility for Sustainable Development					
Society's responsibility for sustainable forest management requires that fair, equitable, and effective forest management decisions are made.					
Element 6.1 Aboriginal and Treaty Rights Recognize and respect Aboriginal and treaty rights.	Treaty and Aboriginal rights	We will recognize and respect Treaty 8 rights	**47**	% conformance to SFM elements pertinent to treaty rights (I.e., hunting, fishing, and trapping) defined in Treaty 8	100% conformance to the SFM indicators and targets of the SFM Elements pertinent to sustaining hunting, fishing and trapping, as follows:· Element 1.1 Ecosystem Diversity (Indicators 3.1, 3.2, 3.3, and 3.4), and Element 1.2 Species Diversity (Habitat Elements) Indicators (3.5, 3.4, 3.6, 3.7, 3.8, 3.9 and 3.10), and· Element 3.2 Water Quality and Quantity Indicators (3.26, 3.27, 3.28, 3.29, and 3.30)
Element 6.2 Respect for Aboriginal Forest Values, Knowledge and Uses Respect traditional Aboriginal forest values and uses identified through the Aboriginal input process.	Aboriginal Forest Values and Uses	We will respect known traditional Aboriginal forest values, and uses.	**46**	See Indicator #46 Percentage of known values and uses addressed in operational planning	
			47	See Indicator #47 % conformance to SFM elements pertinent to treaty rights (I.e., hunting, fishing, and trapping) defined in Treaty 8	
Element 6.3 Public Participation Demonstrate that the public participation process is designed and functioning to the satisfaction of the participants	Social responsibility	We will support land use processes including the LRMP implementation	**48**	Proportion of LRMP implementation or update meetings attended by Canfor and BCTS	100% of meetings will be attended by Canfor and BCTS and information provided as required.
	Public and First Nation participation process.	We will have an effective and satisfactory process that enables public participation of stakeholders and First Nations.	**49**	Public Advisory Committee	We will establish and maintain Public Advisory Committee and generally hold at least one meetings annually.
			50	Terms of reference (TOR) for the Chetwynd TFL 48 DFA public participation process	Obtain PAC acceptance of TOR for public participation process bi-annually (every 2 years)
			51	Number of Open Houses held to solicit broad public input	We will hold a minimum of one annual open house to review SFM plan performance.
			52	Percentage of timely responses to Public Inquires	We will respond to 100% of public inquiries concerning our forestry practices within one month of receipt and provide summary to PAC annually
Element 6.4 Information for Decision-Making Provide relevant information to interested parties to support their involvement in the public participation process, and increase knowledge of ecosystem processes and human interactions with forest ecosystems.	Level of knowledge for decision making	We will provide information to public and First Nations about forest ecosystem values and management	**53**	Distribution / Access to SFM Plan, Annual Reports and Audit Results	All SFM plans, annual reports, and audit reports will be made available during open houses, on Canfor's website (http://www.canfor.com/sustainability/certification/csa.asp), others upon request and distributed to PAC members and advisors
		We will improve and apply knowledge of forest ecosystems, values and management.	**54**	Spatial forecasting and analysis models	We will use spatial forecasting and analysis models to develop strategic SFM analysis and rotation length plans for SFMP4
			55	Currency of Vegetation Inventory	We will use up-to-date vegetation inventory.

Appendix 2 – BCTS SFM Policies

BCTS
BC Timber Sales
Peace-Liard

ENVIRONMENTAL 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 to:

- Comply with all relevant environmental legislation and regulations.
- Strive for excellence in forest management by continually improving the performance of resource management activities and practices.
- Maintain a framework that sets and reviews environmental objectives and targets, and promotes the prevention of pollution associated with BCTS forestry activities.
- Monitor and evaluate key BCTS forestry operations.
- Communicate BCTS business activities and policies to all staff and make them available to the public.

August 16,2005 ***Timber Sales Manager***

Updated: June 2005 **Peace-Liard Business Area**

SUSTAINABLE RESOURCE MANAGEMENT POLICY

BC Timber Sales manages and administers timber harvesting and related forest management activities on BCTS timber sale licenses and related tenures sold on Crown land throughout British Columbia. BC Timber Sales is committed to conducting our business in a manner that reflects our **VISION** to be an effective timber marketer generating wealth through sustainable resource management.

It is the policy of BC Timber Sales to:

- **Conduct** our operations so as to comply with relevant legislation, regulation and policy requirements.
- **Develop** a process to achieve and maintain sustainable forest management (SFM) standards
- **Maintain** a framework that reviews and sets both environmental and SFM objectives and targets, and promotes the prevention of pollution associated with BCTS forestry activities.
- **Encourage** in a manner that is respective of their aboriginal and treaty rights, local First Nations to participate in local SFM processes.
- **Initiate** public participation opportunities to provide local input into forest management activities and plans.
- **Promote and create** a safe, healthy and satisfying work environment and ensure operations will not jeopardize human health and safety.
- **Commit and seek** opportunities to advance our knowledge of sustainable resource stewardship based on sound scientific knowledge.
- **Incorporate** appropriate forest management principles in our overall planning processes through the advances of science and the results of our monitoring activities on our sustainability indicators and targets.
- **Monitor** our day to day operations, evaluate our monitoring results and implement appropriate changes to our SFM in our bid to demonstrate continual improvement in the performance of our resource management activities and practices.
- **Communicate** our commitment to SFM activities and policies to our staff, customers, clients, stakeholders, First Nations, local municipalities and the public.

Dated: August 25, 2005

Timber Sales Manager

Peace-Liard Business Area

Created August 24, 2005

Appendix 3 – Chetwynd Public Advisory Committee Terms of Reference

CANADIAN FOREST PRODUCTS
CHETWYND

BC TIMBER SALES
DAWSON CREEK FIELD TEAM

TFL #48
PUBLIC ADVISORY COMMITTEE
For CSA Certification

TERMS OF REFERENCE
Revised as of
August 31, 2006

A. BACKGROUND

Canadian Forest Products Ltd (Canfor has had an interest in forestry certification since 1993 and was one of the first participants in the development of the Canadian Standards Association (CSA) Sustainable Forest Management System standard. As early as 1996, the company conducted a preliminary audit against both the CSA standard and the Forest Stewardship Council (FSC) Principles and Criteria at one of its Prince George, British Columbia operations. The Chetwynd Tree Farm License (TFL) #48 was first registered to CSA Z809-96 in July 2000.

In 2006, BC Timber Sales (BCTS)- Peace Business Unit (Dawson Creek Field Team) initiated work to attain CSA certification for their operations on TFL #48. To ensure consistency and effectiveness, Canfor and BC Timber Sales developed a joint Sustainable Forest Management Plan for TFL #48, which serves as their defined forest area (DFA for CSA certification. Both parties hope to maintain certification to the current Canadian Standard Association standard.

In Chetwynd, the TFL is composed of 7 separate Blocks (see Appendix 1).

- Block 1 is north of Williston Lake and includes the Adams, Aylard and Dunlevy drainges.
- Block 2 is immediately south of Williston Lake and includes the Carbon, Gething, Dowling and Johnson drainages.
- Block 3A1 is located north of Highway 97; the eastern boundary of this block is formed by the Pine River while the northern most boundary is formed by Graveyard Creek.
- Blocks 3B1 and 3B2 are the former Rice Property. The Rice Property is located east of the Pine River, north of Highway 97 and generally south of Favel's Creek.
- Block 4 is southwest of Chetwynd and includes the Lemoray, Falling, Hasler, Burnt, Brazion and Highhat drainages.
- Block 5 includes the Wolverine drainage and is bounded to the south by the Murray River.

The main neighboring communities of the TFL include Hudson's Hope, Chetwynd and Tumbler Ridge. The attached map (Figure 1) shows the area covered.

B. DEFINED GOALS

The TFL #48 Public Advisory Committee (PAC) is to ensure that sustainable forest 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 decisions. The PAC will represent the diverse range of interests in the Defined Forest Area (DFA) and will have opportunities to work with Canfor and BCTS to:

a) Identify and select values, objectives, indicators, and targets, based on the CSA SFM elements and any other elements of relevance to the DFA;
b) Develop alternative strategies to be assessed
c) Assess alternative strategies and select the preferred one
d) Review the SFM plan
e) Design monitoring programs, evaluate results, and recommend improvements; and
f) Discuss and resolve any issues relevant to SFM on the DFA

Canfor and BCTS and the PAC shall ensure that the values, objectives, indicators, and targets are consistent with relevant government legislation, regulations and policies.

C. OPERATING RULES

1) Ground rules / conduct

The PAC and its members agree to work by the following ground rules:

a) Show mutual respect for all members
b) Minutes to be kept and members to review draft minutes
c) Members to participate in all meeting discussions not only those related to their specific interest area (see Section G)

2) Meeting agenda and dates
   a) Meeting agenda's:
      i) input on upcoming meeting agendas will be obtained during each PAC meeting
      ii) Canfor and BCTS will finalize and distribute meeting agenda
      iii) Time will allocated on each meeting agenda for public presentations, if desired

   b) Generally at least 2 meetings will be held annually in order to:
      i) Review annual performance (including reports and audit results)
      ii) Seek input as related to values, objectives, indicators and targets (see Section B-a)
      iii) additional meeting(s) may be called as seen necessary

   c) meeting dates
      i) will be confirmed jointly between Canfor and BCTS and the PAC
   d) Meeting notices
      i) at least one months advance notice of meeting dates will be given
      ii) Canfor and/or BCTS will make telephone calls to remind members of upcoming meetings

   e) Meeting Location

i) Meetings will be held at a time and place most suitable to the members of the committee, and may vary time or place to satisfy members requirements
ii) Potential sites are:
Seniors' Hall (preferred neutral site)
Canfor office

g) Material, if available, will be provided for review in advance of meetings.

h) Name
The name is: TFL #48 Public Advisory Committee (PAC).

D. TIMELINES

The following summarizes the general timeline for the PAC meetings:

a) Spring meeting to review the annual performance and finalize any input as related to values, objectives, indicators and targets (see Section B- a)
b) Fall meeting to begin review and update values, objectives, indicators and target (see Section B-a). and review audit results

E. COMMUNICATION

1) Internal to PAC
   a) Canfor and BCTS will ensure meeting minutes are distributed following each meeting

2) External
   a) An update will be included in the TFL Annual Report, which is available to those interested.
   b) A brief summary report may be circulated to the local papers following each PAC meeting. Future meeting dates to be announced.
   c) No member of the Advisory Committee is authorized to speak on behalf of the public group unless agreed to by the group, Canfor and BCTS.
   d) When communicating with the media, interest groups or the public at large, specific comments will not be attributed to any individual Advisory Group member without his/her prior consent.
   e) If Advisory Committee member wishes to respond to media, they are to speak on behalf of the interest group they represent only and:
      i) will be respectful of other members or interest groups;
      ii) will not characterize the suggestion or positions of other members or interest groups in their discussions with the public or media.
   f) Members are expected to report back to their interest areas while being respectful of other members

3) Internal to both Canfor and BCTS

a) Input from the PAC will be reported at internal forestry or Woodlands meetings.
b) For Canfor, Implementation reports and updates will reported semi annually to the Regional Forest Management System (FMS) meetings, or quicker if required
c) Feedback from both Canfor and BCTS's FMS/EMS committee on PAC recommendations will be reported to the PAC.

4) General Communication with the Public
a) Canfor and BCTS will provide access to information about the DFA and the SFM requirements
b) Canfor and BCTS will provide information to a broader public about the DFA, PAC and the progress being made related to CSA certification

F. MEETING EXPENSES AND LOGISTICS

1) Meeting Expenses
a) On request, travel costs to meetings will be reimbursed at $0.455/km.
b) If required, accommodation for members who must travel in excess of 1 hour for meetings will be covered.
c) Expense forms for the above need to be submitted to Canfor for reimbursement.

G. ROLES AND RESPONSIBILITIES RELATED to the PAC

1) Public Advisory Committee:
a) The membership will provide opportunity for representation from each of the following:
i) communities
ii) environmental
iii) forest worker
iv) independent forest operator
v) oil/gas
vi) recreation (hunting, fishing)
vii) Saulteau First Nation
viii) Trapping/guide outfitting
ix) West Moberly First Nation
x) McLeod Lake Indian Band

b) In addition to the above members, advisors from the following may assist the committee
BC Timber Sales
Canfor
Louisiana Pacific

Ministry of Energy, Mines and Petroleum Resources
Ministry of Forests and Range – Field Services
Ministry of Agriculture and Lands – Integrated Land Management Bureau
Ministry of Environment
Northern Lights College
Tembec

And others as considered relevant.

c) Selection of Members
   i) when replacement are required, the departing member or the PAC may recommend names to Canfor and BCTS
   ii) based on these recommendations and those identified by Canfor and BCTS, Canfor and BCTS will recruit a replacement member
   iii) to replace a member, the current member may nominate a potential person for that interest. The PAC may also submit a name.
   iv) Canfor and BCTS will confirm appointment
   v) A review of actual membership will take place biannually when the Terms of Reference are reviewed.

2) PAC Member's Role
   a) To provide input as related to the Defined Goals (see above)
   b) To attend meetings regularly.
   c) To identify a potential conflict of interest that could result in direct personal benefit, as related to the potential recommendations of the PAC. Based on this information, the PAC may ask the member to move to the role of Observer for the related meeting(s), step down as a member or continue with the normal progress of the meeting.
   d) Members may be replaced if more than 2 consecutive meetings are missed by the member and the alternate, without a valid reason.
   e) Members are responsible for reaching consensus and decision making for the PAC.
   f) Members may appoint alternates to attend on their behalf and are responsible for briefing alternates prior to meetings
   g) If a member and alternate miss two consecutive meetings, they will be considered inactive

3) Use of Alternates
   a) Alternates may be nominated by members and to be approved by Canfor and BCTS
   b) Alternates are guided by the Terms of Reference and will act as members when the member cannot attend
   c) Alternates to be briefed by member prior to meeting
   d) Alternates are encouraged to attend PAC meetings as observers even if member is in attendance

4) Observers Role
    a) Public are welcome to observe the PAC meetings
    b) Observers may participate in discussions or make presentations only with agreement by the committee or facilitator.

5) Canfor and BCTS's Role
    a) To review and consider the recommendations from the PAC
    b) To make decisions regarding sustainable forest management and certification
    c) To report to PAC on how recommendations were addressed and demonstrate that all input is considered and responses are provided
    d) To provide the necessary and reasonable resources (including human, physical, financial, information and technological)
    e) Will not take part in reaching consensus or decision-making of the PAC

6) Advisor's Role
    a) To provide information and support to the PAC committee
    b) To clarify technical information for the PAC committee
    c) Will not take part in reaching consensus or decision-making of the PAC

7) Facilitator's Role
    a) To ensure that meetings address agenda topics
    b) To ensure that all members have an equitable opportunity to participate in the meeting
    c) To provide support in summarizing and clarifying issues, recommendations, etc.
    d) Will not take part in reaching consensus or decision-making of the PAC

H. DECISION MAKING AND METHODOLOGY

1) The committee agrees to work by consensus defined as:
    a) Every effort shall be made to achieve consensus
    b) Consensus is defined as no member having substantial disagreement on an issue.
    c) Consensus may consist of agreement on a summary of the different perspectives on an issue
    d) Decisions on specific issues will be considered interim consensus, unless agreed otherwise, until there is consensus on the full set of recommendations
    e) Consensus recommendations will require a quorum of active members
    f) Quorum is defined to be over 50% of active members

I. DISPUTE RESOLUTION MECHANISM

1) Process Issues
    a) Process issues will be resolved by the facilitator

2) Technical Issues
   a) The members will work to identify the underlying issues and work towards a solution in a positive friendly environment
   b) The members will seek compromise, alternatives and clarification of information needed
   c) The members will commit to arriving at the best solution possible.
   d) If no consensus solution can be reached, then the outstanding issues will be summarized and forwarded to Canfor and BCTS for their consideration

K. REVIEW OF AND REVISIONS TO TERMS OF REFERENCE

The Terms of Reference will be reviewed bi-annually after adoption or earlier based on consensus of the committee to review. The approval and revisions of the Terms of Reference requires the approval of the Public Advisory Committee and Canfor and BCTS.

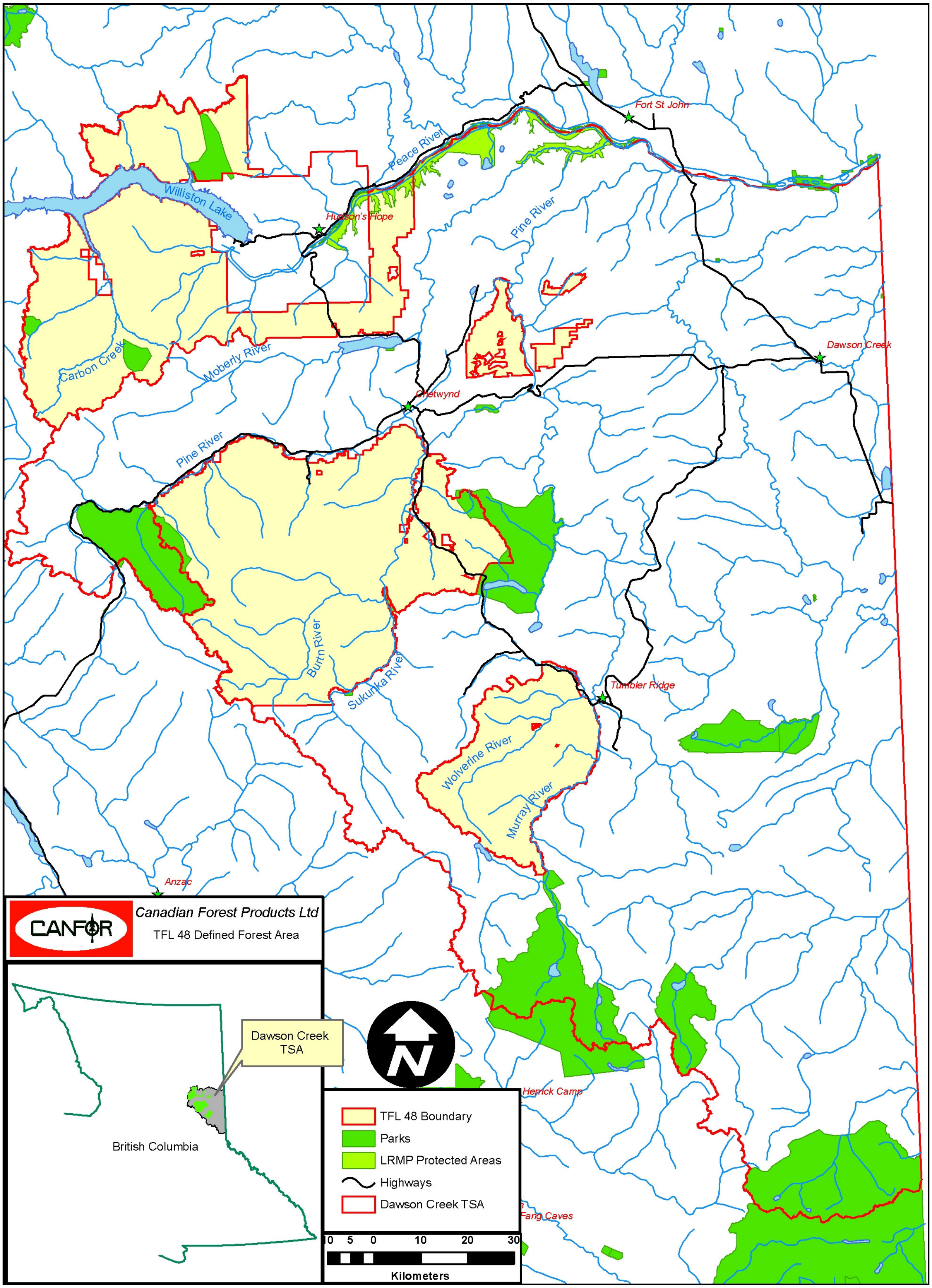

Figure 1 TFL #48 Defined Forest Area

Appendix 4 – Cross-Reference of MoFR and CSA Requirements

Cross Reference Table of MoFR and CSA Requirements

This Sustainable Forest Management Plan was written to meet both the TFL 48 document section 2.27 and the Canadian Standards Association (CSA) standard for sustainable forest management (CAN/CSA-Z809-02).

In general this plan follows the guidelines provided by the MoFR. However there was substantial overlap between some of the Ministry's guidelines and the CSA standard. The following table provides a cross-reference between the requirements outlined in the TFL 48 Document and this SFMP 4 document.

TFL Document Requirement	SFMP 4 Cross-Reference		Page
Planning (2.27(c))			
Detail strategies or objectives pertaining to TFL Management	2	Sustainable Forest Management	7
List other approved plans, direction from government agencies	2.4 2.4.1 2.4.2	Existing Strategic Plans Dawson Creek Land and Resource Management Plan Dunlevy Creek Management Plan	11 11 12
Resource Inventories (2.27(d),(e))			
Vegetation Resource Recreation Visual Landscape Terrain Physical Operability Fish and Fish Habitat Cultural Heritage Wildlife and Wildlife Habitat	2.7	Resource Inventories	16
Management Objectives (2.27(f),(g))			
Management and Utilization of the Timber Resources	4.1	Management and Utilization of Timber Resources	145
Harvesting Methods	3.2 3.41 3.39	Forest Types Harvest Method Harvest Levels/Volumes	27 125 122
Utilization Specifications	3.40	Waste	124
Proposed AAC	3.22	Allowable Annual Cut	88
Integration with BCTS	2.3.1	BC Timber Sales	10

TFL Document Requirement	SFMP 4 Cross-Reference		Page
Protection and conservation of non-timber values and resources	4.2	Protection and Conservation of Non-timber Values and Resources	146
Visual Quality	3.36	Proportion of Harvesting Consistent with Visual Quality Objective	116
Biological Diversity	3.1	Ecosystem Representation	23
	3.2	Forest Types	27
	3.3	Late Seral Forest	30
	3.4	Patch Size Distribution	37
	3.5	Snags/Live Tree Retention	41
	3.7	Average Minimum Width of RRZ and RMZ	48
	3.9	Wildlife Tree Patches	53
	3.10	Habitat Supply for Species of Public Concern	55
	3.11	Species of Management Concern	60
Soils	3.23	Soil Degradation	92
	3.24	Soil Disturbance Surveys	93
Water	3.26	Spills Entering Water bodies	95
	3.27	Stream Crossing Quality Index	96
	3.29	Peak Flow Index	101
Recreation Resources	3.37	Back Country Condition	117
	3.38	Recreational Sites	121
Cultural Heritage Resources	3.46	Known Values and Uses Addressed in Operational Planning	132
Range Land	3.34	Range Opportunities	112
Fish and Wildlife Habitat	3.7	Average Minimum Width of RRZ and RMZ	48
	3.10	Habitat Supply for Species of Public Concern	55
	3.11	Species of Management Concern	60
	3.15	Wildlife Habitat Areas, Ungulate Winter Ranges and Dunlevy Creek Management Plan	67
Integration of harvesting activities with non-timber uses	4.3	Integration of Harvesting Activities with Non-timber Uses	147
Trappers and Guide Outfitters	3.10	Habitat Supply for Species of Public Concern	55
	3.45	Consistency with Third Party Action Plans	131
	3.49	Public Advisory Committee	136
Range Tenure Holders	3.34	Range Opportunities	112
	3.45	Consistency with Third Party Action Plans	131
	3.49	Public Advisory Committee	136
Other Licensed Resource Users	2.3.3	Other Industrial Users (Oil and Gas, Mining, etc)	11
	3.33	Area of Forested Land	111
	3.45	Consistency with Third Party Action Plans	131
	3.49	Public Advisory Committee	136

TFL Document Requirement	SFMP 4 Cross-Reference	Page
Aboriginal People	3.46 Known Values and Uses Addressed in Operational Planning 3.49 Public Advisory Committee	132 136
Forest Fire	4.4 Forest Fire 3.16 Forest Health 3.17 Proportion of Completed Forest Health Action Plans	148 70 79
Forest Health	4.5 Forest Health 3.16 Forest Health 3.17 Proportion of Completed Forest Health Action Plans	148 70 79
Silviculture	4.6 Silviculture	149
Basic Silviculture	3.2 Forest Types 3.12 Coniferous Seeds 3.13 Deciduous Seeds and Vegetative Material 3.18 Regeneration Declaration 3.19 Free Growing Stands	27 62 63 80 82
Pre-82 Backlog	4.6.1 Pre-82 Backlog 1.3.1 Pre-1982 Backlog NSR	149 4
Roads	4.7 Roads 3.20 Permanent Access Corridors	150 84
Consultation with Other Resource Users (2.27 (h))		
Trappers, Guide Outfitters, Range Tenure Holders	2.3.4 Chetwynd Public Advisory Committee 3.49 Public Advisory Committee 3.50 Public Advisory Committee Terms of Reference 3.52 Response to Public Inquires 3.53 Distribution/Access to SFM Plan, Annual Reports and Audit Results 6 Public Review of SFMP 4	11 136 137 139 141 155
Other Licensed Resource Holders	2.3.4 Chetwynd Public Advisory Committee 2.3.2 Other Forest Tenure Holders 2.3.3 Other Industrial Users (Oil and Gas, Mining, etc) 3.49 Public Advisory Committee 3.50 Public Advisory Committee Terms of Reference 3.52 Response to Public Inquires 3.53 Distribution/Access to SFM Plan, Annual Reports and Audit Results 6 Public Review of SFMP 4	11 10 11 136 137 139 141 155
Aboriginal People	2.3.4 Chetwynd Public Advisory Committee 3.49 Public Advisory Committee 3.50 Public Advisory Committee Terms of Reference 3.52 Response to Public Inquires 3.53 Distribution/Access to SFM Plan, Annual Reports and Audit Results 6 Public Review of SFMP 4 6.4 First Nations	11 136 137 139 141 155 156

TFL Document Requirement	SFMP 4 Cross-Reference	Page
Impact Summary of MP Implementation (2.27(j))	5.3 Impact and Summary of Implementing SFMP 4	153
Similarities and Differences between MP's (2.227(k))	5.1 Comparison between MP 3 and SFMP 4 5.2 Impact Summary of Implementing MP 3	151 152

Appendix 5 – Timber Supply Analysis Information Package

BRITISH COLUMBIA

File: 12850-20/48

April 25, 2006

Don Rosen
Inventory Specialist, Chetwynd
Canadian Forest Products Ltd.
4700 - 50 th Street
P.O. Box 180
Chetwynd, BC
V0C 1J0

Dear Don Rosen:

Re: Information Package for Tree Farm Licence (TFL) 48

Thank you for your revised Timber Supply Analysis Information Package (IP) in support of Sustainable Forest Management Plan 4 for TFL 48 (version 2.1 dated March, 2006) submitted March 17, 2006. I have extensively reviewed the document along with Ministry of Forests and Range (MoFR) Region staff, MoFR District staff, and Integrated Land Management Bureau specialists.

The current version of the document still contains inconsistencies that have been discussed with you and the consulting timber supply analyst responsible for preparing the IP. As the MoFR timber supply analyst responsible for reviewing this IP, I accept the document for use in the timber supply analysis for TFL 48 conditional to the notes on the attached pages.

Ministry of Forests and Range
Forest Analysis and Inventory Branch
Location: 1st Floor, 1520 Blanshard Street Victoria BC
Mailing Address: PO Box 9512 Stn Prov Govt Victoria BC V8W 9C3
Tel: (250) 356-5947
Fax: (250) 953-3838

Don Rosen
Inventory Specialist, Chetwynd
Canadian Forest Products Ltd.

I wish to point out that this letter does not mean that the MoFR endorses every aspect of this analysis. During the AAC determination information session, MoFR staff will advise the deputy chief forester regarding the technical validity of the analysis and the implications of its assumptions and results. The deputy chief forester will consider this advice as he develops the rationale for his determination of the AAC for TFL 48.

Sincerely,

G. Nienaber

Gordon Nienaber, RPF
Timber Supply Analyst
Forest Analysis and Inventory Branch

cc: Winn Hays-Byl, Ops. Manager-Stewardship\CSM
MoFR - Peace District

Robert Schuetz
Industrial Forest Service
1595 Fifth Avenue
Prince George, BC
V2L 3L9

Bud Koch, Senior Analysts – TFL
MoFR - Forest Analysis and Inventory Branch

Don Rosen
Inventory Specialist, Chetwynd
Canadian Forest Products Ltd.

Notes and Conditions on Acceptance of Information Package for Sustainable Forest Management Plan 4 - Tree Farm Licence 48

The following are items that must be addressed before the Information Package may be used as the basis for timber supply analysis.

Visual Quality Management
- implement changes agreed to in email dated April 12, 2006
- inputs as proposed are correct but changes are necessary to make this clear

Old Growth Order
- remove NDU/BEC representation constraints presented in Table 51
- implement constraints as set in the legislated Provincial Old Growth Order - provide a sensitivity showing impact of removing Old Growth Order constraints

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TREE FARM LICENCE # 48

Timber Supply Analysis
Information Package
in Support of
Sustainable Forest
Management Plan 4

August 2006

Version 2.3

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CANADIAN FOREST PRODUCTS LTD.
CHETWYND OPERATION

TREE FARM LICENCE # 48

Timber Supply Analysis
Information Package
in Support of
Sustainable Forest Management Plan 4

August 2006

Version 2.3

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1.0 INTRODUCTION

This Information Package was prepared to fulfill the timber supply analysis requirements in support of Management Plan (MP) 4. The format follows the Ministry of Forest's *Provincial Guide for the Submission of Timber Supply Analysis Information Packages for Tree Farm Licences* Version 3, February 1998; and the Supplemental Guide for Preparing Timber Supply Analysis Data Packages June 2003. This document contains the assumptions and modeling procedures that will be used in the timber supply analysis for Tree Farm Licence (TFL) #48

The purpose of the Timber Supply Analysis Information Package (IP) is:

- To provide a detailed account of the factors related to timber supply that the Chief Forester must consider under Section 8 of the Forest Act when determining an allowable annual cut (AAC), and how these are applied in the timber supply analysis;
- To provide a means for communication between licensee, Forest Service and BC Environment staff;
- To provide Forest Service staff the opportunity to review data and information that will be used in the timber supply analysis before it is initiated;
- To ensure that all relevant information is accounted for in the analysis, to a standard acceptable to Forest Service staff;
- To reduce the risk of having analyzes rejected because input assumptions and analysis methods were not agreed upon in advance.

Forest management in TFL # 48 involves both coniferous forest types and deciduous forest types. Management planning of both coniferous and deciduous stands will be completed by Canfor. In this analysis, both the coniferous and deciduous land bases will be analyzed and managed as one complex unit, albeit with different management assumptions and harvest forecasts. A separate harvest forecast will be determined for both the coniferous-leading stands within the TFL, and the deciduous-leading stands within the TFL.

2.0 PROCESS

The management plan process involves some key dates and deadlines in order to keep the process on track. Key dates are as follows:

- **October 15, 2005** - Draft Information Package submission to Bud Koch, RPF, MOF Branch
- **February 21, 2006** – MOF responds to the IP.
- **March 17, 2006** - A revised IP is delivered to the MOF.
- **Aril 25, 2006** – MOF provides a conditional approval letter
- **August, 2006**- A completed timber supply analysis report is delivered to the MOF.
- **__________, 2006** - The timber supply analysis is accepted by the MOF.
- **__________, 2006** - This is the deadline for submission of the proposed Management Plan. Two months after this date the proposed management plan is accepted or rejected.
- **__________, 2006** - The Chief Forester is scheduled to approve the Management Plan.

This package provides a great deal of explanation into the derivation of the input data to the timber supply model. The inventory information is accessed using an ARC-INFO GIS which was used to intersect the many coverages developed by Canfor over the terms of MP's 1, 2 and 3.

2.1 Growth and Yield

Natural stand growth and yield information, as determined through "Batch" version 6.6d of VDYP; and managed stand growth and yield information, as calculated through BatchTIPSY version 3.2b, have been submitted separately to facilitate the review process. The tables are included in Appendix A and B.

2.2 Missing Data/Uncompleted Tables

For this submission of the Information Package there are no missing tables.

3.0 TIMBER SUPPLY FORECASTS/OPTIONS/SENSITIVITY ANALYSES

The purpose of this section is to summarize the harvest forecasts that will be analyzed and provided in the timber supply analysis report for TFL # 48. The set of assumptions pertaining to each sensitivity analysis is covered in Section 11.

3.1 Base Case

The Base Case will identify the short-, medium- and long-term harvest levels based on the current level of integrated resource management, harvesting and silviculture performance. Assumptions include current directions from the Dawson Creek Forest District Manager and the TFL48 Public Advisory Committee (PAC), related to biodiversity requirements, acceptable view-shed management, wildlife management, watersheds, patch size and riparian reserve and management zone requirements.

Changes that have occurred during the course of Management Plan 3 will be incorporated into the Base Case scenario for Sustainable Forest Management Plan 4 (SFMP 4). These changes, in addition to Canfor's standard operating procedures, are detailed in the following Table 1. The harvest level associated with the Base Case analysis and most of the subsequent sensitivity scenarios will be assessed using a non-declining harvest level (the exception is the accelerated harvest scenarios). In each scenario a coniferous harvest level and a deciduous harvest level will be reported. In many cases the non-declining harvest forecast is dependent upon the most constrained period during the forecast period; this will mean that the initial harvest level can be increased to the true long-term harvest level (LTHL) some time during the planning horizon. The LTHL will be identified is the highest level that can be attained while maintaining a more or less constant growing stock. The points of greatest constraint in the harvest flow will also be shown.

Table 1: Base Case Timber Supply Analysis

Issue	Action / Comments
Utilization Standards	Natural stands and managed stands will be harvested at close utilization standards: minimum D.B.H. of 12.5 cm for pine and deciduous, 17.5 cm for spruce and balsam.
Silviculture	Species mix, densities and regeneration delay are based on current and past performance. Species mix and density model current planting practices of 1600 sph. Regeneration delay is based on performance over the last 10 years. Generally, regeneration delay has been reduced to two years or less.
Site Index	Calculated using VDYP. In two or more layered stands, the highest site index was selected.
Legislated FPC Requirement	Canfor will model the legislated requirements of the FPC following the *Provincial Guide for the Submission of Timber Supply Analysis Information Packages for Tree Farm Licences Version 3, Feb 1998 Appendix IV*. This includes RMAs and landscape unit biodiversity emphasis modeling as outlined by the MOF. Old growth biodiversity is modeled using Minimum Natural Disturbance Unit guidelines developed for the Prince George Forest Region.
Visually Sensitive Areas with established VQOs.	Canfor will model the impact of the known scenic area with established visual quality objectives (VQOs). This includes the consolidated inventory of Scenic areas completed by the MOFR in 2005 with established VQO's. Forest cover requirements for each VQO were determined using the *Procedures for Factoring Visual Resources into Timber Supply Analysis Mar* 1998.
Roads	A road management system was created for TFL # 48 during the term of MP 3. Average widths were determined via field sampling and applied to a GIS buffering routine. Existing roads, trails, seismic lines etc. have been identified in the VRI database. Future roads trails etc. will be removed by a percent reduction from all harvested stands.
Deciduous Stands	Deciduous stands will be included in both the gross and net land base. Merchantable deciduous stands across the entire TFL (not just the PA portion) will contribute to the THLB and the deciduous harvest calculation. Deciduous stands and the minor deciduous components of conifer stands are excluded from the THLB in ESSF areas, and where mixed and cable harvesting systems are required.
Wildlife Habitat	Habitat is accounted for through the land base net down for riparian reserves, inoperable areas and un-merchantable forest types. Caribou use predominately alpine and parkland habitats within the TFL and as such no additional forest cover objectives will be modeled. Ungulate winter range in the Dunlevy has been excluded from the THLB. Additional wildlife habitat values are tracked through time through the linkage between wildlife habitat ratings, BEC, site series and structure stage.
Old Growth and Early Seral	Old growth is managed through the application of forest cover constraints by Natural Disturbance Unit and sub-unit. Further, early seral and patch size distribution is handled through the development of a spatial harvest schedule for the first 8 periods (80 years) of the simulation horizon.
Streams and Lakes	Stream classifications have been completed for all 5 Blocks in the TFL. This information was used to buffer the classified streams in the TFL.
Heritage / Cultural	Known heritage and cultural sites have been identified on the TFL. These sites remain unchanged from MP#3. Areas around these sites have been buffered and removed from the THLB.
Recreation	Recreation and ROS information that was developed and utilized in MP# 3, will again be utilized in the Base Case analysis. Recreation class B1 is managed through the application of mature forest cover constraints.
Operability	A Terrain Mapping/Landslide Inventory project for the TFL was used in MP#3 to define operability constraints. This information remains unchanged for SFMP 4. A minimum economic volume/hectare will also apply to the three main operability types.

3.2 Sensitivity Analysis

Uncertainties around the data and assumptions used in the Base Case are investigated using sensitivity analysis. As well, the impact that changes to various management strategies can have on the harvest level are assessed through sensitivity analysis. Usually only one assumption is varied for each sensitivity analysis (harvest forecast). These forecasts are also used to provide input into the management direction for the TFL. Details on all scenarios are provided in Section 11.0.

Table 2: Sensitivity Analysis

Issue	Scenario # / Comments	
MP#3	2	Model old growth by Landscape Unit and BEC as per the Old Growth Order
Natural Range of Variability	3	Examine the impact of utilizing the mean level of the NRV
	4	Examine the impact of utilizing the highest level of the NRV
	5	Examine the impact of removing all biodiversity constraints
Mountain Pine Beetle	6	This scenario will examine the impact of pine mortality on the Tree Farm. Various levels of pine infestation will be tested
	7	This scenario will see an accelerated harvest level directed toward mature pine to mitigate the possible loss in volume due to the MPB
Woodlots	8	Examine the impact of including woodlots into the Base Case harvest flow
Visually Sensitive Areas	9	Examine the impact of adding recommended VQO's as a result of the new visual inventory (1999).
Future mine site	10	A spatial coverage was developed by Canfor through cooperation with the mines operating in the vicinity of TFL48. The cover identifies the future expansion of mining within the TFL. This future expansion was removed from the THLB in the land base net-down. This scenario examines the inclusion of these areas into the THLB.
SIBEC	11	A scenario was developed that adjusts the yield from post-95 managed stands to reflect yield estimates as a result of using the Site Index – Site Series by Region – SIBEC RDM Version May 2006

3.2.1 Sensitivity – MOF Standard Sensitivity Analysis

The following scenarios are standard Timber Supply Review sensitivity analyzes designed to assess the impact of uncertainties surrounding inventory, yield and management assumptions.

Table 3: Standard Sensitivity Analysis on the Base Case

Issue	Scenario #	/ Description	Comments
Harvest Flow	101	Model alternative harvest flows	Test the impact of an accelerated harvest flow and the current short-term harvest flow.
Land base	102	Model the impact of increasing the timber harvesting land base by 5%	Test impact regarding uncertainty with inventory information
	103	Model the impact of decreasing the timber harvesting land base by 5%	
Yield Estimates	104	Model the impact of increasing natural stand yields by 10%	Test implications of under or over estimating empirical stand yields
	105	Model the impact of decreasing natural stand yields by 10%	
	106	Model the impact of increasing managed stand yields by 10%	Test the implications of under or over estimating managed stand yields
	107	Model the impact of decreasing managed stand yields by 10%	
Minimum Harvest Age	108	Model the impact of reducing the minimum cutting age for natural stands by 10 years	Test implications of varying the minimum harvest age
	109	Model the impact of increasing minimum cutting age in natural stands by 10 years	
Visuals	110	Model the impact of decreasing the VQO categories by one class	Test the impact of VQO constraints in Visually Sensitive Areas
	111	Model the impact of increasing the VQO categories by one class	
Forest Cover Constraints	112	Model the impact of reducing the greenup constraint by 10 years	Test the impact of adjacency constraints
	113	Model the impact of increasing the greenup constraint by 10 years.	

Note that additional scenarios beyond those identified in Table 2 and Table 3 may also be examined depending on the analysis results.

3.3 Alternative Harvest Flows over Time

There are many possible harvest flows with different decline rates, different starting harvest levels, and potential tradeoffs between short- and long-term forecasts. One of the requirements of Section 8 of the *Forest Act* is that the Chief Forester considers the short- and long-term implications to British Columbia of alternative rates of timber harvesting from an area. Several alternative flow forecasts will be tested on the coniferous and deciduous land base to enable the Chief Forester to assess short-, medium-, and long-term tradeoffs in the Base Case analysis.

In timber supply analysis various harvest flows (short-, medium- or long-term) are sometimes possible without compromising long-term sustainable harvest flows. In this analysis the short-term harvest level will be increased to the maximum level possible. This will be followed with a decline of 10% per decade to the long-term sustainable harvest flow. Depending on the outcome of the Base Case harvest forecast, alternative rates of decline (or increase), or period prior to decline (or increase), will be explored.

Several issues must be considered in developing the Base Case harvest flow. For example, where harvest levels are declining, the rate of decline from the current harvest level should be controlled to avoid large and abrupt future harvest shortfalls and the long-term level should be stable. In MP's 2 and 3, TFL # 48 was capable of supporting a non-declining harvest flow. The AAC set for the term of Management Plan 3 was approximately that of the initial non-declining harvest flow identified as the Base Case in the timber supply analysis report. Further to Canfor's goal of managing the TFL in a sustainable manner, as well as the need to uphold sustainable forest management commitments, the Base Case harvest flow will for SFMP 4 will portray a mid and long-term non-declining harvest level. However, the short-term harvest level will be accelerated to deal with the development of a mountain pine beetle epidemic encroaching into TFL48 from the west.

4.0 MODEL

Canadian Forest Products Ltd. will use the Remsoft Spatial Planning System (Woodstock v2006.1.1, Spatial Woodstock and Stanley v5) for this timber supply analysis. The model was developed by a private company based out of Fredericton, New Brunswick. The model is used in conjunction with the linear programming optimization model MOSEK.

5.0 CURRENT FOREST COVER INVENTORY

The forest inventory conforms to Ministry of Forest's standards. The current forest cover inventory is based on a re-inventory performed by Canfor during the term of MP 2. The photography for this inventory was taken in 1993/94 for TFL Blocks 4 and 5, and in 1997 for TFL Blocks 1, 2 and 3. The inventory exists in the form of a Vegetation Resource Inventory (VRI). Phase I (the re-inventory) has been adjusted to incorporate extensive timber and ecology ground sampling (e.g. the Phase II part of a VRI). Finally, volume decay loss estimates and taper equations have been localized through a destructive sampling process referred to as "Net Volume Adjustment Factoring" (NVAF). The information gained in the process of completing Phase II and the NVAF revealed that volume estimates were generally underestimated and losses for decay were typically overestimated for many of the stands in TFL 48. This has resulted in both a net increase in the amount of area that will contribute to the timber harvesting land base, and a net increase in the merchantable volume within each stand.

The inventory information of the TFL has been updated to February 2005, to account for stand aging, harvesting and other area/volume depletions. All constructed roads are now part of the VRI and have been removed from the forested land base. Trails, seismic lines and transmission lines have been removed from the forested land base. Canfor's spatial cut-block-tracking, silviculture and road management system was used as the source for the update and accomplished through ArcInfo™ Geographic Information System (GIS) buffering routines. The results of this buffering were visually inspected on the map products.

6.0 DESCRIPTION OF LAND BASE

The information provided in this section of the Information Package follows the order described in the Provincial Guide for the Submission of Timber Supply Analysis Information Packages for Tree Farm Licences version 4 March 2001.

6.1 Timber Harvesting Land Base Determination

The purpose of Table 4 is to summarize the area reductions made to the total area of the TFL, to arrive at the land base that is available for timber harvesting. The reductions and additions are listed in the order in which they are applied. Each reduction and addition is described in more detail in the appropriate sections that follow. Note that in the term of MP #3, the gross area in the TFL has decreased. This is a result of the removal of the Rice Property fields, addition of the Stewart Lake block (TFL48 Instrument 5) and removal of new or expansion areas for Woodlots. It should be noted that the Woodlots have not formally been removed from the TFL through a legal instrument to amend the TFL.

Table 4: Timber Harvesting Land Base Determination

Classification	Gross Area (ha)	Area (ha)	% Prod. Forest
MP 3 TFL Total Area (incl. Water)		643,511	
Changes to TFL Boundary			
Removed woodlots [1]		794	
Removed "Rice Property" farm fields		1231	
Inclusion of the Stewart Block		1,753	
SFMP 4 TFL Total Area (incl. Water)		**643,239**	
Less: TFL Boundary sliver polygons [1]		112	
Water	3,104	3,104	
Mine Sites (existing and proposed)	2,236	2,236	
Existing Roads	5,567	3,830	
Non-Vegetated Land	971	949	
Vegetated Non-Treed (no disturbance history)	67,171	66,943	
Plus: Sukunka Falls Park [2]	426	330	
Potentially Productive Area		**566,394**	**100.0%**
Less: Inoperable	34,038	34,038	6.0%
NDT 5	14,942	13,765	2.4%
Forested Islands	195	141	0.0%
Wildlife Habitat - Bull Trout	86	74	0.0%
Archaeological Sites	10	10	0.0%
Protected Areas (including parks)	14,853	12,849	2.3%
Recreation	1,270	418	0.1%
Buffers: Lakeshore reserves	28	25	0.0%
Stream/River riparian buffers	31,082	27,597	4.9%
Forested Wetlands	4,001	3,558	0.6%
Forested Wetland Buffers	1,882	1,760	0.3%
Low productivity sites	72,618	55,710	9.8%
Problem Forest types	62,497	48,077	8.5%
Sukunka Falls Park [2]	426	286	0.1%
Visual preservation	723	167	0.0%
Dunlevy Ungulate Winter Range	4,480	1,983	0.4%
Rare Site Series	4,080	2,572	0.5%
Total Reductions to Productive Forest		203,029	35.8%
Net Land Base		**363,365**	**64.2%**
Split into: Coniferous THLB		314,829	55.6%
Deciduous THLB		48,536	8.6%
Less: Losses to Future Roads (1.9%)		6,609	1.2%
Future Timber Harvesting Land Base		**356,756**	**63.0%**

Notes: 1 Woodlots have not formally been removed from the TFL, however they have been approved and issued by the MoF.
2 Sliver polygons less than 0.001 hectares in size were dissolved and merged with the largest adjacent polygon. As well, 23 ha were removed having no VRI information.
3 The Sukunka Falls Park is wholly encompassed by TFL48 but is not part of the TFL tenure. Comprising a total of 425 ha this park has been included in the Productive Forest Land Base for biodiversity purposes and then excluded from contributing to the THLB.

6.2 Total Area

The total management area of Tree Farm License # 48, but after reductions for private lands and woodlots that exist within the confines of the TFL is 643,239 hectares. The TFL boundary has changed from the area reported in MP 3, primarily due to the creation of new woodlots, and the addition of the Stewart block in exchange for the removal of the field portion of the Rice Property.

6.3 Non-Vegetated

Non-forest descriptors in the VRI can be broken into two land cover types: non-vegetated land and water.

6.3.1 Water

Water was identified on the VRI file for TFL #48 using BC land classification level 2 (i.e., BCLCS_LEVEL_2). The distribution of water resources relative to BCLCS_LEVEL_5 is shown in Table 5.

Table 5: Non-Vegetated Water

Description	Total Area (ha)
Lakes	1,231
Rivers	1,817
Reservoirs	56
Total	3,104

(BCLCS_LEVEL_5 where level 2 = “W”)

6.3.2 Non-Vegetated Land

Non-vegetated land includes areas in the alpine, uplands and wetlands. The area can be further classified as: snow/ice, rock/rubble and exposed land. The area for these items is described in the TFL vegetation resource inventory file. Details are provided in Table 6.

Table 6: Non-Vegetated Land

Cover Type	Landscape Position	Total Area (ha)
Rock	Upland	775
	Alpine	174
Total		949

Where BCLCS_level_4 = RO

6.4 Roads

Existing roads occur on the inventory files as polygons. During the term of MP#3 roads were classified and buffered based upon average measured widths. The roads occur on the inventory file as non-vegetated land. A total of 3,830 hectares are removed from the productive forest land base area for existing roads.

6.4.1 Classified roads

Roads which have a right-of-way identified on the inventory file by a break in the VRI polygons are identified on the file as “RP” in the non-veg table of the VRI database. Having a non-veg cover type of “RP” being greater than 15% identified the polygons selected for removal from the THLB. These same polygons may have been classified as shrub, herb or some other vegetation type depending on the vegetation contained within the polygon. Typically, paved highways, paved secondary roads, gravel secondary roads and main line roads should have had sufficient width to be typed out in the VRI. During the VRI update completed in February 2005 all roads were buffered by their average width based on road class and included in the VRI as a polygon with the BCLCS Level 4 = “RP”. During the term of MP3 Canfor developed a process of tracking all oil and gas activities on TFL 48. These activities have been included in the VRI update described for roads. Included in this classification are all oil and gas well sites, camps, sumps, road access and borrow pits. From Table 7 we see a total of 3,830 hectares have been classified in this manner.

Table 7: Existing Classified Roads

BCLCS LEVEL 1	BCLCS LEVEL 4	Total Area(ha)
Non-vegetated (N)	Road Surface (RP)	2,654
	Exposed Land (EL)	1,176
	Total	3,830

Note: Included in the net-down for existing classified roads is area lost to exiting well sites.

The “classification” of roads does not infer classification of road ownership but rather that the road has been identified, the right-of-way has been buffered and the road now exists as a polygon on the inventory file.

6.4.2 Existing Unclassified roads

There are no existing unclassified roads within the TFL. During the term of MP 2, Canfor completed a comprehensive road inventory. During MP3, the roads in this inventory were buffered for their average width. A road inventory management process keeps the TFL’s inventory updated for new road construction.

6.5 Mine Sites

Mining is a significant resource activity within the boundary of TFL 48. Mine sites have been identified in this analysis and excluded from the productive forest land base. This exclusion has occurred because it is difficult to predict the timing and extent of land denudation. As well, how much reclamation will occur and over what time period is unknown. Canfor could assume that when this reclamation occurs, many of these areas will contribute to the productive forest land base and provide an upwards pressure on the long term harvest level. However, for the purpose of this analysis no area has been added back to the forested land base due to current or future reclamation activities. Table 8 describes the TFL area exclude from the productive forest land base due to mining claims.

Table 8: Reduction for Mining

Mine Classification	Land Status (BCLCS_LEVEL_2)	Total Area (ha - including mine roads)
Existing	Treed	98
	Non-treed / land	1,625
Proposed	Treed	479
	Non-treed / land	34
	Total	2,236

Mine locations were intersected into the TFL database

6.6 Vegetated Non-Treed

Vegetated non-treed areas were often classified as NCBr in traditional forest cover inventories. These areas have been classified according to their position in the landscape, i.e., wetland, upland or alpine. If disturbance history exists in the upland or wetland areas, it is assumed that the area exists as backlog NSR resulting from a burn, or from logging. In these instances (i.e., when disturbance history exists for these polygons), the area was not netted out. If disturbance history does not exist, the area was netted out of the potentially productive land base. A breakdown of vegetated non-treed area is shown in Table 9. Further discussion on backlog NSR is provided in Section 8.7.2.

Table 9: Vegetated Non-Treed

Landscape Position [1]	Cover Type	Total Area (ha)
Wetland	Shrub tall	431.5
	Shrub low	543.2
	Herb	901.2
	Bryoid	7.3
Upland	Shrub tall	12,915.7
	Shrub low	12,892.1
	Herb	22,915.8
	Bryoid	2,569.9
Alpine	Shrub tall	76.0
	Shrub low	4,968.1
	Herb	7,295.8
	Bryoid	1,553.9
Total Vegetated Non-Treed		67,070.5
Add-back Upland [2]	Shrub low	127.6
Total Vegetated Non-Treed Reduction		66,942.9

1 BCLCS_LEVEL_1 = V, BCLCS_LEVEL_2 = N

2 Area in the uplands with disturbance history (BCLCS_LEVEL_5 = SP) was added back to the productive forest land base

6.7 Inoperable

Over the term of MP 2, Canfor completed a terrain inventory and landslide inventory, as well as slope stability and operability interpretations for TFL # 48. This has been completed using Terrain, BEC variant mapping, landslide inventory and slope to predict terrain stability and operability. Using a combination of slope and terrain stability, all areas of the TFL were classified as conventional harvest systems, mixed harvest systems, cable harvest systems, aerial harvest systems and inoperable. The area in the newly acquired Stewart block did not have this work completed. Conventional Dawson Creek TSA operability mapping was used to define conventional, cable and inoperable areas. The coniferous leading inoperable, which includes aerial areas identified in the Operability interpretations have been excluded from the THLB. As well, the deciduous stands existing on mixed and cable ground have been excluded from harvesting. Table 10 and Table 11 describe physical operability within the TFL by slope class and harvest system.

Table 10: Physical Operability by Slope Class and Harvest System

Physical Operability Class		Slope / Area by Harvest System											
		0-10%		10-45%		45-70%		70-80%		80-100%		100%+	
Stability Index	Stable	124,226	Conv	249,776	Conv	218	Cable						
	Moderately Stable			703,02	Conv	3,862	Cable						
	Quasi-stable			508,83	Mix	34,087	Cable	131	Inop	8	Inop		
	Lower Threshold			21,220	Cable	43,300	Cable	8,902	Inop	3,685	Inop	15	Inop
	Upper Threshold			4,647	Inop.	8,033	Inop	2,968	Inop	2,791	Inop	1,539	Inop
	Defended			2,271	Inop	4,411	Inop	1,964	Inop	2,925	Inop	1,412	Inop
Totals		124,226		399,099		93,911		13,965		9,409		2,965	
		643,575											

Table 11: Physical Operability Classes by Net Area

Operability	Forest Area (ha)	Excluded Forest (ha) [1]	THLB (ha)
Conventional	415,123	114,165	300,958
Mixed	29,631	7,246	22,385
Cable	82,937	46,573	36,364
Aerial	5,928	**5,928**	0
Inoperable	28,111	**28,111**	0
Total	561,729	202,022	359,707

1. The bolded numbers in the excluded column refers to the total area (34,038ha) excluded in the net down table. Other numbers under excluded forest refer to area removed for reasons other than operability.

In this analysis, a net-down was not applied to areas having a conventional, mixed or cable operability classification. A net down of the THLB was applied to all coniferous-leading areas identified as aerial or inoperable. In addition, since it is not current practice to harvest deciduous-leading species from mixed, aerial or cable ground, or from the ESSF, the deciduous-leading stands occurring within these locations have also been excluded from the THLB.

6.8 Non-commercial

Non-commercial cover or NC is not identified on the VRI as a polygon attribute.

6.9 Low Productivity Sites Identified for Immature Stands

Table 12 documents the immature area that is not suitable for harvest due to its poor timber growing potential. A site index is the height of a stand measured at breast height age 50 (mbha50). The site indices indicated in Table 10 reflect the minimum site index required for a stand to reach 120 m3/ha at maturity on conventional ground. Similarly, a minimum stand volume of 150 m3/ha and 200 m3/ha is required for mixed and cable ground respectively. The site indices calculated in Table 12 were derived from VDYP. A 50% crown closure was assumed for coniferous timber types and a 60 % crown closure for deciduous. The stands were assumed to reach maturity at the regional priority cutting age (i.e., 101 for Pl, 141 for Sw, 121 for Bl and 81 for At and Cot).

The Ministry of Forests requested that Canfor monitor the harvesting performance in deciduous leading stands, which are currently classified as having a low timber growing potential. However, as a result of the deciduous manufacturing facility being closed for a significant period of time during MP#3 there was no harvesting of deciduous leading stands. With re-opening of this facility and the addition of other deciduous manufacturing capacity in the Peace an increase in the demand for deciduous is anticipated. Due to the lack of new information the site index limits have remained unchanged from MP#3.

Table 12: Low Site Index applied to Immature Stands

Timber Types	Site Index Upper Limit of Exclusion by Operability Type			Forest Area (ha)	Net Reduction Area (ha)
	Conventional	Mixed	Cable		
Balsam	9.6	10.9	13.0	37,645	25,447
Spruce	7.5	8.5	12.0	11,504	9,393
Pine	10.4	11.7	14.1	10,605	9,090
Aspen	16.1	0	0	11,029	10,137
Cottonwood	12.4	0	0	1,835	1,643
			Totals	72,618	55,710

6.10 Environmentally Sensitive Areas

Environmentally sensitive areas (ESAs) are no longer identified in Vegetation Resource Inventories. Area management concerns for steep slopes, soils, recreation, visual quality, and wildlife must now be addressed through other land base net downs. Some of these net downs include inventories which were accumulated by Canfor and are specific to resource management objectives other than timber management (e.g., recreation). Specific wildlife habitat areas are now being modeled, operability information is extensive and addresses steep slopes, soils, and physical operability concerns. Visual information is accounted for along with recreation net downs.

6.11 Riparian Reserves and Management Zones - Streams and Rivers

Since 1995, Canfor has conducted 1:20,000 RIC standard fish and fish habitat inventories throughout the TFL. Over the term of MP#3, this detailed modeling exercise has been completed for the entire TFL.

A Stream Classification Tool (SCT)(Hatfield and Ecometrics 2000 [1]) was designed to predict stream classes for all reaches in TFL 48. The best fit model used a 20% average reach gradient barrier to upstream fish migration, no fish bearing streams higher than 1300 m in elevation and no fish upstream of a confirmed barrier.

The SCT predicted stream class for more than 30,000 reaches. For the purposes of analysis we established the amount of merchantable volume left in the total Riparian Management Area (RMA). To do this we had to develop a total Riparian Management Area width applied to streams. Riparian Reserve Zone (RRZ) widths were applied as per the Operations Planning Regulations of the Forest Practices Code (e.g., S3 = 20m). Variable retention of merchantable timber left in the RMZs was based on SPs occurring within the TFL and harvested over the past 5 years.

Management Zone widths were applied using the same methodology as for RRZs. *The legislated RMZ width was factored for a percent retention by stream class, as derived from summarizing the prescribed retention in silviculture prescriptions from 2000 to 2003 (See the TFL48 SFMP Sec 3.7 for additional information). The area was then removed from the timber harvesting land base.* The results of the reductions for RRZ and RMZ are shown in Table 13.

Table 13: Riparian reserve and management zones around rivers/streams

Riparian Stream Class	Average Channel Width (m)	Stream Length (m)	FPC Act Reserve Zone Width (m)	FPC Act Mgmt Zone Width (m)	Net Width of Area Buffered (m) (1)	Total Buffered Area (ha)	Net Reduction Area
S1	>20 & < 100	145,016	50.0	20	56.1	31,082	27,597
S2	> 5 & ≤ 20	65,095	30.0	20	46.9		
S3	≥ 1.5 & ≤ 5	1,763,049	20.0	20	60.8		
S4	< 1.5	2,136,642	0.0	30	3.4		
S5	> 3	1,484,134	0.0	30	23.2		
S6	≤3	8,001,367	0.0	20	3.1		
Total		13,595,303					

(1) For TFL Blocks this is the weighted average reserve width of the stream to one side. Buffers were applied to both sides of every stream or river. Streams in the At BEC were not buffered as these areas were already removed from the THLB.

[1] Citation: Hatfield and Ecometrics. 2000. Stream Classification Tool, TFL 48. Prepared for Canadian Forest Products Ltd., Chetwynd. By Hatfield Consultants and Ecometrics Research, West Vancouver, BC. 13pp

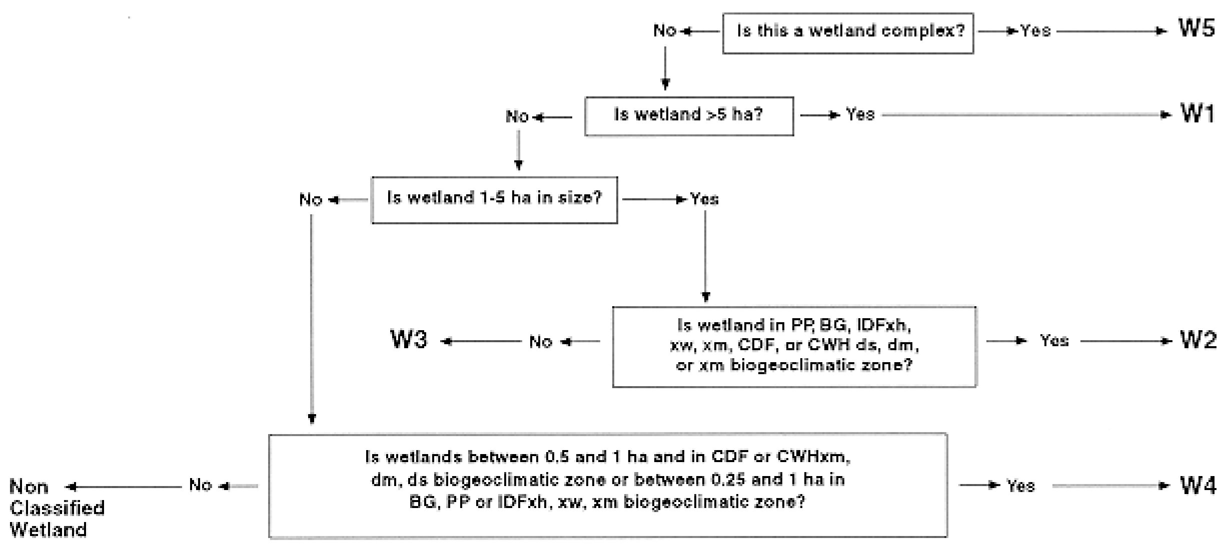
6.11.1 Forested Islands

Islands that exist primarily within the Sukunka River are often sufficiently large enough that riparian reserves did not capture all of the forest area within the island. Since it is unlikely that Canfor will harvest these areas in the foreseeable future, they were removed from the THLB via a visual inspection of maps of the TFL. The mapsheet polygon numbers were identified and used in the TFL net-down. A gross area of 195 hectares was identified as islands. Net within islands is 141 hectares that would otherwise have contributed to the THLB.

6.12 Riparian Reserves - Lakes and Wetlands

Lake riparian reserves were classified according to their size in the VRI. Thirty meter riparian reserves were placed around all lakes having a size between 5 and 1000 hectares.

Wetland classifications were determined using a GIS. Complex wetlands were calculated by buffering wetland polygons to determine which wetlands were within the proximity of others. The logic used to complete this buffer was derived using Figure 12 of the Riparian Management Plan Guidebook as shown below.



Wetlands have a management zone around them of varying widths and stem retention.

were defined as vegetated, treed, wetland polygons and vegetated, non-treed, wetland sites and a 10 meter reserve was placed around them. Complex wetlands are a relatively minor occurrence within the TFL as a result of the moderate to steep slopes. Due to the small area affected and the complexity of identifying and excluding these areas, wetland complex classifications have not been identified in this analysis. Sensitivity analysis may be used to examine the potential impact of addressing management concerns within these areas.

Table 14 describes the area removed from the timber harvesting land base for lakes and wetlands.

Table 14: Riparian reserve zones around lakes and wetlands

<table>
<tr><th rowspan="2">Riparian Class</th><th rowspan="2">Gross Area</th><th colspan="2">Riparian Reserve Zone</th><th colspan="3">Riparian Management Zone [3]</th><th rowspan="2">Total Buffer Width [3] (m)</th><th rowspan="2">Gross Area Reserved (ha)</th><th rowspan="2">Net Area Reduction (ha)</th></tr>
<tr><th>Width (m)</th><th>% Retention</th><th>Width (m)</th><th>% Retention</th><th>Equivalent Distance Retention</th></tr>
<tr><td>Lakes [1]</td><td></td><td>30</td><td>100</td><td>70</td><td>0</td><td>0</td><td>30</td><td>28</td><td>25</td></tr>
<tr><td>W1 [2]</td><td>2093</td><td>10</td><td>100</td><td>40</td><td>40</td><td>16</td><td>26</td><td rowspan="3">1,882</td><td rowspan="3">1,760</td></tr>
<tr><td>W3</td><td>825</td><td>0</td><td>0</td><td>30</td><td>40</td><td>12</td><td>12</td></tr>
<tr><td>W5</td><td>2584</td><td>10</td><td>100</td><td>40</td><td>30</td><td>12</td><td>22</td></tr>
<tr><td>Forest Wetlands</td><td></td><td></td><td></td><td></td><td></td><td>n/a</td><td></td><td>4,001</td><td>3,558</td></tr>
</table>

1 Lakes greater in size than 1000 ha or less than 5 ha did not have a buffer applied.
2 Wetlands were defined as vegetated treed wetland, vegetated non-treed wetland, or non-vegetated wetland in the VRI with an area not less than 5 hectares.
3 Riparian Management Zone retention estimates are based upon the principle and practice of winching merchantable stems out of riparian management zone areas, where the damage to remaining vegetation is minimized. The Percent retention is a rough approximation of the amount of merchantable volume retained in wetland riparian management zones

6.13 Wildlife Habitat Reductions

Land base reductions for wildlife habitat is intertwined with many of the biodiversity, adjacency and IRM assumptions used in the Base Case. Stand level area deductions for riparian areas and other forested land base exclusions will also contribute to wildlife habitat.

Specific reductions however, have been made for bull-trout, and ungulate winter range in the Dunlevy Special Management Area (Butler Ridge, Aylard and Williston Management Units). These area reductions are shown in Table 15.

Table 15: Specific Wildlife Habitat Area Reductions

Critical Habitat	Location	Gross Area (ha)	Forest Area (ha)	Net Area Reduction (ha)
Bull Trout	All	105	86	74
Ungulate Winter Range	Aylard	2461	1661	383
	Butler Ridge	301	199	87
	Williston	2982	2620	1513
	Graham	3704	3408	0 [1]
	Total UWR	9448	7888	1983
Total All Wildlife Reductions		9553	7974	2,057

Note: 768 hectares in the Graham UWR have been excluded from harvesting for other net down reasons.

A wildlife inventory has been carried out on TFL #48. Geographic areas denoting a range of habitat value have been identified based upon Terrain Ecosystem Mapping / Predictive Ecosystem Mapping (TEM/PEM) and the current structural stage of the forest. Since structural stage changes constantly over time, the habitat values in terms of quality and quantity applicable to any one species also changes. Canfor's objective is to manage the entire land base in a manner which maintains or enhances the current distribution of habitat values – though values in specific areas may fluctuate with disturbance activities The results of this analysis will help to derive appropriate forest cover requirements or stand level management practices - if and when applicable.

6.14 Cultural Heritage Resource Reductions

Known cultural heritage resources on TFL #48 have been provided by Archeology Branch, Ministry of Small Business, Tourism and Culture, and mapped by Canfor. As directed by the MOF, the 20 known spot locations have been intersected into the VRI and have been buffered with a 56 m radius to provide an approximate 1 hectare reserve. This 1 hectare buffer provides some measure of protection at a strategic level. More refined, site-specific buffers will be applied on the ground at the operational level of management. Table 16 provides a listing of the sites and the gross area and forested area affected. Consultations with Regional Archeological staff have indicated that a heritage trail is known to cross the TFL. However, the geographic location of this trail is not known, and therefore has not been incorporated into this analysis.

Table 16: Cultural/Heritage Sites

Landscape Unit	# of sites	Forest Area (ha)	Net Area Reduction (ha)
Boucher	3	2.5	2.5
Carbon	3	0.5	0.5
Highhat	3	3	2.8
Martin Creek	7	3.5	3.5
Wolverine	2	1.1	1.1
Total	20	10.6	10.4

6.15 Other Site Reductions

6.15.1 Protected Areas

Protected Areas resulting from the Dawson Creek LRMP have been removed from the T.H.L.B. Table 17 describes the area within the legislated protected areas within TFL #48.

Protected areas listed in the PAS section include; Bocock Peak, Butler Ridge, Klin-se-za (Twin Sisters), Peace River/Boudreau Lake, Pine/LeMoray, Gwillim Lake/Elephant Ridge, and Sukunka Falls Park in the Parks section. The forest area within all protected areas and the Sukunka Falls Park will contribute to the biodiversity seral stage targets within the zones that they occur.

Table 17: Protected Areas and Parks within TFL 48

Protected Area	Gross Area (ha)	Forest Area (ha)	Net Reduction (ha)
PAS	18,388	14,853	12,849
Parks	426	330	286
Total	18,814	15,183	13,135

6.15.2 Agriculture Land Reserves

Information pertaining to the Agricultural Land Reserve was obtained from the Provincial Land and Resource Data Warehouse. A small part of TFL #48 falls within areas identified under the Agriculture Land Reserve (ALR). Any indicated extractions from the TFL as a result of the ALR would have to be Minister approved upon referral under Sec 60.1B of the Forest Act.

Potential ALR's withdrawals have not been addressed in this analysis. The area within the ALR has been treated the same as the rest of the TFL. If a conversion occurs in the future, it is Canfor's understanding that the government would be responsible for providing compensation in some form. As well, should land conversions occur in the future, the impact on the long-term timber supply will be addressed at the time of the next analysis review. Table 18 describes the area within the ALR relative TFL 48.

Table 18: Agriculture Land Reserve Area

Total	Forested	Reductions for Other net down items	ALR Area in the THLB
31,842.00	27,737	7,223	20,514

6.15.3 High Elevation Forests

All forested and non forested areas within Natural Disturbance Type 5 (NDT 5) were removed from the timber harvesting land base. A total of 43,697 hectares are within NDT5. Contributing to the productive forest land base are 14,942 ha. After exclusions for operability, 13,765 ha were removed from the timber harvesting land base.

6.15.4 Seismic Lines, Pipelines, Trails and Transmission Lines

All seismic lines, pipelines, trails and transmission lines identified in the TFL data base had been buffered and identified as polygons in the VRI. These polygons were removed as part of the vegetated non-treed lands identified in Table 9.

6.16 Mature Stand Problem Forest Types

Mature problem forest types are stands that exceed the minimum cutting age, are physically operable, but are excluded from the timber harvesting land base due to the stands being too old, too short, have too small a diameter or have insufficient volume. Although many of these stands may be harvested in part, they are not specifically targeted for harvesting at the present time. Changes in timber value, timber availability, and sawmill requirements may change Canfor's perception of the value of these stands in the future. Table 19 documents the areas that are currently considered to be mature problem forest types. The land base deductions are described according to inventory file attributes.

The area removed from the THLB due to mature stand problem forest types significantly changed in SFMP4 versus MP3 due to the completion of the VRI Phase II ground sampling including Net Volume Adjustment Factor.

Height, age, and net merchantable volume were adjusted as a result of the Phase II and NVAF sampling completed on TFL 48. TSR volume is defined as the net merchantable volume at the 12.5cm+ utilization level in lodgepole pine leading stands and the 17.5cm+ level in all other stands. After adjustment, the average height increased by 5%, age decreased by 7% and TSR volume increase by 34%. The TSR volume increased by 18% in the high priority sample areas (those mature areas most likely to contribute to the timber harvesting land base) (JS Thrower & Associates 2005).

Table 19: Problem Forest Types

Leading Species	Characteristics						
	Age/Height/Stocking	Minimum Volume by Operability Class			Reduction Percent	Total Forested Area	Net Area reduction
		Conv.	Mix	Cable			
B, BH	age class ≥ 6 and height class ≤2, or age class ≥ 6 and stocking class = 2	120	150	200	100	12,658	7,531
BS	age class ≥ 6 and height class ≤2	120	150	200	100	12,587	9,914
S	age class 8 and height class ≤ 2	120	150	200	100	4,971	3,881
	All black spruce stands	All	all	all	100	7,362	5,411
Pl	age class ≥ 5 and height class = 1; all stocking class 4; all stands ≤17.5 metres	120	150	200	100	7,935	6,999
AtCon, CotCon AtDec, CotDec	Area within the ESSF, Area within cable or mixed operability	All	All	All	100	7,747	6,395
	age class ≥ 7 or age class ≥ 4 and height class = 1	120	All	All	100	9,039	7,773
Other Species (W, L, Ep)	all	All	all	all	100	198	173
Total						62,497	48,077

Table 20: Age, Height, Stocking Definitions

Age Class		Height Class		Stocking Class		
#	**Age Range (years)**	**#**	**Height Range (m)**	**Class #**		**Definition**
5	81 - 100	1	0 - 10.4	0		immature
6	101-120	2	10.5 - 19.4	1		mature & ≥ 76 stems/ha, 27.5+ cm dbh
7	121-140	3	19.5 - 28.4	2		mature & < 76 stems/ha, 27.5+ cm dbh
8	141 - 250	4	28.5 - 37.4	Sub-div. of 2	3	mature Pl ≥ 311 stems/ha, 17.5+cm dbh and 50% of stems 7.5+ cm dbh are ≥ 12.5+ cm dbh
9	251 +	5	37.5 - 46.4		4	mature Pl <311/ha, 15.5+cm dbh or ≥ 311/ha, 17.5+ cm dbh and <50% stems 7.5+ cm are ≥ 12.5+ cm dbh

6.16.1 Future roads and trails

During MP3, Canfor undertook a process that used the existing MP3 THLB and terrain information to develop a classified future road network for the entire TFL. Portions of the THLB that will be lost through the construction of future roads and trails were identified by buffering future roads and intersecting the resultant coverage against the THLB identified in MP3. Six classes of future road were developed. Table 21 identifies these classes and the amount of area that may be lost to future road construction. Because the future road network was built using the MP3 THLB cover, this information is not directly compatible with the larger THLB identified in SFMP 4. To incorporate this information into the current analysis, the future road coverage was intersected against the MP3 THLB to determine the loss in THLB area, by analysis unit for future roads. This loss was divided by the total THLB area to derive a percent reduction for future roads. The loss will be applied as percent area reduction applicable as a one time loss to all future managed stands.

Table 21: Future Roads

Class	Description	Width (m)	Area (ha)
1	Mainline	25	5,827
2	Operational	20	
3	Block	8	
10	Highway	50	
11	Secondary	30	
12	Gravel Sec	30	
MP3 THLB Area in existing unmanaged stands and existing older managed stands			314,151
Percent area lost in all existing stands			1.9%
Area in older existing managed stands and existing unmanaged stands			347,824
Maximum Loss to future stands in current analysis (348,296 x 1.9%)			6,609

6.17 Visual Landscape Inventories

During the term of MP 2 (1994), an inventory of visual portions of the TFL landscape was completed by Canfor. In 1999 this visual landscape inventory was added to and updated to the 1997 standard. In 2005 the Ministry of Forests consolidated all visual landscape inventories within the previous Dawson Creek Forest District (TFL48 and Dawson Creek TSA). During this process it was discovered that some areas that had been declared and made known were not part of the TFL 48 visual inventory used in MP3. The 2005 consolidated inventory that was provided by the MoFR, and identifies polygons having an existing VQO (EVQO) on the file, is used in the base case for TFL 48.

In the Base Case the net down logic excluded 723 hectares (of which 167 ha was net) of Visual Preservation VQO based upon the 1999 Preservation VQO classification. The subsequent inclusion of the 2005 visual inventory into the analysis increased the total established Preservation VQO to 1342 ha of Productive Forest. This inclusion only affected about 100 hectares of area that was considered part of the THLB. Rather than remove the 99.8 ha of THLB and rework the THLB throughout this document, the preservation VQO area that is included in the THLB will be constrained to ensure there is no harvesting in Preservation VQOs.

The areas added during the 1999 inventory are represented in the 2005 consolidated inventory as recommended VQO's (RVQO). Sensitivity analysis will be carried out that adds 'Recommended' VQOs to the 2005 consolidated visual landscape inventory. The sensitivity analysis is the cumulative amount of established and recommended VQO's from the 2005 consolidated inventory.

6.18 Recreation

The recreation inventory for TFL # 48 was completed in 1994. Based on input from the Dawson Creek Forest District the recreation inventory was updated in 2001. This updated inventory is used in this analysis. Management for recreation concerns within the TFL utilizes this inventory by making reductions to the net operable land base. The rationale for these reductions can be obtained from the Recreation/Landscape Analysis Report for TFL #48. Table 22 describes the reductions for recreation. To summarize, all areas having a recreation management class equal to 0 are excluded from the THLB. The area in recreation class B1 is traditionally modeled with an 80% inclusion factor. In this analysis we applied a 100% inclusion factor. Although this may seem optimistic, Table 22 reveals that the forested land base in areas identified as Recreation Class B1 have, through landbase reductions for operability, low sites, protected areas and problem forest types, already been reduced by 45 percent. Therefore, the application of forest cover constraints or area reductions will not be applied to the Recreation Class B1 areas.

Table 22: Recreation

Significance Feature	Management Class	Total Area (ha)	Forested Area (ha)	Inclusion Factor	Net Area Excluded for recreation (ha)	Total Forest Area Excluded (ha) [1]	THLB Area (ha)
B	0	1,316	1,222	0	370	1,222	0
B	1	39,550	36,486	1	0	16,449	20,037
C	0	70	44	0	44	44	0
C	1	147,490	114,764	1	0	53,172	61,592
C	2	13,892	10,409	1	0	4839	5,570
D	1	33,603	30,528	1	0	7417	23,111
D	2	405,994	366,076	1	0	116716	249360
Recreation Sites		4	4		4	4	0
Total		641,919	559,533		418	199,864	359,670

Note 1: Refers to the area removed by recreation classification for all net-down criteria, such as operability, riparian buffers, protected areas, problem forest types, etc.

6.19 Rare Site Series

In this analysis, site series and structural stage is used to identify wildlife habitat areas. As well, site series has been incorporated into the net down and rate, unusual site series have been identified. These areas have been excluded from the THLB.

Table 23: Reductions for Rare Site Series

Representation Cluster Name	BECLABEL	Site Series (Site_S1)	Productive Area (ha)	THLB Area Removed
BWBS subhydric wk1	BWBSwk 1	07	220	74
BWBS subhydric wk1	BWBSwk 1	08	84	13
BWBS subhygric wk1	BWBSwk 1	05	1,033	786
BWBS subhygric wk1	BWBSwk 1	06	306	177
BWBS submesic - mesic wk2-03	BWBSwk 2	03	1,313	728
BWBS xeric wk2-02	BWBSwk 2	02	744	545
ESSF subhygric - hygric mv	ESSFmv 2	06	378	249
ESSF subhygric - hygric mv	ESSFmv 4	05	1	0
		Totals	4,079	2,572

6.20 Area Additions

The forested portions of Sukunka Falls Park were added to the Productive Forest Land Base, since the park is enclosed within the boundaries of the TFL. Many other parks and protected areas are also included in the TFL and are identified on the inventory file as TENURE = TFL48. Sukunka Falls was the exception. The forested area in this park will contribute to visual and landscape biodiversity (as do the other parks and protected areas). The park will not contribute to the timber harvesting land base.

Net-down programming which might typically remove not-satisfactorily-restocked areas (NSR), did not remove these stands in the net-down process. Due to a rapid treatment and regeneration program, all NSR stands have an existing site index and species profile.

The gross productive area of NSR in the TFL is 3,245.2 hectares. Approximately 382.7 hectares are considered “lost” due to land base net downs (e.g. riparian reserves). The remaining 2,862.5 hectares comprises 2,148 hectares of current NSR and 714.5 hectares of backlog NSR.

The majority of the NSR existing within the TFL has been surveyed by Canfor to determine the leading species planted and regenerating and to determine an estimated site index based upon the biogeoclimatic ecosystem classification. Based upon this information, the NSR is added back to the appropriate managed stand analysis units.

In theory, backlog NSR continues to exist on TFL48. However, in reality these areas are now stocked sites that have regenerated to mixedwood stands. The concept of rehabilitating these areas to intensively managed plantations is neither practical nor economical. The “backlog NSR” area has been allocated to 2 analysis units – low-stocking conifer and low stocking-deciduous. The total area in these sites is 924 hectares, of which 714.5 hectares contributes to the THLB. These stands are assumed to grow on old “managed” stand curves that had their stocking adjusted to reflect the current stand density in these polygons. Table 47 in Section 8.7.2 describes the NSR area that gets added to managed stand analysis units.

7.0 INVENTORY AGGREGATION

The Remsoft Spatial Planning System utilizes GIS type “Themes” to classify the land base. The themes themselves are used to represent analysis units, and spatially identify areas within the TFL with specific management objectives - analogous to the AUs, zones and groups used in FSSIM.

7.1 Management Zones and Multi-Level Objectives (Groups)

The analysis of spatially specific management objectives and constraints across and within TFL # 48 is accomplished by through the creation of a comprehensive spatial data base that includes the modeling themes shown in Table 24. Each of these themes were selected for a specific reason – details of which are described in the sections following. Zones were created based upon attributes identified in Table 24. Each of the themes 1-15 identified below are described in the Tables that follow – with respect to classifications are area.

Table 24: Modeling Themes

Theme	Label	Description and Application
*THEME {1}	Analysis unit	Based upon Inventory Type group and leading species, site quality and current age – used for associating to yield tables
*THEME {2}	Genetics	Identification of area utilizing Class A Seed for spruce – used for association managed stand yield tables
*THEME {3}	THLB	Classification of the TFL into timber harvesting land base (THLB), non contributing forests (NCLB), Woodlots, private land and non forest.
*THEME {4}	Management	Used to identify the management status of the TFL (ie existing, older (pre 1995) managed, and intensive management (post 1995)) and track transitions from unmanaged to managed forest.
*THEME {5}	Natural Disturbance Unit	Identification of NDUs based upon spatial areas and subdivide into mountain and valley areas by BEC
*THEME {6}	BEC	Biogeoclimatic ecosystem classification
*THEME {7}	Landscape Unit	Landscape units – used for sensitivity analysis
*THEME {8}	VQO	Visual quality area – used for EVQO and RVQO constraints
*THEME {9}	Pulpwood Area	Pulpwood 10 and 13 areas – used for reporting only
*THEME {10}	Recreation Class	Recreation class– used for reporting only
*THEME {11}	Watershed	Used to apply Equivalent Clear-cut area constraints
*THEME {12}	Wildlife Habitat	Used to identify the areas having ungulate winter range habitat values
*THEME {13}	Dunlevy Zone	Used to identify the spatial management areas within the Dunlevy
*THEME {14}	Map stand	Used to identify each mapsheet forest cover polygon within the TFL
*THEME {15}	Remsoft ID	Concatenation of all themes. Used to assign site series and thereby track wildlife habitat ratings (quality and quantity)
Area	Area (ha)	Used to identify the area of each polygon
Age	Age in periods	Used to identify the stand age in 10 year periods; to rate structural stage for the application of wildlife habitat ratings; and to identify carbon amounts as they change by age and analysis unit

7.1.1 Theme 1 – Analysis Unit

Table 25 identifies the criteria used to identify analysis units (species, site quality and current age) the associated area. Correlation between analysis units and yield tables also includes an association with Themes 2, 3 and 4 – genetics, THLB and management class

Table 25: Analysis Units

AU #	AU Code	Description	Forest Area (ha)	THLB Area (ha)	Type Group	Site Index Criteria	Current Age
1	Bl_all	Balsam - all	43,201	5,191	18	all	all
2	Bx_y	Balsam mixed young	34,346	12,966	20	all	<=140
3	Bx_o	Balsam mixed old	18,828	9,097	20	all	>140
4	Bl_s	Balsam Shelterwood	17,561	13,991	20	all	all
5	Sw_yg	Spruce young good	11,913	7,514	21	>10	<=140
6	Sw_ym	Spruce young medium	8,738	5,201	21	<=10	<=140
7	Sw_og	Spruce old good	9,804	5,349	21	>10	>140
8	Sw_om	Spruce old medium	3,551	2,756	21	<=10	>140
9	Sc_yg	Spruce conifer young good	45,961	37,311	22,24,25	>11	<=140
10	Sc_ym	Spruce conifer young medium	20,675	10,517	22,24,25	<=11	<=140
11	Sc_og	Spruce conifer old good	15,284	11,829	22,24,25	>11	>140
12	Sc_om	Spruce conifer old medium	33,447	23,019	22,24,25	<=11	>140
13	Sd_g	Spruce-deciduous good	16,828	13,795	26	>14	all
14	Sd_m	Spruce-deciduous medium	7,853	5,523	26	<=14	all
15	Ss_g	Spruce Shelterwood good	9,403	7,851	21-25	>14	all
16	Ss_m	Spruce Shelterwood medium	15,188	12,534	21-25	<=14	all
17	Pc_yg	Pine Conifer young good	23,826	21,061	30	>15	<=140
18	Pc_ym	Pine Conifer young medium	48,469	34,965	30	<=15	<=140
19	Pc_og	Pine Conifer old good	5,963	5,117	30	>14	>140
20	Pc_om	Pine Conifer old medium	11,897	9,517	30	<=14	>140
21	Pd_g	Pine Deciduous good	14,149	11,574	31,34	>12	All
22	Pd_m	Pine Deciduous medium	4,484	2,043	31,34	<=12	all
23	Pl_g	Pine good	18,389	16,768	28,29	>15	all
24	Pl_m	Pine medium	38,470	29,083	28,29	<=15	all
25	Ac_g	Aspen conifer good	12,817	7,247	41	>15	all
26	Ac_m	Aspen conifer medium	10,000	3,671	41	<=15	all
27	Ad_g	Aspen deciduous good	34,211	22,044	42	>14	all
28	Ad_m	Aspen deciduous medium	6,723	2,471	42	<=14	all
29	Ct_con	Cottonwood-conifer	8,744	4,236	35	all	all
30	Ct_dec	Cottonwood deciduous	14,747	8,409	37-40	all	all
31	LwStk_c	Low stocking – conifer	292	257		all	all
32	LwStk_d	Low stocking – deciduous	632	458		all	all
		Totals	566,394	363,365			

Note: Analysis units were allocated based upon the species percent by volume for managed stand and the inventory type group (ITG) for existing unmanaged stands. AU's 4, 15, 16 were identified spatially as two or more layered stands in the ESSF, SBS, and all stands within the ESSF wc3.

7.1.2 Theme 2 – Genetics

A portion of TFL 48 now has now been delineated for having Class A spruce seed available. Future managed stands within this area will utilize Class A seed for the spruce component of these stands. The yield tables representing the stands in these areas will be adjusted to reflect the volume gain associated with Class A seed. Table 26 describes the amount of area available for Class A seed. Information pertaining to the location of areas for which class A seed is available was obtained from the Ministry of Forests, Tree Improvement Branch (2003).

Table 26: Genetic Gain Area

TFL 48 Classification	Area (ha) where Class A Seed is Available	Area (ha) where Seed is not available	Total Area (ha)
THLB	64,048	299,317	363,365
NCLB	66,505	136,524	203,029
Total Productive Forest	130,553	435,841	566,394

7.1.3 Theme 3 – Timber Harvesting Land Base

Information regarding the timber harvesting land base is provided in Table 4.

7.1.4 Theme 4 – Management Classification

Stands within the TFL are divided into three management classifications. These are:

1. Existing unmanaged stands
2. Existing managed stands (harvested pre 1995)
3. “Future” managed stands (harvested in 1995 and beyond)

After harvesting, the area in existing unmanaged stands and existing managed stand convert to “future” managed stands. Upon conversion, only 98.1 percent of the area is assumed to reforest. The remaining 1.9 percent is assumed to remain as roadway and will no longer contribute to the THLB. Table 27 describes the amount of area currently attributed to each of these management classifications.

Table 27: Management Classifications

THEME 4	THLB Area (ha)	Percent of THLB
Existing unmanaged Area	326,449	90%
Existing managed area	21,371	6%
Future managed area	15,545	4%
Total Area (ha)	363,365	100%

7.1.5 Theme 5 – Natural Disturbance Units

Natural Disturbance units applied in this analysis have been developed for the Prince George Forest Region. Table 28 describes the area by NDU. The area in the Boreal Plains and Boreal Foothills – Valley is shown sub-divided into conifer leading stands and deciduous leading stands. This is done for analysis purposes and the application of old-growth targets.

Table 28: Natural Disturbance Units

THEME 5	Total Area (ha)	NCLB Area (ha)	THLB Area (ha)
Boreal Foothills - Mountain	177,423	73,389	104,034
Boreal Foothills - Valley - Conifer	125,200	30,237	94,963
Boreal Foothills - Valley - Decid.	39,669	19,961	19,708
Omineca - Mountain	13,220	3,708	9,512
Omineca - Valley	6,210	1,815	4,395
Wet Mountain	92,738	42,400	50,338
Boreal Plains - Upland - Conifer	68,120	15,345	52,775
Boreal Plains - Upland - Decid.	43,814	16,174	27,640
Total Area (ha)	566,394	203,029	363,365

7.1.6 Theme 6 – Biogeoclimatic Ecosystem Classification

TFL 48 Biogeoclimatic Ecosystem Classifications (BEC) has not been updated since MP#3. Table 29 describes the area within each BEC across the TFL.

Table 29: Biogeoclimatic Ecosystem Classifications

THEME 6	Total Area (ha)	NCLB Area (ha)	THLB Area (ha)
AT	1,005	1,005	0
BWBSmw1	124,546	40,191	84,355
BWBSwk1	34,648	8,082	26,566
BWBSwk2	12,521	4,452	8,069
ESSFmv2	148,996	53,391	95,605
ESSFmv4	11,758	5,746	6,012
ESSFmvp2	6,393	6,393	0
ESSFmvp4	1,426	1,426	0
ESSFwc3	57,017	32,072	24,945
ESSFwcp3	6,120	6,120	0
ESSFwk2	52,572	15,096	37,476
SBSwk2	109,388	29,051	80,337
Edge slivers no BEC [1]	4	4	0
Total	566,394	203,029	363,365

1 Edge slivers occurred because the BEC cover used was consistent with the BEC inventory from MP3 that was clipped to the TFL boundary. Though BEC coverage occurs over the entire TFL, this problem was discovered too late in the process to redo.

7.1.7 Theme 7 – Landscape Unit

Landscape Units were utilized in MP#3 in conjunction with biogeoclimatic zones to ensure that harvesting did not become overly concentrated in any one place in the TFL. Landscape Units were also used for the application of old seral biodiversity constraints and the maintenance of old growth. This analysis will see Landscape units used in sensitivity scenarios. Table 30 describes the area within the Landscape Units in TFL 48.

Table 30: Landscape Units

LU_NAME	Theme7	Total Area (ha)	NCLB Area (ha)	THLB Area (ha)
BURNT-LEMORAY	bl	106,693	46,106	60,587
BOUCHER	bo	35,464	9,645	25,819
CARBON	ca	80,177	36,157	44,020
DUNLEVEY	du	45,441	20,789	24,652
EAST PINE	ep	18,953	4,524	14,429
GETHING	ge	56,093	15,062	41,031
HIGHHAT	hh	87,168	21,641	65,527
MARTIN CREEK	mc	57,694	17,300	40,394
PINE RIVER	pr	1,624	391	1,233
WOLVERINE	wl	77,087	31,414	45,673
		566,394	203,029	363,365

7.1.8 Theme 8 – Visually Sensitive Areas

Visually sensitive areas within TFL 48 are used to ensure that harvesting within the TFL is planned with sufficient due diligence to minimize the visual impact of harvesting on the scenic landscape. Visually sensitive areas having established visual quality objectives (VQOs) are utilized in the Base Case for this analysis. The established VQO's are based on the 2005 consolidated inventory completed in 2005. Additional scenarios will investigate the effect of recommended VQOs.

Table 31 describes the area within the TFL having Established VQOs. In the forest estate model, VQOs will have forest cover constraints applied to the VQO / landscape unit zonation. See Table 52 for more information

Table 31: Visually Sensitive Areas

THEME 8	Total Area (ha)	NCLB Area (ha)	THLB Area (ha)
Established Modification	13,075	4,280	8,795
Established Maximum Modification	17,090	5,275	11,815
Established Partial Retention	49,995	17,692	32,302
Established Preservation	1,342	1,242	100
Established Retention	12,931	6,416	6,515
Recommended Modification	1,686	525	1,161
Recommended Maximum Modification	1	1	0
Recommended Partial Retention	15,281	7,523	7,758
Recommended Preservation	0	0	0
Recommended Retention	91	77	14
Not Visually Sensitive	454,902	159,997	294,905
Totals	566,394	203,028	363,365

7.1.9 Theme 9 – Pulpwood Area

In MP#3 deciduous leading stands outside of Pulpwood Agreement #13, (with the exception of the remaining deciduous-leading stands in TFL Block 3B1 and 3B2 (Rice Property)) were excluded from the T.H.L.B. for SFMP 4, these stands were included as part of the THLB, so long as they are not in the ESSF. Table 32 describes the total area of PA#10 and PA#13 relative to the TFL. This information is tracked for reporting purposes only.

Table 32: Pulpwood Agreement Area

PA	Total	Forested	Forested Deciduous	Deciduous THLB
Area (ha)	483,758	481,109	81,801	45,408

7.1.10 Theme 10 – Recreation

Information regarding recreation classifications is provided in Section 6.18 and in Table 22.

7.1.11 Theme 11 – Watersheds

Similar in some ways to landscape units, watersheds are used in the current Base case to ensure that harvesting does not become overly concentrated in any one area. Table 33 describes the area in each watershed and the ECA constraint applicable to the watershed. The ECA target refers to the amount of area that can be in a non-green-up state (reflected by a 3m green-up height). (See Section 10.2.4 and Table 54).

Table 33: Watersheds

Watershed Name	THEME11	ECA %	Total Forest (ha)	NCLB (ha)	THLB (ha)	Max <3 m

Watershed Name	THEME11	ECA %	Total Forest (ha)	NCLB (ha)	THLB (ha)	Max <3 m
Eleven Mile	11_Mile35	35	17,833	9,635	8,198	6,242
Seven Mile	7_Miles35	35	6,705	2,553	4,152	2,347
Basin "862"	86Basn_35	35	2,006	263	1,743	702
Adams Creek	Adams_C35	35	5,356	1,811	3,545	1,875
Aylard Creek	Aylard_30	30	5,078	2,277	2,802	1,524
Beany Creek	Beany_C30	30	3,361	1,177	2,184	1,008
Brazion Creek	Brazion30	30	27,568	9,281	18,287	8,270
Burnt Creek	Burnt_C30	30	49,033	19,363	29,670	14,710
Cameron Creek	Cameron40	40	2,430	647	1,783	972
Dunlevy Creek	Dunlevy25	25	15,607	6,354	9,253	3,902
Gaylard	Gaylard25	25	14,800	4,018	10,782	3,700
Gething	Gething25	25	17,044	5,161	11,884	4,261
Gwillim	Gwillim35	35	3,446	1,034	2,412	1,206
Hasler Creek	HaslerC30	30	18,202	4,896	13,306	5,461
Highat Creek	Highhat35	35	14,737	3,677	11,060	5,158
Johnson	Johnson30	30	11,195	2,287	8,908	3,358
Lower Carbon	L_Carbo40	40	10,770	3,208	7,562	4,308
Lower Murray	L_Muray30	30	15,846	4,416	11,430	4,754
Lower Peace Reach	L_Peace40	40	13,066	3,329	9,737	5,226
Lower Pine Residual	L_PineR35	35	15,311	3,168	12,143	5,359
Lower Sukunka	L_Sukun35	35	47,476	13,742	33,734	16,617
Lower Wolverine	L_Wolvr30	30	19,943	7,843	12,100	5,983
Lebleu Creek	LebleuC40	40	1,771	564	1,207	708
LeMoray Creek	LeMoray30	30	9,287	5,197	4,090	2,786
Middle Wolverine	M_Wolvr35	35	14,175	7,103	7,072	4,961
Medicine Woman Creek	Medicin35	35	1,698	359	1,339	594
North Peace Residual	North_Peac	40	8,669	6,925	1,744	3,468
Ruddy Creek	Ruddy_C25	25	5,354	1,979	3,375	1,339
Trapper Creek	Trapper30	30	6,401	2,602	3,800	1,920
Upper Carbon	U_Carbo30	30	38,590	19,286	19,304	11,577
Upper Murray	U_Muray30	30	13,901	5,519	8,382	4,170
Upper Pine Residual	U_PineR30	30	36,200	14,083	22,116	10,860
Upper Sukunka	U_Sukun35	35	21,926	7,316	14,610	7,674
Upper Wolverine	U_Wolvr30	30	13,220	6,532	6,688	3,966
No watershed identified	XXXXXXX		58,388	15,425	42,963	0
			566,393	203,028	363,365	160,965

7.1.12 Theme 12 – Wildlife Habitat Areas & WTPs

Several spatially defined wildlife areas have been delineated for TFL48. Areas pertain to Grizzly habitat, and ungulate habitat. Portions of these areas overlap.

Table 34: Wildlife Habitat

THEME12	Total Productive Forest (ha)	NCLB Area (ha)	THLB Area (ha)
Grizzly	209,504	94,333	115,171
Ungulate	2,637	990	1,647

The wildlife themes identified here were added to allow for the ability to perform sensitivity analysis if required. In some instances, such as the UWR in the Dunlevy, the areas were used to identify stands for removal from the THLB.

Wildlife Tree Patches (WTPs) in this analysis are not spatially identified. To account for WTPs, the amount of area or volume harvested from each forest stand must be reduced by the amount required to be retained as a WTP. For this analysis, a percent volume reduction was used as a proxy to identify area retained as WTPs.

The proportion of the timber harvesting land base that is in WTPs was derived from an intersection of existing WTPs against the total forested land base identified in MP#3. During the MP#3 analysis the proportions of all WTPs within and outside the THLB was identified. The results revealed that 55% percent of all spatially established WTPs were inside the THLB and 45% were outside the THLB

Within the TFL, 8.0 percent of the forested area within cut blocks must legislatively be retained in WTPs after the blocks are harvested.

By extension, this equates to 4.4 percent of the THLB (8.0% * 0.55).

To simulate management of WTPs, this analysis will reduce the volume in each harvested stand by 4.4 percent.

Note that in MP#3, WTPs were modeled not as volume reduction, but by doubling the area in WTPs and modelling these areas on an extended rotation.

7.1.13 Theme 13 - Dunlevy Special Management Area

Forest management considerations for the Dunlevy Special Management Areas are described in the Dunlevy Creek Management Plan. The plan was prepared by the Ministry of Sustainable Resource Management (MSRM), and completed January 24, 2002. Information pertaining to the THLB and other forestry statistics were supplied for the Plan by Canfor, using the TFL 48 Management Plan #3 Data Base. The current analysis has seen an increase in the potential THLB as a result of improvements in inventory information. These increases were utilized to adjust the recommended harvest target for the Dunlevy. Table 35 describes the area within the Dunlevy. These areas have changed in some ways significantly from the 2002 report. The changes are due to the refinement of some of the line work associated with the plan. The Dunlevy theme is used to manage the extent and timing of harvest operations within the Compartments. This is discussed further in Section 10.3.4.1.

Table 35: Dunlevy Creek Management Areas

Compartment #		Total Productive Forest (ha)	NCLB Area (ha)	THLB Area (ha)
1	Adams Creek	6,513	2,903	3,610
2	Aylard Creek	5,438	2,619	2,819
3	Lower Dunlevy	8,657	3,781	4,876
4	Upper Dunlevy	3,184	1,270	1,914
5	Dresser Creek	5,902	2,503	3,399
6	Butler Ridge	5,357	5,357	0
	Totals	35,051	18,433	16,618

7.1.14 Theme 14,15 – Map Stand, Remsoft ID – Additional Wildlife

Map Stand and Remsoft ID are tracked in an analysis completed for Canfor's Public Advisory Group in support of CSA Certification, in order to provide the flexibility to add additional management themes as required. This section pertains to the analysis completed by Canfor in support of this certification – not the timber supply analysis in support of MP#4..

Map stand provides the link to the forest attributes for each forest cover polygon within TFL 48. There are approximately 85,000 mapsheet polygons within the TFL.

The act of intersecting additional inventory coverages such as BEC, NDU, Wildlife, Landscape units, operability, site series, etc results in the division of these forest polygon into numerous divisions and small sliver polygons. To simply the database somewhat, many of the sliver polygon (ie <0.001ha) were dissolved to the adjacent largest polygon. The result is a database of just under 205,000 polygons.

One of the primary applications for tracking the location and timing of harvested stands across TFL 48 is for the identification of wildlife habitat. During the term of MP#3, wildlife habitat ratings were completed for several species of public concern within the TFL. Some of these species were assessed in the Type II analysis for TFL 48 that was completed in 2002. In this analysis, seven species are examined. These are:

Table 36: Wildlife Habitats Evaluated

Species code	English definition
ALAL_FDG	Moose – feeding - growing season
CEEL_FDG	Elk – feeding - growing season
RATA_FDWE	Caribou – feeding – winter early
RATA_FDWL	Caribou – feeding – winter late
MAAM_AW	Marten – all winter habitat
MAPE_AW	Fisher – all winter habitat
URAR_FDP	Grizzly bear – feeding - spring
GUGU_FD_W	Wolverine – feeding winter

Note that in the MP#3 analysis, grizzly bear habitat was managed in the Base Case through the maintenance of early seral targets within NDT's 1 and 2 in a spatially defined area. In this analysis, a forest cover constraint was not applied to manage for Grizzly habitat. Partly because the early seral targets are working counter to the watershed targets,

Wildlife habitat is identified through the application of wildlife habitat ratings. Habitat ratings are based upon a field study of the types of BEC, variant, site series, site series modifier, seral community and structural stage that are coincident with a specific habitat value for a specific species. Each combination of the BEC, site series etc is given a rating of from 1 to 7 denoting the value of that site for the species of interest. All of these ecosystem criteria remain static through time, with the exception of structural stage. Harvesting and simply stand ageing changes the structural stage of a site, which in turn changes its habitat value. Table 37 provides 3 examples of site classifications and their corresponding habitat rating. There are over 5400 different ecosystem classification combinations within the TFL, each of which has a distinct wildlife habitat rating for each species.

Table 37: Wildlife Habitat Ratings

Site descriptor	Examples of ecosystem classifications		
SITE_S1	02$	FM	32
SITEMC_S1			AL
SITE_M1A	w	s	
SERAL_1	ak		
BGCLABEL	BWBSmw1	ESSFmv2	ESSFwc3
SS_Mod	1a	2	6
WILDLIFE_TAG	BWBSmw102$w1a	ESSFmv2FMs2	ESSFwc3326
Species of Interest	**Habitat Ratings Corresponding to the Classifications above**		
ALAL_FDG	6	5	4
CEEL_FDG	4	4	4
RATA_FDWE	6	4	5
RATA_FDWL	6	2	5
MAAM_AW	6	6	5
MAPE_AW	6	6	6
URAR_FDP	6	2	4
GUGU_FD_W	2	2	1

Habitat ratings are a numeric measure (from 1 to 7) based upon the ecosystem classification. Habitat quality is simply the measure of the total area within each rating. Harvesting activities and stands aging over time will affect the location and quantity of the different quality levels. Harvesting and stand ageing will be assumed to affect only the structural stage of the BEC label.

We assume that after clearcut harvesting the structural stage of the stand will convert to a "3" = Shrub/herb.

Table 38: Structural Stage Projection Assumptions

Structural Stage	Description	Age/BEC Criteria[1]
3	Shrub / Herb	Any new cut blocks and stands < 20 years old
4	Pole / Sapling	Stand age 21-40 years
5	Young Forest	Stand age 41-80 years
6	Mature Forest	BWBS – 81-140 years Other BEC – 81-250 years
7	Old Forest	BWBS – 141+ years Other BEC 251+ years

1 We also assume that the structural stage of stands in the alpine and the parklands (i.e. ESSFmvp2) will remain static over time.

8.0 GROWTH AND YIELD

Yield curves have been forwarded to Research Branch staff for their review and acceptance. Appendix I includes a tabular account of the yield tables used in this analysis.

8.1 Site Index Assignments

Site indices for existing natural stands were assigned using the MOF's Variable Density Yield Prediction Model, batch version 6.6d.

Site indices for existing managed stands were assigned using the site index assigned to the VRI file from Canfor's Silviculture Management System. The site index was based upon the biogeoclimatic ecosystem classification (BEC) in which each managed stand belonged, which was in turn based on the silviculture survey. Each silviculture strata is assigned a site index based on either SIBEC or growth intercept during the silviculture survey. Current NSR stands are assigned a site index based on SIBEC. The spatial and attribute information was then updated into the VRI.

8.2 Utilization Levels

During the term of SFMP 4 harvesting will be conducted to the utilization standards indicated in Table 39.

Table 39: Utilization Levels

Species	Utilization			
	Minimum Dbh (cm)		Maximum Stump Height (cm)	Minimum Top dib (cm)
	Natural Stands	Plantations		
Spruce	17.5	17.5	30.0	10.0
Balsam	17.5	17.5	30.0	10.0
Lodge pole Pine	12.5	12.5	30.0	10.0
Deciduous	12.5	12.5	30.0	10.0

8.3 Decay Waste and Breakage for Unmanaged Stands

To obtain net volumes per hectare, Ministry of Forests' decay, waste and breakage factors provided in the Variable Density Yield Prediction Model (VDYP) for Forest Inventory Zone (FIZ) L and Special Cruise 474 were used.

8.4 Operational Adjustment Factors for Unmanaged and Managed Stands

Operational adjustment factors for managed stands were applied to all managed stand yield tables. Factors of 15% OAF 1 and 5% OAF 2 were used. An additional 5% OAF was applied to the managed portion of shelterwood stands to reflect their slower growth under a canopy.

8.5 Volume Adjustments

An adjustment to the volume in unmanaged stands was applied to several coniferous analysis units that exist in the ESSF. To reflect Canfor's practice of retaining deciduous stems within the ESSF, the deciduous component of leading coniferous-mixed-wood stands within the ESSF was removed from the VDYP generated volume curve for each of these AU's.

Table 40 shows the amount of volume removed for existing unmanaged Analysis units for the deciduous component of coniferous leading stands in the ESSF.

Table 40 Volume adjustments for Stands in the ESSF

Unmanaged AU [1]	Description	Percent Reduction	THLB Area Affected (ha)
13 - Sd_g	Spruce deciduous stands in good sites	20	603
14 - Sd_m	Spruce deciduous stands in medium site	25	521
21 - Pd_g	Pine deciduous stands in good sites	20	868
22 - Pd_m	Pine deciduous stands in medium sites	18	449

1: Four yield tables were added to the analysis to reflect this volume adjustment for stands in the ESSF.

8.6 Yield Table Development

8.6.1 Aggregated Yield Tables

Yield tables are initially created such that a natural stand yield table exists for every forest polygon within the TFL. These polygons are then assigned to an analysis unit and the yield tables area-weighted to produce one table for each analysis unit. Zone specific' yield curves exist a) in the form of future managed stand yield tables where genetic seed is currently available for spruce; and b) in for natural stands in the ESSF where the deciduous component of these stands is not harvested.

8.6.2 Yield Tables for Existing Unmanaged Stands

Yield tables for natural stands were generated using the Variable Density Yield Prediction (VDYP) 'batch' model, version 6.6d.

Separate curves were produced for some of the natural mature stands versus natural immature stands. This was done in cases where significant amounts of area existed for natural stands both in an immature and over-mature (>140 years) state. A review of the area distribution by age class and inventory type group revealed that this was particularly evident in spruce-leading stands.

A temporary yield curve was created for each forest polygon in the TFL. The yield curves were then grouped by analysis unit and area-weighted to provide one curve for each analysis unit. All of the net area in each analysis unit was used in the generation of the curves. With the exception of the deciduous volume reduction to coniferous mixed-wood stands in the ESSF, and the effect of class A seed on future managed stand in the "genetic zone", the same set of curves were applied across the TFL #48.

Copies of the curves were forwarded to Mr. Robb Drummond at the MOF Resources Inventory Branch for approval.

8.6.3 Existing Timber Volume Check

To verify that significant error did not occur in the aggregation of polygons into analysis units, the total net volume of the current inventory (i.e., T.H.L.B.) using VDYP polygon specific volumes was compared to the total net volume of the current inventory (i.e., T.H.L.B.) using the aggregated analysis unit volumes from the VRI file.

Table 41: Total TFL Empirical Volume

	Method Used		
	Polygon Specific (m3)	Analysis Unit (m3)	% difference
Total Empirical Volume (m3)	80,707,931	81,279,857	0.71%

The calculations are performed as follows:

1) Total polygon specific inventory volume: Σ(all unmanaged polygons in the T.H.L.B. (projected VDYP volume/ha 'multiplied by' net polygon area))

2) Total analysis unit volumes: Σall analysis units (Σall age classes (analysis unit area in age class N 'multiplied by' VDYP estimated volume @ age class N))

8.6.4 Yield Tables for Managed Stands

Managed stand yield tables were created using the Table Interpolation Program for Stand Yields (Version 3.2) for balsam, spruce, and lodgepole pine. Mixed-wood stands will have their managed stand yield tables blended as a portion of both VDYP and TIPSY. The species distribution derived for the natural mixed-wood stand curves was used to determine the percentage of deciduous to be blended with the coniferous.

All stands harvested on or after 1995 were assumed to be intensively managed and growing along TIPSY generated managed stand yield tables (MSYT).

Stands harvested prior to 1995 will also grow along TIPSY MSYT, but will utilize a combination of natural and planted regeneration histories, longer regeneration delays, and reduced stocking. Table 27 showed the amount of area which has a harvest year that is pre 1995 and will be assumed to be growing on the MSYT. The combination of increased regeneration delay, reduced stocking levels, increased proportion of naturals and Canfor's historic activities of a) monitoring stocking levels, b) fill planting, c) brushing and d) thinning activities, make TIPSY a more appropriate model than VDYP to use to estimate the growth and yield of these stands.

The Prince George and Peace River Class A seed planning units (SPU) occur within TFL 48. Class A trees are available within the Prince George (PG) SPU. Stands harvested after 1995 and into the future will incorporate the improved Class A Sx seed that is available for the PG SPU portions of the TFL. Canfor intends to use improved seed where available, for all spruce planted in the future (See Table 42).

Table 42: Yield Table Transitions

Current Status	Seed Planning Unit	Transition
Unmanaged	Sx PG SPU	Future managed with Genetic Gain for Sw
	Sx PR SPU	Future managed
Existing Managed (harvested pre 1995)	Sx PG SPU	Future managed with Genetic Gain for Sw
	Sx PR SPU	Future managed
Future Managed (harvested on or after 1995)	Sx PG SPU	Future managed with Genetic Gain for Sw
	Sx PR SPU	Future managed

8.6.4.1 Silviculture Systems

The mature and over-mature even-aged stands in TFL #48 are predominantly spruce, spruce-balsam and spruce-lodge pole pine. Clear- cutting will generally be the prescribed harvesting system for these timber types.

The mature and over-mature uneven-aged, two-layered stands in the ESSF and SBS in TFL #48 are predominately balsam with a spruce-balsam under-story, or spruce with a spruce-balsam under-story. These stands will be harvested using an irregular shelterwood harvesting system. Historic regeneration problems which occurred in these sites as a result of clear cut harvesting has indicated that this is a more appropriate silviculture system. Typically the stands have a top layer of 200 year-old plus stems with a bottom layer of stems aged 50-70 years. Canfor currently harvests these stands in the winter by removing the top layer. Approximately 40-45% of the area is accessed through a trail system. The existing regeneration is left to become mature. The trails are regenerated within 2 years with spruce seedlings at a density of 1600 stems per hectare (sph). Once the regenerated stand becomes mature, the stand will once again be treated to an irregular shelterwood system. The system was modeled using the following assumptions.

- Unmanaged shelterwood stands are harvested by removing 90% of their mature volume.
- After harvesting the area reverts to a managed shelterwood stand. This stand has a structural stage equivalent to a 65 year old stand.
- The managed shelterwood stand yield table is comprised of 45 percent MSYT as defined by TIPSY and 55% advanced regeneration as defined by VDYP.
- The stand will be eligible for re-harvesting when the MSYT portion of the stand reached maturity. This will occur when the stand reaches an age equivalent of 65 + the culmination age of the MSYT portion of the stand.

- Harvesting will remove 90 percent of the managed shelterwood stand.

See Appendix II for a detailed graphical description of the logic used for each of the shelterwood yield tables.

8.6.4.2 Silviculture Management Regimes

The TIPSY model does not contain data for the managed growth of deciduous stands. Since portions of conifer-deciduous and deciduous-coniferous stands are assumed to regenerate naturally, the portion which remains deciduous will regenerate to the original VDYP curve. The coniferous portion will grow on a TIPSY curve which is blended to the VDYP curve.

8.6.4.3 Aggregated Yield Tables

Within TFL # 48, the forest cover polygons comprising the T.H.L.B. were aggregated into analysis units based on leading species, secondary species, site index and current age.

8.6.4.4 Regeneration Delay

Regeneration delay by analysis unit is shown in Table 44 and Table 45. The regeneration delay was applied as an input directly into the TIPSY model during the creation of the post-1995 managed stand yield tables.

8.6.4.5 Regeneration Assumptions

Table 23, Table 44 and Table 45 describe the regeneration assumptions used to create managed stand yield tables. As indicated in Table 42, three sets of managed stand yield tables are used to represent the TFL. The first set applies to stands harvested prior to 1995. The second set applies to all stands harvested on or after 1995. The third applies to all future stands harvesting in the portion of the TFL where Class A seed is currently available.

8.6.4.6 Species Conversion

Operating under the principle that there will be no significant net gain or loss of deciduous in the TFL, mixed-wood stands will regenerate to their original proportions of coniferous and deciduous. The managed deciduous component will be assumed to grow on VDYP curves. The coniferous component will be assumed to grow on the TIPSY curve.

Table 43: Regeneration Assumptions (Stands Harvested prior to 1995)

AU #	AU description	Existing managed area	Weighted SI	Species % [6]	Regen method [4]	Regen Density [3]	yield table source [5]
1	BL_all	487	14.7	Sw 100	P 60 N 40	1300	TIPSY
2	Bx_y	1,222	14.6	Sw 100	P 60 N 40	1300	TIPSY
4	Bl_s	8	15.0	Sw 100	P45 N 55	1300	TIPSY
6	Sw_ym	1300	9.0	Sw 100	P 60 N 40	1300	TIPSY
9	Sc_yg	7,823	16.8	Sw 80 Pl 20	P 20 N 80	1300	TIPSY
10	Sc_ym	6	9.0	Sw 80 Pl 20	P 50 N 50	1300	TIPSY
13	Sd_g	3,493	18.3	Sw 53 At 47	P 53 N 47	1300	TIPSY/ VDYP
14	Sd_m	237	12.0	Sw 64 At 36	P 64 N 36	1300	TIPSY/ VDYP
15	Ss_g	35	13.5	Sw 100	P45 N 55	1300	TIPSY / VDYP
16	Ss_m	311	12.0	Sw 100	P45 N 55	1300	TIPSY / VDYP
17	Pc_yg	4,075	19.3	Pl 80 Sw 20	P 20 N 80	1300	TIPSY
18	Pc_ym	665	14.5	Pl 80 Sw 20	P 50 N 50	1300	TIPSY
23	Pl_g	494	18.8	Pl 100	P 20 N 80	1300	TIPSY
24	Pl_m	76	14.4	Pl 100	P 50 N 50	1300	TIPSY
25	Ac_g	21	21.0	At 70 Sw 17 Pl 13	N 70 P 30	1300	VDYP/TIPSY
26	Ac_m	57	15.0	At 69 Sw 13 Pl 18	N 89 P 31	1300	VDYP/TIPSY
27	Ad_g	339	18.3	At 100	N 100	3000	VDYP
29	Ct_con	6	17.0	At 70 Sw 25 Pl 5	N 70 P 30	1300	VDYP/TIPSY
31	LwStk_c	257	17.7	Sw60 Pl10 Ac30	N100	550	TIPSY/VDYP
32	LwStk_d	458	19.2	At45 Ct30 Sw20 Pl 5	N 100	700	VDYP/TIPSY
		21,370					

1 Proportions of deciduous in coniferous leading stands were obtained based upon the current percent species distribution.

2 Operational Adjustment Factors of 15% and 5% were applied to all managed stand yield tables when TIPSY was used.

3 Regeneration Density refers to TIPSY inputs only. In instances where the yield table source is VDYP, the regeneration density is assumed to follow the change in density and volume predicted by natural stand yield tables

4 'Regen method' refers to the proportion of analysis unit area that is planting (P) versus natural (N). The 'P' always refers to a TIPSY input. The 'N' may refer to a TIPSY input or a VDYP input depending on the 'yield table source'. With the exception of AU27 all resultant yield tables are blended. Where the yield table source is just TIPSY, the resultant table is a blend of planting and naturals using the 'regen method' proportions. Where yield table source is TIPSY and VDYP, the resultant yield table is a blend of TIPSY input, and the original unmanaged aspen tables (Aus 27 and 28) depending on site quality)

5 Species % cells that indicate an At component describe the proportion of the resultant AU the comes from unmanaged AU 27 or 28.

Table 44: Regeneration Assumptions (Stands Harvested on/after 1995 Outside Genetic Area)

AU#	AU_decip	Area_ha	Site index	SIBEC	Species %	TIPSY Regen Density	Regen method	Regen Delay	Yield Table Source
1	BL_all	1,940	11.7	12.6	Bl 100	1600	P 100	2	TIPSY
2	Bx_y	9,641	12.6	12.6	Bl 100	1600	P 100	2	TIPSY
3	Bx_o	4,035	9.7	12.6	Bl 100	1600	P 100	2	TIPSY
4	Bl_s	919	11.6	13.9	Bl 100	1600	P45 N55	0	TIPSY/VDYP
5	Sw_yg	9,394	16.5	16.6	Sw100	1600	P 100	2	TIPSY
6	Sw_ym	2,367	14.4	17.1	Sw100	1600	P 100	2	TIPSY
7	Sw_og	5,423	14.0	17.7	Sw100	1600	P 100	2	TIPSY
8	Sw_om	2,224	9.2	17.2	Sw100	1600	P 100	2	TIPSY
9	Sc_yg	34,547	15.3	16.7	Sw80 Pl20	1600	P 100	2	TIPSY
10	Sc_ym	9,050	11.2	15.6	Sw80 Pl20	1600	P 100	2	TIPSY
11	Sc_og	10,673	13.7	17.3	Sw80 Pl20	1600	P 100	2	TIPSY
12	Sc_om	16,200	9.2	15.8	Sw80 Pl20	1600	P 100	2	TIPSY
13	Sd_g	13,729	17.4	17.4	Sw65 At35	1600	P 65 N 35	2	TIPSY/VDYP
14	Sd_m	5,443	13.0	17.1	Sw65 At35	1600	P 65 N 35	2	TIPSY/VDYP
15	Ss_g	2,041	12.1	15.5	Sw 100	1600	P45 N 55	0	TIPSY/VDYP
16	Ss_m	2,192	8.2	15.2	Sw 100	1600	P45 N 55	0	TIPSY/VDYP
17	Pc_yg	20,360	17.7	17.9	Pl80 Sw20	1600	P 100	2	TIPSY
18	Pc_ym	31,298	13.3	16.6	Pl80 Sw20	1600	P 100	2	TIPSY
19	Pc_og	4,432	16.4	18.2	Pl80 Sw20	1600	P 100	2	TIPSY
20	Pc_om	7,871	12.1	16.6	Pl80 Sw20	1600	P 100	2	TIPSY
21	Pd_g	11,502	15.9	17.4	Pl65 At35	1600	P 65 N 35	2	TIPSY/VDYP
22	Pd_m	1,986	11.6	17.2	Pl65 At35	1600	P 65 N 35	2	TIPSY/VDYP
23	Pl_g	13,350	17.4	17.1	Pl100	1600	P 100	2	TIPSY
24	Pl_m	30,001	13.1	16.4	Pl100	1600	P 100	2	TIPSY
25	Ac_g	7,235	17.8	17.5	At70Sw17Pl13	1600	N 70 P 30	2	VDYP/TIPSY
26	Ac_m	3,622	14.4	17.4	At70Sw17Pl13	1600	N 70 P 30	2	VDYP/TIPSY
27	Ad_g	22,040	18.4	18.4	At100	n/a	N 100	2	VDYP
28	Ad_m	2,453	12.9	12.9	At100	n/a	N 100	2	VDYP
29	Ct_con	4,230	16.0	18.1	Ct73Sw17P10	1600	N 73 P27	2	VDYP/TIPSY
30	Ct_dec	8,404	15.6	15.6	Ct100	n/a	N 100	2	VDYP
31	LwSTK_c	257	17.7	17.7	Pl 55 Sw 45	1600	P 100	2	TIPSY
32	LwStk_d	458	19.2	19.2	At 55 Sw 45	1600	N 55 P 45	2	VDYP/TIPSY
		299,317	14.6	16.7					

Notes:

1. Operational Adjustment Factors (OAFs) of 15% and 5% were applied to TIPSY managed stand yield tables .
2. See footnotes under Table 43 for additional information
3. The logic used to create the shelterwood yield tables is provided in Appendix II
4. The SIBEC column indicates the area-weighted site index determined using the MOF's *Site Index Estimates by Site Series*, May 2006. This information was used in sensitivity analysis.

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Table 45: Regeneration Assumptions (Stands Harvested on/after 1995 Inside Genetic Area)

AU#	AU_decip	Area_ha	Site index	SIBEC	Species	Density	Regen Planted	Regen Delay	Genetic Gain in Sw	Yield Table Source
1	BL_all	3,251	10.2	12.6	Bl 100	1600	P 100	2	19	TIPSY
2	Bx_y	3,310	12.4	11.9	Bl 100	1600	P 100	2	19	TIPSY
3	Bx_o	5,078	9.7	12.6	Bl 100	1600	P 100	2	19	TIPSY
4	Bl_s	13,031	9.9	13.8	Bl 100	1600	P45 N55	0	19	TIPSY/VDYP
5	Sw_yg	377	14.4	14.6	Sw100	1600	P 100	2	19	TIPSY
6	Sw_ym	109	12.7	14.2	Sw100	1600	P 100	2	19	TIPSY
7	Sw_og	342	11.9	14.3	Sw100	1600	P 100	2	19	TIPSY
8	Sw_om	584	9.0	13.1	Sw100	1600	P 100	2	19	TIPSY
9	Sc_yg	2,672	14.5	14.0	Sw80 Pl20	1600	P 100	2	19	TIPSY
10	Sc_ym	1,394	10.0	14.0	Sw80 Pl20	1600	P 100	2	19	TIPSY
11	Sc_og	1,248	13.0	13.4	Sw80 Pl20	1600	P 100	2	19	TIPSY
12	Sc_om	6,893	8.8	13.6	Sw80 Pl20	1600	P 100	2	19	TIPSY
13	Sd_g	66	17.9	14.9	Sw65 At35	1600	P65 N35	2	19	TIPSY/VDYP
14	Sd_m	81	10.5	14.5	Sw65 At35	1600	P65 N35	2	19	TIPSY/VDYP
15	Ss_g	5,825	11.6	14.0	Sw 100	1600	P45 N55	0	19	TIPSY/VDYP
16	Ss_m	10,367	8.1	14.2	Sw 100	1600	P45 N55	0	19	TIPSY/VDYP
17	Pc_yg	702	16.8	14.9	Pl80 Sw20	1600	P 100	2	19	TIPSY
18	Pc_ym	3,667	12.9	14.6	Pl80 Sw20	1600	P 100	2	19	TIPSY
19	Pc_og	685	16.2	14.7	Pl80 Sw20	1600	P 100	2	19	TIPSY
20	Pc_om	1,646	11.8	14.4	Pl80 Sw20	1600	P 100	2	19	TIPSY
21	Pd_g	72	14.6	12.8	Pl65 At35	1600	P65 N35	2	n/a	TIPSY
22	Pd_m	57	11.3	17.3	Pl65 At35	1600	P65 N35	2	n/a	TIPSY
23	Pl_g	369	16.5	15.3	Pl100	1600	P 100	2	n/a	TIPSY
24	Pl_m	2,130	12.7	15.1	Pl100	1600	P 100	2	n/a	TIPSY
25	Ac_g	12	16.0	17.5	At70Sw17Pl13	1600	N70 P30	2	19	VDYP/TIPSY
26	Ac_m	49	10.8	17.4	At70Sw17Pl13	1600	N70 P30	2	19	VDYP/TIPSY
27	Ad_g	4	16.1	16.1	At100	n/a	N 100	2	n/a	VDYP
28	Ad_m	18	10.4	10.4	At100	n/a	N 100	2	n/a	VDYP
29	Ct_con	6	13.5	17.5	Ct73Sw17P10	1600	N73 P27	2	19	VDYP/TIPSY
30	Ct_dec	4	7.3	7.3	Ct100	n/a	N 100	2	n/a	VDYP
		64,049	10.6	13.8						

Notes:

5. Operational Adjustment Factors (OAFs) of 15% and 5% were applied to TIPSY managed stand yield tables See footnotes under Table 43 for additional information
6. The logic used to create the shelterwood yield tables is provided in Appendix II
7. The SIBEC column indicates the area-weighted site index determined using the MOF's Site Index Estimates by Site Series, May 2006. This information was used in sensitivity analysis.

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8.7 Silviculture History

8.7.1 Existing Managed Immature

All stands harvested prior to 1995 will be modeled to grow on managed stand yield tables. The purpose of Table 46 is to document, for each analysis unit, the area of existing managed second growth stands within the TFL.

Table 46: Immature Management History

AU #	AU Description	Existing pre 1995 Managed Stands (area ha)			Existing post 1995 Managed Stands (Area ha)		Total Area
		<10yrs	10yrs to 20yrs	>20yrs	<10yrs	>=10yrs	
1	BL_all	0	258	229	63	40	591
2	Bx_y	179	459	584	463	532	2,218
4	Bl_s	0	0	8	0	725	732
5	Sw_yg	160	618	507	670	206	2,161
6	Sw_ym	6	9	0	1,385	477	1,877
9	Sc_yg	759	5,227	1,838	850	401	9,074
10	Sc_ym	0	6	0	1,161	652	1,819
13	Sd_g	536	1,929	1,028	182	127	3,803
14	Sd_m	10	176	51	686	230	1,153
15	Ss_g	0	0	35	0	909	944
16	Ss_m	0	0	311	0	122	433
17	PC_yg	683	2,474	918	160	159	4,393
18	Pc_ym	61	459	146	657	417	1,739
21	Pd_g	0	0	0	0	0	0
22	Pd_m	0	0	0	0	0	0
23	Pl_g	9	369	116	58	27	579
24	Pl_m	3	18	55	302	144	522
25	Ac_g	0	17	4	0	0	21
26	Ac_m	0	57	0	427	259	743
27	Ad_g	13	259	67	0	0	339
28	Ad_m	0	0	0	204	86	290
29	Ct_con	0	5	1	399	213	618
30	Ct_dec	0	0	0	2	2	4
		2,419	12,339	5,899	7,668	5,729	34,054

Notes: The older areas in "Existing Future Managed Stands" are a combination of wildlife tree patches delineated in cut blocks and the residual area in shelterwood stands. Due to the multilayers in shelterwood stands and the age of the advanced regen, all managed shelterwood stands are assumed to have a minimum age of 65 years

8.7.2 Current NSR and Low Stocking Sites

Low stocking sites were previously considered backlog NSR that had been logged prior to 1987. All other NSR is current NSR. A breakdown of the amount of NSR by analysis unit and management class is provided in Table 47.

Current NSR is created from harvesting operations. It is treated under silviculture prescriptions. The regeneration delay of 2 years or less keeps the amount of current NSR relatively small.

Areas with a logging history before 1987 and do not currently meet the backlog free growing standard due to low stocking are included in the “LwStk” analysis units. Due to the amount of stocking present and the dispersed nature of the areas no additional treatments are proposed. Only a small amount of area remains within theTFL48 of this nature. The areas are described in Appendix III, Table 67. They will grow under a managed stand yield table that has had its initial stocking adjusted to reflect the actual stocking that is present in these stands; see AU’s 31 and 32.

Table 47: Current NSR and Low stocking sites

AU# [1]	Description	Current NSR Area (ha)	Low Stocking (only Aus 31 and 32)
5	Sw_yg	512	
6	Sw_ym	5	
9	Sc_yg	435	
10	Sc_ym	32	
13	Sd_g	5	
14	Sd_m	81	
15	Ss_g	17	
16	Ss_m	142	
17	Pc_yg	500	
18	Pc_ym	96	
23	Pl_g	41	
24	Pl_m	210	
27	Ad_g	64	
29	Ct_con	8	
31	LwStk_c	0	257
32	LwStk_d	0	458
	totals	2,148.0	714.5

9.0 PROTECTION

9.1 Non-Recoverable Losses (NRLs)

Non-recoverable losses are timber volumes that are being destroyed on an annual basis by natural causes. Estimated annual losses are deducted from the gross harvested volume in the model to determine the net volume of timber that could be harvested over time.

In the Data Package for MP 3, a calculated NRL number based on the forest cover inventory was summarized by non-logging disturbances. This estimate will be used in the analysis for SFMP 4 as well. The estimates are split for coniferous and deciduous species:

Table 48: Non recoverable losses

Cause	Net Loss (m3/year)
Fire	44,605
Insects / Disease	4,367
Windthrow (and other natural causes)	7,174
Total	56,146

Reduction for Non-Recoverable Coniferous Losses: 49,700 m^3/year

Reduction for Non-Recoverable Deciduous Losses: 6,400 **m^3/year**

The TFL 48 MP#3 Management Plan approval letter written by the Deputy Chief Forester indicated that NRL's may be overestimated and asked Canfor to work with the MOF to confirm or vary this estimate. See Table 26 in Section 3.16 of the SFMP for the results for the work done to-date. Over the past 5 years it is estimated that there has been significantly less NRL's than what is currently being modeled (e.g. 4,395m^3/year). However, in consideration of the MPB outbreak currently on TFL48, Canfor has chosen not to adjust downward the NRL estimate at this time.

Sensitivity analysis is conducted around the impact of mountain pine beetles on the TFL. In these scenarios, non-recoverable losses are calculated explicitly for the first decade using an annual IFS Mountain Pine Beetle Epidemic and Control model. Additional volume NRLs will be applied at a rate of 5000m^3/year for the first decade for conifer and 49,700m^3/year thereafter. For deciduous they remain the same at 6,400m^3/year.

Stand mortality was also addressed through a ceiling cap on the maximum age that a stand could achieve. Once it achieved this age, if not harvested, it was assumed that it would cycle back as an immature stand. The maximum age applied to each leading species was estimated by adding 10 years to the age of the oldest stands within the TFL. The ages applied were:

- Spruce Leading 460 years
- Pine-leading 350 years
- Balsam-leading 460 years
- Aspen-leading 200 years
- Cottonwood-leading 310 years

10.0 INTEGRATED RESOURCE MANAGEMENT

10.1 Forest Resource Inventories

Table 49: Forest Resources Inventory Status

Inventory	Standard	Completed	Approved	Approved By	Status
Forest Cover/VRI	VRI Phase 1	2000	2000	Regional Inventory Forester	Updated to for depletion to Dec 31, 2004
	VRI Phase II/NVAF	2004	2005	Provincial Biometrician	Approved – (Age Height and volumes adjusted and projected to 2005)
Visual Landscape	RIC	2005	2005	Regional Manager (2005 consolidated inventory)	Pending: EVQO used in basecase RVQC used in sensitivity
Recreation	RIC	1999	1995/2001	Regional Manager	Approved
Stream	RIC	1997-2000			Pending
Operability	n/a	2000	Dec 2000	Regional Geomorphologist	Approved
Road/trail network	n/a	2000	n/a	n/a	n/a
BEC	MOF	2000	Nov 2000	Regional Ecologist	Approved
Grizzly Habitat	MOELP	2000		District Manager	Approved
Ungulate Winter Range	MOE	2000	2005	MOE	Provided by MOE
Silviculture	MLSIS	2000	yearly	District Manager	Approved
Protected Areas	MOELP	2000	June 29, 2000	Cabinet per Parks FTP Site	Approved
TFL Boundary	N/A	2004	July 27, 2004	Resource Tenures Branch. New boundary included with TFL 48 Instrument 5 document	Approved
PA 10 & 13	N/A	2000	2000	District Manager	Approved
LRMP RMZ's	LUCO	1999	March 1999	Cabinet	Approved
Archeological Sites	N/A	Unknown	June 1999	Ministry of Small Business Tourism and Culture	Approved
Genetic Gain	MoFR	2003	2003	MoFR – Tree Improvement Branch	Approved
Site Series	RIC	2001	Pending	Regional Ecologist	Pending completion of accuracy assessment
Landscape Units	N/A	2001	2004	Minister of Sustainable Resource Management	Approved
Natural Disturbance Units	N/A	2003	2003	Regional Ecologist	Approved
Watersheds	N/A	2005	N/A	N/A	N/A
Agricultural Land Reserve	N/A	2004	2004	Agricultural Land Commission (MSRM)	Approved

10.2 Forest Cover Requirements and Modeling Constraints

This analysis for TFL 48 will utilize the Remsoft Spatial modeling system. The simulation part of this system, known as “Woodstock” will be used to determine a sustainable harvest level by formulating the TFL as a linear program by declining an objective function and constraints as outputs. “Linear programs” are models that are comprised of a set of mathematical relationships that are functions of activities that comprise the alternatives. These relationships describe the criterion of optimality (the objective function) and the set of feasible alternatives (constraints due to limitations of the system being modeled). The problem with pure linear programming on a system as complex as TFL 48 is that one can only optimize a single objective function at a time; all other goals must be handled as constraints. Within TFL 48, goals for maximizing harvests are equally important as goals of maintaining habitat and old-growth. As a compromise, “Goal Programming” is used. In goal programming, every management goal is specified as an absolute constraint on an output. The details of this are beyond the scope of this information package.

For the purposes of modeling forest management across TFL 48, harvesting is conducted with consideration given to the following management restrictions.

1. Minimum harvest age and minimum economic volume
2. A sustainable future THLB growing stock
3. Minimum old-growth constraints applied by natural disturbance unit
4. Limits on the amount of harvesting in visually sensitive areas
5. Limits on the minimum amount of thermal cover in ungulate winter range
6. Limits on the minimum amount of old growth within NDU/BEC Variant
7. Restrictions on access, timing and harvest levels within the Dunlevy Special Management Area
8. Limits on the amount of area below hydrological green up by watershed (ECA)

These management considerations are modeled aspatially within the Woodstock model. Spatial management considerations are modeled explicitly within the Stanley model by utilizing the preliminary harvest schedule identified through Woodstock, and then calibrating this by rationalizing adjacency constraints, cutblock size, opening size, and greenup delays.

Each of these management considerations are discussed in the sections following.

10.2.1 Natural Disturbance Units – Natural Range of Variation

Work completed within the Prince George Forest Region by the Regional Ecologist has seen the recent establishment of natural disturbance units or NDUs. NDUs were developed through a scientific process to replace the Provincial identification of Natural Disturbance Types, as defined by the Forest Practices Code Act Biodiversity Guidebook. The rational to support NDUs is documented by the Ministry of Forests Northern Interior Forest Region office. Further information is also provided in the Section 3.3 of SFMP4, where a detailed discussion occurs around Late Seral Forest Indicators and the targets.

The application of NDU constraints on TFL 48 for the Base Case scenario is based upon the minimum natural range of variation for stands greater than 140 years of age (100 years for deciduous in the Boreal Plains and Boreal Foothills - Valley). Table 50 describes the area within each NDU zone and subzone as well as the minimum NRV target applied to each of these areas as a percent and in equivalent area.

Table 50: Natural Disturbance Units – Natural Range of Variation

NDU	THLB Area (ha)	Total Forest Area (ha)	NRV % Target	Target Area (ha) >140 yrs (>100 yrs for decid)	Decades until Constraint is met through the NCLB
Boreal Foothills – Mountain	104,034	177,423	33	58,550	6
Boreal Foothills – Valley - Conifer	94,963	125,200	23	28,796	10
Boreal Foothills – Valley – Decid.	19,708	39,669	10	3,967	always
Omineca – Mountain	9,512	13,220	58	7,668	never
Omineca – Valley	4,395	6,210	23	1,428	4
Wet Mountain	50,338	92,738	84	77,900	never
Boreal Plains - Upland – Conifer	52,775	68,120	17	11,580	6
Boreal Plains - Upland – Decid.	27,640	43,814	10	4,381	always
Total Area (ha)	363,365	566,394		194,270	

Due to the large size of NDUs and the desire that there is some representation of old growth by BEC, the constraints identified in Table 50 have been expanded to include NDU/BEC combinations. Table 51 identifies the proportion of forest area designated as old growth (above 140 years for conifer and 100 years for deciduous) that will be applied to each NDU/BEC across the TFL.

Note that portions of Parks that are within the TFL have been excluded from the timber harvesting land base, but are retained in the model as these areas contribute to biodiversity and seral stage targets. These areas were identified in Table 17.

Table 51 NDU/BEC old growth constraints

Natural Disturbance Unit	BEC	Late Seral Target	Forest Area (ha)
Boreal Plains - Deciduous	BWBSmw1	10%	39028
	BWBSwk1	10%	4217
	ESSFmv2	10%	510
	SBSwk2	N/A	41
Boreal Plains Deciduous - Total		10%	
Boreal Foothills – Valley - Deciduous	BWBSmw1	10%	23129
	BWBSwk1	10%	1606
	BWBSwk2	10%	5082
	SBSwk2	10%	9866
Boreal Foothills – Valley - Deciduous - Total		10%	
Boreal Plains - Conifer	BWBSmw1	5%	31425
	BWBSwk1	5%	23531
	ESSFmv2	5%	12959
	SBSwk2	N/A	202
Boreal Plains – Conifer - Total		17%	
Boreal Foothills – Valley - Conifer	BWBSmw1	7%	30912
	BWBSwk1	7%	5294
	BWBSwk2	7%	7438
	SBSwk2	7%	81537
Boreal Foothills – Valley – Conifer - Total		23%	
Boreal Foothills – Mountain	ESSFmv2	10%	106082
	ESSFmv4	10%	11756
	ESSFwc3	10%	24543
	ESSFwk2	10%	26406
Boreal Foothills – Mountain - Total		33%	
Omineca Valley	BWBSmw1	N/A	31
	SBSwk2	7%	6179
Omineca Valley - Total		23%	
Omineca Mountain	ESSFmv2	17%	13188
Omineca Mountain - Total		58%	
Wet Mountain	ESSFmv2	25%	16256
	ESSFwc3	25%	32389
	ESSFwk2	25%	26163
	SBSwk2	25%	11558
Wet Mountain- Total		84%	

10.2.2 Visually Sensitive Areas

The base case utilizes the established VQO's as represented in the 2005 consolidated Visual Landscape Inventory. This is the not same inventory used for Management Plan 3.

Canfor's management of visually sensitive areas has evolved such that all new harvesting proposed in visually sensitive areas has to be planned using the principles of visual landscape design. In addition, Canfor has taken further actions that effectively address visual landscape management. These include:

- Block layout consistent with visual landscape design and biodiversity requirements which soften block appearance;
- The initial minimum target density on the TFL is 1600 sph. This density exceeds that of the Regional well-stocked stand target of 1200 sph;
- Road and trail deactivation/rehabilitation, grass seeding/reforestation and an acute awareness of dispersed site disturbance have reduced site disturbance well below levels considered normal when VAC denudation percentages were calculated;
- Site preparation methods where used, now emphasize minimal disturbance of the duff in order to maintain a more natural look to the blocks. Broadcast burning is not used and raw planting is the preferred treatment. This minimizes exposed rock and soil;
- Mixed species plantations which avoid monocultures, and improves visual characteristics;
- Increased cable harvesting reduces the presence of skid trails on the steeper visual slopes.

Over the past 5 years, Canfor has demonstrated performance in the following harvesting methods: Ground-based conventional, cable and aerial systems. Silviculture systems used are selection, shelterwood, irregular shelterwood, patch cut, clearcut and clearcut with reserves. Shelterwood harvesting has been used extensively during the term of MP 2 and MP 3 to ensure regeneration concerns are addressed in higher elevation ESSF balsam and spruce multi-layered stands. Selection logging techniques have also been used in visually sensitive areas to minimize the impact on visual resources. These actions demonstrate Canfor's commitment to managing the visual resource.

Table 52 describes the area by VQO and the percent constraint applied to each of the designations. Constraints will be applied at the landscape unit level to the total forested area within each VQO.

Table 52: Forest Cover Constraints in Visual Areas

VQO	LU_NAME	Productive Forest (ha)	THLB	Max % < greenup	Max area < greenup	Years to greenup
Established Modification	Boucher	222	154	21.9	49	24
	Burnt-Lemory	1062	429	21.9	233	24
	Carbon	10	0	21.9	2	24
	Dunlevey	1310	586	21.9	287	24
	Gething	3937	2686	21.9	862	24
	Highhat	1959	1587	21.9	429	24
	Martin Creek	1282	1050	21.9	281	24
	Wolverine	3294	2302	21.9	721	24
Established Maximum Modification	Burnt-Lemory	3590	2157	25	898	23
	Highhat	10430	7342	25	2608	23
	Martin Creek	3070	2316	25	768	23
Established Partial Retention	Boucher	6226	3616	9.9	616	24
	Burnt-Lemory	2373	1255	9.9	235	24
	Carbon	2002	1592	9.9	198	24
	Dunlevey	2992	344	9.9	296	24
	Gething	5480	3997	9.9	543	24
	Highhat	8379	5970	9.9	830	24
	Martin Creek	11103	7715	9.9	1099	24
	Wolverine	11440	7814	9.9	1133	24
Established Retention	Burnt-Lemory	1193	271	1.6	19	28
	Carbon	1960	1384	1.6	31	28
	Dunlevey	2328	317	1.6	37	28
	East Pine	1064	467	1.6	17	28
	Gething	1782	1147	1.6	29	28
	Highhat	546	413	1.6	9	28
	Martin Creek	259	44	1.6	4	28
	Wolverine	3753	2470	1.6	60	28
Recommended Modification	Carbon	127	6	21.9	28	24
	Dunlevy	242	63	21.9	53	24
	Gething	621	162	21.9	136	24
	Highhat	424	35	21.9	93	24
	Martin Creek	73	10	21.9	16	24
	Wolverine	181	2	21.9	40	24
Recommended Partial Retention	Burnt-Lemory	463	95	9.9	46	24
	Carbon	6667	1067	9.9	660	24
	Dunlevy	6248	467	9.9	619	24
	Gething	1525	135	9.9	151	24
	Highhat	2	0	9.9	0	24
	Martin Creek	21	0	9.9	2	24
	Wolverine	352	44	9.9	35	24
Recommended Retention	Carbon	79	2	1.6	1	28
	Martin Creek	5	0	1.6	0	28
	Wolverine	5	0	1.6	0	28

Note: Only established VQOs were applied in the Base Case scenario. Recommended VQOs were included in sensitivity analysis. When modelling, maximum modification VQO areas were grouped with the IRM zones identified in Table 53: Forest Cover Constraints in Non-Visual Areas

10.2.3 Forest Cover Constraints in Non-visually Sensitive Areas

Harvest methods are generally feller buncher/grapple skidder on the majority of the timber types scheduled for harvesting during the term of MP 3. Hand felling/line skidding occurs on a site specific basis as required. Cable logging was initiated in the TFL during the term of MP 1. MP 2 saw the cable logging program expand significantly and the advent of helicopter logging in two areas: (CP 645 in 1997, and CP 631 in 2002).

As sensitive sites (e.g., stream protection or steep slopes) are identified, logging methods are selected to best suit the site. Logging methods will continue to be prescribed on a site specific basis and carried out so as to minimize soil disturbance, soil compaction and other environmental concerns.

Canfor will continue to use and develop innovative harvesting systems to address site specific concerns. Although much of the TFL has highly productive sites, minimum volume requirements are a factor in determining logging systems. The minimum economic volume within stands must exceed a certain volume in order to offset the higher costs associated with mixed or cable logging. Volume however, is not the only factor used in the selection of a harvesting system, rather the harvesting system is chosen that best meets the site specific objectives. Examples of where site specific harvest methods may be used:

- Helicopter logging of wind-throw in viewsheds to meet VQOs, and to minimize site disturbance and damage to existing plantations.
- Helicopter logging of previously inoperable areas in the TFL.
- Irregular shelterwood systems in uneven aged stands, to reduce plantation mortality and increase fiber production.
- Selective or partial cut cable yarding systems in highly visible or sensitive areas.
- Cable yarding throughout the TFL to minimize soil disturbance on steep or wet ground.

Cut block adjacency is reflected aspatially through a maximum of 33% of the area less than 3 metres in height, for the non-visually sensitive areas of the TFL. As well, cut block adjacency is also reflected in the 20-year spatial harvest plan which is created in support of the Base Case harvest level that will be presented in the timber supply analysis report. Table 53 shows the forest cover constraints applied to the non-visual portions of each landscape unit.

Table 53: Forest Cover Constraints in Non-Visual Areas [1]

LU_NAME	Productive Forest (ha)	THLB	Max % less than greenup	Max area less than greenup	Years to greenup
Conifer Leading Stands					
Boucher	15,621	12,540	33	4,138	18
Burnt-LeMoray	98,033	57,456	33	18,960	18
Carbon	75,585	40,846	33	13,479	18
Dunlevy	26,976	16,214	33	5,351	18
East Pine	6,658	5,807	33	1,916	18
Gething	41,350	31,888	33	10,523	18
Highhat	67,348	52,784	33	17,419	18
Martin Creek	35,656	26,667	33	8,800	18
Pine River	1,132	926	33	306	18
Wolverine	54,485	31,333	33	10,340	18
Deciduous Leading Stands					
Boucher	13,230	9,509	33	3,138	10
Burnt-LeMoray	2,971	1,156	33	381	10
Carbon	559	185	33	61	10
Dunlevy	11,834	7,190	33	2,373	10
East Pine	11,233	8,155	33	2,691	10
Gething	3,441	1,243	33	410	10
Highhat	8,936	4,772	33	1,575	10
Martin Creek	9,393	4,918	33	1,623	10
Pine River	492	308	33	102	10
Wolverine	4,115	1,753	33	578	10
Total All	489,048	315,650		104,165	

Note: The areas identified in this table include area from Table 52 as existing maximum modification, and all recommended VQOs were included as not visually sensitive in the base case analysis.

10.2.4 Forest Cover Constraints in Watersheds

Equivalent Clear-cut Area (ECA) constraints are applied to the watersheds identified in Table 33 according to the guidelines shown in Table 54.

Table 54: ECA Application

Average Height (m)	Mid-point Height (m)	Years to Achieve Height (years)	Hydrologic Recovery (IWAP) (%)	ECA Constraint (Max. % of Area less than Trigger Height)			
				25%	30%	35%	40%
0 - < 3 m	0	0	0%	na	n/a	n/a	n/a
3 - < 5m	3	17	25%	25% < 17 yrs	30% < 17 yrs	35% < 17 yrs	40% < 17 yrs
5 - < 7 m	5	25	50%	31% < 25 yrs	37.5% < 25 yrs	43.8% < 25 yrs	48.8% < 25 yrs
7 - < 9 m	7	32	75%	38% < 32 yrs	45% < 32 yrs	52.5% < 32 yrs	57.5% < 32 yrs
9 m +	9	39	90%	44% < 39 yrs	52.5% < 39 yrs	61% < 39 yrs	66% < 39 yrs

10.2.5 Forest Cover Objectives in Ungulate Winter Range

Ungulate winter range habitat areas are constantly being revised within the TFL. Some of the constraints applicable to winter range have been addressed in land base net-downs. *Additionally, for the Sukunka Graveyard ungulate winter range (see "Ungulate" in* Table 34) *a maximum of 20 percent of the productive forest may be less than 3 metres in height and a minimum of 50 percent of the productive forest must be greater than 100 years.*

The rationale for these forest cover constraints were first tested as a sensitivity analysis in MP3. Subsequently, the results have been used as a rationale by the MoE in the "Material Supporting the Notice to Establish" these UWR areas under Section 7(2) of the Forest Planning and Practices Regulation.

10.3 Rationale for Other Land Base Modelling Considerations

10.3.1 Recreation

The following recreation sites have been removed from the timber harvesting land base:

- Boulder Lake
- Carbon Lake
- Gething Creek
- Wright Lake

10.3.2 Forest Ecosystem Networks

There are no forest ecosystem networks established for TFL # 48.

10.3.3 Wildlife Tree Patches

Refer to Section 7.1.12 for details and rationale.

10.3.4 Higher Level Plans

TFL # 48 falls entirely within the Dawson Creek Land and Resource Management Plan (LRMP). The Dawson Creek LRMP was officially approved with direction to implement on March 30, 1999.

New protected areas that were proposed in the LRMP have received official designation under an Order-In-Council (OIC). These areas have been excluded from the T.H.L.B.

Resource management zones, which were defined as part of the LRMP process will not have specific forest cover constraints applied to them. Canfor believes that all of the activities and concerns associated with the resource management zones can and will be addressed at the operational level of management, rather than at the strategic level. Landscape Unit, biogeoclimatic zone, variant biodiversity objectives provide sufficient levels of spatial resolution to ensure that multi-resource management objectives are being addressed.

The LRMP recognizes the Twin Sisters RMZ as an area of profound spiritual significance and traditional use value to the First Nations people of northeastern BC. Due to the low levels of THLB within the RMZ's and the management of visual areas from the Twin Sisters Protected Area, Canfor feels that no additional forest cover constraints will be necessary to meet the objectives stated in the LRMP section 4.13.

Table 55 : Twin Sisters RMZ Forested and THLB Areas

RMZ	Gross Area	Forested Area	THLB	THLB % of Gross Area
Twin Sisters Mountain Sub-RMZ	6340	5628	2264	36%
Twin Sisters Headwaters Sub-RMZ	17861	15019	7494	42%

10.3.4.1 Dunlevy Creek Management Plan

During the term of MP#3, a special management plan for the Dunlevy block of the TFL was developed (January 24, 2002) and prepared by the Ministry of Sustainable Resource Management and subsequently received Government endorsement. The Plan divides the Dunlevy into several compartments and identifies specific operational guidelines around which harvesting and mineral extraction may occur. The information used to determine that amount of harvesting in each compartment was based upon the MP#3 THLB. Since the THLB has changed for in this analysis, the area targets are adjusted accordingly and in keeping with the relative amount of harvest area to THLB area. The timing of harvest has not changed; however, additional periods were included to cover the entire planning horizon. Spatially, the model blocked stands in these planning periods using a 60-hectare target block size and a 500-metre buffer between blocks. Table 56 describes the planning periods and the area targeted for harvesting in the Dunlevy.

Table 56: Area Proposed for Harvest by Decade within the Dunlevy Plan Area

Period	THLB Areas and Decade Targeted	Compartment				
		Adams	Aylard	Lower Dunlevy	Upper Dunlevy	Dresser Creek
	2001 THLB	3,621	2,261	6,379	1,891	2,704
	2006 THLB	3,610	2,819	4,876	1,914	3,400
1	2005			245	480	
2	2015	1,246				
3	2025			245		
4	2035				480	
5	2045		561	245		
6	2055			489		1,697
7	2065	722				
8	2075			489		
9	2085					
10	2095	897				
11	2105			726		
12	2115		848			
13	2125			726		1,697
14	2135		848			
15	2145				566	
16	2155	1,246		245		
17	2165					
18	2175			245	480	
19	2185		561			
20	2195	722		245		
21	2205					
22	2215			489		
23	2225		848			

Period	THLB Areas and Decade Targeted	Compartment				
		Adams	Aylard	Lower Dunlevy	Upper Dunlevy	Dresser Creek
	2001 THLB	3,621	2,261	6,379	1,891	2,704
	2006 THLB	3,610	2,819	4,876	1,914	3,400
24	2235			489		
25	2245	897				1,697

10.3.5 Minimum Harvest Age Derivation

Minimum harvestable ages are simply minimum criteria. While harvesting may occur in stands at the minimum harvest age in order to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time or avoiding large inter-decadal changes in harvest levels), most stands will not be harvested until well past the minimum timber production ages due to other resource values.

On TFL #48 the minimum harvest age is set at the culmination age for each analysis unit, so long as the analysis unit has achieved a minimum economic volume of 140m3/ha by this age. This is consistent with the management strategies designed to maximize fiber production, while giving consideration for economic realities. Full site occupancy, maximizing M.A.I. and culmination age harvesting will help to achieve Canfor's forest management, economic opportunity and employment objectives. On a more stand specific basis, cutting priority is highest on blow-down, insect attacked or fire damaged stands. To date, Forest Development Plans have placed priorities on harvesting stands affected by blow-down or pest damage, and stands with a high risk of blow-down or declining rates of growth. Table 57 shows the minimum cutting age (i.e., culmination age) by analysis unit.

Table 57: Minimum Merchantability Standards

AU #	AU Description	Culmination Age			
		Unmanaged Stands	Existing Managed Stands	Future Managed Stands	Future Managed Stands with Genetic Gains
1	Bl_all	160	120	140	150
2	Bx_y	130	120	130	120
3	Bx_o	150	n/a	170	150
4	Bl_s	150	145	210	210
5	Sw_yg	100	110	100	100
6	Sw_ym	130	190	120	120
7	Sw_og	120	n/a	120	130
8	Sw_om	170	n/a	170	170
9	Sc_yg	120	110	110	100
10	Sc_ym	140	190	140	150
11	Sc_og	130	n/a	120	120
12	Sc_om	190	n/a	170	170
13	Sd_g	100	90	90	80
14	Sd_m	130	140	130	150
15	Ss_g	160	175	195	195
16	Ss_m	210	195	255	195
17	Pc_yg	80	80	80	70
18	Pc_ym	110	110	90	100
19	Pc_og	90	n/a	80	80
20	Pc_om	120	n/a	100	110
21	Pd_g	80	n/a	80	90
22	Pd_m	110	n/a	100	110
23	Pl_g	90	80	80	80
24	Pl_m	120	90	90	90
25	Ac_g	80	80	90	90
26	Ac_m	90	100	100	130
27	Ad_g	70	n/a	70	70
28	Ad_m	80	n/a	80	80
29	Ct_con	90	90	80	110
30	Ct_dec	110	n/a	110	110
31	LwStk-c	n/a	100	80	n/a
32	wStk-d	n/a	110	70	n/a

In addition to Culmination Age, each stand was assessed to ensure they met the minimum economic volume target of 140m3/ha. At the ages shown, all analysis units achieve 140m3/ha.

10.3.6 Operability

The majority of harvesting on the TFL takes place with conventional, ground-based equipment. This reflects the generally favorable operating conditions in the area. Non-conventional methods such as overhead cable systems and helicopter logging are used as required, to harvest steeper ground to meet terrain stability requirements or to expand summer harvesting opportunities on areas with sensitive soils. Currently, approximately 40% of harvesting activities within the TFL utilize cable systems. The increased use of this system has occurred as a result of the backlog of cable ground accessible from existing roads. This component of cable logging will decrease to a lower level over time. Horse logging or small tractor logging is being utilized on a small scale to provide social opportunities, to demonstrate the ability to carry out partial cuts and to meet visual quality objectives through shelterwood or selective cutting.

Utilizing any and all of these systems where applicable has resulted in there being very few physically inoperable areas within the TFL

Economic operability has been estimated using a combination of the age/height/stocking attributes of a forest stand, and an indication of site quality. Although these areas are excluded at this time from the timber harvesting land base, this does not preclude Canfor's harvesting within them some time in the future. Estimates of future market conditions are typically difficult to predict. Economic operability is also addressed through minimum volume criteria applied to stands existing where mixed and cable harvesting systems are required.

10.3.7 Initial Harvest Rate

The principle harvest flow pattern being considered will mimic the harvest flow indicated in MP 3. This was a non-declining harvest level.

10.3.8 Harvest Rules

In general terms, harvesting priorities take into account forest profile considerations, forest health conditions, hydrologic considerations, wildlife and environmental issues. However, the principal emphasis will be placed on maximizing growth potential from the productive forest land base.

In a linear programming type of modeling solution, the resultant harvest level is that which addresses all management constraints and selects stands in a manner that maximizes the overall harvest. In support of this objective, the following harvest rules will be applied to the linear programming matrix:

1. Maximize the coniferous harvest
2. Maximize the deciduous harvest
3. Ensure that the long term merchantable growing stock does not decline after 170 years.

10.3.9 Harvest Profile

The harvest profile will be divided between the deciduous land base and the coniferous land base. In MP#3, the deciduous harvest came solely from the pulpwood portion of the TFL. In SFMP 4, this harvest is expanded to include the merchantable deciduous across the entire TFL.

10.3.10 Silviculture Systems

Clear cutting is the system of choice on the TFL. Irregular shelterwood harvesting is also occurring on approximately 9.4% of the timber harvesting land base land base. This is represented by analysis units 4, 15, 16 in the Base Case.

10.3.11 Harvest Flow Objectives

Guidance in developing harvest flow objectives is taken from the current economic and social objectives of the Crown expressed by the Minister of Forests in a letter to the Chief Forester in 1994. He emphasized the importance of the continued availability of good forest jobs and to the long-term stability of communities that rely on forests. He continues on to state that any decreases in allowable cut at this time should be no larger than necessary to avoid compromising long-run sustained yield.

In the Base Case for this analysis, a non-declining harvest flow will be modeled. This may mean that the initial flat-line harvest level is increased to the long term harvest level at some time in the forecast period. The long-term harvest level is defined by the highest long-term level that can be attained while maintaining a (more or less) constant total growing stock.

Harvest flow objectives must also consider the threat of the mountain pine beetle that is prevalent east of the Rockies and has in the past year, advanced into TFL48 through several southerly mountain passes. An accelerated harvest flow that targets pine at risk of attack from the MPB will be modeled in sensitivity analysis. The harvest flow objective for these MPB scenarios will be to minimize the non-recoverable losses attributed to MPB tree mortality

11.0 Option Assumptions

The options and sensitivity analysis, which will be assessed in the Timber Supply Analysis Report, are summarized in Table 58. A brief description of how each scenario will be modeled follows, along with the changes to pertinent tables. Some of the changes to the scenarios are self evident. In those cases, additional information is not provided.

Table 58: Summary List of Scenarios

#	Name	Description
2	LU/BEC	Model old growth by Landscape Unit and BEC as per the Old Growth Order
3	Mean NRV	Examine the impact of utilizing the mean level of the NRV
4	Max NRV	Examine the impact of utilizing the highest level of the NRV
5	No NRV	Examine the impact of removing all biodiversity constraints
6	MPB – no uplift	Examine the impact of pine mortality while maintaining the Base Case harvest level
7	MPB – Uplift 30%	This scenario will see an accelerated harvest level directed toward mature pine to mitigate the possible loss in volume due to the MPB
8	Include Woodlots	Examine the impact of including woodlots into the Base Case harvest flow
9	Recommended VQOs	Examine the impact of a new visual inventory.
10	Mining	Examine the inclusion of proposed mine sites into the TFL
101	30 year accelerated	Maximize the harvest for the next 30 years than drop to a NDY
102	Increase TFL 5%	Increase the THLB landbase by 5%
103	Decrease TFL 5%	Decrease the TFL by 5%
104	Incr. natural stands by 10%	Increase all empirical yield tables by 10%
105	Decr. naturals by 10%	Decrease all empirical yield tables by 10%
106	Incr. managed stands by 10%	Increase all managed yield tables by 10%
107	Decr. managed by 10%	Decrease all managed yield tables by 10%
108	Decr. min cut age 10yrs	Decrease the minimum cutting by 10 years
109	Incr. min cut age 10 years	Increase the minimum cutting ages by 10 years
110	Incr VQOs one class	Adjust the constraints on each VQO up one class. (e.g., retention VQO area as assigned a preservation VQO constraint)
111	Decr VQOs one class	Adjust the constraints on each VQO down one class. (e.g., retention VQO area as assigned a partial retention VQO constraint)
112	Inrc greenup constraint	Increase all greenup constraints in the Stanley model by 1 period
113	Decr greenup constraint	Decrease all greenup constraints in the Stanley model by 1 period

11.1 Scenario 2 Model Landscape Unit BEO

In this scenario the NDU guidelines will be replaced with LU/BEC constraints as shown below.

Table 59: Group Constraints applied based on the Established Old Growth Order

BEO	LU / BEC	Species	Prod Forest	NCLB	THLB	Constraint
Low	Boucher - BWBSmw1	Conif	11,472	3,034	8,438	11%>140
Low	Boucher - BWBSmw1	Decid	15,962	5,310	10,652	13%>100
Low	Boucher - BWBSwk1	Conif	5,279	371	4,907	11%>140
Low	Boucher - BWBSwk1	Decid	1,798	771	1,028	13%>100
Low	Boucher - SBSwk2	All	951	159	792	9%>250
Intermediate	Burnt-Lemoray - ESSFwc3	All	41,630	25,022	16,608	19%>250
Intermediate	Burnt-Lemoray - ESSFwk2	All	38,937	10,965	27,976	19%>250
Intermediate	Burnt-Lemoray - SBSwk2	All	22,986	7,029	15,957	9%>250
Intermediate	Carbon - ESSFmv2	All	46,132	20,883	25,249	9%>250
Intermediate	Carbon - ESSFwc3	All	9,716	4,607	5,109	19%>250
Intermediate	Carbon - ESSFwk2	All	4,368	1,310	3,059	19%>250
Intermediate	Carbon - SBSwk2	All	15,192	4,590	10,601	9%>250
High	Dunlevey - BWBSmw1	Conif	10,295	3,762	6,533	16%>140
High	Dunlevey - BWBSmw1	Decid	9,341	5,307	4,034	19%>100
High	Dunlevey - BWBSwk2	Conif	7,438	2,806	4,632	16%>140
High	Dunlevey - BWBSwk2	Decid	5,082	1,646	3,436	19%>100
High	Dunlevey - ESSFmv4	All	11,756	5,746	6,011	13%>250
Low	East Pine - BWBSmw1	Conif	6,892	954	5,938	11%>140
Low	East Pine - BWBSmw1	Decid	12,039	3,569	8,470	13%>100
Low	Gething - BWBSmw1	Conif	8,864	1,880	6,984	11%>140
Low	Gething - BWBSmw1	Decid	2,810	1,610	1,201	13%>100
Low	Gething - ESSFmv2	All	24,147	6,970	17,178	9%>250
Low	Gething - SBSwk2	All	20,162	4,495	15,667	9%>250
Low	highhat - BWBSmw1	Conif	7,470	1,659	5,811	11%>140
Low	highhat - BWBSmw1	Decid	8,747	3,554	5,192	13%>100
Low	highhat - ESSFmv2	All	31,099	7,292	23,808	9%>250
Low	highhat - ESSFwk2	All	2,536	610	1,926	19%>250
Low	highhat - SBSwk2	All	37,297	8,514	28,783	9%>250
Low	Martin Creek - BWBSmw1	Conif	12,408	2,414	9,994	11%>140
Low	Martin Creek - BWBSmw1	Decid	10,956	4,840	6,116	13%>100
Low	Martin Creek - BWBSwk1	Conif	18,409	3,705	14,704	11%>140
Low	Martin Creek - BWBSwk1	Decid	2,448	1,196	1,252	13%>100
Intermediate	Wolverine - BWBSmw1	Conif	3,792	854	2,938	11%>140
Intermediate	Wolverine - BWBSmw1	Decid	1,769	991	778	13%>100
Intermediate	Wolverine - BWBSwk1	Conif	5,128	953	4,175	11%>140
Intermediate	Wolverine - BWBSwk1	Decid	1,576	1,079	498	13%>100
Intermediate	Wolverine - ESSFmv2	All	34,141	13,105	21,036	9%>250
Intermediate	Wolverine - ESSFwc3	All	5,576	2,378	3,198	19%>250
Intermediate	Wolverine - ESSFwk2	All	6,727	2,212	4,516	19%>250
Intermediate	Wolverine - SBSwk2	All	12,794	4,260	8,533	9%>250

Note: Landscape unit / BEC groups without THLB area are not shown in this table.

11.2 Scenario 3 Model Mean NRV

Table 60 describes the old growth constraints applied to the natural disturbance units in TFL 48 if mean natural range of variability targets were used.

Table 60: Scenario 3 - Mean NRV

NDU	THLB Area (ha)	Total Forest Area (ha)	NRV % Target	Target Area (ha) >140 yrs (>100 yrs for decid)	Decades until Constraint is met through the NCLB
Boreal Foothills - Mountain	104,034	177,423	41	72,743	12
Boreal Foothills - Valley - Conifer	94,963	125,200	32	40064	never
Boreal Foothills - Valley - Decid.	19,708	39,669	15	5950	3
Omineca - Mountain	9,512	13,220	63.5	8395	never
Omineca - Valley	4,395	6,210	31.5	1956	never
Wet Mountain	50,338	92,738	84	77900	Never
Boreal Plains - Upland - Conifer	52,775	68,120	25	17,030	never
Boreal Plains - Upland - Decid.	27,640	43,814	15	6,572	4
Total Area (ha)	363,365	566,394		230,610	

11.3 Scenario 4 Model Maximum NRV

Table 61 describes the old growth constraints applied to the natural disturbance units in TFL 48 if maximum natural range of variability targets were used.

Table 61: Scenario 4 - Maximum NRV

NDU	THLB Area (ha)	Total Forest Area (ha)	NRV % Target	Target Area (ha) >140 yrs (>100 yrs for decid)	Decades until Constraint is met through the NCLB
Boreal Foothills – Mountain	104,034	177,423	49	86,937	never
Boreal Foothills – Valley - Conifer	94,963	125,200	40	50,080	Never
Boreal Foothills – Valley – Decid.	19,708	39,669	20	7,934	5
Omineca – Mountain	9,512	13,220	69	9,122	never
Omineca – Valley	4,395	6,210	40	2,484	Never
Wet Mountain	50,338	92,738	88	81,609	Never
Boreal Plains - Upland – Conifer	52,775	68,120	33	22,480	Never
Boreal Plains - Upland – Decid.	27,640	43,814	20	8,763	6
Total Area (ha)	363,365	566,394		269,409	

11.4 Scenarios 6 and 7 Modelling the Mountain Pine Beetle Epidemic

To model the mountain pine beetle epidemic, two models were used. The first model is a Beetle epidemic and control model that was run on an annual basis for 10 years. The principle inputs to this model were analysis unit areas, volumes, diameters classes, along with assumptions on the level of infestation, shelf-life, the amount of harvest volume directed towards pine beetle control and volume salvage and single tree control. The principle output was the forecast amount of non-recoverable pine volume losses determined by the epidemic model. These NRLs were then factored into the Woodstock model by directing MPB 'harvesting' of pine volume only in leading pine stands and in leading spruce stands with a significant pine component. The leading pine stands attacked by the beetle were assumed to regenerate back to themselves as unmanaged stands. The leading spruce stands continued to grow on the same yield curve, less the pine component.

Stands at risk to attack by the Mountain Pine Beetle were identified by assuming that all leading pine analysis units greater than 60 years of age and all leading spruce analysis units having 40% or more pine component would be attacked and killed over the next 10 years. This assumption results in the following statistics.

- Gross mature (>60 years age) pine volume in the TFL is 25,235,600 cubic metres
- Total number stands with pine volume is 33,700
- 119417 ha THLB or 153,476 ha of productive forest are greater than 60 years age with more than a 40% pine component. Under this assumption 18,343,800 cubic metres of pine in the THLB is at risk. This is equivalent to approximately 35 years harvest under the current coniferous AAC.
- All analysis units have their pine component separated from the remainder of the stand volume.

Scenarios were tested that modeled a non-declining harvest flow and an accelerated harvest flow. Scenarios were also tested using different levels of pine infestation.

11.5 Scenario 8 – Woodlots

During the initial phase of the net down process, woodlots were removed from the productive forest land base and the THLB. Table 62 identifies the woodlots within the TFL. Woodlots are divided into two separate categories; 1) those that were removed in MP3 but the AAC apportionment table included with the Management Plan approval letter dated September 20, 2001 did not reflect the removal and 2) those new woodlots removed during the term of MP3 and in the SFMP4 analysis. In this scenario, these 1,042 and 797 hectares are added back to the productive forest land base and the THLB as 2 separate scenarios to quantify the impact of each removal.

Table 62: Woodlot Licenses

TENURE	Accounted for in MP3	Removed in MP4
W0266	247	
W0297		314
W0668	176	262
W1189		218
W1501	619	
	1,042	797

11.6 Scenario 9 – Recommended Visual Quality Objectives

Scenario 9 tests the impact of the visual quality classes identified recently by the Regional landscape forester. Table 52: Forest Cover Constraints in Visual Areas identifies the recommended area within each VQO. The recommended VQO's for new scenic areas within each landscape unit were removed from the IRM zone (except for recommended maximum modification) and forest cover constraints consistent with the VQO designation were applied.

11.7 Scenario 10 – Mine Sites

Scenario 10 tests the impact of including the proposed mine sites identified in Table 8: Reduction for Mining. This scenario add the entire forested area in proposed mine sites (i.e., 479 hectares) to the THLB. Although this is an overestimate of the amount of area, the impact of this amount of area inclusion is expected to be relatively small.

11.8 Scenario 11 – SIBEC

Scenario 11 builds off of the base case assumptions making two changes. All post95 managed stand yield tables (except the shelterwood tables) where adjusted using site index estimates by site series (e.g., SIBEC). The current May 2006 estimates were acquired from the MOF's website. Table 44 and Table 45 indicate the area weighted site index by analysis unit resulting from the SIBEC tables. As a result of the change in yield table, the minimum harvest age associated with the changes were also addressed. The measure of impact was reviewed through a non-declining yield harvest flow.

11.9 Scenarios 101 to 113 – Standard MOF Sensitivity Analysis

Scenarios 101 to 113 are standard sensitivity scenarios that are traditionally requested by the MOF. The value of these scenarios is to evaluate the relative weight of various input and management assumptions on the harvest flow for a land base. The procedures used to conduct these scenarios are consistent with MOF Analysis Branch Timber Supply Review sensitivity analysis.

Appendix I
Yield Tables

Table 63: Unmanaged Stand Yield Tables

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
Bl_all	0	0	0	0	4	17	39	66	93	116	136	155	173	192	211	229	247	263	279	295	310	325	339	353	366	376
Bx_y	0	0	0	1	7	25	56	91	124	152	178	201	223	245	267	287	305	323	339	355	370	384	398	412	425	435
Bx_o	0	0	0	0	1	8	23	47	75	99	121	141	160	179	197	215	231	247	263	277	291	305	318	330	342	352
Bl_s	0	0	0	0	2	10	26	50	76	98	119	137	155	173	191	208	224	239	254	268	282	296	308	320	332	342
Sw_yg	0	0	0	0	7	33	80	131	179	221	257	289	316	341	363	382	398	412	424	435	445	453	461	468	474	480
Sw_ym	0	0	0	0	1	1	2	8	27	58	88	116	142	166	189	210	228	246	261	275	289	301	312	322	332	341
Sw_og	0	0	0	0	2	14	43	86	131	171	206	238	267	292	315	336	354	370	384	396	408	418	428	437	445	452
Sw_om	0	0	0	0	0	1	2	8	28	58	90	121	149	177	202	226	248	268	287	304	320	335	349	362	374	385
Sc_yg	0	0	0	0	3	19	56	105	154	198	238	274	307	337	363	385	404	420	433	445	456	466	476	484	492	499
Sc_ym	0	0	0	0	0	1	4	18	46	81	115	148	178	206	233	256	277	296	313	329	343	357	369	381	392	402
Sc_og	0	0	0	0	1	9	36	79	126	169	208	243	276	305	331	354	373	389	404	416	427	438	448	457	465	473
Sc_om	0	0	0	0	0	1	3	13	35	65	97	128	158	186	213	238	260	281	300	317	333	349	363	377	389	400
Sd_g	0	0	0	0	5	28	76	132	182	225	261	293	320	343	363	379	392	402	410	418	424	430	436	440	444	448
Sd_m	0	0	0	0	0	1	12	41	80	119	154	185	213	238	260	279	294	306	317	327	335	343	351	357	363	369
Ss_g	0	0	0	0	1	6	18	41	74	109	140	168	194	218	241	261	280	297	313	327	341	353	365	376	386	395
Ss_m	0	0	0	0	0	1	4	10	22	41	63	87	110	133	155	175	195	213	231	247	263	277	291	304	316	327
Pc_yg	0	0	1	17	61	115	164	206	243	276	306	333	357	379	396	409	418	424	427	428	431	434	438	441	444	447
Pc_ym	0	0	0	2	16	49	88	125	158	187	214	239	262	283	299	312	322	329	333	336	339	343	347	351	355	358
Pc_og	0	0	1	12	50	101	147	187	223	255	284	310	334	356	372	385	394	401	404	406	409	413	417	420	424	427
Pc_om	0	0	0	1	10	35	69	102	133	162	188	212	234	254	270	283	293	301	306	309	313	317	322	326	330	333
Pd_g	0	0	0	6	29	66	107	145	178	207	233	257	278	297	311	322	329	333	334	334	336	338	340	342	344	346
Pd_m	0	0	0	0	2	16	43	74	104	131	156	178	199	217	232	243	250	255	258	260	261	264	267	269	271	273
Pl_g	0	0	1	17	62	117	167	213	254	291	325	357	387	413	432	446	456	462	464	464	465	468	471	474	477	480
Pl_m	0	0	0	1	14	46	84	121	155	187	216	244	270	294	312	326	336	342	345	346	348	352	355	358	362	365
Ac_g	0	0	0	7	33	75	117	155	187	215	239	258	273	285	295	302	307	310	312	313	314	316	317	319	320	321
Ac_m	0	0	0	0	6	24	49	75	98	118	136	151	164	174	182	188	192	194	196	198	199	201	202	204	205	206
Ad_g	0	0	0	9	38	79	120	156	187	213	234	250	262	270	277	283	285	285	286	286	286	286	287	287	287	287
Ad_m	0	0	0	0	3	19	47	76	102	125	144	160	172	181	188	193	196	196	197	197	198	198	199	199	200	200
Ct_con	0	0	1	7	31	71	113	150	182	210	235	256	275	292	306	317	323	326	328	330	332	334	336	337	339	340
Ct_dec	0	0	0	3	17	46	82	117	148	176	201	223	242	258	271	280	284	285	286	286	287	288	288	289	289	289

Table 64: Species Distribution (%) in Existing Unmanaged Stands

AU	S	B	PL	L	AC	AT	E
1	9	91	0	0	0	0	0
2	29	63	8	0	0	0	0
3	31	66	3	0	0	0	0
4	24	75	1	0	0	0	0
5	91	1	3	0	4	1	0
6	91	2	4	0	2	1	0
7	92	3	3	0	2	0	0
8	90	7	2	0	1	0	0
9	61	10	23	0	3	3	0
10	62	18	18	0	1	1	0
11	64	14	19	0	2	1	0
12	65	27	8	0	0	0	0
13	62	1	5	0	17	13	2
14	61	2	7	0	16	12	2
15	72	24	4	0	0	0	0
16	70	29	1	0	0	0	0
17	25	4	65	0	2	4	0
18	25	8	64	0	1	2	0
19	27	5	64	0	2	2	0
20	25	10	63	0	1	1	0
21	11	0	61	0	6	21	1
22	9	1	62	1	5	21	1
23	6	0	92	0	0	2	0
24	5	1	93	0	0	1	0
25	17	0	13	0	6	61	3
26	13	1	18	0	4	63	1
27	3	0	2	0	12	82	1
28	4	0	3	0	11	80	2
29	25	0	7	0	60	7	1
30	6	0	2	0	64	17	11

Table 65: Existing Managed Stand Yield Tables

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
Bl_all	0	0	0	0	1	17	57	113	170	224	277	324	360	390	413	433	449	463	475	484	491	499	501	501	501	501
Bx_y	0	0	0	0	1	16	55	110	167	221	273	320	358	387	410	430	446	460	472	482	489	497	500	500	501	500
Bl_s	0	0	0	0	1	15	52	106	166	221	276	323	360	390	414	434	450	465	477	487	495	501	503	504	504	505
Sw_yg	0	0	0	0	6	42	112	192	266	332	381	420	451	477	496	512	521	527	530	533	533	534	535	534	532	530
Sw_ym	0	0	0	0	0	0	1	4	17	38	68	102	136	168	199	228	258	286	310	332	350	365	378	390	399	408
Sc_yg	0	0	0	0	8	32	79	137	195	248	294	331	361	384	404	421	435	445	454	459	462	464	466	466	466	465
Sc_ym	0	0	0	0	0	0	1	6	18	37	63	93	123	152	179	205	230	254	276	294	310	323	335	345	354	362
Sd_g	0	0	0	4	31	90	153	208	263	304	334	356	374	387	398	407	409	409	409	408	408	407	407	406	404	401
Sd_m	0	0	0	0	1	8	31	68	109	150	184	216	247	274	296	313	326	336	345	352	358	363	368	372	375	378
Ss_g	0	0	0	0	0	6	27	66	117	169	217	264	307	342	370	394	412	429	443	455	466	474	480	487	492	493
Ss_m	0	0	0	0	0	1	10	35	73	119	164	206	246	285	319	346	369	389	405	419	431	441	451	459	465	470
Pc_yg	0	0	0	20	71	131	188	242	286	322	352	376	396	413	426	436	444	450	456	460	464	466	463	461	458	455
Pc_ym	0	0	0	2	21	53	91	128	162	192	218	242	264	282	295	307	316	324	332	338	342	346	350	353	356	357
Pl_g	0	0	0	22	77	137	189	235	273	301	326	348	366	379	391	402	411	416	421	425	430	432	436	439	441	436
Pl_m	0	0	0	2	25	60	98	132	162	187	209	228	245	259	270	279	286	293	299	304	307	310	313	315	317	319
Ac_g	0	0	0	14	65	138	219	290	350	396	432	460	481	496	504	507	509	510	511	510	509	509	508	508	508	508
Ac_m	0	0	0	0	7	31	70	117	165	209	249	285	314	337	356	373	386	399	409	417	424	430	432	433	434	435
Ct_con	0	0	0	2	19	59	114	171	226	274	315	346	373	394	412	427	439	449	456	461	465	467	467	467	467	467
LwStk_c	0	0	1	10	32	68	113	155	196	230	260	286	309	327	342	355	365	372	378	383	387	390	393	395	396	397
LwStk_d	0	0	1	6	21	50	87	124	157	185	209	229	246	259	270	278	282	284	286	288	289	290	291	291	291	291

Table 66: Post 1995 Stands Yield tables (inside the Genetic Areas)

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
Bl_all	0	0	0	0	0	1	15	49	93	142	186	226	263	304	337	364	385	401	414	424	433	441	446	451	455	458
Bx_y	0	0	0	0	1	14	55	113	173	224	272	323	361	390	411	427	441	451	459	467	472	476	479	482	484	481
Bx_o	0	0	0	0	0	1	8	32	71	114	160	198	235	270	307	337	362	381	396	409	418	427	434	439	444	448
Bl_s	0	0	0	0	0	0	0	27	42	54	65	76	86	99	121	147	176	203	228	251	275	298	317	335	348	360
Sw_yg	0	0	0	0	6	50	119	189	250	312	363	399	425	444	459	471	481	487	493	497	495	493	491	489	487	485
Sw_ym	0	0	0	0	1	18	67	128	187	238	290	338	375	400	421	435	449	458	466	473	477	480	484	487	484	481
Sw_og	0	0	0	0	0	9	42	91	147	193	237	282	321	352	373	391	404	415	424	431	437	441	444	447	449	452
Sw_om	0	0	0	0	0	0	2	16	45	80	119	157	190	221	252	284	311	333	351	364	376	385	393	400	406	409
Sc_yg	0	0	0	0	8	50	113	175	228	281	324	355	377	394	407	417	426	432	437	441	440	439	439	438	437	434
Sc_ym	0	0	0	0	0	1	11	39	77	119	160	195	228	261	293	317	339	354	367	377	385	393	398	403	407	411
Sc_og	0	0	0	0	2	23	75	134	188	236	284	325	357	379	397	411	422	430	438	443	447	451	455	454	452	450
Sc_om	0	0	0	0	0	0	2	14	40	73	109	146	177	206	233	262	288	309	327	340	352	362	369	376	382	387
Sd_g	0	0	0	4	46	121	193	262	318	354	380	400	414	425	430	431	431	431	430	430	430	428	426	424	422	421
Sd_m	0	0	0	0	1	7	27	61	100	141	177	208	238	267	290	310	323	333	341	348	354	358	361	365	368	370
Ss_g	0	0	0	0	0	0	0	16	32	50	68	84	102	130	164	199	232	261	290	317	339	357	372	384	395	405
Ss_m	0	0	0	0	0	0	0	0	12	22	35	48	60	76	102	134	169	200	229	258	285	307	326	341	354	365
Pc_yg	0	0	2	41	106	169	222	265	304	334	353	369	382	393	402	410	416	419	422	424	426	428	430	431	433	434
Pc_ym	0	0	0	6	29	66	107	145	178	205	230	252	269	284	296	306	315	323	329	332	335	337	339	341	343	345
Pc_og	0	0	2	32	87	144	193	232	268	297	318	333	345	355	364	371	377	382	386	387	388	389	390	390	391	392
Pc_om	0	0	0	2	14	40	72	103	133	159	180	200	218	233	245	256	264	271	277	282	287	291	295	298	301	301
Pd_g	0	0	0	6	37	80	123	160	191	216	237	255	269	280	289	295	300	304	307	309	311	313	314	316	317	318
Pd_m	0	0	0	0	4	22	49	78	105	129	149	167	180	192	201	209	216	221	225	229	232	234	237	239	241	244
Pl_g	0	0	0	19	73	134	186	228	262	292	315	330	344	355	365	374	382	388	392	395	398	400	403	405	406	408
Pl_m	0	0	0	1	15	45	82	117	147	173	195	213	228	241	253	263	272	279	286	292	295	297	299	301	302	303
Ac_g	0	0	0	5	31	80	131	176	216	250	276	296	312	325	335	343	349	352	354	355	356	357	358	359	360	361
Ac_m	0	0	0	0	4	18	41	70	98	125	148	168	186	201	213	223	230	235	240	243	246	249	252	254	256	257
Ad_g	0	0	0	9	38	79	120	156	187	213	234	250	262	270	277	283	285	285	286	286	286	286	287	287	287	287
Ad_m	0	0	0	0	3	19	47	76	102	125	144	160	172	181	188	193	196	196	197	197	198	198	199	199	200	200
Ct_con	0	0	0	5	23	61	106	148	185	217	247	271	292	309	324	335	341	346	349	352	355	357	358	359	360	361
Ct_dec	0	0	0	3	17	46	82	117	148	176	201	223	242	258	271	280	284	285	286	286	287	288	288	289	289	289

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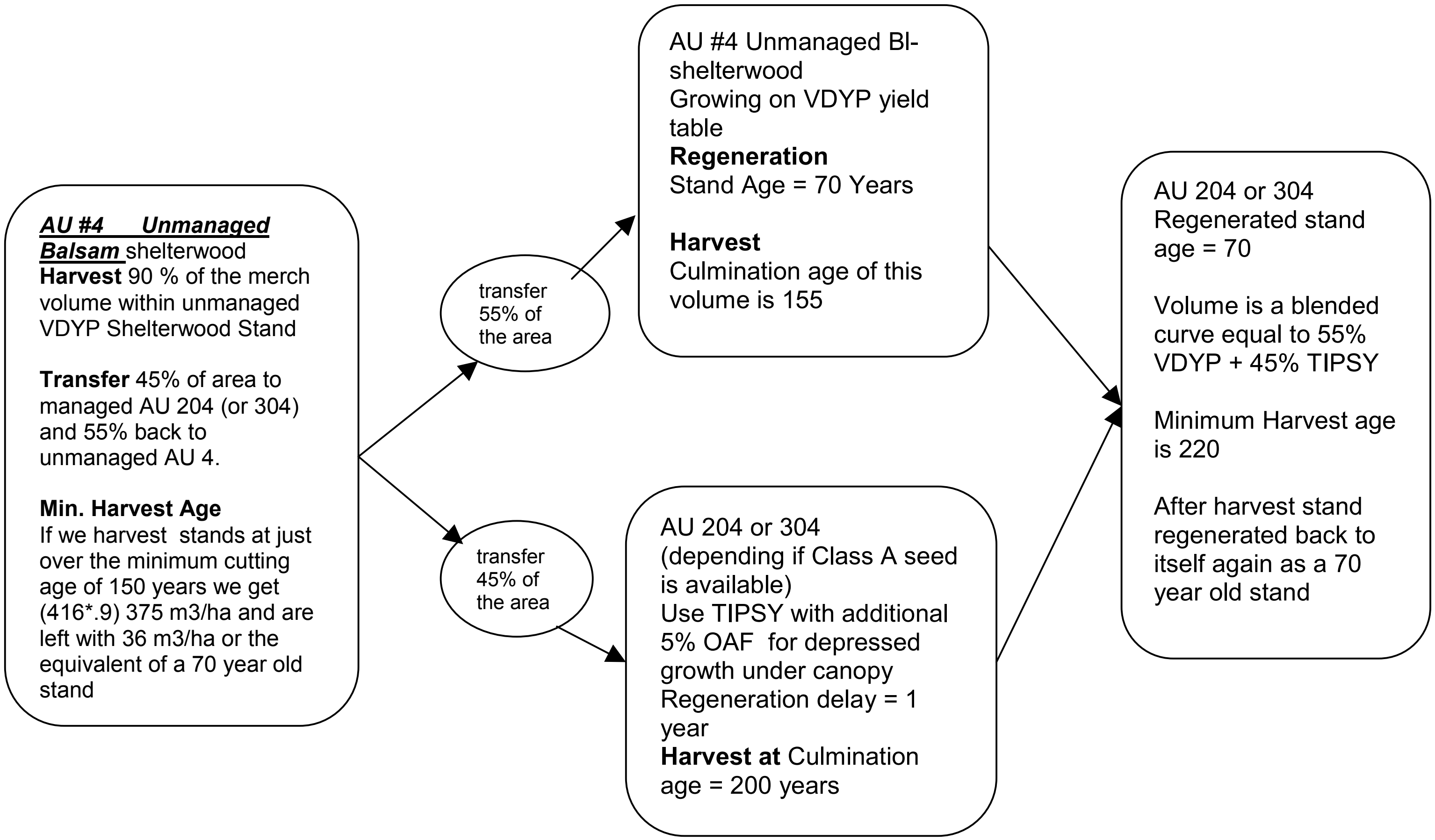
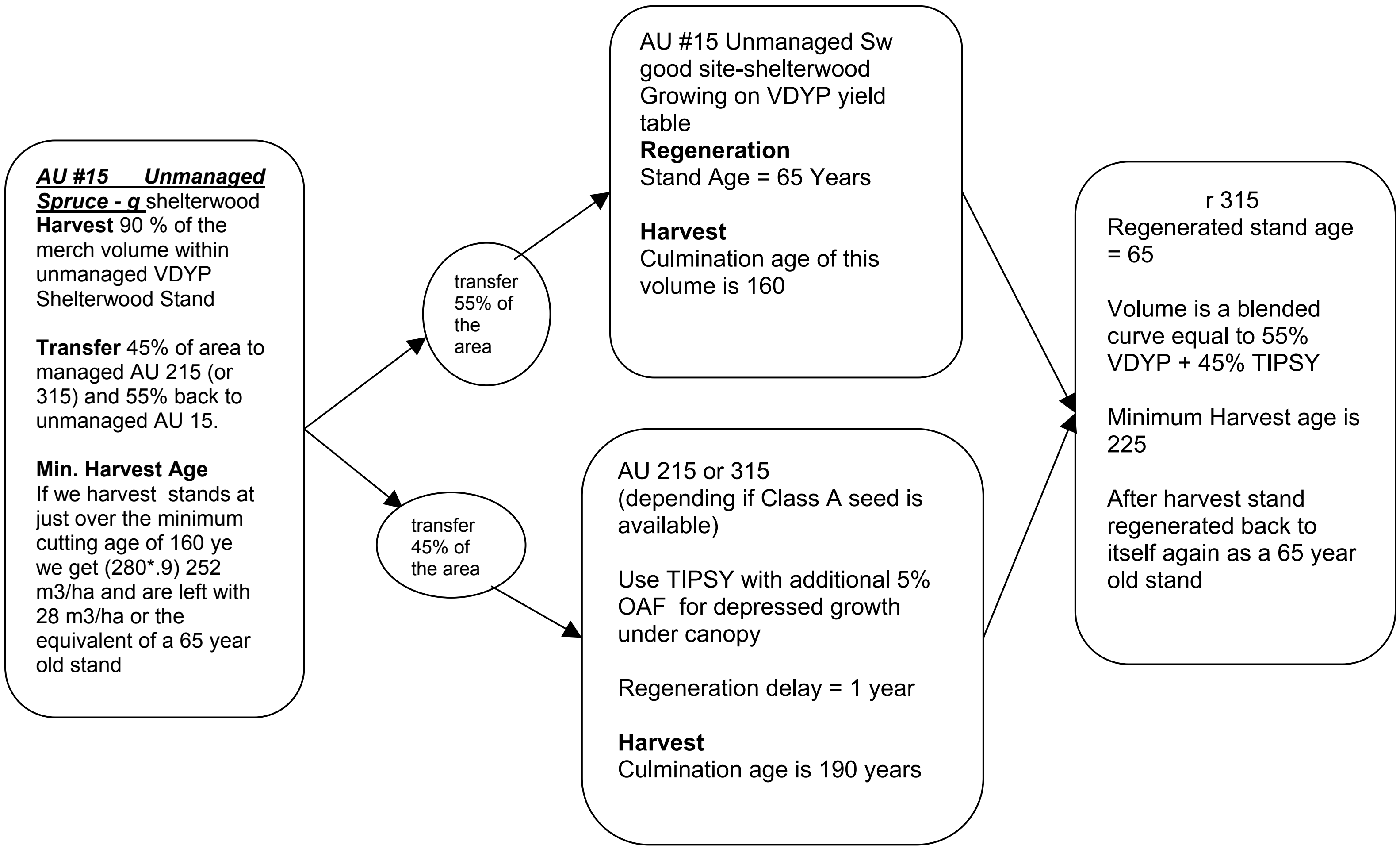
Appendix II

Modeling Shelterwood Stands

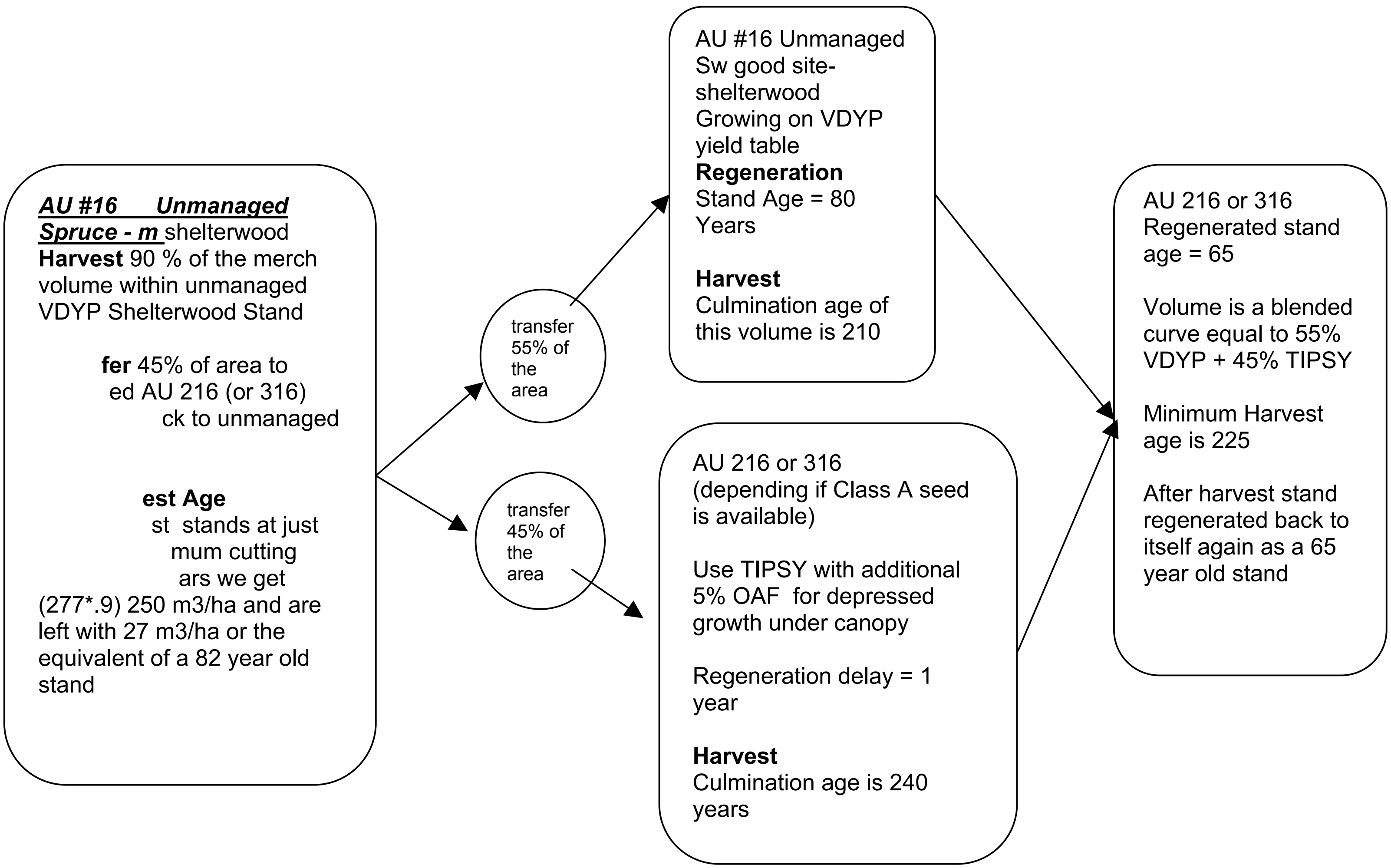
Flow Chart of Modeling Assumptions used to Model Balsam Shelterwood Harvesting



Flow Chart of Modeling Assumptions used to Model Good Site Spruce Shelterwood Harvesting



Flow Chart of Modeling Assumptions used to Model Medium Site Spruce Shelterwood Harvesting



Appendix III

Low Stocking Stand information

Table 67: Stocking Status of Stands with Low Stocking

						Area by Species (Inv Layer)						
MAPSTAND	ha	BlockID	Stratum	Tree Type	Current Status Label	Ac	At	Bl	Ep	Pli		Total
093O020_1576	2.1	051-001	C	CONIFEROUS	I:SX90/BL10-0/0-0.0/0.0-24-3-300(1999),S:SX75/BL25-19-0.02-24-133(1999)0(FG)	-	-	0.2	-	-	1.9	2.1
093O020_1579	2.8	051-001	C	CONIFEROUS	I:SX90/BL10-0/0-0.0/0.0-24-3-300(1999),S:SX75/BL25-19-0.02-24-133(1999)0(FG)	-	-	0.3	-	-	2.5	2.8
093P015_1498	2.0	071-002	D	CONIFEROUS	I:SX50/PLI40/BL10-0/0-0.0/0.0-12-5-333(1999),S:SX83/PLI17-8-0.6-15-200(1999)0(FG)	-	-	0.2	-	0.8	1.0	2.0
093P015_1500	6.3	071-002	D	CONIFEROUS	I:SX50/PLI40/BL10-0/0-0.0/0.0-12-5-333(1999),S:SX83/PLI17-8-0.6-15-200(1999)0(FG)	-	-	0.6	-	2.5	3.1	6.3
093P092_967	20.4	002-01A	B	CONIFEROUS	I:SW70/AC10/AT10/EP10-0/0-0.0/0.0-15-0-466(1994),S:SW100-5-0.9-15-222(1994)22(FG)	2.0	2.0	-	2.0	-	14.3	20.4
093P092_973	1.1	002-01A	B	CONIFEROUS	I:SW70/AC10/AT10/EP10-0/0-0.0/0.0-15-0-466(1994),S:SW100-5-0.9-15-222(1994)22(FG)	0.1	0.1	-	0.1	-	0.8	1.1
093O099_1669	6.0	210-003	C	CONIFEROUS	I:BL50/SW29/AT14/AC7-0/0-0.0/0.0-15-20-467(2000)(7),S:SW66/BL17/PLI17-12-1.7-15-200(2000)(7)167(FG)	0.4	0.8	3.0	-	-	1.7	6.0
093O089_1508	7.7	240-005	B	CONIFEROUS	I:SW26/AT25/AC18/PLI18/BL13-0/0-0.0/0.0-21-6-500(2001)(7),S:SW60/PLI33/BL7-10-1.5-21-188(2001)(7)63(FG)	1.4	1.9	1.0	-	1.4	2.0	7.7
093O089_1518	1.4	240-005	B	CONIFEROUS	I:SW26/AT25/AC18/PLI18/BL13-0/0-0.0/0.0-21-6-500(2001)(7),S:SW60/PLI33/BL7-10-1.5-21-188(2001)(7)63(FG)	0.3	0.4	0.2	-	0.3	0.4	1.4
093O089_1529	0.4	240-005	B	CONIFEROUS	I:SW26/AT25/AC18/PLI18/BL13-0/0-0.0/0.0-21-6-500(2001)(7),S:SW60/PLI33/BL7-10-1.5-21-188(2001)(7)63(FG)	0.1	0.1	0.1	-	0.1	0.1	0.4
093O089_1631	3.7	992-003	A	CONIFEROUS	I:PLI94/AC6-0/0-0.0/0.0-21-7-514(2001)(7),S:PLI100-13-2.3-21-257(2001)(7)143(FG)	0.2	-	-	-	3.5	-	3.7
093O089_1635	0.9	992-003	A	CONIFEROUS	I:PLI94/AC6-0/0-0.0/0.0-21-7-514(2001)(7),S:PLI100-13-2.3-21-257(2001)(7)143(FG)	0.1	-	-	-	0.8	-	0.9
093O089_1646	2.9	992-003	A	CONIFEROUS	I:PLI94/AC6-0/0-0.0/0.0-21-7-514(2001)(7),S:PLI100-13-2.3-21-257(2001)(7)143(FG)	0.2	-	-	-	2.7	-	2.9
093O089_1613	7.2	209-001	B	CONIFEROUS	I:SW50/AC25/BL25-0/0-0.0/0.0-21-5-600(2001)(7),S:SW100-20-2.2-21-250(2001)(7)50(FG)	1.8	-	1.8	-	-	3.6	7.2
093O039_1727	1.5	039-002	C	CONIFEROUS	I:SW90/BL10-0/0-0.0/0.0-12-10-680(1994),S:SW91/BL9-6-0.3-12-440(1994)0(FG)	-	-	0.2	-	-	1.4	1.5
093O089_1593	5.2	209-002	B	CONIFEROUS	I:PLI54/SW25/AC21-0/0-0.0/0.0-21-15-686(2001)(7),S:PLI75/SW25-11-2.2-21-457(2001)(7)286(FG)	1.1	-	-	-	2.8	1.3	5.2
093O089_1594	0.1	209-002	B	CONIFEROUS	I:PLI54/SW25/AC21-0/0-0.0/0.0-21-15-686(2001)(7),S:PLI75/SW25-11-2.2-21-457(2001)(7)286(FG)	0.0	-	-	-	0.1	0.0	0.1
093O089_1596	1.2	209-002	B	CONIFEROUS	I:PLI54/SW25/AC21-0/0-0.0/0.0-21-15-686(2001)(7),S:PLI75/SW25-11-2.2-21-457(2001)(7)286(FG)	0.2	-	-	-	0.6	0.3	1.2
093O058_527	0.8	060-001	B	CONIFEROUS	I:SX90/AT10-0/0-0.0/0.0-21-3.5-760(1999),S:SX91/PLI9-9-0.8-21-400(1999)0(FG)	-	0.1	-	-	-	0.7	0.8
093O058_531	0.4	060-001	B	CONIFEROUS	I:SX90/AT10-0/0-0.0/0.0-21-3.5-760(1999),S:SX91/PLI9-9-0.8-21-400(1999)0(FG)	-	0.0	-	-	-	0.4	0.4
094B008_1839	32.7	216-005	B	CONIFEROUS	I:SW48/AC33/BL13/PLI4/AT2-0/0-0.0/0.0-21-5-800(2000)(7),S:SW82/BL9/PLI9-14-2.3-21-276(2000)(7)88(FG)	10.8	0.7	4.2	-	1.3	15.7	32.7
094B008_1894	4.3	216-002	C	CONIFEROUS	I:SW54/BL38/PLI8-0/0-0.0/0.0-18-3-800(2000)(7),S:SW64/BL18/PLI18-10-1.2-18-367(2000)(7)167(FG)	-	-	1.6	-	0.3	2.3	4.3
093P051_2343	1.8	032-001	D	CONIFEROUS	I:SW60/AC40-0/0-0.0/0.0-15-5-800(1998),S:SW100-11-1.4-15-486(1998)0(FG)	0.7	-	-	-	-	1.1	1.8
093P051_2360	0.7	032-001	D	CONIFEROUS	I:SW60/AC40-0/0-0.0/0.0-15-5-800(1998),S:SW100-11-1.4-15-486(1998)0(FG)	0.3	-	-	-	-	0.4	0.7
093P051_2368	0.5	032-001	D	CONIFEROUS	I:SW60/AC40-0/0-0.0/0.0-15-5-800(1998),S:SW100-11-1.4-15-486(1998)0(FG)	0.2	-	-	-	-	0.3	0.5
093P051_2373	1.2	032-001	D	CONIFEROUS	I:SW60/AC40-0/0-0.0/0.0-15-5-800(1998),S:SW100-11-1.4-15-486(1998)0(FG)	0.5	-	-	-	-	0.7	1.2
093P051_2391	0.7	032-001	D	CONIFEROUS	I:SW60/AC40-0/0-0.0/0.0-15-5-800(1998),S:SW100-11-1.4-15-486(1998)0(FG)	0.3	-	-	-	-	0.4	0.7
093O089_1576	4.4	240-007	C	CONIFEROUS	I:BL55/SW36/PLI9-0/0-0.0/0.0-18-1-880(2001)(7),S:SW49/BL38/PLI13-11-1.6-18-320(2001)(7)280(FG)	-	-	2.4	-	0.4	1.6	4.4
094B039_68	5.4	259-009	A	CONIFEROUS	I:SW71/EP20/AC9-0/0-0.0/0.0-18-8-985(2001)(7),S:SW100-15-3.5-18-369(2001)(7)169(FG)	0.5	-	-	1.1	-	3.8	5.4
094B039_70	7.7	259-009	A	CONIFEROUS	I:SW71/EP20/AC9-0/0-0.0/0.0-18-8-985(2001)(7),S:SW100-15-3.5-18-369(2001)(7)169(FG)	0.7	-	-	1.5	-	5.5	7.7
093O050_2349	2.9	024-002	B	CONIFEROUS	I:SW50/BL27/AC23-0/0-0.0/0.0-15-6-1120(2000)(7),S:SW66/BL34-15-1.6-15-300(2000)(7)180(FG)	0.7	-	0.8	-	-	1.5	2.9
093O050_2365	0.4	024-002	B	CONIFEROUS	I:SW50/BL27/AC23-0/0-0.0/0.0-15-6-1120(2000)(7),S:SW66/BL34-15-1.6-15-300(2000)(7)180(FG)	0.1	-	0.1	-	-	0.2	0.4
093O050_2372	2.0	024-002	B	CONIFEROUS	I:SW50/BL27/AC23-0/0-0.0/0.0-15-6-1120(2000)(7),S:SW66/BL34-15-1.6-15-300(2000)(7)180(FG)	0.5	-	0.5	-	-	1.0	2.0
093O058_523	1.6	060-001	A	CONIFEROUS	I:SX50/AT30/EP20-0/0-0.0/0.0-21-12.3-1160(1999),S:SX100-8-0.9-21-400(1999)0(FG)	-	0.5	-	0.3	-	0.8	1.6
093O058_525	0.5	060-001	A	CONIFEROUS	I:SX50/AT30/EP20-0/0-0.0/0.0-21-12.3-1160(1999),S:SX100-8-0.9-21-400(1999)0(FG)	-	0.1	-	0.1	-	0.2	0.5

						Area by Species (Inv Layer)						
MAPSTAND	ha	BlockID	Stratum	Tree Type	Current Status Label	Ac	At	Bl	Ep	Pli	Sx	Total
093O058_528	2.8	060-001	A	CONIFEROUS	I:SX50/AT30/EP20-0/0-0.0/0.0-21-12.3-1160(1999),S:SX100-8-0.9-21-400(1999)0(FG)	-	0.8	-	0.6	-	1.4	2.8
093O089_1491	8.1	205-003	D	CONIFEROUS	I:SW54/AC20/AT16/PLI6/BL4-0/0-0.0/0.0-21-23-1350(2001)(7),S:SW84/PLI12/BL4-17-2.1-21-350(2001)(7)150(FG)	1.6	1.3	0.3	-	0.5	4.4	8.1
093O099_1906	0.6	205-003	D	CONIFEROUS	I:SW54/AC20/AT16/PLI6/BL4-0/0-0.0/0.0-21-23-1350(2001)(7),S:SW84/PLI12/BL4-17-2.1-21-350(2001)(7)150(FG)	0.1	0.1	0.0	-	0.0	0.3	0.6
093O099_1908	0.5	205-003	D	CONIFEROUS	I:SW54/AC20/AT16/PLI6/BL4-0/0-0.0/0.0-21-23-1350(2001)(7),S:SW84/PLI12/BL4-17-2.1-21-350(2001)(7)150(FG)	0.1	0.1	0.0	-	0.0	0.3	0.5
093P015_1487	5.5	071-001	A	CONIFEROUS	I:SX40/AC30/AT20/BL10-0/0-0.0/0.0-15-14-1357(1999),S:SX91/PLI9-11-1.5-15-314(1999)0(FG)	1.7	1.1	0.6	-	-	2.2	5.5
093P015_1505	10.0	071-001	A	CONIFEROUS	I:SX40/AC30/AT20/BL10-0/0-0.0/0.0-15-14-1357(1999),S:SX91/PLI9-11-1.5-15-314(1999)0(FG)	3.0	2.0	1.0	-	-	4.0	10.0
093O089_1561	3.2	240-008	C	CONIFEROUS	I:SW52/AT20/PLI18/AC8/BL2-0/0-0.0/0.0-18-7-1442(2001)(7),S:SW63/PLI37-9-1.8-18-474(2001)(7)168(FG)	0.3	0.6	0.1	-	0.6	1.7	3.2
093O089_1579	6.6	240-008	C	CONIFEROUS	I:SW52/AT20/PLI18/AC8/BL2-0/0-0.0/0.0-18-7-1442(2001)(7),S:SW63/PLI37-9-1.8-18-474(2001)(7)168(FG)	0.5	1.3	0.1	-	1.2	3.4	6.6
094B039_62	3.3	259-011	B	CONIFEROUS	I:SW61/EP19/AC10/PLI10-0/0-0.0/0.0-18-10-1600(2001)(7),S:SW100-10-1.8-18-600(2001)(7)333(FG)	0.3	-	-	0.6	0.3	2.0	3.3
094B039_64	1.4	259-011	B	CONIFEROUS	I:SW61/EP19/AC10/PLI10-0/0-0.0/0.0-18-10-1600(2001)(7),S:SW100-10-1.8-18-600(2001)(7)333(FG)	0.1	-	-	0.3	0.1	0.8	1.4
094B040_114	0.4	259-011	B	CONIFEROUS	I:SW61/EP19/AC10/PLI10-0/0-0.0/0.0-18-10-1600(2001)(7),S:SW100-10-1.8-18-600(2001)(7)333(FG)	0.0	-	-	0.1	0.0	0.2	0.4
093P033_1067	1.7	A24961-001	C	CONIFEROUS	I:SX60/AC21/PLI19-11/15-1.8/6.0-18-3-1675(2003)(7),S:SX71/PLI29-12-2.5-18-600(2003)(7)225(FG)	0.4	-	-	-	0.3	1.0	1.7
093P033_1080	2.2	A24961-001	C	CONIFEROUS	I:SX60/AC21/PLI19-11/15-1.8/6.0-18-3-1675(2003)(7),S:SX71/PLI29-12-2.5-18-600(2003)(7)225(FG)	0.5	-	-	-	0.4	1.3	2.2
093O089_1536	0.6	205-002	C	CONIFEROUS	I:SW48/AC42/AT7/BL3-0/0-0.0/0.0-15-9-1681(2001)(7),S:SW91/BL7/PLI2-17-2.4-15-289(2001)(7)74(FG)	0.3	0.0	0.0	-	-	0.3	0.6
093O089_1541	16.2	205-002	C	CONIFEROUS	I:SW48/AC42/AT7/BL3-0/0-0.0/0.0-15-9-1681(2001)(7),S:SW91/BL7/PLI2-17-2.4-15-289(2001)(7)74(FG)	6.8	1.1	0.5	-	-	7.8	16.2
093O089_1553	3.3	205-002	C	CONIFEROUS	I:SW48/AC42/AT7/BL3-0/0-0.0/0.0-15-9-1681(2001)(7),S:SW91/BL7/PLI2-17-2.4-15-289(2001)(7)74(FG)	1.4	0.2	0.1	-	-	1.6	3.3
093O098_1689	7.3	220-005	A	CONIFEROUS	I:PLI40/SX30/BL20/AC10-0/0-0.0/0.0-12-10-1733(1995),S:PLI57/SX43-8-1.4-12-667(1995)433(FG)	0.7	-	1.5	-	2.9	2.2	7.3
093O039_1738	2.6	039-004	C	CONIFEROUS	I:SX77/BL23-0/0-0.0/0.0-12-2-2120(1999),S:SX79/BL21-4-0.2-10-560(1999)0(FG)	-	-	0.6	-	-	2.0	2.6
093P092_1005	0.8	992-014	A	CONIFEROUS	I:SW54/EP29/AC17-0/0-0.0/0.0-18-3-2141(2001)(7),S:SW100-15-2.3-18-282(2001)(7)71(FG)	0.1	-	-	0.2	-	0.4	0.8
093P092_1007	14.3	992-014	A	CONIFEROUS	I:SW54/EP29/AC17-0/0-0.0/0.0-18-3-2141(2001)(7),S:SW100-15-2.3-18-282(2001)(7)71(FG)	2.4	-	-	4.2	-	7.7	14.3
093O050_2265	3.2	022-002	B	CONIFEROUS	I:BL50/SX50-0/0-0.0/0.0-12-12-2267(1999),S:SX86/BL14-13-1.8-12-400(1999)0(FG)	-	-	1.6	-	-	1.6	3.2
093O050_2269	1.8	022-002	B	CONIFEROUS	I:BL50/SX50-0/0-0.0/0.0-12-12-2267(1999),S:SX86/BL14-13-1.8-12-400(1999)0(FG)	-	-	0.9	-	-	0.9	1.8
093P042_2101	15.7	A22658-001	A	CONIFEROUS	I:SX43/EP30/AC27-0/0-0.0/0.0-18-0-2363(1996),S:SX100-9-0.5-18-475(1996)88(FG)	4.2	-	-	4.7	-	6.7	15.7
093O098_1697	0.8	220-006	A	CONIFEROUS	I:SX80/AC10/PLI10-0/0-0.0/0.0-19-10-2366(1995),S:SX79/PLI16/BL5-5-1.0-19-600(1995)0(FG)	0.1	-	-	-	0.1	0.6	0.8
093O099_1690	2.9	222-005	G	CONIFEROUS	I:SW70/PLI30-0/0-0.0/0.0-21-1-2988(1992),S:SW83/PLI17-2-0.25-21-200(1992)0(FG)	-	-	-	-	0.9	2.0	2.9
Total Conifer Area	257					47.7	15.5	24.5	15.8	25.0	128.1	257
					Average Conifer Sp Comp Sx50 Ac19 Pl10 Bl10 At 06Ep 06 1183sph (334wssph)	19%	6%	10%	6%	10%	50%	100%
093P084_1325	2.6	008-002	C	DECIDUOUS	I:EP47/AC33/SW20-0/0-0.0/0.0-18-10-150(2001)(7),S:SW100-12-2.4-18-20(2001)(7)0(FG)	0.9	-	-	1.2	-	0.5	2.6
093P084_1328	5.3	008-002	C	DECIDUOUS	I:EP47/AC33/SW20-0/0-0.0/0.0-18-10-150(2001)(7),S:SW100-12-2.4-18-20(2001)(7)0(FG)	1.7	-	-	2.5	-	1.1	5.3
093P084_1338	12.5	008-002	C	DECIDUOUS	I:EP47/AC33/SW20-0/0-0.0/0.0-18-10-150(2001)(7),S:SW100-12-2.4-18-20(2001)(7)0(FG)	4.1	-	-	5.9	-	2.5	12.5
093P084_1299	3.0	008-001	B	DECIDUOUS	I:EP64/AT18/SW18-0/0-0.0/0.0-18-15-440(2001)(7),S:SW100-21-7.0-18-80(2001)(7)40(FG)	-	0.5	-	1.9	-	0.5	3.0
093O099_1522	0.1	213-002	C	DECIDUOUS	I:AC90/SW10-0/0-0.0/0.0-21-1.5-560(1998),S:SW100-12-1.7-21-80(1998)0(FG)	0.1	-	-	-	-	0.0	0.1
093P015_1521	2.7	071-003	C	DECIDUOUS	I:AC50/AT30/SX20-0/0-0.0/0.0-12-3-629(1999),S:SX100-10-0.9-12-143(1999)0(FG)	1.3	0.8	-	-	-	0.5	2.7
093O089_1725	0.6	240-013	A	DECIDUOUS	I:AC38/SW31/BL14/PLI14/AT3-0/0-0.0/0.0-15-2-900(2001)(7),S:PLI42/SW33/BL25-11-2.9-15-300(2001)(7)225(FG)	0.2	0.0	0.1	-	0.1	0.2	0.6
093O089_1729	1.1	240-013	A	DECIDUOUS	I:AC38/SW31/BL14/PLI14/AT3-0/0-0.0/0.0-15-2-900(2001)(7),S:PLI42/SW33/BL25-11-2.9-15-300(2001)(7)225(FG)	0.4	0.0	0.2	-	0.2	0.3	1.1
093O089_1730	3.8	240-013	A	DECIDUOUS	I:AC38/SW31/BL14/PLI14/AT3-0/0-0.0/0.0-15-2-900(2001)(7),S:PLI42/SW33/BL25-11-2.9-15-300(2001)(7)225(FG)	1.4	0.1	0.5	-	0.5	1.2	3.8
093O089_1731	1.4	240-013	A	DECIDUOUS	I:AC38/SW31/BL14/PLI14/AT3-0/0-0.0/0.0-15-2-900(2001)(7),S:PLI42/SW33/BL25-11-2.9-15-300(2001)(7)225(FG)	0.5	0.0	0.2	-	0.2	0.4	1.4
093O089_1672	9.4	207-001	A	DECIDUOUS	I:AC50/SW43/BL7-0/0-0.0/0.0-18-10-982(2000)(7),S:SW100-13-3.3-18-382(2000)(7)145(FG)	4.7	-	0.7	-	-	4.1	9.4
093O089_1704	3.2	207-001	A	DECIDUOUS	I:AC50/SW43/BL7-0/0-0.0/0.0-18-10-982(2000)(7),S:SW100-13-3.3-18-382(2000)(7)145(FG)	1.6	-	0.2	-	-	1.4	3.2

						Area by Species (Inv Layer)						
MAPSTAND	ha	BlockID	Stratum	Tree Type	Current Status Label	Ac	At	Bl	Ep	Pli	Sx	Total
093O090_1124	3.1	207-001	A	DECIDUOUS	I:AC50/SW43/BL7-0/0-0.0/0.0-18-10-982(2000)(7),S:SW100-13-3.3-18-382(2000)(7)145(FG)	1.6	-	0.2	-	-	1.3	3.1
093O090_1125	0.6	207-001	A	DECIDUOUS	I:AC50/SW43/BL7-0/0-0.0/0.0-18-10-982(2000)(7),S:SW100-13-3.3-18-382(2000)(7)145(FG)	0.3	-	0.0	-	-	0.2	0.6
093O090_1127	6.8	207-001	A	DECIDUOUS	I:AC50/SW43/BL7-0/0-0.0/0.0-18-10-982(2000)(7),S:SW100-13-3.3-18-382(2000)(7)145(FG)	3.4	-	0.5	-	-	2.9	6.8
093O090_1137	0.9	207-001	A	DECIDUOUS	I:AC50/SW43/BL7-0/0-0.0/0.0-18-10-982(2000)(7),S:SW100-13-3.3-18-382(2000)(7)145(FG)	0.4	-	0.1	-	-	0.4	0.9
093O090_1145	2.3	207-001	A	DECIDUOUS	I:AC50/SW43/BL7-0/0-0.0/0.0-18-10-982(2000)(7),S:SW100-13-3.3-18-382(2000)(7)145(FG)	1.1	-	0.2	-	-	1.0	2.3
093P043_1882	2.3	021-001	C	DECIDUOUS	I:AC50/SX40/BL10-0/0-0.0/0.0-12-1-1080(1999),S:SX83/PLI17-6-0.5-12-240(1999)0(FG)	1.1	-	0.2	-	-	0.9	2.3
093P015_1493	0.4	071-002	C	DECIDUOUS	I:AT60/SX30/PLI10-0/0-0.0/0.0-12-15-1100(1999),S:PLI60/SX40-11-2.9-12-167(1999)0(FG)	-	0.2	-	-	0.0	0.1	0.4
094B039_66	1.7	259-012	A	DECIDUOUS	I:EP36/SW32/AC26/AT6-0/0-0.0/0.0-18-6-1240(2001)(7),S:SW100-16-3.0-18-240(2001)(7)200(FG)	0.4	0.1	-	0.6	-	0.5	1.7
093P004_2016	0.7	T5998	B	DECIDUOUS	I:AC55/SW45-0/0-0.0/0.0-21-4-1265(2001)(7),S:SW100-16-2.1-21-341(2001)(7)141(FG)	0.4	-	-	-	-	0.3	0.7
093P004_2021	4.0	T5998	B	DECIDUOUS	I:AC55/SW45-0/0-0.0/0.0-21-4-1265(2001)(7),S:SW100-16-2.1-21-341(2001)(7)141(FG)	2.2	-	-	-	-	1.8	4.0
093P004_2027	1.1	T5998	B	DECIDUOUS	I:AC55/SW45-0/0-0.0/0.0-21-4-1265(2001)(7),S:SW100-16-2.1-21-341(2001)(7)141(FG)	0.6	-	-	-	-	0.5	1.1
093P004_2029	10.4	T5998	B	DECIDUOUS	I:AC55/SW45-0/0-0.0/0.0-21-4-1265(2001)(7),S:SW100-16-2.1-21-341(2001)(7)141(FG)	5.7	-	-	-	-	4.7	10.4
093P004_2039	0.7	T5998	B	DECIDUOUS	I:AC55/SW45-0/0-0.0/0.0-21-4-1265(2001)(7),S:SW100-16-2.1-21-341(2001)(7)141(FG)	0.4	-	-	-	-	0.3	0.7
093P004_2052	1.8	T5998	B	DECIDUOUS	I:AC55/SW45-0/0-0.0/0.0-21-4-1265(2001)(7),S:SW100-16-2.1-21-341(2001)(7)141(FG)	1.0	-	-	-	-	0.8	1.8
093P004_2059	0.6	T5998	B	DECIDUOUS	I:AC55/SW45-0/0-0.0/0.0-21-4-1265(2001)(7),S:SW100-16-2.1-21-341(2001)(7)141(FG)	0.3	-	-	-	-	0.3	0.6
093O099_1870	38.8	202-003	B	DECIDUOUS	I:AC43/AT38/SW15/PLI4-0/0-0.0/0.0-27-24-1767(2001)(7),S:SW89/PLI11-16-2.4-27-267(2001)(7)71(FG)	16.7	14.7	-	-	1.6	5.8	38.8
093P004_2030	6.1	T5998	C	DECIDUOUS	I:AT40/SW35/AC15/BL5-0/0-0.0/0.0-18-5-1814(2001)(7),S:SW92/BL8-10-1.4-18-418(2001)(7)205(FG)	0.9	2.7	0.3	-	-	2.1	6.1
093P004_2031	2.9	T5998	C	DECIDUOUS	I:AT40/SW35/AC15/BL5-0/0-0.0/0.0-18-5-1814(2001)(7),S:SW92/BL8-10-1.4-18-418(2001)(7)205(FG)	0.4	1.3	0.1	-	-	1.0	2.9
093P004_2040	1.4	T5998	C	DECIDUOUS	I:AT40/SW35/AC15/BL5-0/0-0.0/0.0-18-5-1814(2001)(7),S:SW92/BL8-10-1.4-18-418(2001)(7)205(FG)	0.2	0.6	0.1	-	-	0.5	1.4
093P004_2044	10.2	T5998	C	DECIDUOUS	I:AT40/SW35/AC15/BL5-0/0-0.0/0.0-18-5-1814(2001)(7),S:SW92/BL8-10-1.4-18-418(2001)(7)205(FG)	1.5	4.6	0.5	-	-	3.6	10.2
093P004_2047	5.9	T5998	C	DECIDUOUS	I:AT40/SW35/AC15/BL5-0/0-0.0/0.0-18-5-1814(2001)(7),S:SW92/BL8-10-1.4-18-418(2001)(7)205(FG)	0.9	2.6	0.3	-	-	2.0	5.9
093P004_2053	1.4	T5998	C	DECIDUOUS	I:AT40/SW35/AC15/BL5-0/0-0.0/0.0-18-5-1814(2001)(7),S:SW92/BL8-10-1.4-18-418(2001)(7)205(FG)	0.2	0.6	0.1	-	-	0.5	1.4
093P004_2060	1.0	T5998	C	DECIDUOUS	I:AT40/SW35/AC15/BL5-0/0-0.0/0.0-18-5-1814(2001)(7),S:SW92/BL8-10-1.4-18-418(2001)(7)205(FG)	0.1	0.4	0.0	-	-	0.3	1.0
093O099_1836	1.8	205-004	C	DECIDUOUS	I:AC56/SW19/BL13/AT11/PLI1-0/0-0.0/0.0-21-5-1891(2001)(7),S:SW57/BL39/PLI4-12-1.1-21-418(2001)(7)109(FG)	1.0	0.2	0.2	-	0.0	0.3	1.8
093O099_1838	3.3	205-004	C	DECIDUOUS	I:AC56/SW19/BL13/AT11/PLI1-0/0-0.0/0.0-21-5-1891(2001)(7),S:SW57/BL39/PLI4-12-1.1-21-418(2001)(7)109(FG)	1.8	0.4	0.4	-	0.0	0.6	3.3
093O099_1871	3.0	205-004	C	DECIDUOUS	I:AC56/SW19/BL13/AT11/PLI1-0/0-0.0/0.0-21-5-1891(2001)(7),S:SW57/BL39/PLI4-12-1.1-21-418(2001)(7)109(FG)	1.7	0.3	0.4	-	0.0	0.6	3.0
093O099_1603	0.8	219-002	C	DECIDUOUS	I:AT34/AC30/SW20/PLI10/BL3/EP3-0/0-0.0/0.0-15-21-1977(2000)(7),S:SW62/PLI34/BL4-12-1.5-15-394(2000)(7)149(FG)	0.3	0.3	0.0	0.0	0.1	0.2	0.8
093P043_1875	2.3	021-001	B	DECIDUOUS	I:AC50/SX40/AT10-0/0-0.0/0.0-15-9-2000(1999),S:SX95/BL5-10-1.5-15-367(1999)0(FG)	1.1	0.2	-	-	-	0.9	2.3
093P043_1878	4.0	021-001	B	DECIDUOUS	I:AC50/SX40/AT10-0/0-0.0/0.0-15-9-2000(1999),S:SX95/BL5-10-1.5-15-367(1999)0(FG)	2.0	0.4	-	-	-	1.6	4.0
093O089_1511	48.1	202-002	C	DECIDUOUS	I:AT48/SW23/AC21/PLI6/BL2-0/0-0.0/0.0-18-10-2069(2001)(7),S:SW78/PLI19/BL3-13-2.0-18-315(2001)(7)74(FG)	10.1	23.1	1.0	-	2.9	11.1	48.1
093O089_1513	1.3	202-002	C	DECIDUOUS	I:AT48/SW23/AC21/PLI6/BL2-0/0-0.0/0.0-18-10-2069(2001)(7),S:SW78/PLI19/BL3-13-2.0-18-315(2001)(7)74(FG)	0.3	0.6	0.0	-	0.1	0.3	1.3
093O089_1519	21.7	202-002	C	DECIDUOUS	I:AT48/SW23/AC21/PLI6/BL2-0/0-0.0/0.0-18-10-2069(2001)(7),S:SW78/PLI19/BL3-13-2.0-18-315(2001)(7)74(FG)	4.6	10.4	0.4	-	1.3	5.0	21.7
093O099_1645	11.1	210-002	B	DECIDUOUS	I:AT36/AC27/EP19/SW12/PLI5/BL1-0/0-0.0/0.0-18-20-2331(2000)(7),S:SW68/PLI25/BL7-18-1.8-18-215(2000)(7)15(FG)	3.0	4.0	0.1	2.1	0.6	1.3	11.1
093O099_1655	19.1	210-002	B	DECIDUOUS	I:AT36/AC27/EP19/SW12/PLI5/BL1-0/0-0.0/0.0-18-20-2331(2000)(7),S:SW68/PLI25/BL7-18-1.8-18-215(2000)(7)15(FG)	5.2	6.9	0.2	3.6	1.0	2.3	19.1
093P075_419	0.7	T3B003	20D	DECIDUOUS	I:AC55/AT33/SX12-0/0-0.0/0.0-15-5-2366(2003)(7),S:SX100-2-0.3-15-286(2003)(7)0(FG)	0.4	0.2	-	-	-	0.1	0.7
093P075_424	1.3	T3B003	20D	DECIDUOUS	I:AC55/AT33/SX12-0/0-0.0/0.0-15-5-2366(2003)(7),S:SX100-2-0.3-15-286(2003)(7)0(FG)	0.7	0.4	-	-	-	0.2	1.3
093O060_2405	7.1	062-001	C	DECIDUOUS	I:AT50/PLI20/SW20/AC10-0/0-0.0/0.0-24-25-2440(1997),S:SW78/PLI22-5-1.2-24-460(1997)0(FG)	0.7	3.5	-	-	1.4	1.4	7.1
093O060_2410	0.6	062-001	C	DECIDUOUS	I:AT50/PLI20/SW20/AC10-0/0-0.0/0.0-24-25-2440(1997),S:SW78/PLI22-5-1.2-24-460(1997)0(FG)	0.1	0.3	-	-	0.1	0.1	0.6
093O089_1599	0.2	214-001	D	DECIDUOUS	I:AC36/AT33/PLI15/SW10/EP5-0/0-0.0/0.0-18-7-2483(2001)(7),S:PLI69/SW31-15-5.7-18-358(2001)(7)208(FG)	0.1	0.1	-	0.0	0.0	0.0	0.2

						Area by Species (Inv Layer)						
MAPSTAND	ha	BlockID	Stratum	Tree Type	Current Status Label	Ac	At	Bl	Ep	Pli	Sx	Total
093O089_1610	0.6	214-001	D	DECIDUOUS	I:AC36/AT33/PLI15/SW10/EP5-0/0-0.0/0.0-18-7-2483(2001)(7),S:PLI69/SW31-15-5.7-18-358(2001)(7)208(FG)	0.2	0.2	-	0.0	0.1	0.1	0.6
093O089_1614	0.2	214-001	D	DECIDUOUS	I:AC36/AT33/PLI15/SW10/EP5-0/0-0.0/0.0-18-7-2483(2001)(7),S:PLI69/SW31-15-5.7-18-358(2001)(7)208(FG)	0.1	0.1	-	0.0	0.0	0.0	0.2
093O089_1487	15.5	250-004	D	DECIDUOUS	I:AT56/AC19/PLI16/SW8/BL1-0/0-0.0/0.0-21-19-3097(2001)(7),S:PLI57/SW43-20-6.7-21-386(2001)(7)117(FG)	2.9	8.7	0.2	-	2.5	1.2	15.5
093O089_1501	0.2	250-004	D	DECIDUOUS	I:AT56/AC19/PLI16/SW8/BL1-0/0-0.0/0.0-21-19-3097(2001)(7),S:PLI57/SW43-20-6.7-21-386(2001)(7)117(FG)	0.0	0.1	0.0	-	0.0	0.0	0.2
093O099_1799	4.6	250-004	D	DECIDUOUS	I:AT56/AC19/PLI16/SW8/BL1-0/0-0.0/0.0-21-19-3097(2001)(7),S:PLI57/SW43-20-6.7-21-386(2001)(7)117(FG)	0.9	2.6	0.0	-	0.7	0.4	4.6
093O099_1896	5.4	250-004	D	DECIDUOUS	I:AT56/AC19/PLI16/SW8/BL1-0/0-0.0/0.0-21-19-3097(2001)(7),S:PLI57/SW43-20-6.7-21-386(2001)(7)117(FG)	1.0	3.0	0.1	-	0.9	0.4	5.4
093O099_1595	5.7	208-004	B	DECIDUOUS	I:AC36/EP31/AT22/SW10/BL1-0/0-0.0/0.0-18-30-3297(2000)(7),S:SW97/BL3-21-3.4-18-189(2000)(7)23(FG)	2.1	1.3	0.1	1.8	-	0.6	5.7
093O099_1613	32.1	208-004	B	DECIDUOUS	I:AC36/EP31/AT22/SW10/BL1-0/0-0.0/0.0-18-30-3297(2000)(7),S:SW97/BL3-21-3.4-18-189(2000)(7)23(FG)	11.6	7.1	0.3	10.0	-	3.2	32.1
093P092_931	39.7	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	7.2	10.3	-	14.3	-	7.9	39.7
093P092_944	9.2	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	1.7	2.4	-	3.3	-	1.8	9.2
093P092_951	0.2	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	0.0	0.0	-	0.1	-	0.0	0.2
093P092_953	3.9	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	0.7	1.0	-	1.4	-	0.8	3.9
093P092_955	7.7	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	1.4	2.0	-	2.8	-	1.5	7.7
093P092_958	5.8	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	1.0	1.5	-	2.1	-	1.2	5.8
093P092_962	10.7	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	1.9	2.8	-	3.9	-	2.1	10.7
093P092_966	0.9	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	0.2	0.2	-	0.3	-	0.2	0.9
093P092_971	1.8	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	0.3	0.5	-	0.6	-	0.4	1.8
093P092_987	4.0	045-001	B	DECIDUOUS	I:EP36/AT26/SW20/AC18-0/0-0.0/0.0-18-19-3310(2001)(7),S:SW99/PLI1-24-1.6-18-340(2001)(7)57(FG)	0.7	1.1	-	1.5	-	0.8	4.0
093P004_1994	0.7	T5997	A	DECIDUOUS	I:AC40/AT40/SX20-0/0-0.0/0.0-18-20-5433(2001)(7),S:SX94/PLI6-14-1.8-18-233(2001)(7)50(FG)	0.3	0.3	-	-	-	0.1	0.7
093P004_1995	0.4	T5997	A	DECIDUOUS	I:AC40/AT40/SX20-0/0-0.0/0.0-18-20-5433(2001)(7),S:SX94/PLI6-14-1.8-18-233(2001)(7)50(FG)	0.1	0.1	-	-	-	0.1	0.4
093P004_1996	0.3	T5997	A	DECIDUOUS	I:AC40/AT40/SX20-0/0-0.0/0.0-18-20-5433(2001)(7),S:SX94/PLI6-14-1.8-18-233(2001)(7)50(FG)	0.1	0.1	-	-	-	0.1	0.3
093O089_1485	3.1	250-004	B	DECIDUOUS	I:AT69/AC26/PLI3/BL1/SW1-0/0-0.0/0.0-21-52-5894(2001)(7),S:PLI62/SW38-22-6.5-21-153(2001)(7)35(FG)	0.8	2.2	0.0	-	0.1	0.0	3.1
093O099_1804	11.1	250-004	B	DECIDUOUS	I:AT69/AC26/PLI3/BL1/SW1-0/0-0.0/0.0-21-52-5894(2001)(7),S:PLI62/SW38-22-6.5-21-153(2001)(7)35(FG)	2.9	7.7	0.1	-	0.3	0.1	11.1
093O099_1861	0.6	250-004	B	DECIDUOUS	I:AT69/AC26/PLI3/BL1/SW1-0/0-0.0/0.0-21-52-5894(2001)(7),S:PLI62/SW38-22-6.5-21-153(2001)(7)35(FG)	0.2	0.4	0.0	-	0.0	0.0	0.6
093O099_1891	6.1	250-004	B	DECIDUOUS	I:AT69/AC26/PLI3/BL1/SW1-0/0-0.0/0.0-21-52-5894(2001)(7),S:PLI62/SW38-22-6.5-21-153(2001)(7)35(FG)	1.6	4.2	0.1	-	0.2	0.1	6.1
093O099_1786	2.3	205-004	E	DECIDUOUS	I:AT82/PLI9/SW7/AC1/BL1-0/0-0.0/0.0-21-65-6215(2001)(7),S:SW58/PLI42-11-0.9-21-292(2001)(7)46(FG)	0.0	1.9	0.0	-	0.2	0.2	2.3
093O099_1801	7.9	205-004	E	DECIDUOUS	I:AT82/PLI9/SW7/AC1/BL1-0/0-0.0/0.0-21-65-6215(2001)(7),S:SW58/PLI42-11-0.9-21-292(2001)(7)46(FG)	0.1	6.4	0.1	-	0.7	0.5	7.9
Total Decid Area	458					130.1	149.2	8.2	59.9	15.9	94.6	458
Total Area	715				Deciduous Sp Comp At33 Ac28 Sx21 Ep13 Pl03 Bl03 2486sph(294wssph)	28%	33%	2%	13%	3%	21%	100%

Appendix 6 – Timber Supply Analysis Report

BRITISH COLUMBIA

August 31, 2006

File: 12850-20/48

Don Rosen
Inventory Specialist, Chetwynd
Canadian Forest Products Ltd.
4700 - 50th Street
P.O. Box 180
Chetwynd, BC V0C 1J0

Dear Don Rosen:

Re: Information Package for Tree Farm Licence (TFL) 48

Thank you for your Timber Supply Analysis Report in support of Sustainable Forest Management Plan 4 for TFL 48 (version 1.0b dated August, 2006) submitted August 8, 2006. I have reviewed the report and discussed the results with the consulting timber supply analyst responsible for preparing the report.

As the MoFR timber supply analyst responsible for reviewing this analysis report, I accept the document for use in the AAC determination for TFL 48 with no conditions.

I wish to point out that this letter does not mean that the MoFR endorses every aspect of this analysis. During the AAC determination information session, MoFR staff will advise the deputy chief forester regarding the technical validity of the analysis and the implications of its assumptions and results. The deputy chief forester will consider this advice as he develops the rationale for his determination of the AAC for TFL 48.

Sincerely,

G. Nienaber

Gordon Nienaber, R.P.F.
Timber Supply Analyst
Forest Analysis and Inventory Branch

cc: Winn Hays-Byl, MoFR - Peace District
Robert Schuetz, Industrial Forest Service
Bud Koch, MoFR - FAIB

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TREE FARM LICENCE # 48

TIMBER SUPPLY ANALYSIS REPORT
In support of
MANAGEMENT PLAN # 4

Prepared for

Canadian Forest Products Ltd.

Chetwynd Operations

August 2006

Version 1.0b

Prepared by:

Robert Schuetz, RPF
INDUSTRIAL FORESTRY SERVICE LTD.

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1. Executive Summary

A spatial timber supply analysis has been completed for TFL 48 in support of Sustainable Forest Management Plan #4. This analysis assessed both the coniferous and deciduous species within the TFL and derived a sustainable harvest level for both.

As per the direction of the Chief Forester in the AAC Rationale for Management Plan #3, Phase II vegetation resource inventory sampling of stands within the TFL has been completed. This sampling project resulted in a significant increase in the timber harvesting land base for the TFL; as well as a significant increase in the current merchantable growing stock and the estimation of unmanaged stand site productivity.

A base case scenario was identified using a coniferous timber harvesting land base (THLB) of 314,800 hectares and a deciduous THLB of 48,500 hectares. Upon this land base, natural range of variation seral targets have been applied to natural disturbance units at both the landscape level and by biogeoclimatic zone. Visual quality objectives have been maintained. Watersheds are monitored for hydrologic greenup. Riparian habitat, legislated protected areas, recreation sites, archeological sites and wildlife tree patches have been identified and preserved.

Both the coniferous and deciduous land bases have a current age class distribution that continues to be heavily skew to the mature and over-mature. For the coniferous land base, this provides a very stable platform whereby seral stage targets are met either immediately, or in the very near future.

The current AAC for TFL 48 is 580,000m^3/year. This is partitioned 525,000 to coniferous-leading species and 55,000 to deciduous-leading species. The current analysis reveals that a harvest of 642,800m^3/year can be supported by coniferous-leading stands and 94,200m^3/year by deciduous-leading stands.

Sensitivity analysis on the base case scenario, as well as on alternative management strategies, was completed. The analysis showed that the base case was sensitive to changes in visual quality objectives, old growth constraints and managed stand yield estimates. Sensitivity analysis also showed that the TFL could support a 25 to 50 percent higher short-term harvest for 10 to 30 years, and still maintain a mid-term non-declining harvest very near the base case.

Analysis on the potential impacts of a growing mountain pine beetle infestation was examined. Infestation scenarios ranging from 40 to 80 percent maximum pine mortality were simulated. The results indicated that up to 50 percent pine mortality could occur on the TFL, with minimal impact on the mid-term harvest level. Maximum mortality in excess of 50 percent had in increasingly negative effect on mid-term timber supply.

Additional analysis, giving consideration to the combined effect of managed stand yields (ie SIBEC), recommended VQOs and the focus on pine harvesting as a result of MPB mortality, revealed that a coniferous harvest of 744,000m^3/year and a deciduous harvest of 101,300m^3/year are sustainable for the long term. In consideration of this information, Canfor believes the allowable annual cut for Tree Farm License 48 should be set at 845,300m^3/year for the term of SFMP#4.

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Timber Supply Analysis Report
In support of Tree Farm License 48's
Management Plan # 4

2. Introduction

In accordance with Section 35(1)(vii) of the Forest Act of British Columbia, Canadian Forest Products Ltd.'s, Chetwynd Operations (Canfor), has completed a timber supply analysis of Tree Farm License (TFL) # 48, in support of and leading to the preparation of Sustainable Forest Management Plan (SFMP) # 4.

A timber supply information package was submitted to the Ministry of Forests and Range (MOF) on February 21, 2006. After one revision and clarification on the visual inventory used in the analysis, conditional approval was received on April 25, 2006. A complete information package incorporating the issues identified in the approval letter is provided in Appendix I.

This report examines the short, medium and long-term timber supply for TFL 48. In many ways this analysis is a continuation of forest management activities and assumptions used and modeled in MP#3. In regard to forest management and timber supply modelling assumptions, important information relative to TFL#48 includes:

- A revised TFL boundary, whereby the 'Stewart Block" has been added to the TFL and parts of the TFL's Rice Property have been removed from the TFL and added to the Dawson Creek TSA.
- As a result of Phase II statistical analysis of inventory field data and corresponding volume adjustment factors, a significantly larger timber harvesting land base has been identified.
- Visually sensitive areas have been updated.
- The base case analysis utilizes natural disturbance units (although the 'Established Old Growth Order' is also examined in sensitivity analysis).
- The Dunlevy higher level plan has been incorporation into the analysis.
- The Remsoft® Planning models were used to conduct aspatial and spatial timber supply modelling.
- The potential loss in economic lodgepole pine growing stock as a result of the migration of the mountain pine beetle into TFL48 is examined.

This analysis report is divided into four principle sections.

- Section one deals with the Base Case scenario. This scenario best describes the management practices and forestry operations carried out at the present time.
- Section two investigates a large number of "what if" questions regarding various

assumptions on the Base Case scenario. Although the best available information was applied to the timber supply model in the Base Case scenario, uncertainty is implicit when a computer attempts to mimic the complicated, ever-changing dynamics of a complex ecosystem. To assess the impact that variables could have on timber supply, sensitivity analysis is used to identify which variables could have significant effects on timber supply. Uncertainty in these variables could result in a large or small upward or downward movement in the timber supply picture.

- Section 3 considers alternative management strategies relative to the TFL and the impact of these strategies on timber supply. This section is focused on providing Canfor with quantitative information to assist in the direction that management practices or information acquisition should be directed on TFL 48.

- Section four summarizes the most pertinent results from the first three sections and draws some conclusions on the current and future state of the forest resource.

3. Description of Tree Farm License # 48

Tree Farm License # 48 is located in and adjacent to the Rocky Mountains in the north-east interior of British Columbia. Divided into five non-contiguous blocks, the TFL land base spans a wide range of terrain; from the flat, spruce-pine-aspen forests of the Alberta Plateau, to the Rocky Mountain foothills and the jagged peaks of the Hart Ranges in the Rocky Mountains. Map 1 identifies the location of TFL 48 within the Province and relative to the Dawson Creek Forest District.

The TFL comprises a wide range of ecosections. The Engelmann Spruce-Subalpine Fir (ESSF) predominates within the TFL. Alpine Tundra (AT), Sub-Boreal Spruce (SBS) and Boreal White and Black Spruce (BWBS) also occur in varying amounts. The principle commercial tree species are white spruce (Picea glauca), lodgepole pine (Pinus contorta var. latifolia), sub-alpine fir (i.e., balsam) (Abies lasiocarpa), trembling aspen (Populus tremuloides) and cottonwood (Populus balsamifera). Paper birch (Betula papyrifera), larch (Larix laricina) and black spruce (Picea mariana) also occur, but are seldom utilized in any significant amount.

Principle road access to the TFL is by Highway 97-North (from Prince George and Mackenzie), or via Highway 97-West from Dawson Creek. The towns of Chetwynd, Tumbler Ridge and Hudson Hope are the principle population centers within or adjacent to the TFL. From these population centers, access to the forests within the TFL is possible through an expanding network of forest service roads and operational roads. These include the Johnson Creek, Sukunka River, Hasler Creek, Wolverine River, and Murray River Forest Service Roads. The road network has been developed to access areas of spruce bark beetle attack, pine beetle attack, fire salvage and contiguous drainages of old, merchantable timber.

Logging began in and around the current area of TFL 48 as early as the 1950's. A Chetwynd-based sawmill was first constructed in 1958-59 and has undergone reconstruction and several modernization programs since that time. In 1963, Canfor Limited purchased the sawmill from the Fort St. John Lumber Company. TFL 48 was awarded to Canadian Forest Products Ltd. in December 1988. Since this time Canfor's Chetwynd Operations personnel have managed the TFL.

The annual harvest level maintained by Canfor in the Chetwynd area was initially authorized under several Forest Licenses. In 1988, Canfor exchanged the apportionment from one of these forest licenses into an apportionment under a tree farm license. The initial allowable annual cut (AAC) was set at 410,000 cubic metres on an estimated land base of 661,365 hectares. Canfor maintained this apportionment for the term of Management Plan #1. In 1994, the AAC was increased 25.4% to 514,000 cubic metres on an adjusted land base of 638,811 hectares. The term of this apportionment is coincident with the term of Management Plan # 2, (i.e., from December 31, 1996 to December 31, 2001). On September 20 2001, the AAC was again increased, this time by 11 percent to 580,000 cubic metres. Table 1 shows the current apportionment to deciduous leading stands and coniferous leading stands

The Chief Forester's decision to set the AAC at 580,000 m3 was made with the direction that during the term of Management Plan # 3, Canfor:

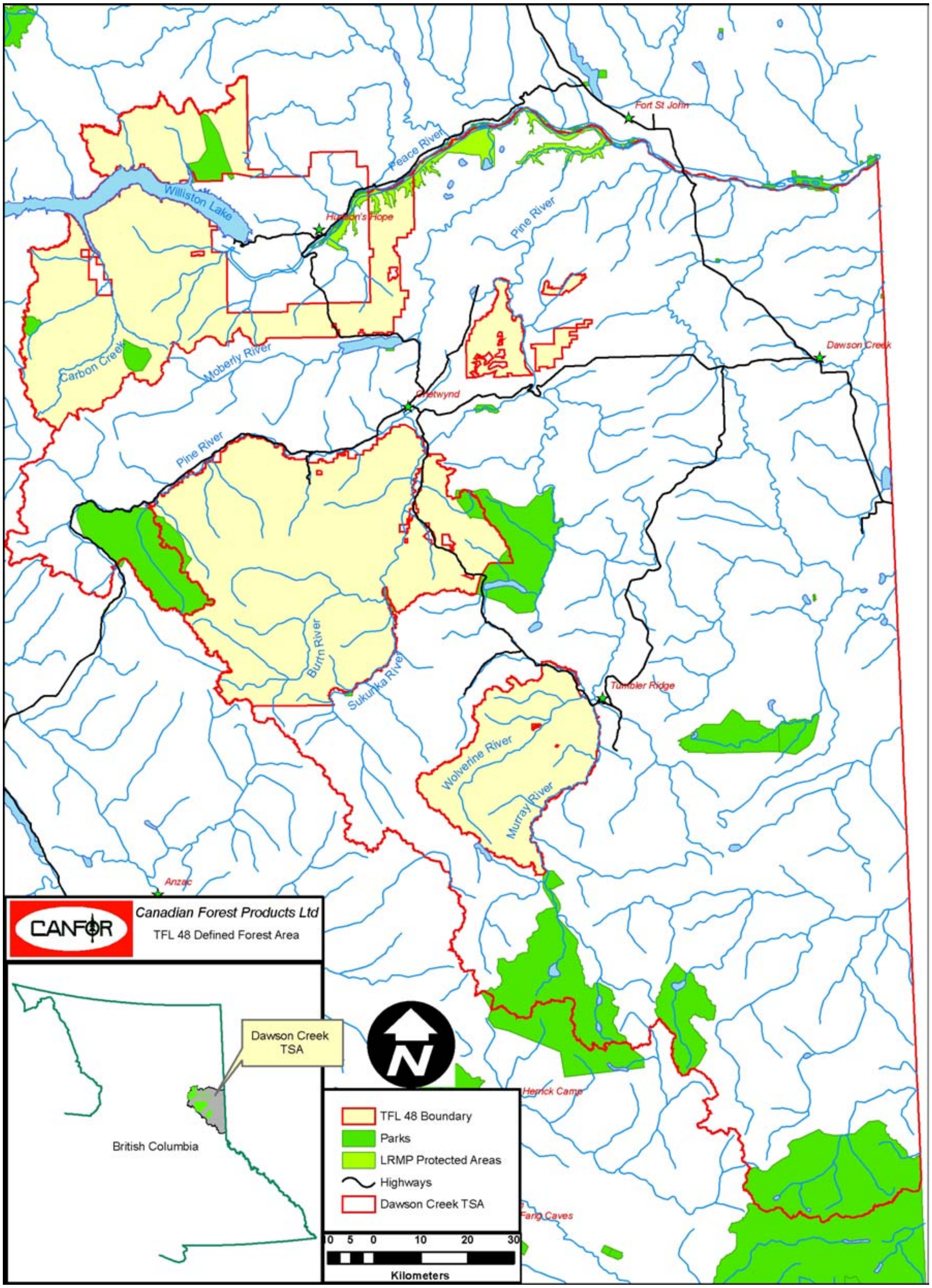
- Complete Phase II sampling of the TFL
- Ensure all polygons have an inventory label
- Monitor harvesting performance in deciduous leading stands
- Document stand conversion activities in the Rice Property
- Localize site productivity information
- Monitor the productivity of regeneration and advanced regeneration in shelterwood stands
- Document actual Wildlife tree patch retention
- Track and quantify areas denuded for energy exploration and development.
- Confirm management practices in riparian areas
- Confirm the amount of not satisfactorily restocked lands

Canfor has responded to all of these requests made by the Deputy Chief Forester in the AAC Rationale Document. This reader is directed to the Sustainable Forest Management Plan #4 document for TFL 48 for specific information.

Table 1 Current AAC Apportionment

1	Coniferous partition applicable to coniferous and deciduous trees harvested from *coniferous-leading stands.*	525,000 m3/year
2	Deciduous partition applicable to coniferous and deciduous trees harvested from *deciduous-leading stands.*	55,000 m3/year

Map 1 Location of TFL48



4. Information Preparation for the Timber Supply Analysis

A tremendous amount of effort goes into the preparation of a timber supply analysis for a TFL timber supply review. With regards to forest and other resource inventories, the following activities were completed or reworked during the past 5 years.

- Stream classifications were completed for the TFL
- The Phase II Sampling of the TFLs VRI inventory was completed and revealed that volumes and growth potential were generally underestimated when compared to previous information,
- The known visual inventory was updated and is now in line with visual inventories from the Dawson Creek TSA
- Wildlife habitat ratings have been completed for eight species across the TFL.
- Estimates of losses to future roads, trails and landings have been improved through the application of a model that produced a hypothetical road network to access the entire THLB. The THLB area lost as a result of this road network was used as a percent area conversion to non-productive applicable to existing unmanaged stands after their initial harvest.
- An inventory of existing and proposed energy and mining exploration and development activities was completed across the TFL. The net impact of these activities is minimal and is discussed further in this report.

4.1. Land Base Inventory

The inventory's for TFL 48 currently exists in a spatially explicit ARC-INFO geographic information system (GIS). This GIS contains the results of a union of all of the different inventories identified in the appended information package into one comprehensive database. The resultant inventory database was then used to spatially identify the areas that will contribute to the present and future THLB. This THLB is shown in Map 2.

As per the analysis completed for MP#3, this analysis also identifies and tracks the distribution and age of productive forest area that was excluded from the THLB. This was done to allow the forested areas that have been excluded from the THLB, to contribute to biodiversity seral-stage targets, visual quality objectives, and the maintenance of wildlife habitat.

Areas excluded from the THLB are represented in riparian reserves, operability reserves, parks, alpine forest and recreation areas. Map 2, Figure 1 and Table 2 summarize the area reductions that were made to the TFL's productive forest area for the purpose of determining the THLB. It is estimated that 64 percent of the productive forest area is eligible for timber harvesting activities either presently, or some time in the future. This proportion is divided between the coniferous THLB (56%) and the deciduous THLB (8%).

Map 2 Timber Harvesting Land Base

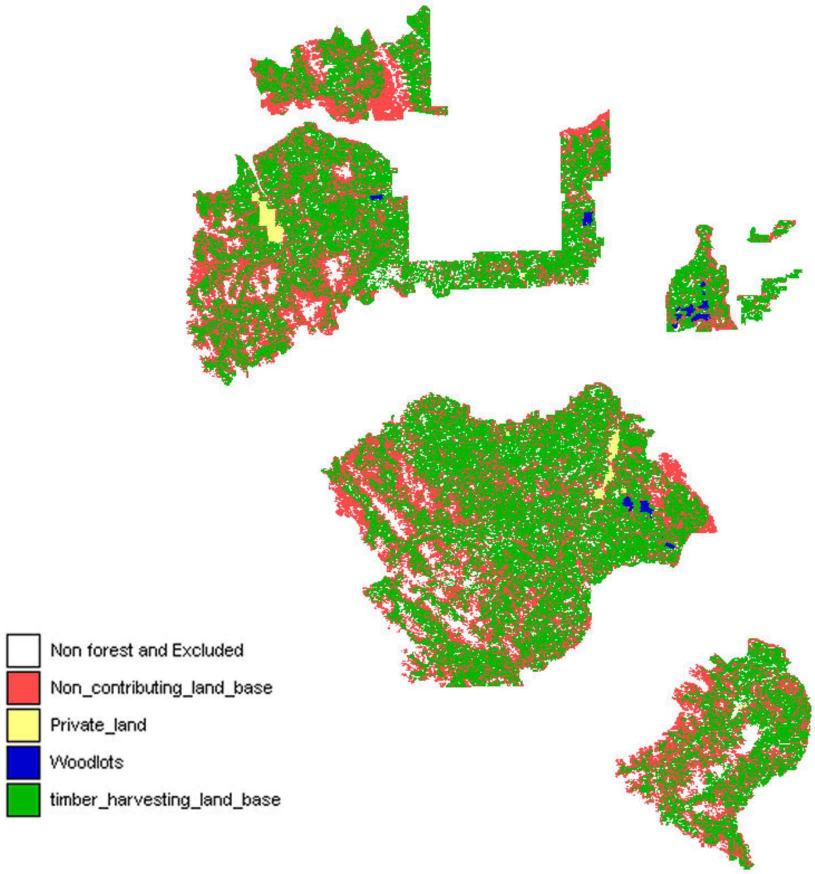


Figure 1 Distribution of the Productive Forest Area

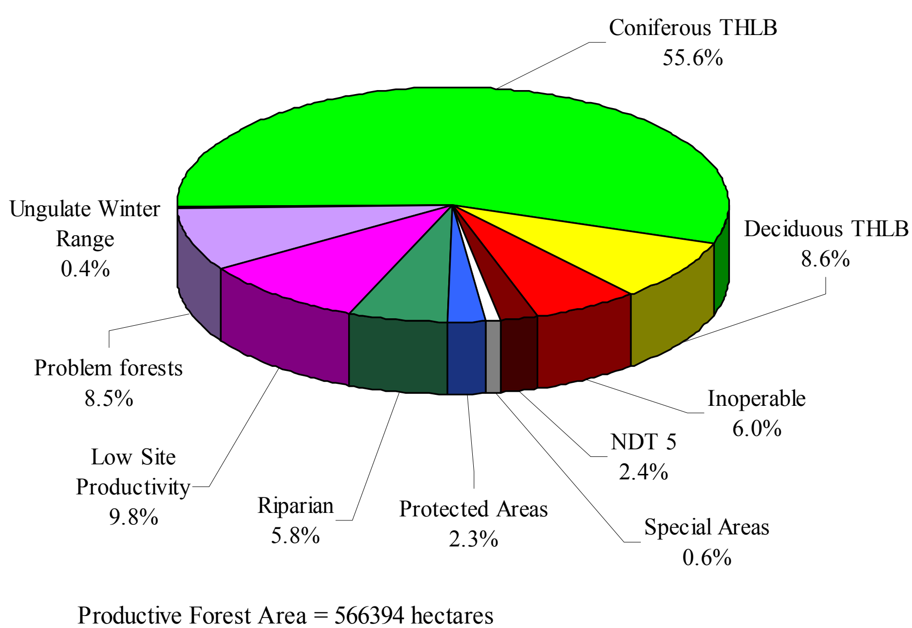


Table 2 Timber Harvesting Land Base Determination

Classification	Gross Area (ha)	Area (ha)	% Prod. Forest
MP 3 TFL Total Area (incl. Water)		643,511	
Changes to TFL Boundary			
Removed woodlots		794	
Removed "Rice Property" farm fields		1231	
Inclusion of the Stewart Block		1,753	
SFMP 4 TFL Total Area (incl. Water)		**643,239**	
Less: TFL Boundary sliver polygons		112	
Water	3,104	3,104	
Mine Site	2,236	2,236	
Existing Roads	5,567	3,830	
Non-Vegetated Land	971	949	
Vegetated Non-Treed (no disturbance history)	67,171	66,943	
Plus: Sukunka Falls Park	426	330	
Potentially Productive Area		**566,394**	**100.0%**
Less: Inoperable	34,038	34,038	6.0%
NDT 5	14,942	13,765	2.4%
Forested Islands	195	141	0.0%
Wildlife Habitat - Bull Trout	86	74	0.0%
Archaeological Sites	10	10	0.0%
Protected Areas (including parks)	14,853	12,849	2.3%
Recreation	1,270	418	0.1%
Buffers: Lakeshore reserves	28	25	0.0%
Stream/River riparian buffers	31,082	27,597	4.9%
Forested Wetlands	4,001	3,558	0.6%
Forested Wetland Buffers	1,882	1,760	0.3%
Low productivity sites	72,618	55,710	9.8%
Problem Forest types	62,497	48,077	8.5%
Sukunka Falls Park	426	286	0.1%
Visual preservation	723	167	0.0%
Dunlevy Ungulate Winter Range	4,480	1,983	0.4%
Rare Site Series	4,080	2,572	0.5%
Total Reductions to Productive Forest		203,029	35.8%
Net Land Base		**363,365**	**64.2%**
Split into: Coniferous THLB		314,829	86.6%
Deciduous THLB		48,536	13.4%

Commercial tree species within the TFL comprise white spruce, lodgepole pine, balsam fir, trembling aspen and cottonwood. A large proportion of these species existing in mixedwood stands comprising two or more different species. Species such as larch, white birch and black spruce also make up small amounts of problem forest types. These species may be harvested when existing within mixedwood stands, but will not be specifically targeted for harvest during the term of MP#4. Figure 2 shows the distribution of commercial species within the THLB. Map 3 shows the distribution of species across the productive forest land base. Apparent from both images is the predominance of white spruce and lodgepole pine. Deciduous species exist in the lower elevations along the eastern foothills and as trace amounts within leading-coniferous stands. In keeping with Canfor's operational objectives, deciduous stands within the ESSF have been excluded from the timber harvesting land base. Further, the deciduous volume within leading-coniferous stands (in the ESSF), have been removed from natural stand yield tables.

The current age class distribution of the forest inventory for the TFL is shown in Map 4 Current Age Class Distribution

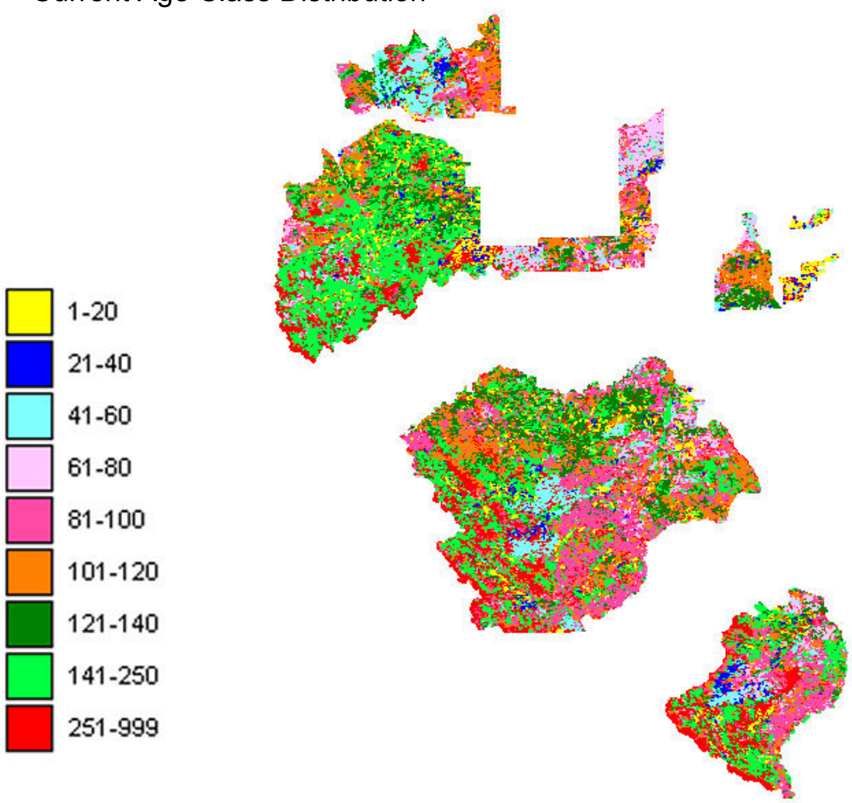


Figure 3 and Map 4. Approximately 65 percent of the conifer stands and 80 percent of the deciduous stands within the TFL's timber harvesting land base are presently above or very near the minimum harvest age and considered economically merchantable. The average age of stands within the TFL is 115 years. Forested areas excluded from harvesting have an age class distribution similar to that of the THLB.

Map 3 Species Distribution

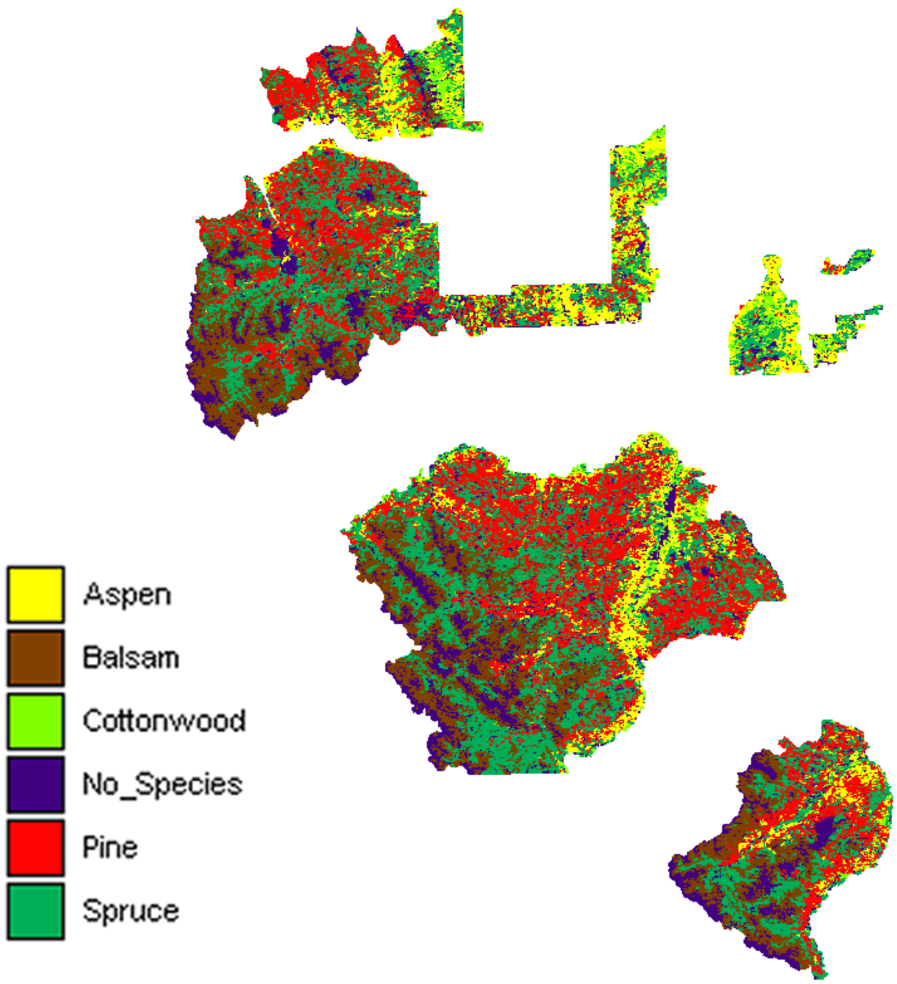
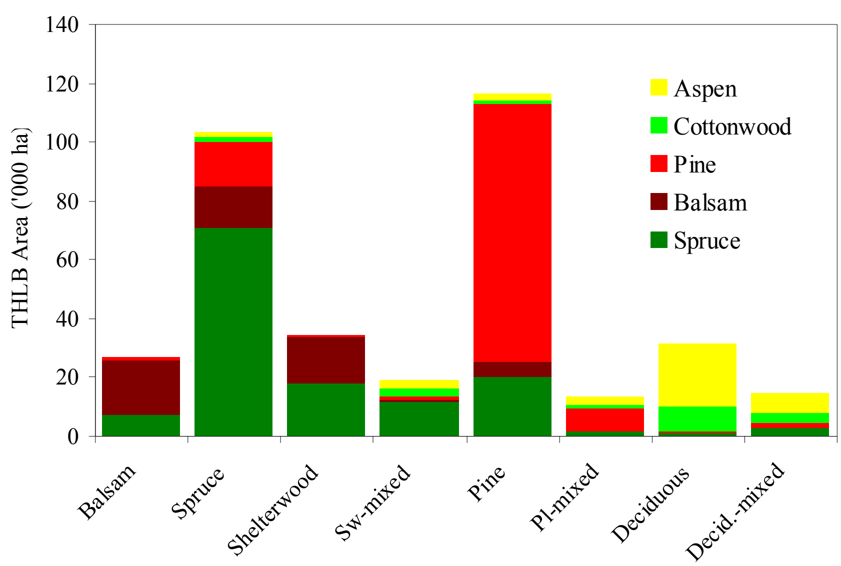


Figure 2 Species within Aggregated Timber Types



Map 4 Current Age Class Distribution

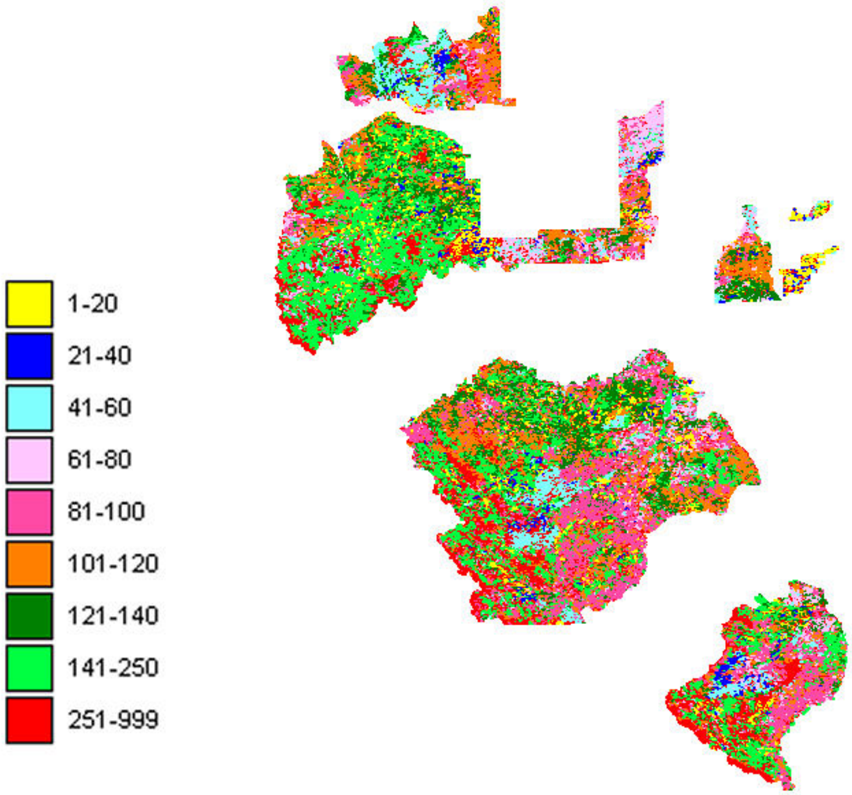
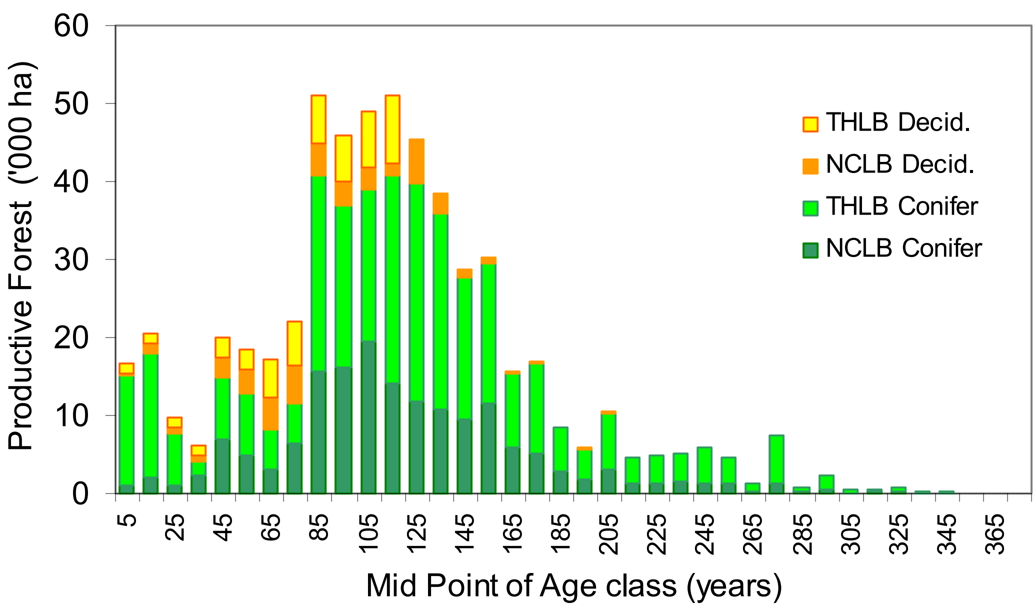


Figure 3 Current Age Distribution



4.2. Timber Growth and Yield

Timber growth and yield in this analysis refers to the change in existing stand volume over time, and the effect that current harvesting and silviculture management practices have on the future yield from managed stands and plantations.

Growth and yield tables for existing unmanaged stands within TFL 48 were calculated using the Ministry of Forests VDYP batch model. The merchantable forest inventory (or growing stock) for the TFL is simply the sum of the area of each forest stand, multiplied by the stand's estimated volume per hectare. The current analysis shows a significant increase in the merchantable growing stock for the TFL from that reported in MP#3 (i.e. from 55 to 81 million cubic metres). The increase is primarily attributable to the completion of Phase II sampling of stands across the TFL, and the corresponding statistical adjustments to the Vegetation Resource Inventory (VRI) completed by J.S Thrower and Associates in March 2005[1]. The adjustments showed:

- Mean annual increment (MAI) was found to be underestimated by 42 percent across the TFL.
- Site index was underestimated by 10 percent (average of 11.4 from Phase 1 sampling → 12.4 from Phase II sampling)
- Volume per hectare was underestimated by 34 percent.

The impact of these adjustments relative to the MP#3 analysis is a 15 percent gain in the size of the timber harvesting land base through inclusion of stands previously considered of marginal merchantability; and an overall 47 percent increase in the growing stock for the TFL, through an increase in estimated volumes and the increase in the THLB.

The growth and yield of existing and future managed stands is predicted using the MOF's Table Interpolation Prediction for Stand Yields (TIPSY) model. The conversion of area from natural unmanaged stands to managed plantations typically results in dramatically improved growth on the part of the managed plantation. This improvement occurs as a result of silviculture practices that include:

- Shorten regeneration delays,
- Site preparation,
- Planting a specified number of evenly spaced seedling that are 1 or 2 years of age,
- Monitoring plantation growth,
- Fill planting areas where seedling growth was unsuccessful,
- The performance of genetically improved stock,
- Control of competing species such as brush or grasses, and
- Thinning/spacing overstocked plantations.

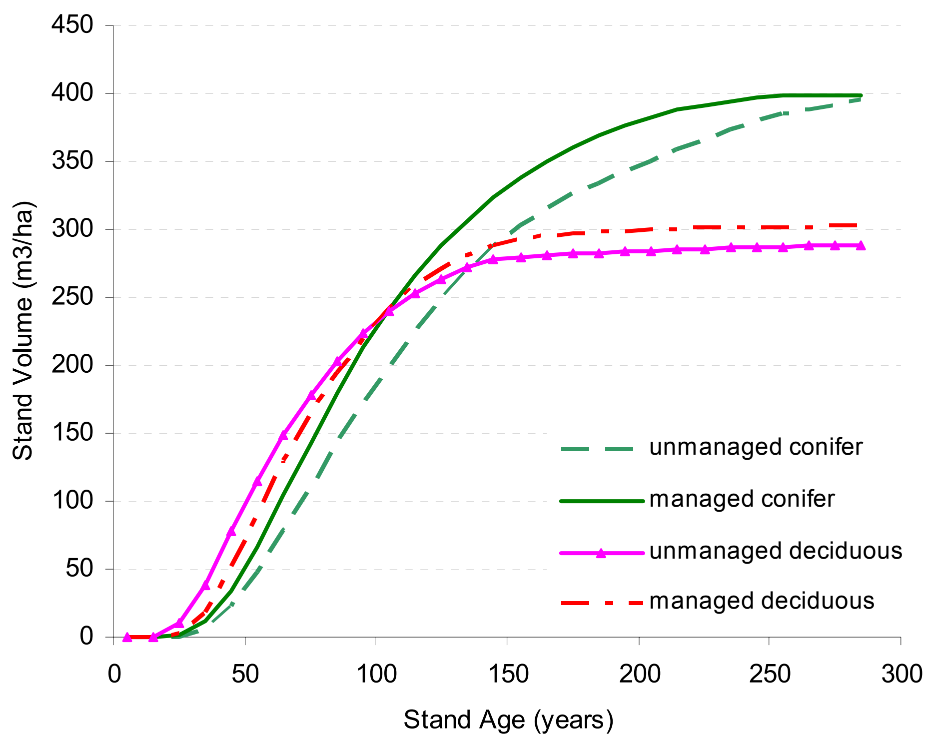
The combined impact from these activities is an increase in the volume expected from managed coniferous stands that is better than the volume achieved in unmanaged stands. Figure 4 shows the resultant area-weighted managed and unmanaged yield tables for coniferous and deciduous stands in TFL 48. The variance in deciduous yields is largely a result of weighing the unmanaged deciduous component with the smaller

[1] See Tree Farm Licence 48 Vegetation Resources Inventory Statistical Adjustment for Timber Supply Review , March 2005, J.S. Thrower and Associates Ltd., 31 pages

managed coniferous component in mixedwood stands. The short-term coniferous results however are significant. As a result of the conversion from unmanaged natural stands to managed plantations the economic rotation (culmination age) of the average stand is shortened by 20 years (e.g. from 135 to 115 for conifer stands) - though the average yield at culminations remains relatively the same. In the long term, there is very little change in the estimated yield results.

The differences in the coniferous results indicated in Figure 4 differ noticeably from the results shown on a similar graph produced for MP#3. The MP#3 graph indicated a much greater growth potential as a result of forest management. What has happened is that the Phase II sampling completed during the term of MP#3 has significantly increased the estimated volume of existing stands across the TFL. However, the corresponding site index has changed only slightly (i.e. 10%). The net result is that the gap between natural and managed stand coniferous volumes has closed significantly. Whether this is an accurate estimation of managed stand yields will be resolved in the future; though it is discussed further in Section 8.3 of this report, where we look at the impact of site index adjustments using the biogeoclimatic ecosystem classification of stands rather than age and height.

Figure 4 Differences between Natural and Managed Stand Growth



Within the existing THLB, stands may fall into one of several categories based upon their current management status. Figure 5 describes the stand attributes for the TFL in respect to historic management. Although harvesting operations have occurred within the TFL for over the past 30 years, very little area has remained in a denuded state. Not sufficiently restocked area (NSR) has declined to less than one percent of the THLB. Approximately 10 percent of the THLB is presently considered managed forest with respect to their future potential growth and yield. These are separated into pre- and post-1995 harvesting to distinguish between improved plantation management, with respect to planting densities and the availability of nursery grown seedlings. Immature natural stands exist primarily as a result of disturbances that occurred prior to 1990, such as fire, insects or other catastrophic events. These areas have been left to regenerate naturally and occur as stands with varying levels of stocking. Thrifty stands have been indicated to show the amount of area that will become merchantable over the next twenty years. At 14 percent of the TFL, a considerable portion of the THLB will soon become merchantable. Stands above the minimum harvest age comprise 51 percent of the THLB, 13 percent of which may be considered as having old growth characteristics. As we will see later in this report, the proportion of old growth within the TFL is expected to rise over time.

Map 5 Management History

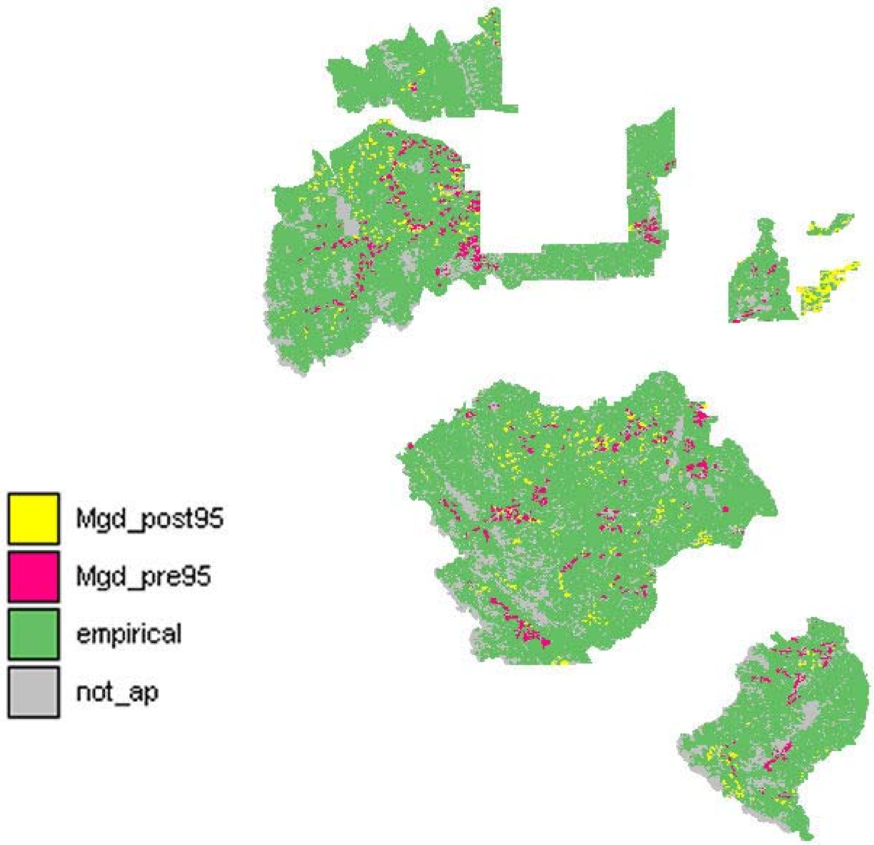
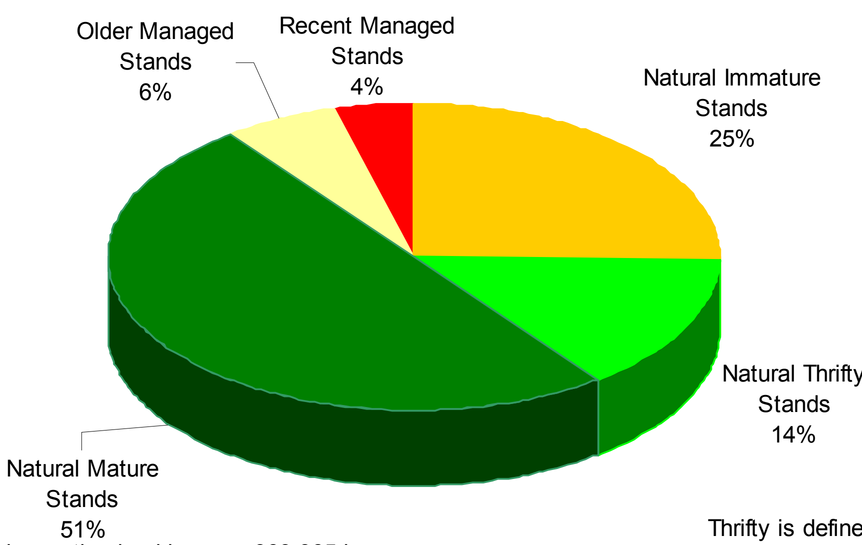


Figure 5 Management Classifications of the THLB



Timber harvesting land base = 363,365 ha

Thrifty is defined as 20 years less than mininum harvest age

4.3. Management Practices

This timber supply analysis utilized the Remsoft forest estate model "Spatial Woodstock" version 2006.1.1. The information used to model forest management practices within TFL 48 is detailed in Appendix I. The following are a few very general silviculture and harvesting practices that reflect current management on TFL 48 and were explicitly modeled in this timber supply analysis.

- Silviculture practices describe the post-harvesting activities utilized by Canfor to establish and maintain a free growing stand of merchantable tree species. The silviculture practices that best describe current performance include a 2-year regeneration delay, planting nursery-grown coniferous seedlings and establishing plantations with an average of 1,600 stems per hectare.

- The area contributing to the deciduous harvest has been expanded beyond the borders of the pulpwood agreement area, to be coincident with the entire TFL. Deciduous species are assumed to regenerate naturally and grow along the same yield curve predicted for unmanaged deciduous stands.

- Operating under the principle of "no net loss" in the proportion of deciduous and coniferous in the TFL, mixedwood stands were assumed to maintain their current proportion of deciduous and coniferous volume.

- Forest health and non-recoverable losses (NRL) describe the predicted average loss in volume in the TFL from fire, insects and disease. Although losses in recent years have dropped significantly, the occurrence of mountain pine beetles on the east side of the Rockies and a rapidly escalating sanitation program are cause for significant concern. The NRL's for the TFL remained unchanged from MP#2 and MP#3.

- Stand mortality was also modeled by apply a maximum lifespan to each forested stand in the TFL (i.e., conifer and deciduous). Stands achieving this maximum lifespan were assumed to die and regenerate naturally to themselves as immature stands.

- Utilization describes the minimum size of trees and logs that are removed from a stand during harvesting. Standard "close" utilization is currently described by harvesting to a 10 cm top and a 30 cm stump height. Pine and deciduous are harvested down to a minimum 12.5 cm diameter at breast height. Spruce and balsam are likewise harvested down to a minimum 17.5 cm diameter at breast height.

- Forest cover constraints and green-up heights are used to prevent harvesting from becoming overly concentrated in any one area. The TFL is managed such that no more than 33 percent of the area within the THLB is ever less than 3 metres in height.

- Visually sensitive areas are managed by limiting the visual evidence of harvesting to certain levels. Once again, forest cover constraints and extended green-up delays are used to restrict harvesting within these areas. In TFL 48 scenic areas have been identified specific to each landscape unit. Within each visually sensitive area, harvesting is restricted based upon the visual quality objective for the area. Green-up heights are increase to 5 or 6 metres depending on the visually quality objective and the average slope within the area. shows the location of existing visually sensitive areas (used in the Base Case) and recommended VQO areas (used for sensitivity analysis).

- Minimum harvest age refers to the minimum age at which a stand is eligible for harvesting. Culmination age[2] is the point at which stands are first considered eligible for harvesting. In this analysis culmination age is used as minimum age criteria for selecting eligible stands for harvest.

- Landscape level biodiversity is modeled in the timber supply analysis using the natural disturbance units provided to Canfor by the Prince George MOF Regional ecologist. Sensitivity analysis is also completed using the legislated "Old Growth Order". Biodiversity is applied to the timber supply model by defining the minimum amount of area that must be above a minimum old growth age for each NDU and each NDU and biogeoclimatic zone (BEC). Map 6 shows the distribution of natural disturbance units across the TFL. Map 8 shows the biogeoclimatic ecosystem classifications zones.

- Wildlife habitat is managed through the preservation of riparian reserves around streams, rivers, lakes and wetlands, by the maintenance of old growth stands, green-up delays on harvesting, and the maintenance of wildlife tree patches within cut blocks. Ungulate winter range habitat was addressed through the removal of potential harvestable area in the Dunlevy and through application of old 'thermal' constraints and early seral constraints in the Sukunka.

- Proposed protected areas that were identified in the Dawson Creek Land and Resource Management Plan have since been legislated into parks by the Provincial Government, with the exception of the Peace River / Boudreau Lake proposed protected area. All of these areas have been excluded from contributing to the THLB, including the proposed Peace River / Boudreau Lake area. The forested area within all of the parks within the TFL boundary contributes to achieving the biodiversity targets wherein they occur.

- Harvesting and access in the Dunlevy (north of the Peace arm of Williston Lake) is guided by the Dunlevy Creek Management Plan that received government endorsement in 2002. The timing and spatial quantity of area harvested each decade is modeled explicitly throughout this analysis. See Map 9 for the location of management zones within the Dunlevy.

- Watersheds were defined across much of the TFL during the term of MP#3. See Map 10. This analysis modeled the requirement that there is a limit to the maximum amount of area that could be less than a 3 metre greenup.

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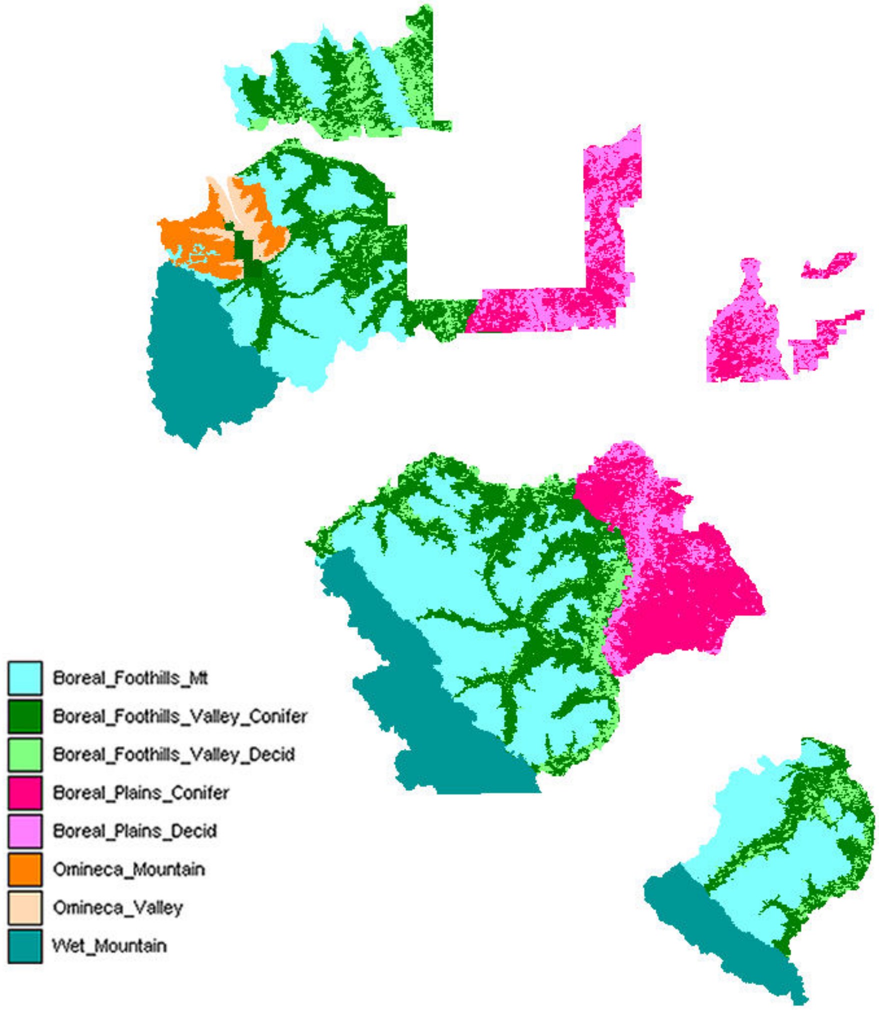
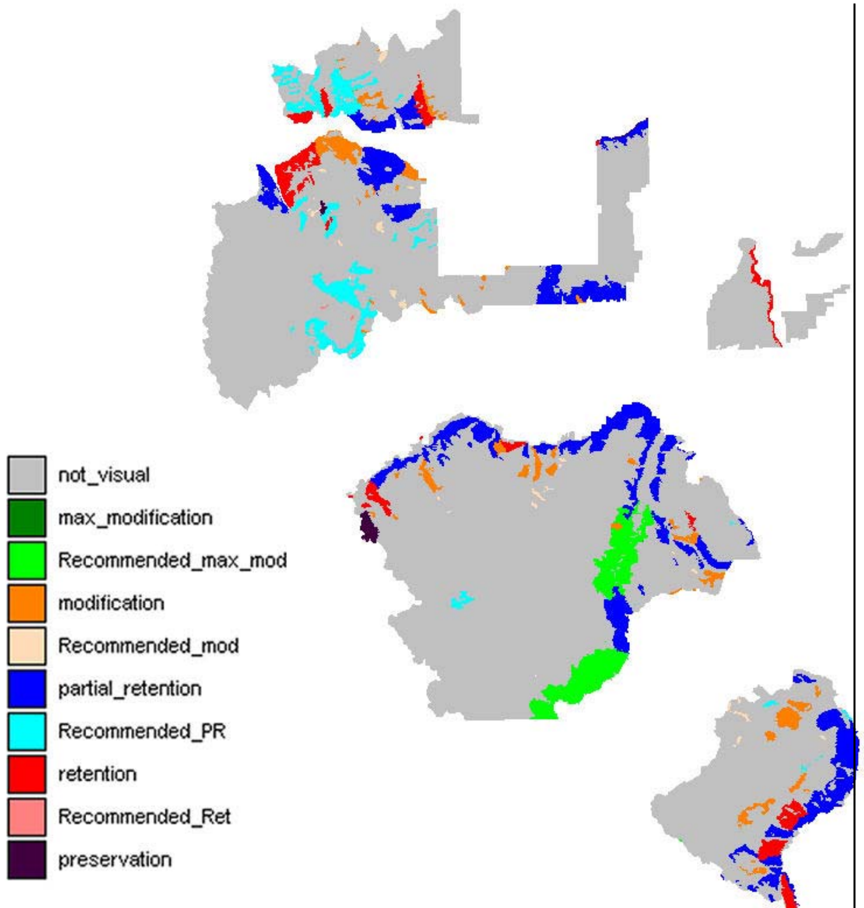
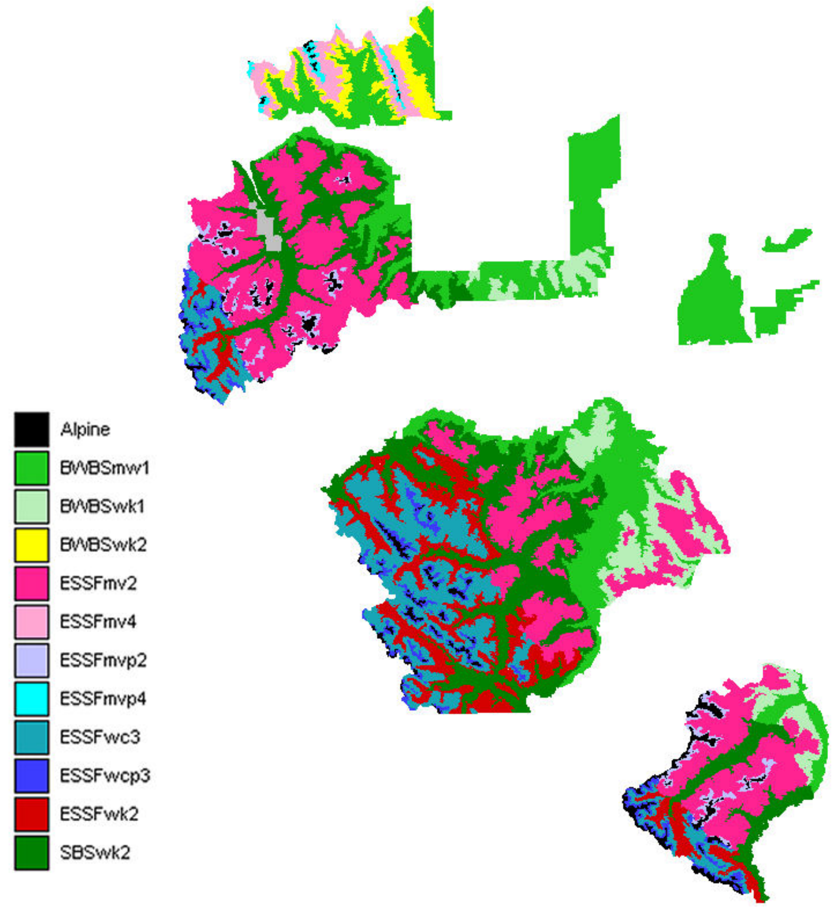
2 Culmination age is the age at which a stand of timber achieves its highest mean annual increment (MAI) and is the optimal biological rotation age to maximize volume production from a growing site.

Map 6 Natural Disturbance Units

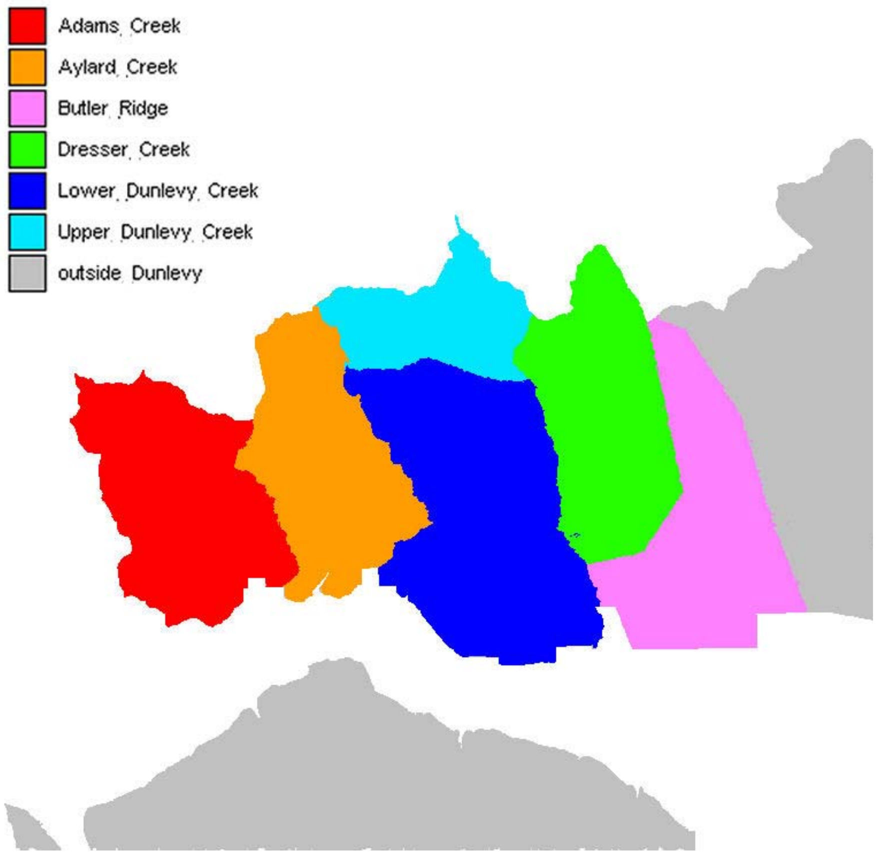




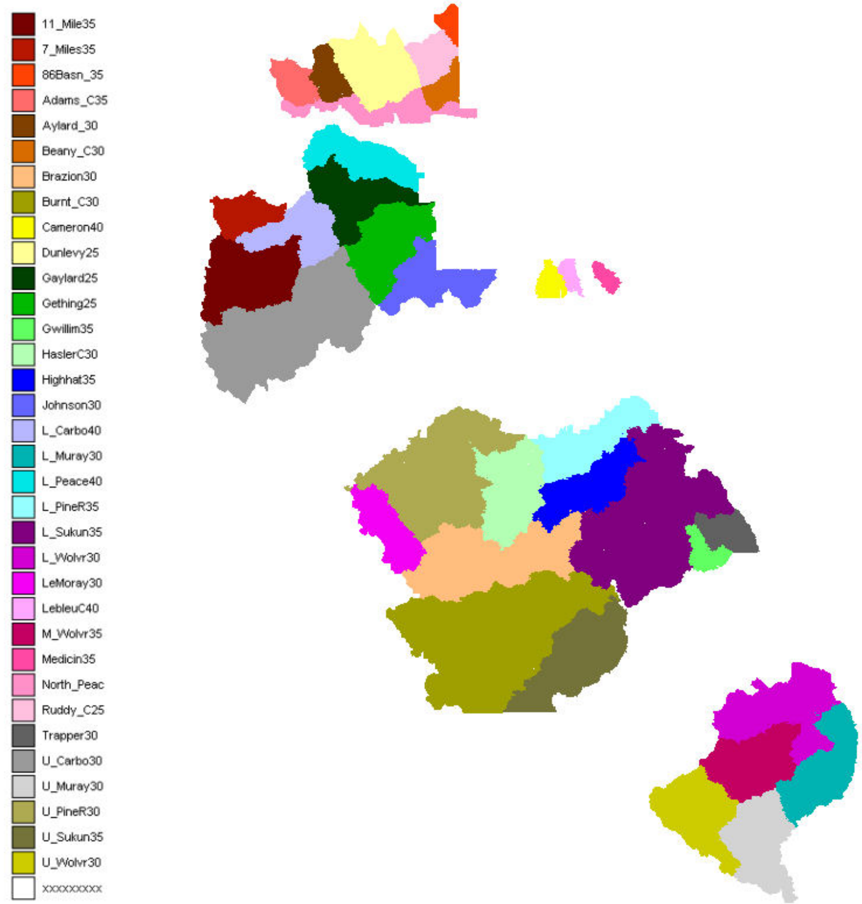
Map 7 Visually Sensitive Areas



Map 8 Biogeoclimatic Zones



Map 9 Dunlevy Management Zones



Map 10 Watersheds

4.4. Timber Supply Analysis Methods

The purpose of this analysis is to examine the short and long-term timber harvesting opportunities within TFL 48, in light of current, potential and forecasted management practices. To guide this process several steps were taken sequentially:

1. Digital forest inventory files and management zone coverages' are "loaded" into an ARC INFO® geographic information system (GIS) and are used as the base information to describe the current state of the gross forested land base.
2. An information package is then compiled that describes the "net down process", whereby the THLB is identified from within the forested land base. Basically, each forested stand must meet a certain set of predefined conditions for the stand to be eligible as a candidate for the THLB. As was revealed in Figure 1, these stands can be excluded from harvesting consideration for a wide number of reasons.
3. Each stand within the timber harvesting land base and the non contributing land base is then described in terms of its current age, volume, species, and location with respect to other resource values or management considerations.
4. Future age and volume is then predicted for each stand using unmanaged and managed stand growth and yield tables. These tables and the areas within each stand are aggregated into analysis units, to simplify the inputs into the forest estate model. Analysis units are aggregations of stands having the same general variables describing tree species, land productivity, disturbance history and current stand age.
5. Management assumptions are then defined by quantifying the rules and practices that determine the eligibility of a stand for harvesting at any given time during the planning horizon. Management assumptions can vary from the application of minimum harvest ages, to harvest priorities, to green-up and seral requirements within a target area.
6. Information regarding land based inventory, stand growth and yield, and management assumptions are then applied to a forest estate model. This model attempts to capture the essence of a real system by isolating and retaining the important elements of the system, and disregarding the rest. A conceptual model of a forest encompasses:

   - A method of describing the forest (a classification scheme),
   - A range of silviculture activities and natural events, along with a specification of how affected areas develop following these activities and events,
   - A means of measuring the impact of interventions and natural events (forest conditions, benefits and outputs),
   - A method of accounting for the passage of time

7. In this analysis the Remsoft® modelling system is used as the analysis tool. The Remsoft system combines the forest model 'Woodstock' (in linear (goal) programming mode). Remsoft's cut-block builder and harvest scheduler 'Stanley®' is also used to conduct sensitivity analysis around the validity of aspatial results. The Woodstock model is used to determine a Base Case harvest flow. Sensitivity analysis is then carried out on many modelling parameters to evaluate both the relative importance of various modelling

assumptions to the base case harvest flow, and to measure the impact of alternative management decisions.

8. Sensitivity analysis was completed to address the uncertainty surrounding a growing mountain pine beetle problem. A beetle epidemic and control model was used to calculate the non-recoverable losses that may occur over the next decade. The model was run annually using various levels of infestation and control responses. The results from this model with respect to non-recoverable pine losses were applied to the Remosft model to determine the possible mid-term harvest level resulting from various degrees of pine mortality.

This type of analysis is similar to those completed by the BC Ministry of Forest's Analysis Branch in all of the Timber Supply Areas (TSA) of the Province. The MOF's goal in each TSA is to determine the timber supply implications of one particular timber-harvesting regime. Typically, this is the regime that best describes current operational practices, which may be carried out by a number of different forest license holders and British Columbia Timber Sales. This analysis differs from that goal by using the timber supply analysis process to assess several different timber harvesting regimes. Like the MOF, a Base Case regime is analyzed which describes current operational practice. In addition, other regimes are assessed which Canfor may then wish to pursue during the term of the next Management Plan. Such regimes might include the impact of management alternatives on an escalating mountain pine beetle epidemic; or reverting back to the Old-Growth Order for biodiversity management. This assessment of alternative regimes allows the TFL holder to quantify the harvest forecast implications of various management practices, as justification for changing current management practices.

5. Analysis Results

The results for the timber supply analysis for TFL 48 ,that have been completed in support of Sustainable Forest Management Plan # 4, have been divided into three sections.

Section five deals at length with the Base Case harvest forecast. As the scenario that best describes current forestry practices, this scenario also describes the sustainable harvest level if the status quo is maintained and if the information used accurately represents the current and future state of the forest.

Section six provides sensitivity analysis on the Base Case and analyzes the effect that changes in management assumptions will have on the harvest forecast. Changes in modelling assumptions are imposed to quantify the effect that these changes have relative to the Base Case harvest.

Section seven provides additional analysis that Canfor has initiated to determine the quantitative information required to assess alternative operational practices. This section provided quantitative information on the impact of a possible mountain pine beetle epidemic.

All of the scenarios described in this report used the same basic criteria in identifying the harvest forecast. These criteria are:

- All of the harvests shown in this report were calculated using a 250-year (25 decade) time line,
- The goal of each scenario was to maximize the harvest level, subject to the goals relating to:
    - Early seral objectives,
    - Old growth objectives,
    - The maintenance of a long-term stable THLB growing stock, and
    - Harvest flow objectives for coniferous and deciduous leading stands that varied between non-declining, even flow, accelerated, or a predetermined sequential step-down.
- All scenarios reported have had the non-recoverable losses removed from the harvest flow results. Non-recoverable losses were assumed to be 49,700m^3/year for coniferous-leading stands, and 6400m^3/year for deciduous-leading stands. Losses of only 5000m^3/year were applied to conifer-leading stands in the first decade in the mountain pine beetle epidemic scenarios.
- Sensitivity scenarios may have one of three effects on the Base Case harvest flow: 1) the scenario may be more constraining and result in a reduction in the harvest flow; 2) the scenario may be less constraining and have a positive impact on the sustainable harvest level; 3) they have no effect at all.

6. Base Case Harvest Forecast

Table 3 and Figure 6 describe the Base Case harvest forecast for TFL 48. The current allowable harvest level for TFL 48 is 580,000 cubic metres per year. This can be increased immediately to 737,000m^3/yr. Net of NRLs, this harvest level could be apportioned 642,800m^3/yr to coniferous-leading stands and 94,200m^3/yr to deciduous-leading stands. This non-declining harvest level is a substantial increase over the harvest level identified in the analysis completed for Management Plan #3. The principle reason for this increase is a result of the Phase II vegetation resource inventory sampling that was completed for TFL48. The Phase II sampling revealed that, for the most part, stand yields within the TFL had been significantly underestimated. Revisions to the inventory increased the estimated average volume per hectare and the estimated site productivity of stands. As a result of these two adjustments, the timber harvesting land base increased substantially. An increase in the coniferous and deciduous harvest levels were therefore an anticipated consequence of the efforts and improvements in resource information that Canfor had acquired during the term of Management Plan #3.

Also shown in Figure 6 is the level of stand mortality that has occurred during the term of the simulation. This mortality is the sum of volume-based NRLs and the application of a ceiling on the maximum age that a stand can attain to before mortality is assumed to occur. Mortality increases as the non-contributing land base ages over time and stand level mortality is assumed to occur. The results shown in Figure 6 and Table 3 are net of this mortality.

Figure 7 shows the change in the growing stock within the TFL over time. Growing stock is a measure of the total volume existing within an area at any given time. The total growing stock includes volume from young plantations, mature stands and old growth stands that exists within the THLB and the NCLB. As we see in Figure 7, harvesting operations that are occurring and forecasted to continue to occur within TFL 48 do not have a negative impact on the total growing stock within the TFL. The total growing stock is forecast to increase from 120 million cubic metres to an average of 131 million cubic metres over the next 100 years.

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Table 3 Base Case Harvest Flow

Scenario	Land Base	Net Short Term Yield (m^3/yr)
Base Case	Conifer	642,800
	Deciduous	94,200
	Total	737,000

Figure 6 Base Case Harvest Forecast

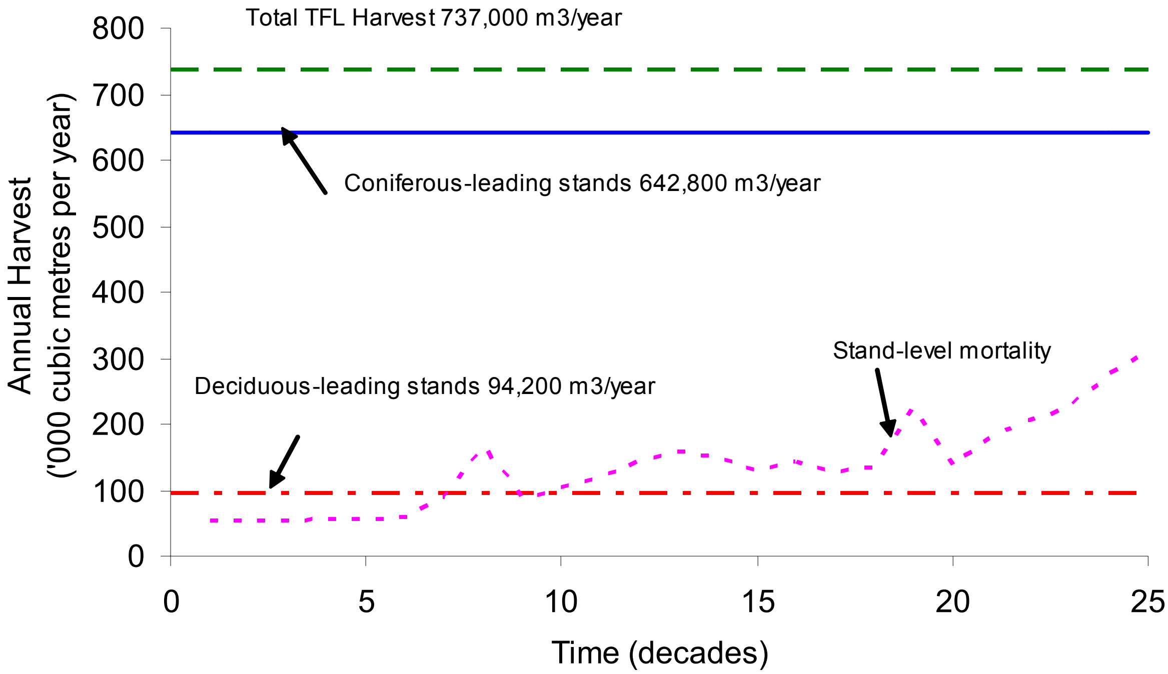
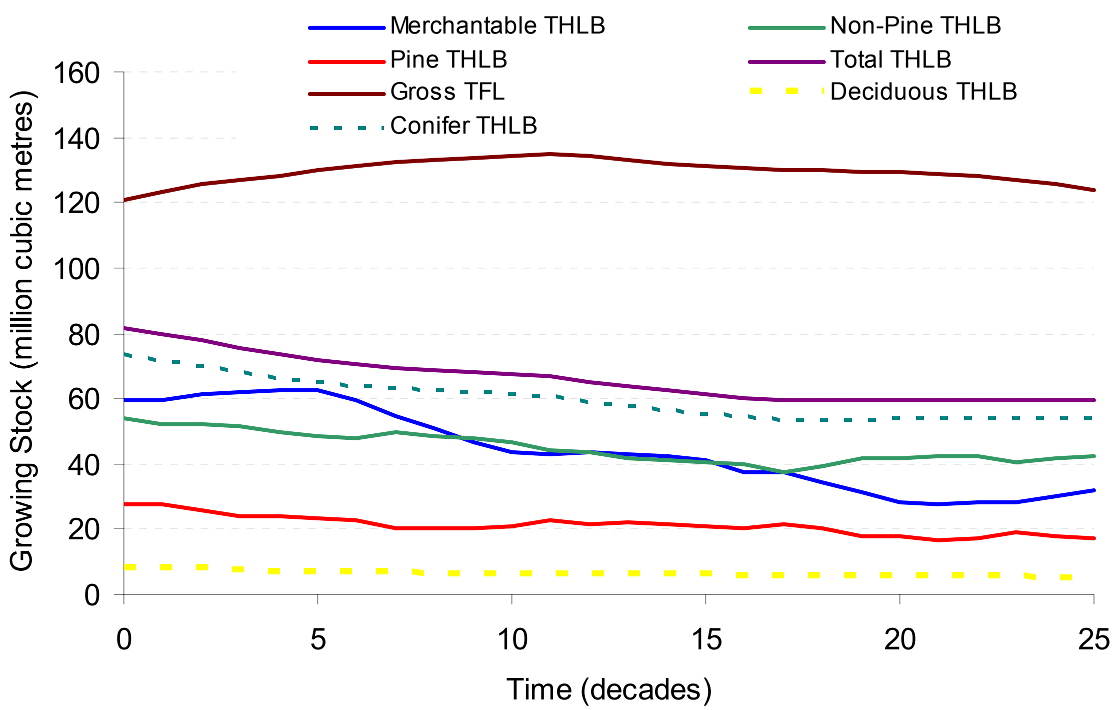


Figure 7 Changes in Growing Stock – Base Case



The growing stock representing TFL's timber harvesting land base is forecast to decline slowly from 81 million cubic metres to a steady long-term level of about 60 million cubic metres by period 17. This occurs for several reasons. One of the constraints applied to the linear programming solution to determining a sustainable harvest level is that the THLB growing stock beyond period 17 be non-declining. As we see, this constraint has been met. Period 17 was selected as the target point because the analysis completed for MP#3 identified period 18 as the point in the planning horizon when the harvest flow was most constrained[1]. By reducing the constraint one period, we account for the five-year interval since the completion of the last analysis, and ensure that the timber supply is sustainable beyond the 25-decade planning horizon. We see from the application of this constraint it has repercussions on the level of stand mortality witnessed in Figure 6, whereby the amount of volume lost due to old stands dying increases significantly after period 17.

The area between the total growing stock and the THLB growing stock is the volume existing in coniferous and deciduous forests that do not contribute to the THLB. This volume increases over the next 100 years and then remains fairly constant. This is primarily a result of stands within the NCLB aging and becoming old growth. As the old growth hits a maximum age, they are assumed to die and regenerated back to unmanaged stands.

The difference in area between the merchantable THLB growing stock and the total THLB growing stock in Figure 7 is the amount of volume in stands that are under the current minimum harvest age (i.e., immature stands). Since the majority of the TFL is presently above the minimum cutting age, the majority of the TFL might be considered to be mature or old growth forest. The harvesting activities that would result from the Base Case harvest flow will shift the distribution of area and volume into younger age classes.

There are approximately 8 million cubic metres of volume in deciduous-leading stands. Apparent from the size of the deciduous THLB and the volume of wood that deciduous stands contain, this is a relatively minor component of the tree farm.

Figure 8 shows the average volume harvested over time. The graph shows that over the next 100 years, the average volume removed from mature coniferous stands should equate to 335 cubic metres per hectare. Likewise, the deciduous land base is forecast to provide approximately 250 m^3 per hectare over the next 100 years.

[1] See Section 6.0 Page 20 TFL48 Analysis in support of MP#3

Figure 8 Average Stand Volume harvested

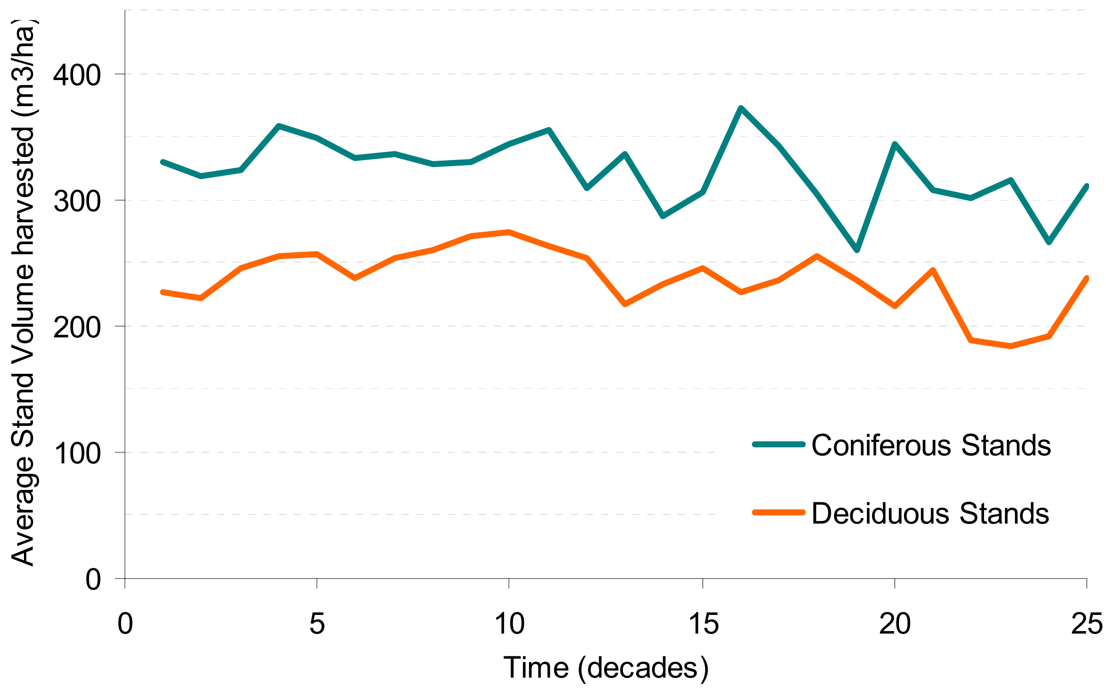
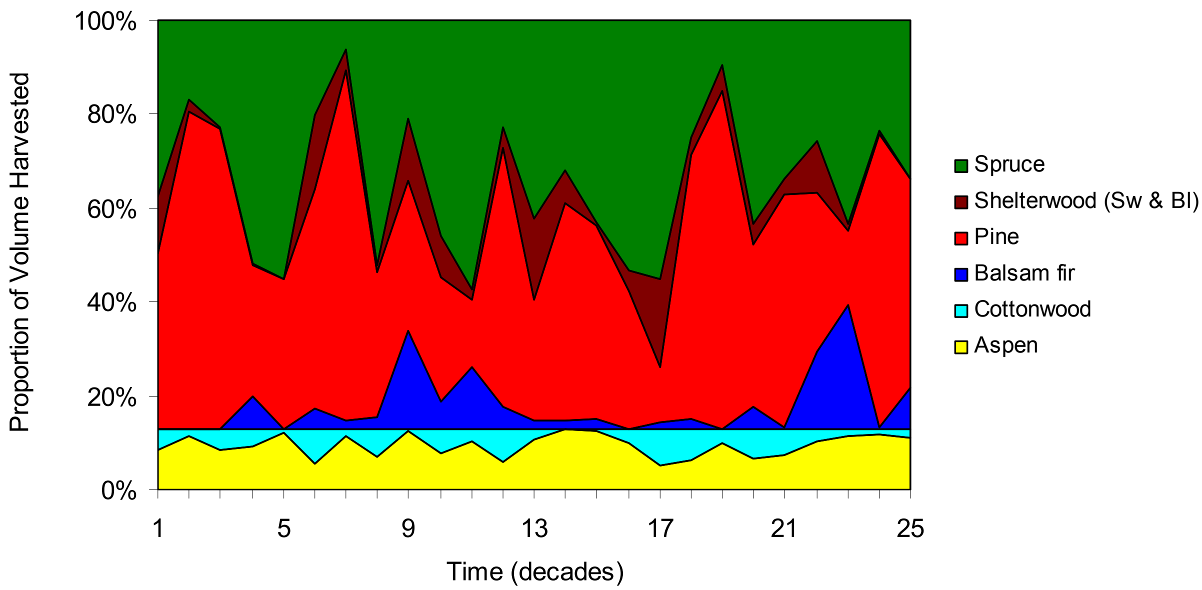


Figure 9 Leading Species Harvested over time



Over the term of the planning horizon, the volume per hectare from harvested coniferous stands remains relatively constant. Although a shift will occur from harvesting old growth conifer stands to younger plantations, the change in volume/hectare is not substantial. This is supported by the information provided in Figure 4, where we saw that the difference between unmanaged stand growth and managed stand yields are relatively small. It is important to note that although the Phase II sampling had an impact on improving the yield estimates for unmanaged stands, the site productivity (Site index) for most of these stands was still based upon VDYP estimates using stand age and height. A system that determined site productivity based upon biogeoclimatic information and site series will result in a different answer.

Figure 9 shows the change in the proportion of leading species harvested over the planning horizon. Using a linear programming optimization model, the goal is to select stands for harvesting in a manner that maximizes the harvest level, subject to many early and late seral constraints. Throughout the planning period, the proportion of harvest from leading deciduous stands remains constant at about 13 percent. The proportion of harvest from balsam-leading stands is relatively low in the initial periods of the simulation. Largely because forest cover constraints are considerably higher in mountainous areas where balsam stands predominate. In the first decade, the quantity of harvest from pine and spruce-leading stands are about equal at 37 percent each. Shelterwood stands, (e.g. balsam-fir and spruce) fill the remainder at 12 percent. In the next two decades we see a large shift in the pine harvest (i.e. to about 65%). The shift occurs for two reasons: the model recognizes that areas having a predominance of pine volume also have less stringent old-forest constraints - as a result of shorter fire-return intervals; second, the rotation age of pine stands is substantially shorter then spruce or balsam, therefore by targeting older pine stands the model is able to establish these areas on comparatively faster growing plantations.

Figure 10 shows the change in area harvested over time. Over the next 30 years, approximately 2,150 hectares of leading-coniferous stands and 440 hectares of leading-deciduous stands are required to support the Base Case harvest level on an annual basis. The amount of area harvested is relatively constraint for the first 100 years as the majority of the harvest comes from older unmanaged stands with a relatively constant average volume per hectare. After 100 years, increasing amounts of the harvest comes from managed stands of varying ages, resulting in wider fluctuations in the annual amount of area harvested. The product of the area harvested in Figure 10 and the average volume harvested in Figure 8, is the non-declining base case harvest level.

Figure 10 Area Harvested per year

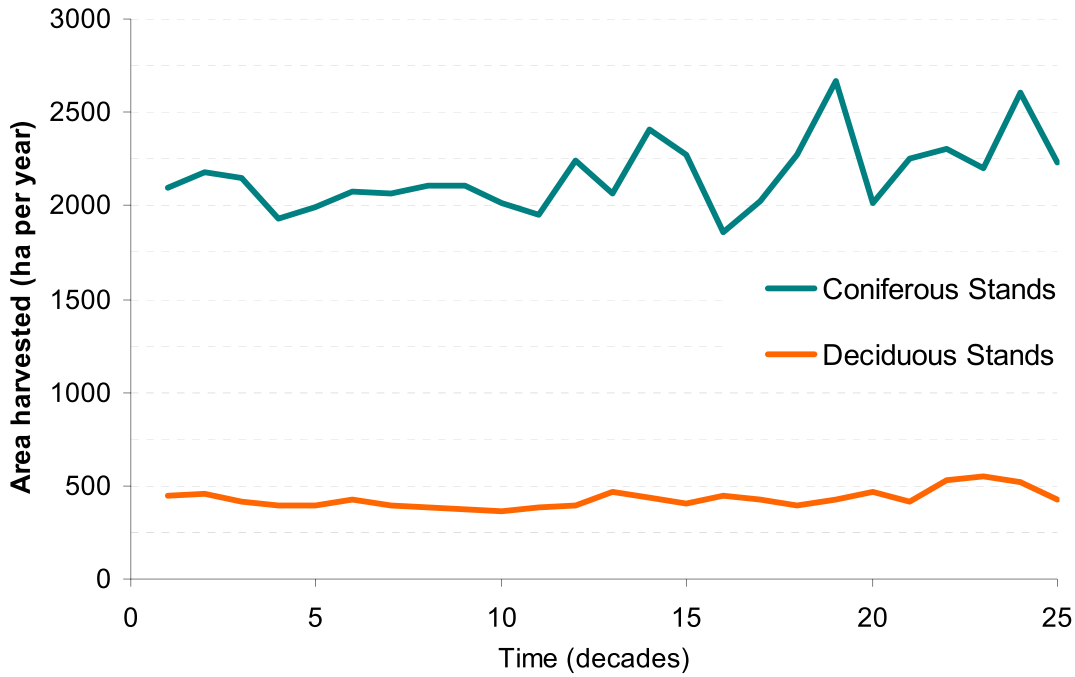


Figure 11 Shifts from Unmanaged to Managed Stand Harvesting

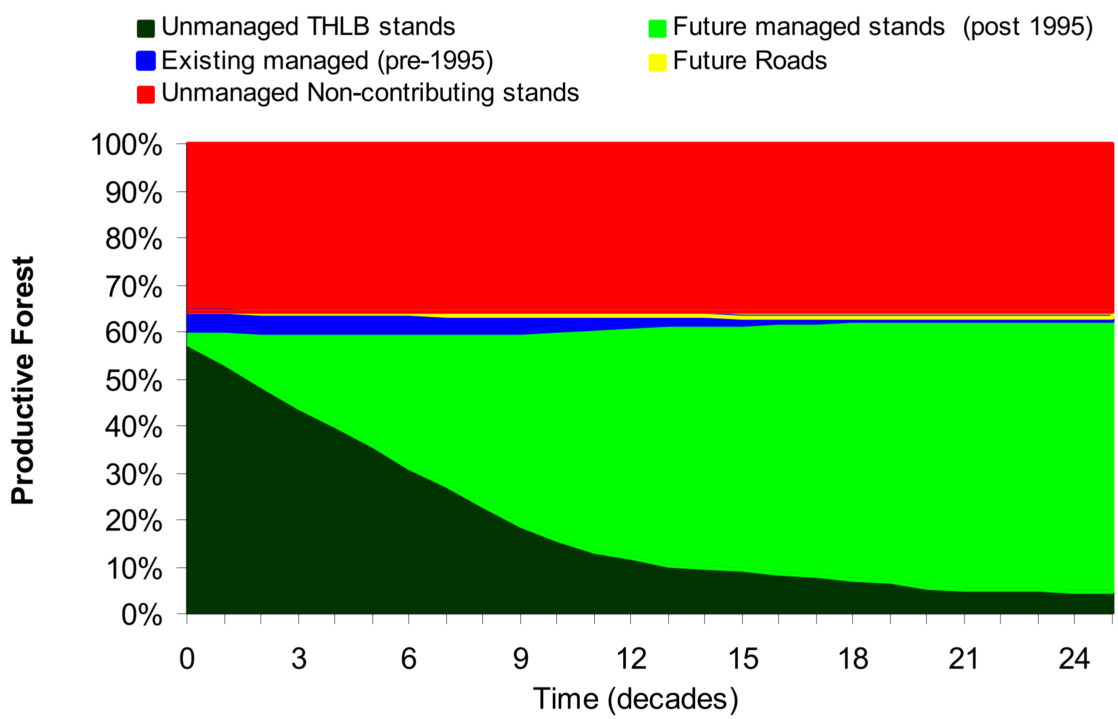


Figure 11 shows the gradual change over time in the management classification of the TFL. Throughout the planning horizon, the amount of area in the non-contributing land base (NCLB) is assumed to remain static at about 36 percent. Existing roads have been excluded from the productive forest area; however the construction of future roads will result in the gradual loss of an additional 5000 hectares over the next 100 years.

Currently, approximately 93 percent of the productive forest area is considered unmanaged, four percent of the area exists in older managed stands (i.e. having pre-1995 logging history) and slightly less than four percent in post 1995 "future" managed stands where silviculture activities have been increasingly more intensive after harvesting. Harvesting will continue to occur within the TFL. As a result the amount of managed forest area will increase. However, in 80 years, 59 percent of the productive forest land base will still remain unmanaged. In 200 years, there will still be a small portion of the TFL in unmanaged THLB stands. These are the visually sensitive areas (having retention and partial retention VQOs) that, due to forest cover constraints, are managed on a very long rotation.

Figure 12 shows the change in the average age of stands that are either harvested, or die, during next 25 decades. The average age of conifer-leading and deciduous-leading stands harvested throughout the simulation period remains relatively constant. For conifer-leading stands the ages harvested range from 80 years to 460 years, though they average throughout the simulation period between 150 and 200 years old stands. Deciduous leading stands experience a similar harvest age pattern, wherein the average age is between 100 and 150 years.

Figure 12 also shows the average age of stand mortality within the TFL. Mortality is addressed in the forest estate model in three ways. (1) Within all forest stands, mortality occurs as certain trees out-compete others, resulting in a decline in the total stems per hectare. This is offset by a rapid increase and then gradual decrease in the volume per hectare of a stand. The yield tables used in the forest estate model implicitly account for this individual tree-level mortality. (2) Stand level mortality was address through the application of a ceiling on the maximum age that a stand can achieve and still remain merchantable, or in the case of the non-contributing land base, continue to support forest cover constraints. (3) The final adjustment for stand mortality is through a volume reduction applied to the total harvest level. All of the harvest flows indicated in this report are net of this volume. A non recoverable loss of 49,700 cubic metres per year was applied to conifer-leading stands, and 6,400 cubic metres annually to deciduous leading stands. The level of mortality identified in Figure 12 is a function of the second method of mortality accounting identified above. Initially most of the mortality occurs in deciduous-leading stands, the majority of which are over-mature. Later, increasing amounts of mortality occur in coniferous stands in both the THLB and the NCLB.

Figure 12 Average Age of the Stand Harvested

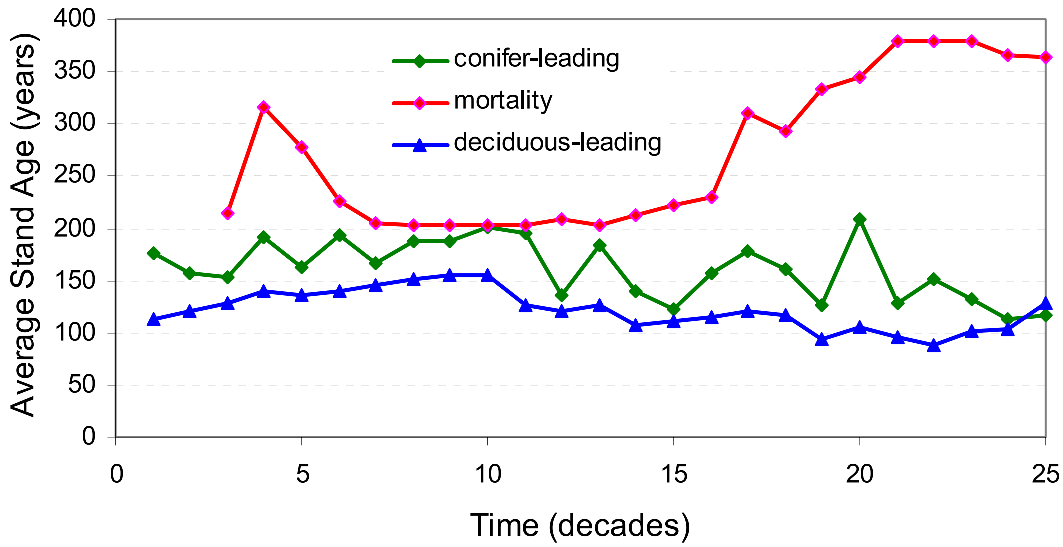


Figure 13 through to Figure 18 show the present and projected change in the age class structure of the coniferous and deciduous forest land bases, at select point in time. If 100 years is a reasonable measure of stand maturity, then 63 percent of the current productive forest land base is mature or over-mature. In 50 years, this will increase to 66%, before declining slowly over the next 200 years to about 50 percent of the productive land base.

The change in the coniferous age class distribution is typical of the shift from a largely uneven age class distribution of stands less then the minimum cutting age, to a somewhat normal distribution. This distribution however does not hold true for all stands within the timber harvesting land base. Stands that are constrained in visually sensitive areas (i.e., preservation, retention and partial retention) get progressively older, resulting in a distribution of old stands with ages well beyond 200 years.

The deciduous land base has a similar age class distribution though existing within a smaller life span. We witness deciduous stands within the THLB aging and being harvested (by the model) when they are well beyond 100 years of age. The minimum cutting age for deciduous stands was based upon their economic culmination age. However, deciduous stands (aspen in particular) that age well beyond 100 years are often of questionable economic value. Perhaps a merchantability cap of 100-120 years would have been appropriate, however, the lack of demand for deciduous stems within the TFL over the past 10 years make this a speculative assumption. Currently about 66 percent of the deciduous-leading stands within the TFL are older than 60 years.

Figure 13 Current Age Class Distribution

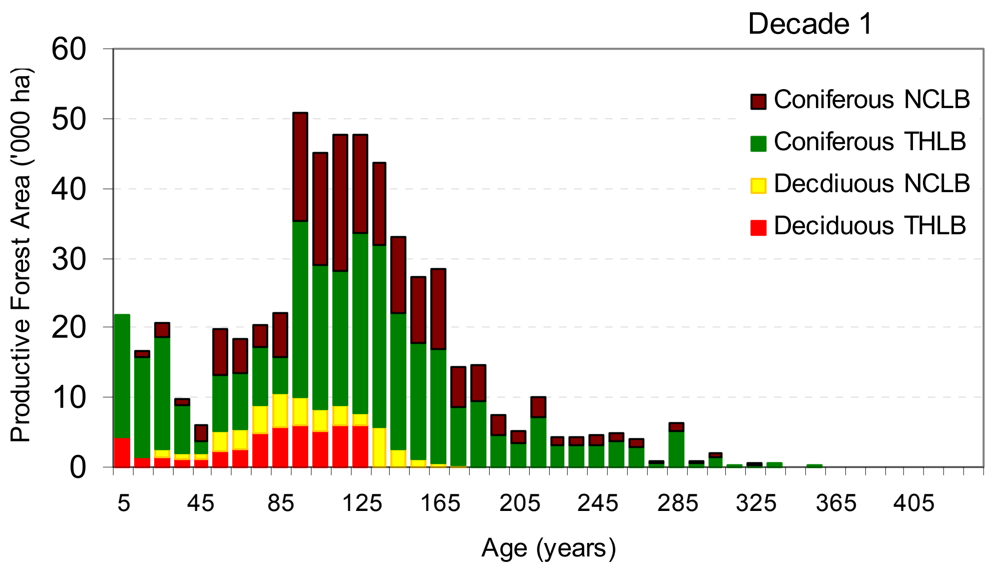


Figure 14 Decade 5 Age Class Distribution

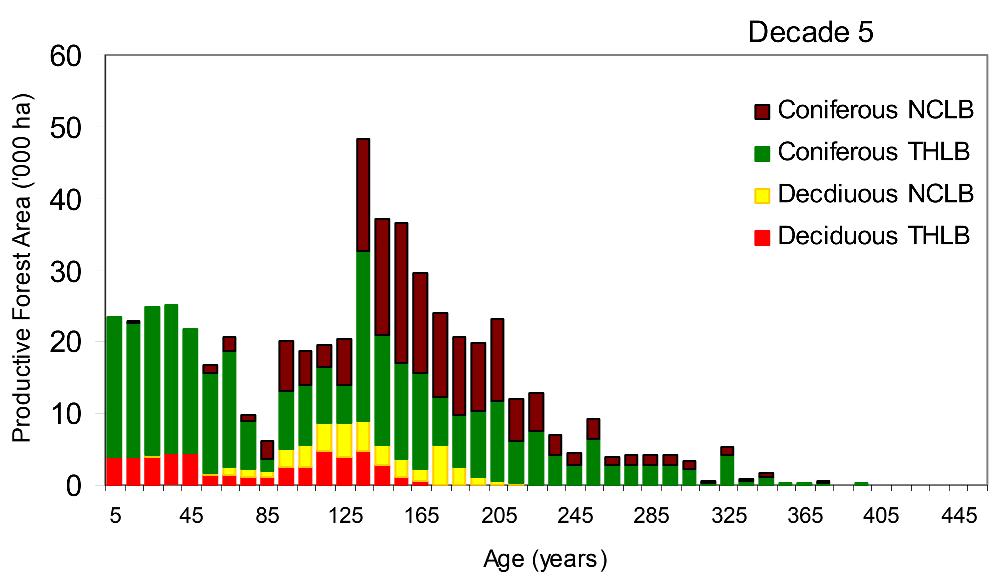


Figure 15 Decade 10 Age Class Distribution

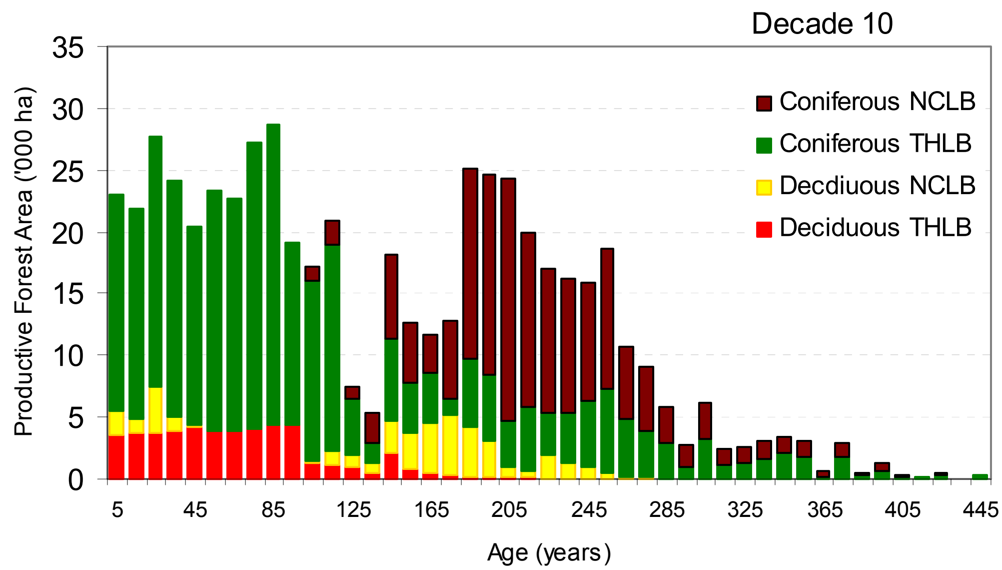


Figure 16 Decade 15 Age Class Distribution

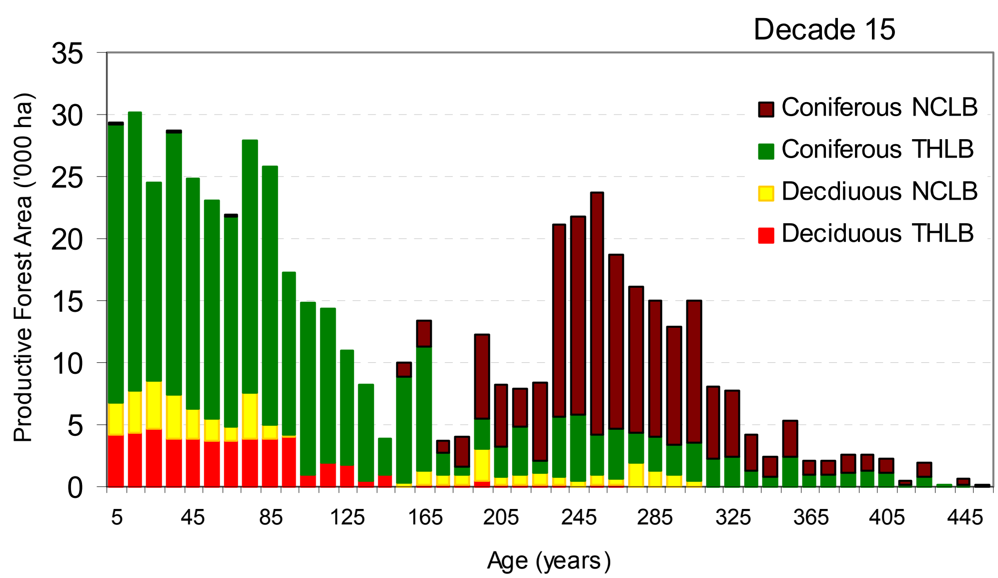


Figure 17 Decade 20 Age Class Distribution

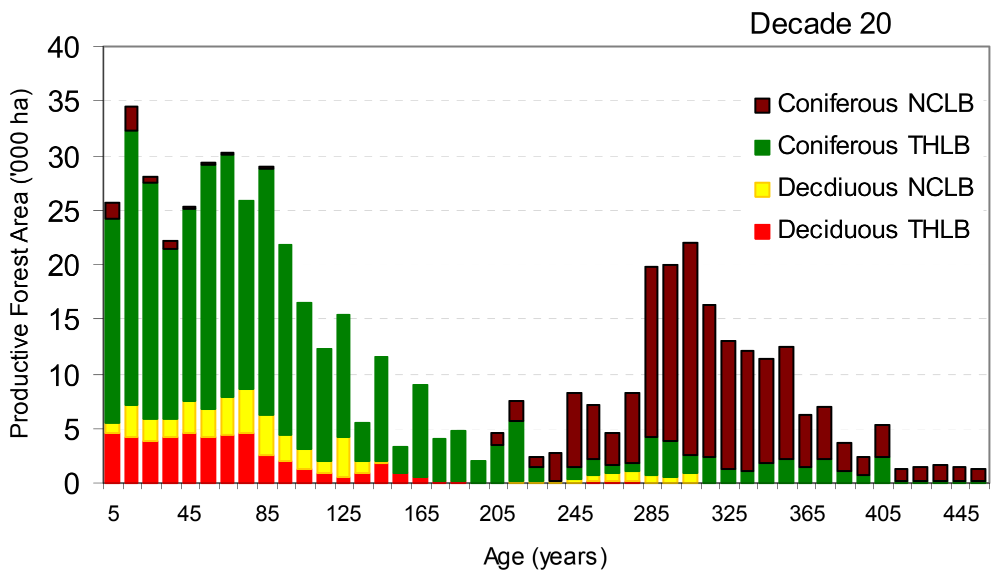
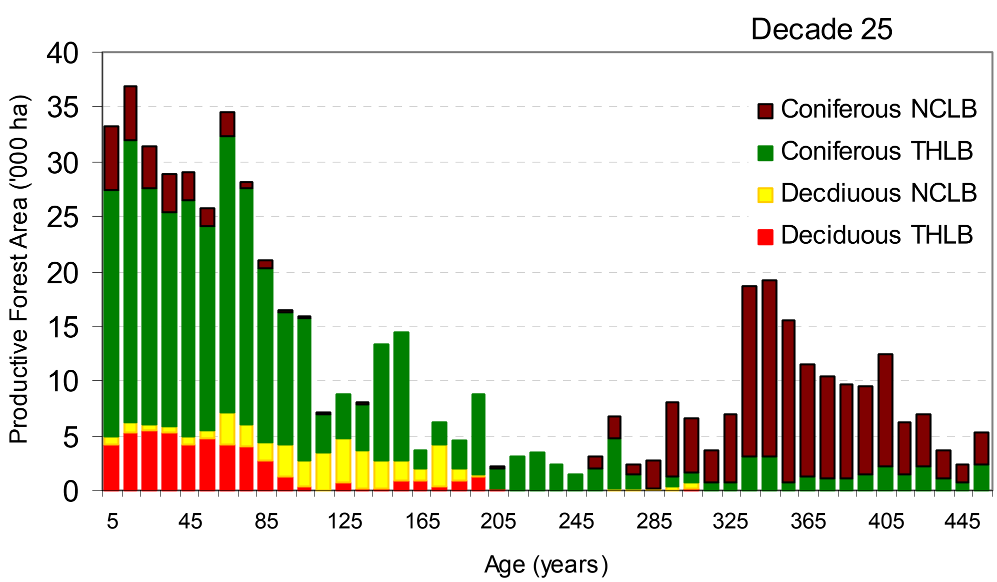


Figure 18 Decade 25 Age Class Distribution



7. Sensitivity Analysis on the Base Case

Sensitivity analysis on the Base Case harvest results were completed to assess the magnitude of impact of uncertainties in modelling assumptions (such as inventory, yield and management practices) on the harvest flow. The scenarios modeled here follow standard Ministry of Forest's protocol whereby only one Base Case assumption is addressed per scenario, to quantitatively measure the impact of the assumption on the Base Case harvest level.

7.1. Accelerated Harvest Levels

The Base Case harvest level utilized a harvest rule that forced the model to derive a non-declining harvest flow for both the coniferous and deciduous land bases. Two sensitivity analyses were conducted to measure the impact of an accelerated harvest level that maximized the harvest for 10 years, and then for 30 years. In each case the accelerated harvest would be followed by a maximum decline of ten percent per decade to a non-declining mid- and long-term harvest level.

Capitalizing on the surplus of mature and over-mature stands within the timber harvesting land base, an immediate coniferous harvest level of 969,900 m^3/year (51% above the base case) is supportable for one decade before declining to a mid-term level of 619,200 m^3/year (3.7 percent below the Base Case). A similar result can be experienced in the deciduous land base, whereby the short-term harvest level can be increased 52 percent to 143,500 m^3/year before taking three sequential 10 percent drops to a non-declining harvest flow of 92,000m^3/year - which is 2.4 percent below the deciduous Base Case.

An alternative accelerated scenario was to maximize the short term harvest flow 30 years, before dropping to a non-declining yield. The results of this scenario reveal that a coniferous AAC of 789,100m^3/year is possible (23% above the Base Case) with a subsequent drop to 629,700 m^3/year (2% below Base Case). Similarly, the deciduous AAC could be set at 116,800m^3/year and then decline to 93,000m^3/year having the same relative impact in comparison to the deciduous Base Case.

The results of these scenarios are shown in Figure 19 and Figure 20 and quantified in Table 4.

Table 4 Accelerated Harvest Flows

Scenario	Short term (m^3/year)		Mid and long term (m^3/year)		Short-term % change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous	Coniferous	Deciduous
10 year accelerated	969,900	143,500	619,200	92,000	50.9%	52.3%
30-year accelerated	789,100	116,800	629,700	93,000	22.8%	23.4%

Figure 19 Accelerated Harvest for 10-years

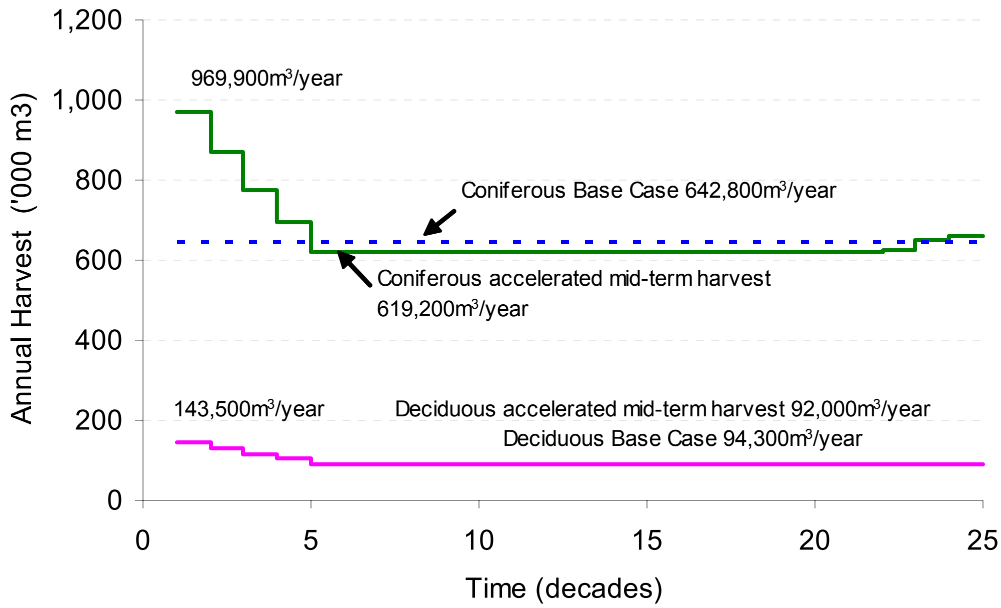
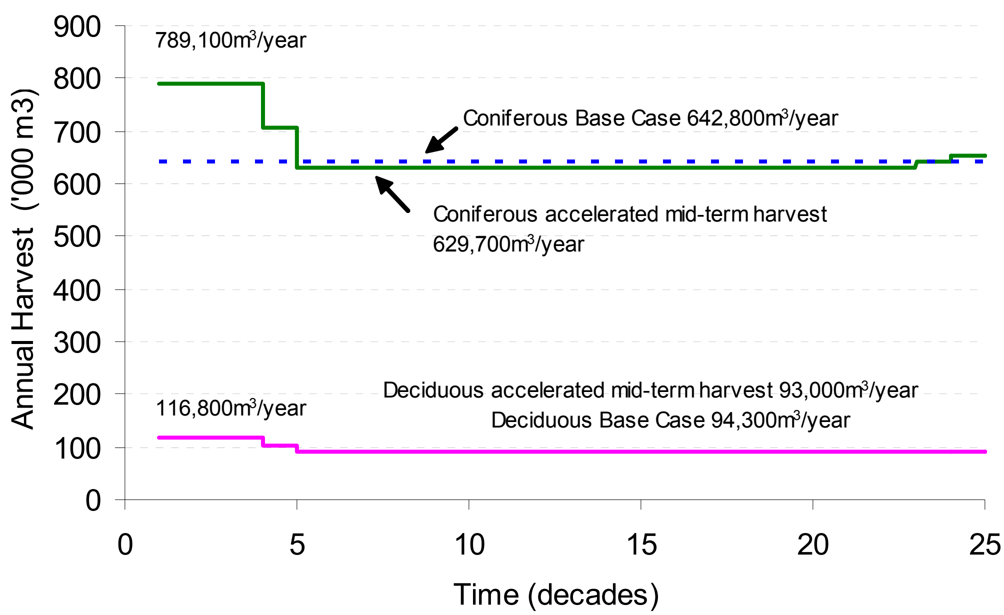


Figure 20 Accelerated Harvest for 30-years



7.2. Sensitivity of changes to the size of the TFL

Changes to the size of tree farms may come about in two ways: (1) a re-evaluation of what stands might contribute to the timber harvesting land base – which thereby keeps the gross area constant; or (2) through the addition or deletion of area to the gross TFL boundary. The first type of change is subjective and would need to be based upon management performance. The second would be either a political action or an economic investment into private land. Since we cannot speculate with any level of reasonable certainty on what the future will bring, a generic size adjustment was applied to all stands within the TFL. The adjustment involved increasing all stands by five percent for one scenario, and then decreasing the size of all stands by five percent for a second scenario. As the stand types and geographic attributes for each adjustment were kept the same as in the Base Case, forest constraint objectives were also increased or decreased by five percent as was appropriate.

Table 5 and Figure 21 show the results of these two scenarios. Increasing the size of the TFL provides only a marginal increase in the harvest flow, since much of the area added is assumed to exist in areas that are already heavily constrained due to the short-term impact of some forest cover constraints. Therefore, the benefit is only experienced for those parts of the TFL where immediate harvesting can occur.

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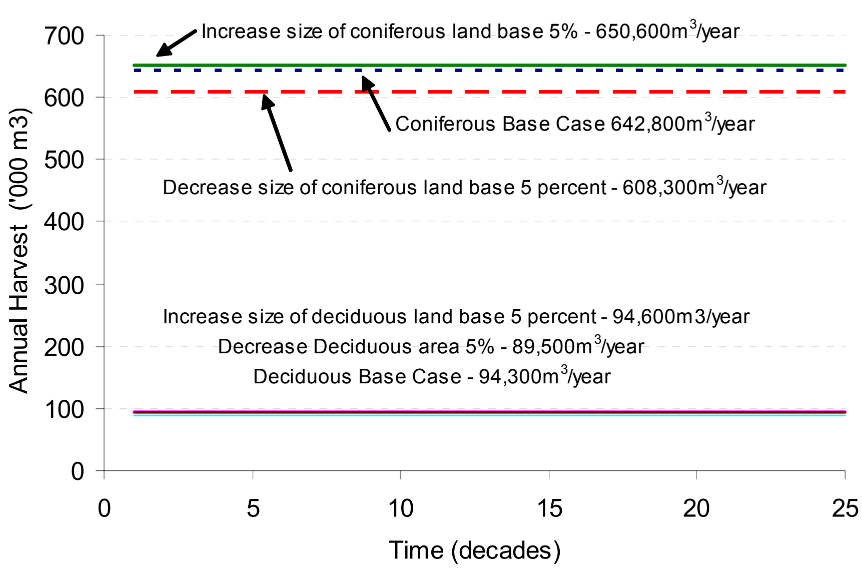
Table 5 Adjust TFL Size

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
Increase TFL Area 5%	650,600	94,900	1.2%	0.7%
Decrease TFL area 5%	608,300	89,500	-5.4%	-5.0%

Figure 21 Adjust TFL Size



7.3. Sensitivity of changes to empirical and managed stand yield tables

The Base Case harvest flow utilizes four sets of yield tables by analysis unit. These are:

1. unmanaged stand yield tables,
2. managed stand tables for areas harvested pre-1995
3. managed stands harvested post-1995
4. managed stands harvested post-1995 with genetically improved spruce

The volume estimates associated with empirical (unmanaged) stands have increased substantially over the term of Management Plan #3 as a result of the completion of Phase II sampling for TFL48. A set of scenarios assesses the relative impact of additional ten percent increases, and decreases of empirical and managed stand yield tables, as compared to the Base Case harvest flow.

The results of these scenarios are shown in Table 6, Figure 22 and Figure 23. The results from these four scenarios reveal that the Base Case harvest flow is more sensitivity to adjustments in managed stand yield estimates then to empirical yield estimates.

Table 6 Changes to stand yield tables

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
Increase empirical stand yields 10%	660,400	97,200	2.7%	3.2%
Decrease empirical stand yields 10%	616,700	91,500	-4.1%	-2.9%
Increase managed stand yields 10%	686,700	101,700	6.8%	8.0%
Decrease managed stand yields 10%	590,900	87,100	-8.1%	-7.5%

Figure 22 Adjust empirical yield tables

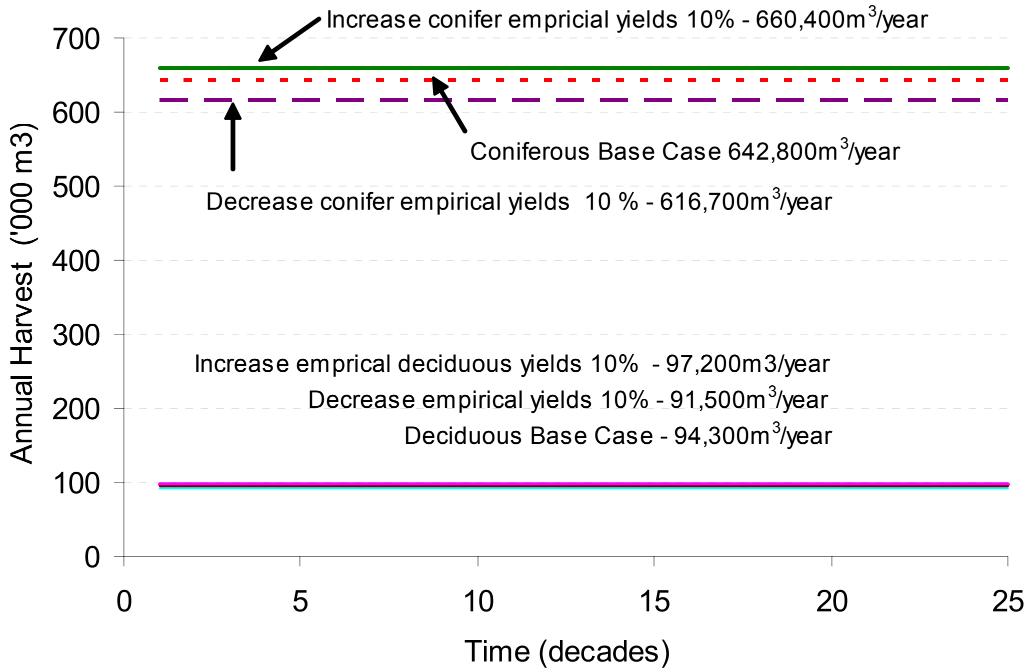
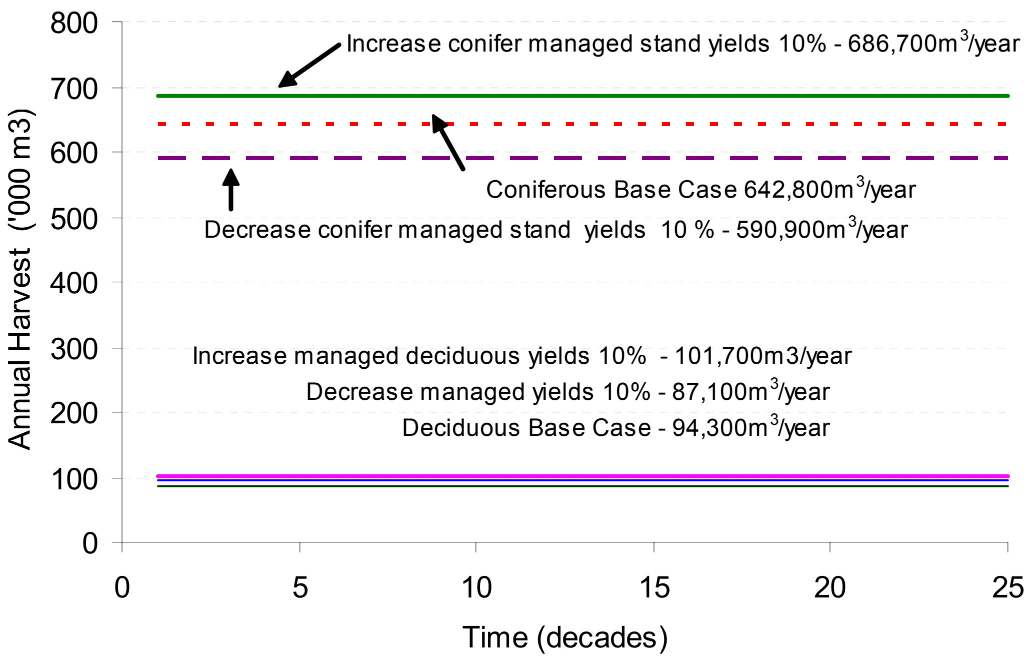


Figure 23 Adjust managed stand yield tables



7.4. Sensitivity of the minimum cutting age

The minimum cutting age applied to this base case analysis utilized the economic rotation period of each analysis unit. In other words, the culmination age of each analysis unit was calculated by identifying the point in the life of a stand when the change in mean annual increment was the highest. Two sensitivity scenarios were run to determine how sensitive the Base Case harvest flow was to changes in the minimum cutting age. The results of this sensitivity analysis are shown in Table 7 and Figure 24. The results indicated by these two scenarios shows that the Base Case is not very sensitive to changes in the minimum cutting age of stands.

Table 7 Change in the minimum cutting age

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
Decrease minimum cutting age 10 years	655,100	95,300	1.9%	1.1%
Increase minimum cutting age 10 years	626,800	92,500	-2.5%	-1.8%

Figure 24 Changes in the minimum cutting age

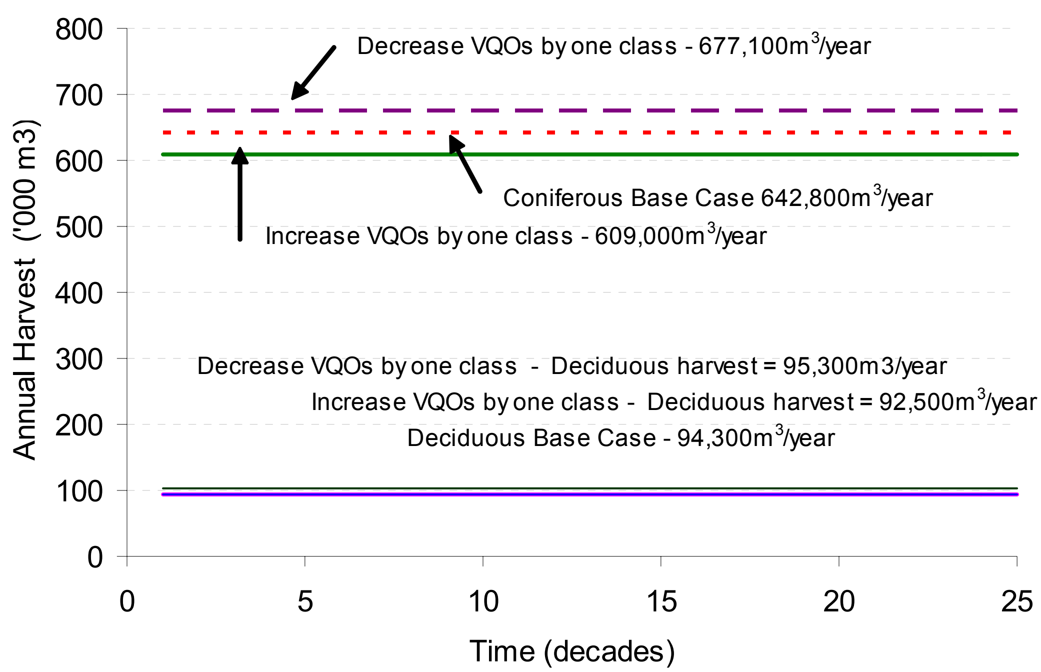
7.5. Sensitivity of changes to visual quality objectives

The scenic areas modeled in the Base Case scenario utilize the visual line work that is presently established for TFL 48. This line work utilizes the consolidated visual inventories for the Dawson Creek TSA and TFL 48. Each visually sensitive polygon is assigned a visual quality objective. The objectives place a constraint upon each area such that no more than a pre-determined amount of forest land may be less than a 5 metre greenup height. For example, an area having retention VQO may have no more than 1.6 percent of the area less than 5 metres. To assess the sensitivity of the Base Case harvest flow to the visual quality objectives, each scenic area had their VQO adjusted up, and then down one class. A move up meant that retention VQO areas were now considered partial retention, and the constraint was reduced from no more than 1.6 percent area less then 5 metres to no more than 9.9 percent less than 5 metres. A similar adjustment was made to preservation, partial retention and modification VQOs. The impacts of these changes are shown in Table 8 and Figure 25. The results reveal that the established VQOs within TFL 48 place a significant constraint on the coniferous harvest level. The deciduous harvest is sensitive to a relaxing of the VQOs, however increasing the constraints has relatively no impact.

Table 8 Sensitivity of established VQOs

	Harvest (m^3/year)		% change from Base Case	
Scenario	**Coniferous**	**Deciduous**	**Coniferous**	**Deciduous**
Increase VQO one class	609,000	93,800	-5.3%	-0.4%
Decrease VQOs one class	677,100	102,000	5.3%	8.3%

Figure 25 Sensitivity of established VQOs



7.6. Sensitivity of changes to the green-up delay

Greenup delay in an a-spatial model is used to ensure that the distribution of harvesting across the TFL does not become overly concentrated within one area. Greenup delay is applied to the timber harvesting land base portion of each landscape unit. Furthermore it is applied to ensure hydrologic recovery occurs within each watershed. Table 9 shows that neither increasing nor decreasing the greenup delay had an impact on the Base Case harvest flow.

Table 9 Sensitivity of greenup delay

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
Increase greenup delay 10 years	642,800	94,500	-0.01%	0.29%
Decrease greenup delay 10 years	642,900	94,200	0.02%	0.29%

7.7. Sensitivity of old seral forest cover constraints

The Old-Growth Order for BC is identified in the landscape unit planning guidebook and describes the proportion of old growth timber that should be reserved within each landscape unit and biogeoclimatic zone. The old growth order was not used in the Base Case harvest flow, rather the old seral constraints as identified by the Prince George Regional ecologist were used and applied to areas identified as natural disturbance units (NDU). While the NDUs are geographically larger than landscape units, the old seral constraints are generally more stringent. Rather than eight NDU constraints applied to large areas of the TFL, the old growth order applies 40 old seral constraints to the TFL. The results of the application of old-growth order constraints on the TFL, as well as the removal of all old-growth and NDU constraints are shown in Table 10 and Figure 26.

The results shown here reveal that the old-growth order constraints allows us to increase the non-declining coniferous harvest level for the TFL by 10 percent, but it has almost no impact on the deciduous harvest flow. Furthermore, removal of all old-growth constraints results in only a slightly better harvest flow than the application of the old-growth order itself. In both scenarios, there is very little impact on the deciduous harvest flow.

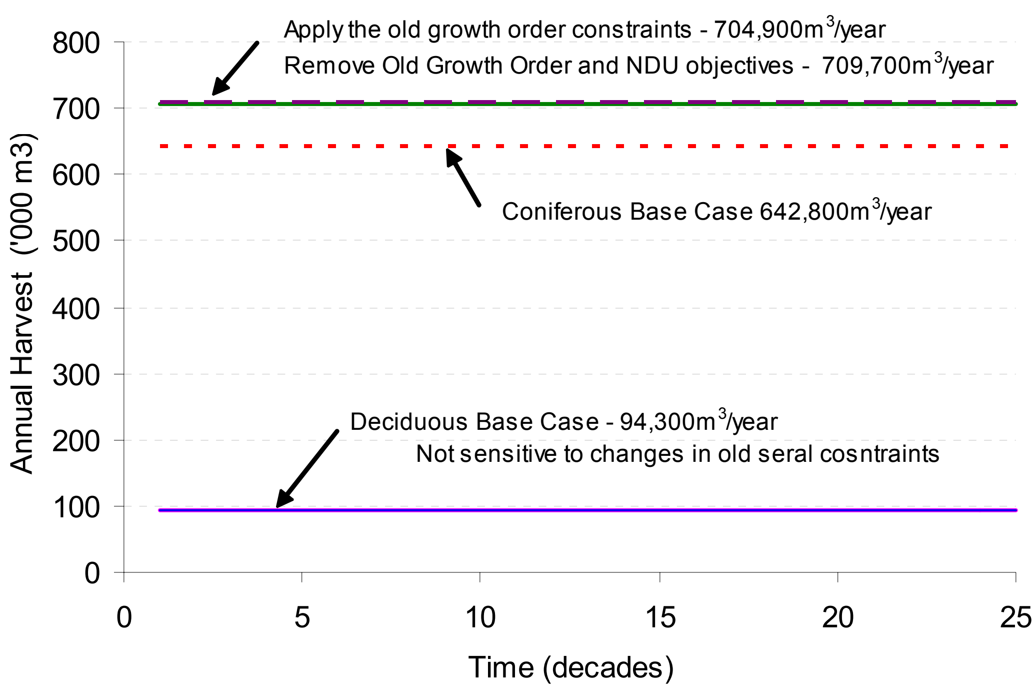
The reason for these results is due to the contribution of the non-contributing land base to old-growth. In the deciduous land base, old growth targets for the Base Case and for the Old Growth Order scenario are sufficiently low that the objectives are met within the existing age class distribution. Where they are not met immediately, they will be achieved in the next 1-3 decades as deciduous stands continue to age. A similar occurrence exists for the coniferous land base. Though considerably more focused geographically by landscape unit and biogeoclimatic zone, Old Growth Order constraints are largely met by the NCLB in the next three to 10 decades. On the other hand, constraints applied by NDU in the Omineca Mountain and Wet Mountain NDUs are never met through the NCLB alone.

Table 10 and Figure 26 also quantify the impact of removing all early seral and old growth constraints. While harvest flow constraints are still imposed through the application of minimum harvest ages, non-declining harvest levels and a future non-declining growing stock, this scenario places some parameters around the impact of these seral age constraints. This scenario reveals that the net coniferous harvest could be increased to 741,300m^3/year (a 15 percent increase), indicating that the conifer land base is quite sensitive to early and later seral constraints. The deciduous harvest level also increases to 102, 400m^3/year (an 8% increase). Proportionally less due to the shorter rotation ages, reduced green up periods and lower old-growth constraints.

Table 10 Old growth order constraints

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
Old Growth Order (LU/BEC targets)	704,900	94,000	9.7%	-0.2%
No Old Growth constraints	709,700	94,100	10.4%	-0.1%
Remove all constraints (Visual and old growth)	741,300	102,400	15.3%	8.7%

Figure 26 Sensitivity of old growth order constraints



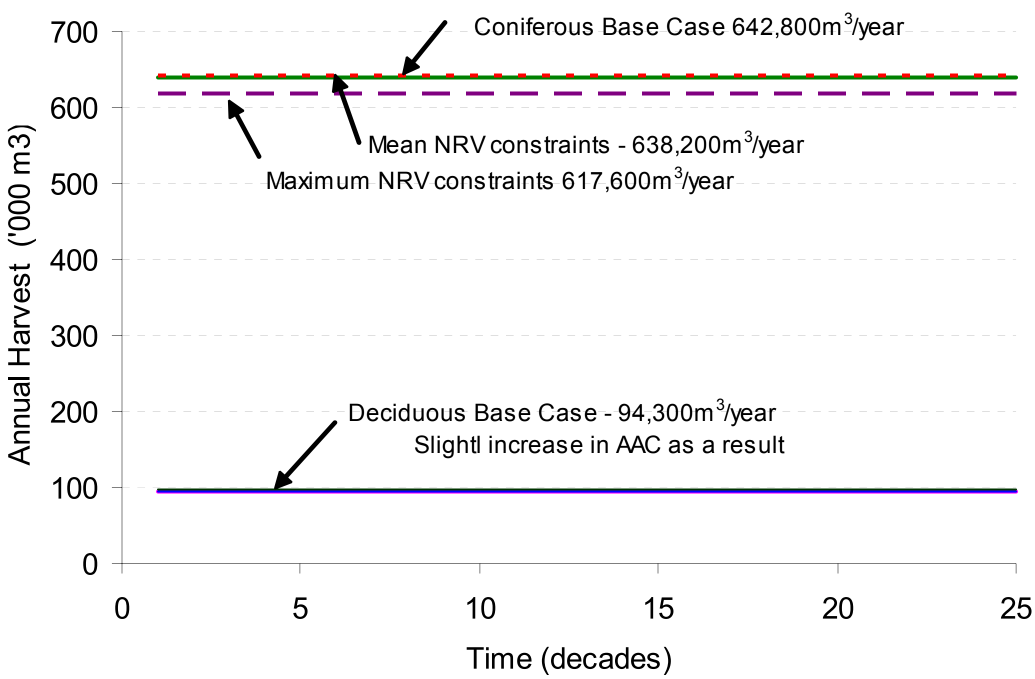
7.8. Sensitivity of varying the NDU constraints

The range of natural variation (NRV) applied to each natural disturbance unit in the Base Case is the minimum NRV identified by the Prince George MOF regional ecologist. Two scenarios were identified that tested the impact of applying the mean and the maximum NRV constraint on the Base Case harvest flow. The results of these two scenarios are shown in Table 11 and Figure 27. Although 19 percent more area is required as old growth in the application of mean NRV constraints, the majority of this area is eventually met through the non-contributing land base. However, application of maximum NRV constraints poses a heavier burden on the availability of fibre in the THLB. The constraint reduces the coniferous and deciduous harvest flows by approximately 4 percent, relative to the Base Case.

Table 11 Sensitivity of the Natural Range of Variation

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
Mean NRV	638,200	95,000	-0.7%	0.9%
Maximum NRV	617,600	98,300	-3.9%	4.3%

Figure 27 Sensitivity of the Natural Range of Variation



8. Analysis of Alternative Management Assumptions

The scenarios identified in Section 7 of this report look at the relative impact of various modelling assumptions on the Base Case harvest flow. This section is not so different, but for the fact that the changes imposed on the base case assumptions are applied to examine the impact of alternative management strategies on the sustainable harvest level for the TFL. There are three principle strategies we examine in this section.

1. The impact of including recommended VQOs on the harvest flow
2. The impact of woodlots and mine sites on the harvest flow
3. The impact of SIBEC
4. The impact of spatial harvest flow constraints
5. The impact of the mountain pine beetle on the harvest flow

Details on the assumptions used for the first two categories are discussed in the Information Package that is appended to this report. Information regarding the mountain pine beetle is highly subjective and discussed both in the information package and herein.

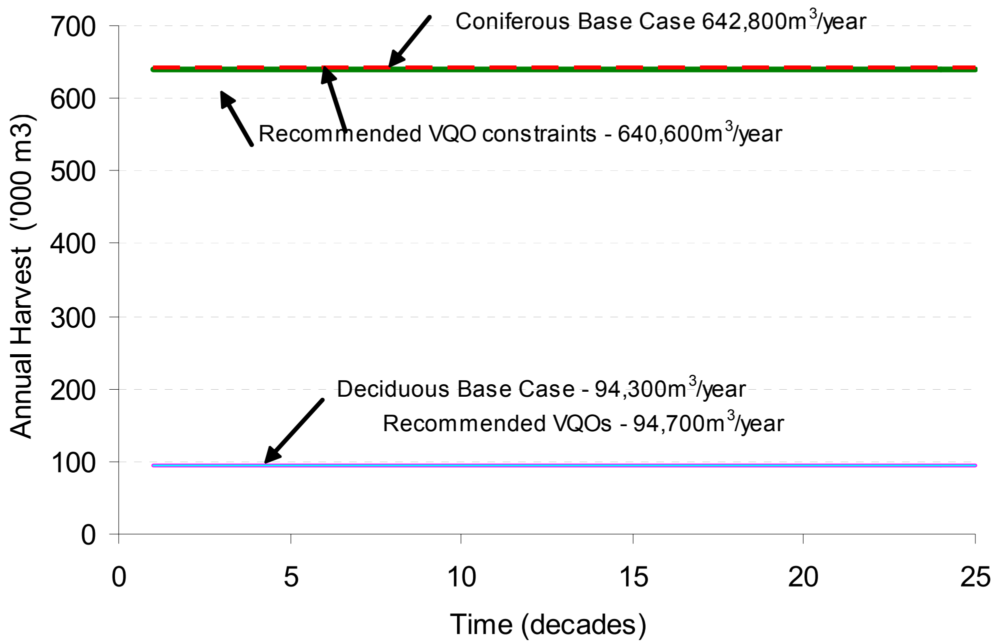
8.1. Impact of Recommended VQOs

The Base Case analysis applied constraints to the known established visually sensitive areas within the TFL. This scenario examined the impact of including recommended VQO areas into the known visual landscape inventory. Both the established and recommended VQO areas are shown in Map 7. The impact of adding recommended VQOs to the analysis is shown by Table 12 Figure 28.

Table 12 Impact of Recommended VQOs

	Harvest (m^3/year)		% change from Base Case	
Scenario	**Coniferous**	**Deciduous**	**Coniferous**	**Deciduous**
Recommended VQOs	640,600	94,700	-0.3%	0.5%

Figure 28 Impact of Recommended VQOs



Adding recommended VQOs does not have a substantial impact on the harvest flow for the TFL. A review of Table 52 in the information package provides a clue as to why. Recommended VQOs increases the area predominately in retention and partial retention VQOs in the Gething, Carbon and Dunlevy landscape units. The productive forest area within recommended partial retention VQOs exceeds 15,000 hectares. However, the THLB within these areas is only 1800 hectares. All of the partial retention constraints in Dunlevy and Gething landscape units is achieved through the occurrence of stands in the NCLB. The Carbon landscape unit is only slightly worst off then when adjacency is modelled on the THLB, versus the application of early seral constraints on the productive forest areas (THLB + NCLB).

The harvest flow for the deciduous land base shows a very slight (almost negligible) increase as a result of the application of the recommended VQO constraints. This occurs as a result of higher restrictions on the coniferous land base enabling greater availability for the deciduous land base.

8.2. Impact of woodlots and mine-sites

Existing woodlots have been removed from the productive forest land base for the TFL. Both existing and proposed mines sites have also been removed from the productive forest land base. The removal of proposed mines sites in the net down logic was inadvertent. However, as the productive forest area affected by these proposed mines sites is only 0.08 percent of the TFL's total forest area (i.e. 479 ha), the effort to redo the net-down and all of the corresponding tables in the information package was forgone.

Three scenarios were investigated to quantify the inclusion of area back into the TFL.

1) An analysis was rerun that included 479 forested hectares of proposed mine sites into the THLB.
2) A second analysis included 1,042 hectares representing woodlots that were removed during the term of Management Plan 3, but the AAC apportionment table accompanying the MP approval letter dated Sept 20, 2001 did not reflect the removal. These 1,042 hectares are assumed to increase the THLB by 1040 hectares.
3) A third scenario added-back woodlots removed from the previous scenario 2 as well as new woodlots or top ups to existing woodlots removed during the term of MP3. The scenario involved 1,839 ha of which 1,816 are assumed would have contributed to the THLB.

The results of these three scenarios, in relation to the Base Case, are shown in Table 13. In relation to the Base Case harvest flow, and in consideration of the uncertainty associated with various other modelling assumptions, the relative impact of these scenarios on the Base Case harvest level is negligible.

Table 13 Impact of proposed mine sites and woodlots

	Harvest (m^3/year)		% change from Base Case		change in THLB area (ha)	change in conifer yield (m3/yr)
Scenario	**Coniferous**	**Deciduous**	**Coniferous**	**Deciduous**		
Proposed Mine sites	643,705	94,265	0.14%	0.07%	+ 479	+ 970
Woodlot Scenario 1	645,500	94,500	0.42%	0.32%	+ 1,040	+ 2,700
Woodlot Scenario 2	647,100	94,650	0.67%	0.48%	+ 1,816	+ 4,300

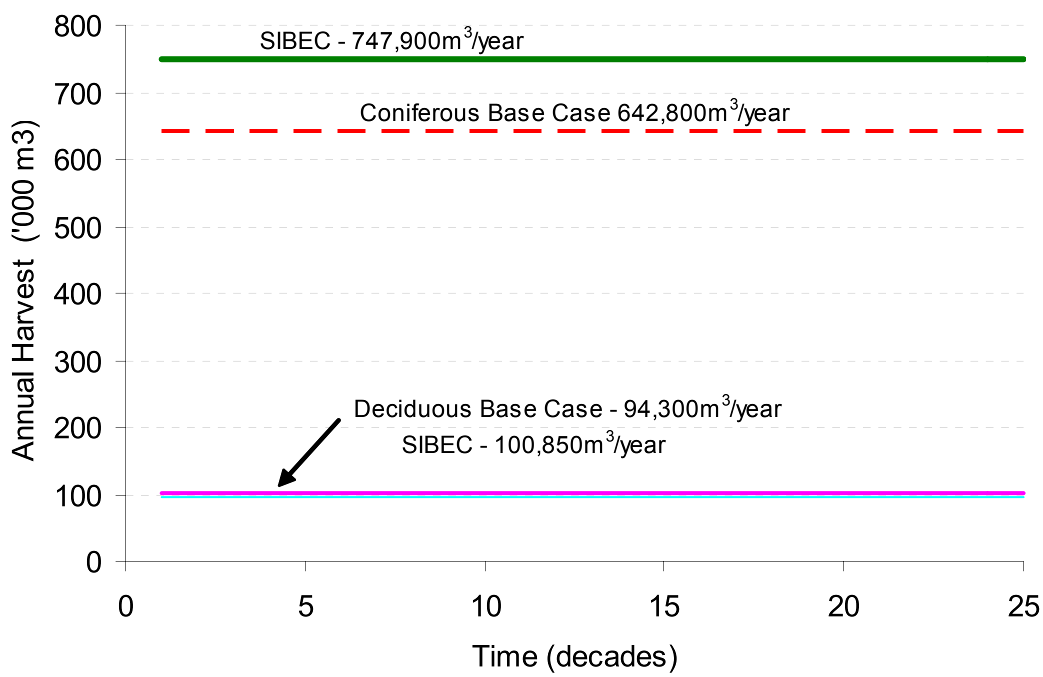
8.3. Impact of site index adjustments by biogeoclimatic zone (SIBEC)

A sensitivity analysis was completed that investigated the impact of site index adjustments to future managed stands. This was accomplished by using site series, tree species and biogeoclimatic zone to estimate site index through the MOF publication Site Index Estimates by Site Series for Coniferous Tree Species in BC – May 2006. The information package appended to this report identifies the weighted average site index by analysis unit as a result of this guidebook. The results of this analysis revealed that both the coniferous and deciduous non-declining harvest levels could be increased to 747,900 m^3/year and 100,850m^3/year respectively. This is a 16 percent increase for coniferous stands and a seven percent increase for deciduous stands (See Figure 29 and Table 14).

Table 14 Impact of SIBEC

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
SIBEC	747,900	100,850	16.35%	7.06%

Figure 29 Impacts of SIBEC



8.4. Impact of the Mountain pine beetle

The mountain pine beetle (MPB) is a growing forest heath concern in TFL48. In the last two years, a significant infestation has migrated from the west, spilling over into both the Dawson Creek TSA and TFL 48. Several scenarios were developed to estimate the impact of alternative levels of pine mortality as a result of the MPB.

In the past few years, there have been many timber supply analyses completed across BC, to estimate the impact of the MPB on short and mid-term timber supplies. Though all of them provide some insight into the short and mid-term timber supply situation, they are each plagued with the same critical uncertainties that are very important to produce an accurate mid-term timber supply picture. These uncertainties are:

- The shelf-life of dead pine with respect to nominal lumber production.
- The rate, intensity and future spread of the MPB.
- The impact of pine mortality on the existing and future stand volumes with consideration to existing ingress and future regeneration.
- New uses for dead pine timber.
- The level of immature pine mortality.
- Future social and political conservation requirements when faced with both large areas denuded of trees and residual non-recoverable losses.

The assumptions regarding the forgoing bullets are either unknown or strongly suspect, hence how an analyst deals with these uncertainties when constructing a forest estate modelling exercise will have a significant impact on the mid-term timber supply result. To address some of this uncertainty, many scenarios were run, each offering a slightly different view of the short term timber supply picture.

To model the MPB epidemic two models were used. The first is an a-spatial beetle epidemic and control model developed by IFS[2] in 1986 for the Chilcotin epidemic, and used sporadically over the past five years to address MPB infestations in other areas of the interior. Run using annual periods, the inputs to the model include:

- At risk area
- Pine volume by diameter class (17.5cm+ and 12.5cm+)
- Estimation of maximum mortality
- Proportion of pine stocking
- AAC directed to clear cutting, selective cutting, single tree pile and burn
- Shelf life
- Maximum dead volume that the mill can accept

There are many outputs from this model; however the one most pertinent to this exercise is the determination of non-recoverable pine losses as a result of varying the levels of harvest and the assumed maximum mortality. The NRLs determined using the IFS Beetle model were identified for leading pine stands or leading spruce stands having a

[2] The model is an adaptation OF THE Reed-Frost model: See Cole, Walter E., Gene D Amman and C.E. Jensen 1985 Mountain Pine beetle dynamics in lodgepole pine forests. Part II Modelling of mountain pine beetle populations. USDA For. Serv. Gen Tech. Report INT-188

significant pine component. Pine stands that were killed ('harvested') by the MPB were assumed to regenerate to an unmanaged stand. Pine mortality in leading spruce stands resulted in the pine component being removed from the spruce yield tables. All scenarios had forest cover constraints applied throughout the simulation time period. When the total pine NRLs were determined, this was applied to the Remsoft model and modeled using 10-year periods.

Table 15 shows the inputs and the non-recoverable loss results for a select number of scenarios using the IFS beetle model. The NRL results from this table were then entered into the forest estate model and produced the harvest flows indicated in Table 16, Figure 30 and Figure 31. The harvest rules applied to the long-term forest estate model for beetle scenarios 1-3 were:

1) A non-declining conifer harvest,
2) An even flow deciduous harvest,
3) 385,200 m^3/year directed to pine harvesting (representing 60% of the base case harvest level)
4) Traditional volume NRLs in decade 1 were reduced from 49,700 to 5000m^3/year

The harvest rules applied to beetle scenarios 4-7 were:

1) Total conifer harvest in the first decade = 884,300m^3/year, of which 615,510 was directed to pine; These values were arbitrarily chosen as a level of volume that Canfor might be able to process using existing manufacturing capacity in Chetwynd.
2) An even-flow conifer harvest from periods 2 to 5;
3) A non-declining conifer harvest from periods 5-25;
4) Even-flow deciduous harvest.
5) Traditional volume NRLs in decade 1 were reduced from 49,700 to 5,000m^3/year

Table 15 Annual Beetle model inputs and resultant NRLs

Beetle Scenario	Pine at Risk (m^3)	Maximum Mortality (%)	Shelf-life (years)	Total Conifer Harvest level (m^3/year)	Harvest Directed at pine (m^3/year)	Single-tree Pile and burn (m^3/year & duration in years)	Total Resultant NRLs (m^3)
Beetle 1	26,800,000	40	5	642,800	385,200	9,000 & 4	732,000
Beetle 2	26,800,000	50	5	642,800	385,200	9,000 & 4	2,640,000
Beetle 3	26,800,000	80	5	642,800	385,200	9,000 & 4	9,364,000
Beetle 4	26,800,000	40	5	879,300	615,510	9,000 & 4	151,129
Beetle 5	26,800,000	50	5	879,300	615,510	9,000 & 4	1,514,000
Beetle 6	26,800,000	70	5	879,300	615,510	9,000 & 4	5,892,000
Beetle 7	26,800,000	80	5	879,300	615,510	9,000 & 4	8,159,000

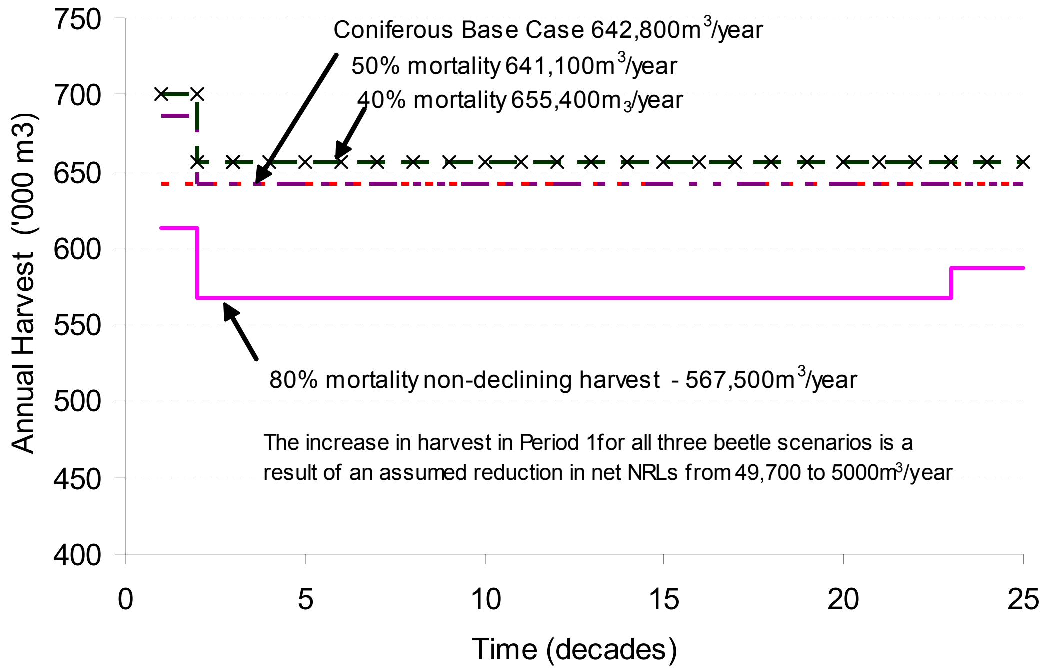
Note: pine at risk constitutes 23.1 million m^3 of pine in pine-leading stands and 3.7 million m^3 of pine in spruce-leading stands.

Table 16 Mid and long-term impacts of MBP Mortality

Scenario	Maximum mortality (%)	Short- term Harvest (decade 1) (net m^3/year)	Short-term % change from Base Case	Mid-term (decades 2-5) (net m^3/year)	Mid-term % change from Base Case	Long-term (decade 10) (net m^3/year)	Long-term % change from Base Case
Base Case	0	642,800	0.0%	642,000	0.0%	642,000	0.0%
Beetle 1	40	612,250	-4.6%	567,551	-11.6%	567,551	-11.6%
Beetle 2	50	685,814	6.8%	641,114	-0.1%	641,114	-0.1%
Beetle 3	80	700,109	9.1%	655,409	2.1%	655,409	2.1%
Beetle 4	40	879,300	37.0%	571,474	-11.0%	571,474	-11.0%
Beetle 5	50	879,300	37.0%	645,374	0.5%	645,374	0.5%
Beetle 6	70	879,300	37.0%	653,061	1.7%	653,061	1.7%
Beetle 7	80	879,300	37.0%	601,661	-6.3%	601,661	-6.3%

Note: the net harvest level in the short term has been reduced by 5000 m^3/year instead of 49,700m^3/year to reflect the fact the most NRLs are being accounted for in the simulation. Thereafter, NRLs are applied at 49700m^3/year for coniferous stand.

Figure 30 Non-declining harvest flows in response to beetle scenarios



There are countless combinations of alternative modelling assumptions that could be included in this analysis. For example, just changing the shelf-life incrementally in Beetle Scenario 7 (i.e., wherein maximum pine mortality was assumed to be 80 percent and Canfor conducts a pine harvest of 624,510 m^3/year) resulted in a change in the NRLs as indicated by Figure 32 – from a high of 10 million m^3 to a low of 6.7 million m^3. We cannot predict what will happen with any degree of confidence, and only the next few years will determine what the most appropriate assumptions should have been. That said, the beetle scenarios examined provide insight to one very interesting point. Pine mortality of up to 50 percent will act like much like an accelerated harvest. The model responds by harvesting a disproportion amount of pine in the short-term, causing the mid-term harvest level is slightly higher then the Base Case scenario. This is possible because the Base Case was derived using a preconceived harvest rule that demands that the coniferous and deciduous harvests be non-declining. In light of the amount of mature and old-growth forests within the TFL, this rule is not the most economically or productively advantageous to the TFL manager. Though not shown in Section 7.1 (accelerated harvest levels) similar results were witnessed when smaller accelerated harvest levels were targeted for shorter time periods and a more dramatic step-down process.

In the long-term (e.g. after 100 years), the harvest flow should match the Base Case. That it did not is a result of requiring a stable THLB growing stock after period 17 to influence the harvest earlier in the simulation period.

Figure 31 Accelerated harvesting in response to beetle scenarios

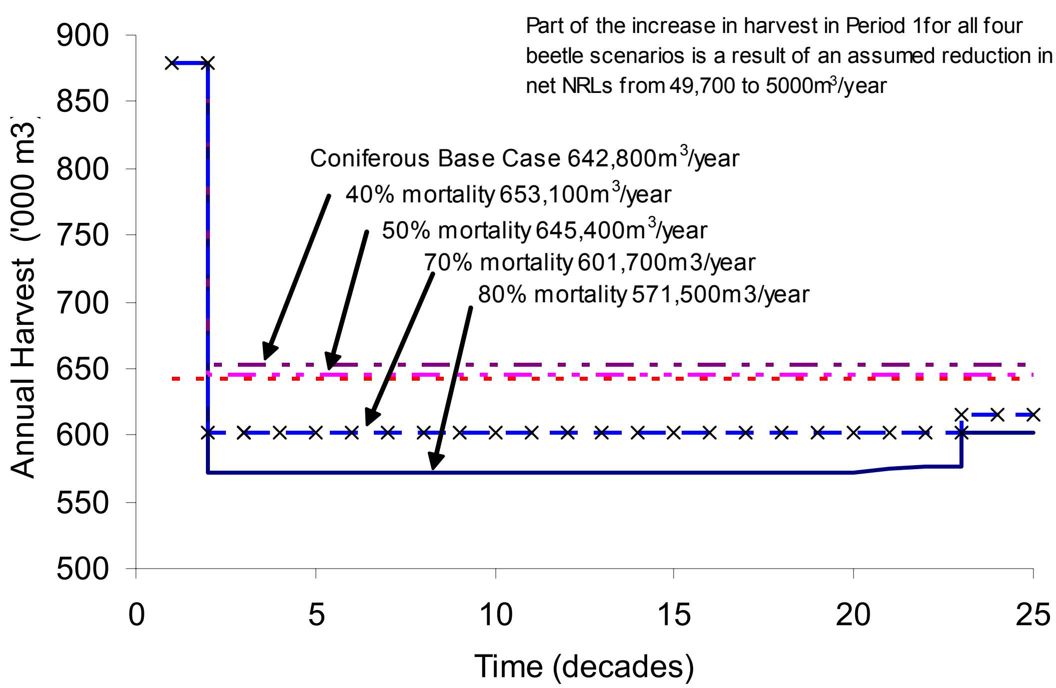
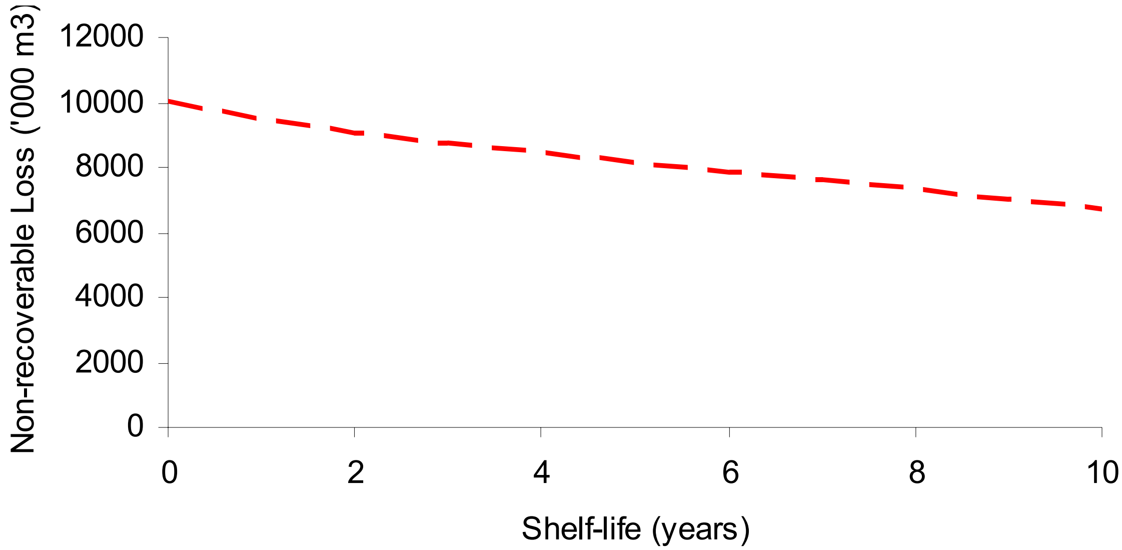


Figure 32 Sensitivity of Shelf Life



8.5. Preferred Management Scenario

A final scenario was constructed that Canfor believed would best address the management environment for TFL 48 going into Management Plan #4. This scenario involved both an a-spatial analysis of certain management initiatives, and then the construction of a hypothetical 20-year harvest plan in support of this harvest flow. The management scenario involved:

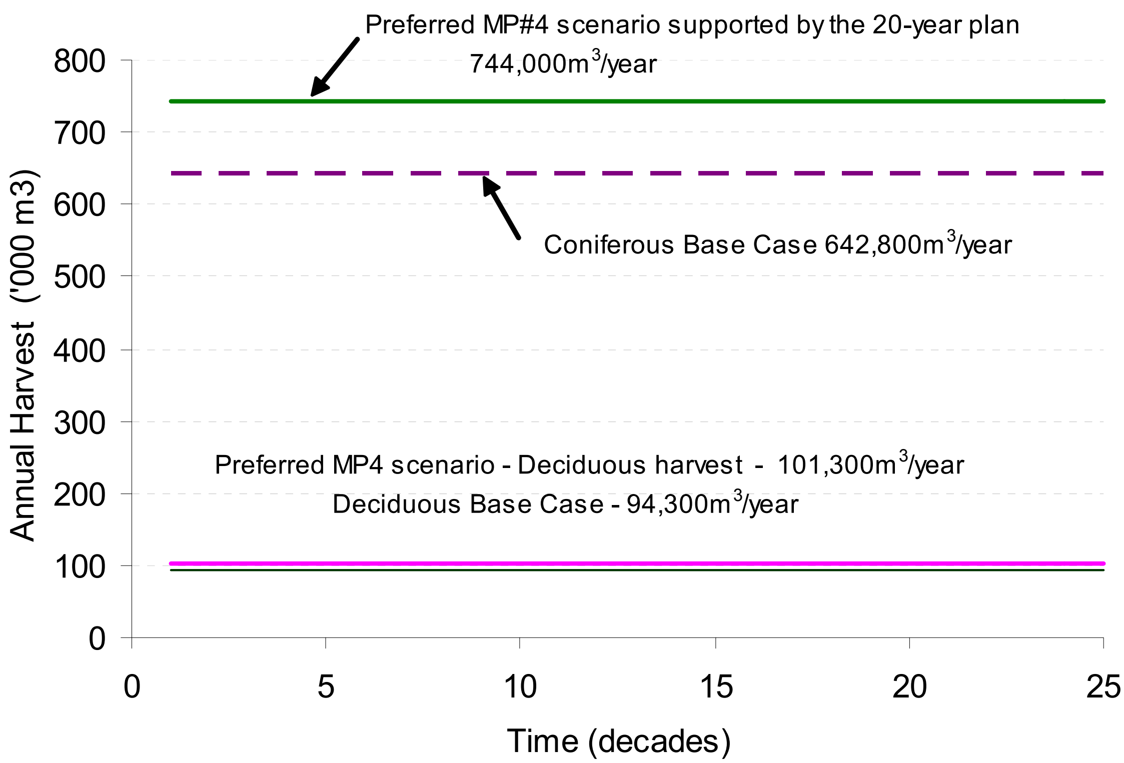
- Application of the SIBEC estimates for future managed stand yield tables.
- Application of recommended visual quality objectives.
- Target a minimum of 70 percent of the coniferous harvest in the first decade to pine volume.

The results of this scenario are shown in Table 17 and Figure 33. The hypothetical harvest plan of cut-blocks scheduled for four 5-year periods is provided in the Twenty Year Plan in support of Management Plan #4. Map 11 shows a projected age class distribution 20 years into the future should this preferred management scenario be accepted by the Ministry of Forests.

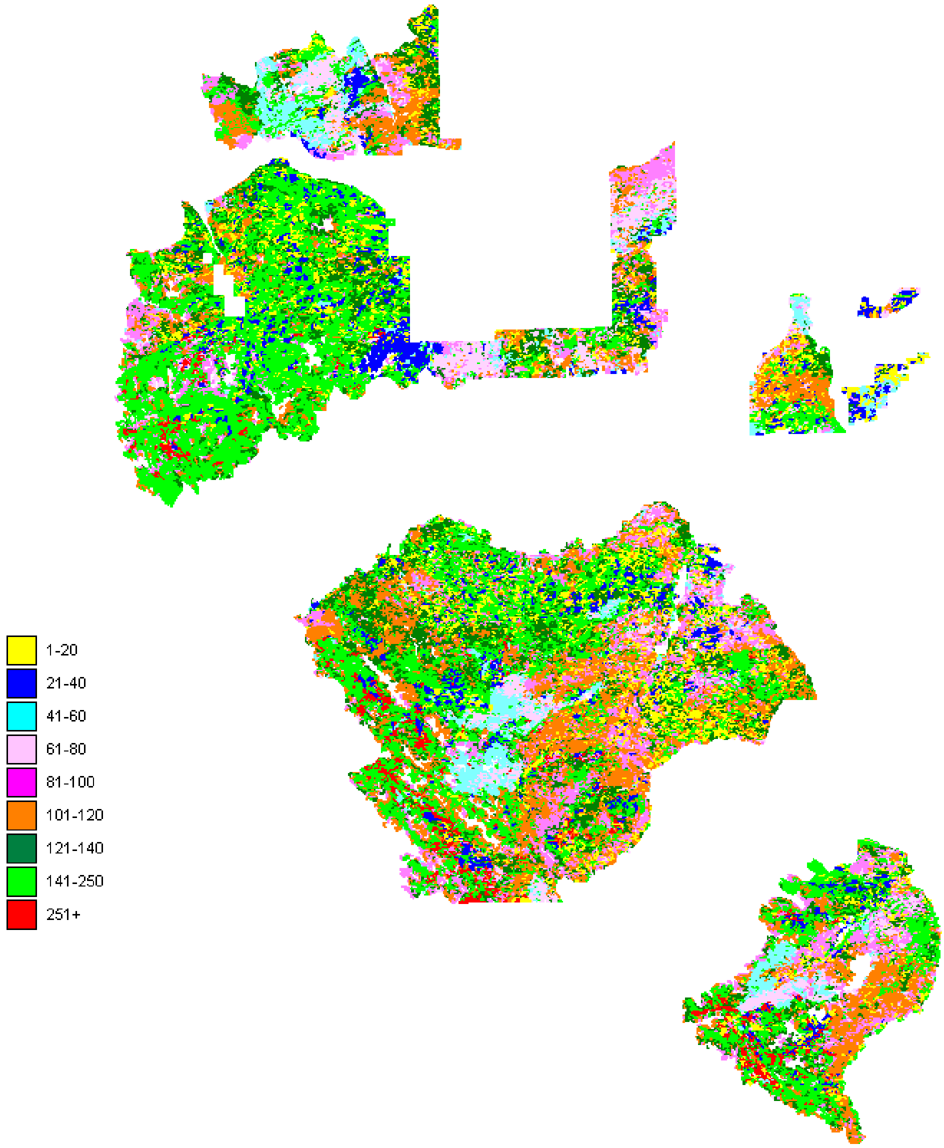
Table 17 Scenario supporting the spatial 20-year plan

Scenario	Harvest (m^3/year)		% change from Base Case	
	Coniferous	Deciduous	Coniferous	Deciduous
Preferred Management Plan #4 supporting the 20-year plan	744,000	101,300	15.7%	7.6%

Figure 33 Scenario supported by the 20-year plan



Map 11 Age Class Distribution after 20-years – Preferred Management Scenario



8.6. Summary

The following two tables provide a summary of the Base Case and sensitivity scenario results for the deciduous and coniferous land bases.

Table 18 Coniferous Harvest Flow Results

Scenario		Initial Harvest Level			Mid--term Harvest Level		
#	Description	Volume (m3/year)	Duration (years)	% change From Base Case	Volume (m3/year)	Duration (years)	% change From Base Case
1	Coniferous Base Case	642,800	250	0.00%	642,800	250	0.00%
2	Maximum 10 year accelerated	969,900	10	50.89%	619,200	50 to 250	-3.67%
3	Maximum 30-year accelerated	789,100	30	22.76%	629,700	50 to 250	-2.04%
4	Increase TFL size by 5%	650,600	250	1.21%	No change		
5	Decrease TFL size by 5%	608,300	250	-5.37%	No change		
6	Increase empirical stand yields 10%	660,400	250	2.74%	No change		
7	Decrease empirical stand yields 10%	616,700	250	-4.06%	No change		
8	Increase managed stand yields 10%	686,700	250	6.83%	No change		
9	Decrease managed stand yield 10%	590,900	250	-8.07%	No change		
10	Increase minimum cutting age 10 yrs	655,100	250	1.91%	No change		
11	Decrease minimum cutting age 10 yrs	626,800	250	-2.49%	No change		
12	Increase VQO constraints one class	609,000	250	-5.26%	No change		
13	Decrease VQO constraints one class	677,100	250	5.34%	No change		
14	Increase greenup delay 10 years	642,800	250	0.00%	No change		
15	Decrease greenup delay 10 years	642,900	250	0.02%	No change		
16	Old Growth Order (LU/BEC targets)	704,900	250	9.66%	No change		
17	No Old Growth constraints	709,700	250	10.41%	No change		
17b	No constraints at all	741,300	250	15.32%	No change		
18	Mean NRV	638,200	250	-0.72%	No change		
19	Maximum NRV	617,600	250	-3.92%	No change		
20	Recommended VQOs	640,600	250	-0.34%	No change		
21	Proposed Mine sites	643,705	250	0.14%	No change		
22	Woodlot Scenario 1	645,500	250	0.42%	No change		
23	Woodlot Scenario 2	647,100	250	0.67%	No change		
24	SIBEC Managed stand yield tables	747,875	250	16.35%	No change		
B1	40% MPB mortality - NDY	700,100	10	8.91%	655,400	50 to 200	1.96%
B2	50% MPB mortality - NDY	685,800	10	6.69%	641,100	50 to 200	-0.26%
B3	80% MPB mortality - NDY	612,250	10	-4.75%	567,550	50 to 200	-11.71%
B4	40% MPB mortality - accelerated	879,300	10	36.79%	653,000	50 to 200	1.59%
B5	50% MPB mortality - accelerated	879,300	10	36.79%	645,400	50 to 200	0.40%
B6	70% MPB mortality - accelerated	879,300	10	36.79%	601,700	50 to 200	-6.39%
B7	80% MPB mortality - accelerated	879,300	10	36.79%	571,500	50 to 200	-11.09%
25	20-year plan scenario	744,000	250	15.76%		No change	

Table 19 Deciduous Harvest Flow Summary

Scenario		Initial Harvest Level			Mid-term Harvest Level		
#	Description	Volume (m3/year)	Duration (decades)	% change From Base Case	Volume (m3/year)	Duration (decades)	% change From Base Case
1	Deciduous Base Case	94,200	250	0.0%	94,200	25	0
2	Maximum 10 year accelerated	143,500	10	52.3%	91,960	50 to 250	-2.4%
3	Maximum 30-year accelerated	116,800	30	24.0%	93,000	50 to 250	-1.3%
4	Increase TFL size by 5%	94,900	250	0.7%	No change		
5	Decrease TFL size by 5%	89,500	250	-5.0%	No change		
6	Increase empirical stand yields 10%	97,200	250	3.2%	No change		
7	Decrease empirical stand yields 10%	91,500	250	-2.9%	No change		
8	Increase managed stand yields 10%	101,700	250	8.0%	No change		
9	Decrease managed stand yield 10%	87,100	250	-7.5%	No change		
10	Increase minimum cutting age 10 yrs	92,500	250	-1.8%	No change		
11	Decrease minimum cutting age 10 yrs	95,300	250	1.2%	No change		
12	Increase VQO constraints one class	93,800	250	-0.4%	No change		
13	Decrease VQO constraints one class	102,000	250	8.3%	No change		
14	Increase greenup delay 10 years	94,500	250	0.3%	No change		
15	Decrease greenup delay 10 years	94,500	250	0.3%	No change		
16	Old Growth Order (LU/BEC targets)	94,000	250	-0.2%	No change		
17	No Old Growth constraints	94,100	250	-0.1%	No change		
17b	No constraints at all	102,430	250	8.7%	No change		
18	Mean NRV	95,000	250	0.8%	No change		
19	Maximum NRV	98,300	250	4.4%	No change		
20	Recommended VQOs	94,700	250	0.5%	No change		
21	Proposed Mine sites	94,265	250	0.1%	No change		
22	Woodlot Scenario 1	94,500	250	0.3%	No change		
23	Woodlot Scenario 2	94,650	250	0.5%	No change		
24	SIBEC Managed stand yield tables	100,900	250	7.1%	No change		
B1	40% MPB mortality - NDY	93,400	250	-0.8%	No change		
B2	50% MPB mortality - NDY	94,300	250	0.1%	No change		
B3	80% MPB mortality - NDY	95,850	250	1.8%	No change		
B4	40% MPB mortality - accelerated	94,200	250	0.0%	No change		
B5	50% MPB mortality - accelerated	95,000	250	0.8%	No change		
B6	70% MPB mortality - accelerated	96,000	250	1.9%	No change		
B7	80% MPB mortality - accelerated	96,400	250	2.3%	No change		
25	20-year plan scenario	101,324	250	7.6%	No change		

9. Conclusion

The Phase II VRI sampling that was completed by Canfor for TFL 48 during the term of management plan #3 has had a very significant impact on what is the sustainable harvest level for the tree farm. The revisions to the inventory information for the TFL have resulted in an improvement in knowledge about the productivity of existing empirical stands. This knowledge has led to a reduction in the amount of area that was previously considered problem forest types or low site, and a corresponding increase in the timber harvesting land base.

This analysis report provides a case that the current AAC apportioned to TFL 48 (i.e. 580,000m^3/year) can be increased 27 percent to the sustainable harvest level of 737,000m^3/year. This AAC would be apportioned 642,800 cubic metres to coniferous leading stands and 94,200 cubic metres to deciduous leading stands. Furthermore, the AAC for the TFL could be increased to 845,300m^3/year (i.e. 744,000m^3 for conifer and 101,300m^3 for deciduous) as indicated by the preferred management scenario. At this level, pending confirmation that SIBEC site quality estimates are reasonable, the harvest level is sustainable, should be sufficiently high-enough (at least in the short-term) to deal with pine mortality from the MPB epidemic, and is at a level that Canfor can effectively process, given the current manufacturing capacity within the Chetwynd sawmill.

Sensitivity analysis shows that upwards and downwards pressures on the harvest flow exist.

Principle downward pressures on the coniferous harvest flow include:

- Uncertainty about the spatial constraints with respect to harvesting within the Dunlevy special management areas.
- Uncertainty about the ability to schedule harvests (eg cutting age) at the optimal economic timing in order to maximize long-term productivity.
- Uncertainty about future land base withdrawals for woodlots, mines and petroleum extraction.
- Recommended VQOs
- Pine mortality from the MPB in excess of 50% of the merchantable pine growing stock

The major upwards pressures on the coniferous harvest flow include:

- Future improvements to stand productivity information through SIBEC and localized SIBEC sampling.
- The short-term opportunity cost of pine mortality if the MPB epidemic is not controlled.
- The ability to support a very significant accelerated harvest with minimal impact on the mid-term harvest forecast.

Downward pressures on the deciduous harvest flow include:

- Uncertainty about the economic lifespan (age) of deciduous stands with respect to utilization.
- Uncertainty about the seral succession of deciduous-mixed wood stands to coniferous-mixedwood.
- Lack of performance on the part of Canfor, LP, Tembec in the utilization of deciduous within the TFL.

- Uncertainty about future land base withdrawls for woodlots, mines and petroleum extraction.

Upward pressures on the deciduous harvest flow include:

- An expansion of the deciduous land base beyond the traditional borders of the Pulpwood Areas.
- The ability to support a significant accelerated harvest level that declines to within two percent of the non-declining level.

10. Discussion

Over the past 20 years, since Canfor obtained the license to harvest within the Chetwynd tree farm, we have witnessed a steady increase in the sustainable harvest forecast for the TFL - from a 1988 initial harvest estimation of 410,000m^3/year, to the current coniferous non-declining harvest flow of 642,800 m^3/year, an increase of 56 percent. There is little doubt that future improvement in inventory productivity information will continue the trend. Whether it be SIBEC, reductions in operational adjustment factors, reduced non-recoverable losses, or improvements in the availability of genetically improved stock types.

That the TFL is at risk to a mountain pine beetle epidemic is evident from current BC-Alberta dialogue, and from the efforts taken over the past two years within the Dawson Creek TSA and TFL48 to control the migration of beetle populations from the west. However, estimations on the intensity of the spread of the beetle across the TFL are just that. Canfor is extremely fortunate to have tenure over a tree farm that has a diversity of merchantable tree species much of which exists in mixed-wood stands. The combination of mixed-forests, isolated mountain valleys, and susceptibility of greater weather extremes may prove to be a blessing. To the extent that the beetle may kill up to 50 percent of the pine, the growing stock within the TFL is resilient enough to maintain the mid-term harvest at near the Base Case harvest level. At the extreme, should the beetle kill 80 percent of the pine volume at risk, then improvements in site productivity will likely off-set any significant mid-term fall-down.

At this point in time, speculation on the severity of a beetle epidemic likely does not justify significant capital expenditure that may be necessary to expand milling capacity of Canfor's Chetwynd sawmill. However, this does not preclude that additional analysis or review of the AAC may be warranted before the term of Management Plan #4 has expired, should the epidemic grow to infestation levels experienced in the B.C. central interior. The non-declining Preferred Management scenario harvest level indicated in this analysis report provides significant opportunity for Canfor to focus additional efforts towards the control of beetle populations and the salvage of dead pine.

A significant short and mid-term threat to the forest health of the TFL will be the continued maintenance of surplus over-mature fibre. This threat extends not just to the pine, but the spruce, balsam and deciduous stands as well. Harvesting at, or even above the Base Case level will maintain this old-growth well into the future. This is, in part, an artifact of managing a THLB that constitutes only 64 percent of the productive forest area. A move to determine a maximum sustainable harvest level for the TFL (through better understanding of site productivity and natural disturbance cycles) is vital to the long-term viability of the tree farm as a predictable source of fibre supply.

Appendix 7 – Twenty Year Plan

Canadian Forest Products Ltd.

TREE FARM LICENCE #48
Chetwynd

20-YEAR PLAN REPORT

January 1, 2006 to December 31, 2026

in support of
Management Plan 4

Version 1.0b

August 4, 2006

Prepared for:
Canadian Forest Products Ltd.

Prepared by
Industrial Forestry Service Ltd.

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APPENDIX

1.0 INTRODUCTION

A 20-Year Plan (TYP) has been prepared by Canadian Forest Products Ltd. in support of the timber supply analysis and Sustainable Forest Management Plan # 4 for Tree Farm Licence # 48 (TFL 48). This plan is a strategic development plan prepared in accordance with Section 2.18 of the Tree Farm License 48 agreement.

The timber supply analysis identified several alternative management scenarios using a coniferous timber harvesting land base (THLB) of 314,800 hectares and a deciduous THLB of 48,500 hectares. Upon this land base, natural range of variation seral targets have been applied to natural disturbance units at both the landscape level and by biogeoclimatic zone. Visual quality objectives have been established and are maintained in the simulation model. Watersheds are monitored for hydrologic greenup. Riparian habitat, legislated protected areas, recreation sites, archeological sites and wildlife tree patches have been identified and preserved.

Both the coniferous and deciduous land bases have a current age class distribution that continues to be heavily skew to the mature and over-mature. For the timber harvesting land base, this provides a very stable platform against which seral stage targets are met either immediately, or in the very near future.

The current AAC for TFL 48 is 580,000m^3/year. This is partitioned 525,000 to coniferous-leading species and 55,000 to deciduous-leading species. The current analysis reveals that under current management assumptions, a Base Case harvest of 642,800m^3/year can be supported by coniferous-leading stands and 94,200m^3/year by deciduous-leading stands. Additional analysis, giving consideration to managed stand yields (ie SIBEC), recommended VQOs and the focus on pine harvesting as a result of MPB mortality, revealed that a coniferous harvest of 744,000m^3/year and a deciduous harvest of 101,300m^3/year are sustainable for the long term. In consideration of this information, Canfor believes the allowable annual harvest level for the term of SFMP#4 should be set at 845,300m^3/year. This twenty year plan was prepared in support of a proposed AAC of 845,300m^3/year.

2.0 STATUS OF THE INFORMATION USED IN THE PLAN

Figure 1 is a key map illustrating the location of TFL 48 within the Dawson Creek Forest District. The inventory/forest cover information used to prepare the TYP is consistent with the information used in the timber supply analysis in support of the Base Case harvest forecast prepared for MP #4. Table 1 summarizes the digital file source data and the status of the inventories for TFL 48 that was considered in preparation of the TYP. The forest cover inventory was updated for disturbance to February 2005. There is a very slight, inconsequential lag between this date and the start of the 20-year plan, which was set to January 2006

Figure 1 Location of TFL 48

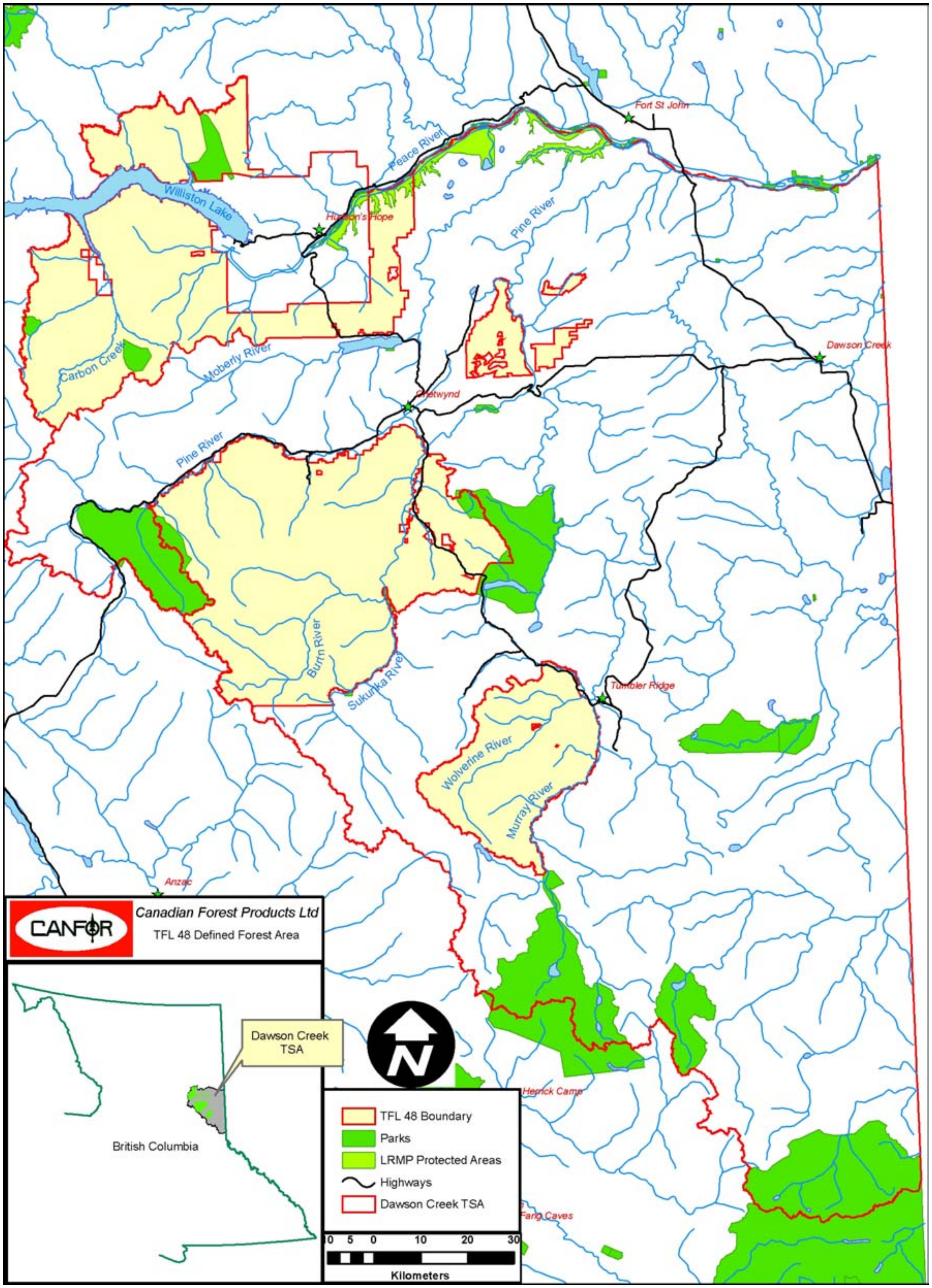

Table 1. Forest Resources Inventory Status

Inventory	Standard	Completed	approved	Approved By	Status
Forest Cover/VRI	VRI Phase 1	2000	2000	Regional Inventory Forester	Updated to for depletion to Dec 31, 2004
	VRI Phase II/NVAF	2004	2005	Provincial Biometrician	Approved – (Age Height and volumes adjusted and projected to 2005)
Visual Landscape	RIC	2005	2005	Regional Manager (2005 consolidated inventory)	Pending – EVQO used in basecase RVQO used in sensitivity
Recreation	RIC	1999	1995/2001	Regional Manager	Approved
Stream	RIC	1997-2000			Pending
Operability	n/a	2000	Dec 2000	Regional Geomorphologist	Approved
Road/trail network	n/a	2000	n/a	n/a	n/a
BEC	MOF	2000	Nov 2000	Regional Ecologist	Approved
Grizzly Habitat	MOELP	2000		District Manager	Approved
Ungulate Winter Range	MOE	2000	2005	MOE	Provided by MOE
Silviculture	MLSIS	2000	yearly	District Manager	Approved
Protected Areas	MOELP	2000	June 29, 2000	Cabinet per Parks FTP Site	Approved
TFL Boundary	N/A	2004	July 27, 2004	Resource Tenures Branch. New boundary included with TFL 48 Instrument 5 document	Approved
PA 10 & 13	N/A	2000	2000	District Manager	Approved
LRMP RMZ's	LUCO	1999	March 1999	Cabinet	Approved
Archeological Sites	N/A	Unknown	June 1999	Ministry of Small Business Tourism and Culture	Approved
Genetic Gain	MoFR	2003	2003	MoFR – Tree Improvement Branch	Approved
Site Series	RIC	2001	Pending	Regional Ecologist	Pending completion of accuracy assessment
Landscape Units	N/A	2001	2004	Minister of Sustainable Resource Management	Approved
Natural Disturbance Units	N/A	2003	2003	Regional Ecologist	Approved
Watersheds	N/A	2005	N/A	N/A	N/A
Agricultural Land Reserve	N/A	2004	2004	Agricultural Land Commission (MSRM)	Approved

3.0 IDENTIFIED CONSTRAINTS AND THEIR APPLICATION

The constraints imposed on cut-blocks in the TYP are consistent with the timber supply analysis resource management constraints. The constraints to the timber supply that are represented in the TYP are as follows:

3.1 Landbase Restrictions

These restrictions reflect the net down of the productive forest to define the timber harvesting landbase (THLB). Restrictions include features such as recreation sites, riparian reserves, problem forest types, parks, wildlife habitat areas etc.

Landbase constraints for wildlife tree patches are applied through a percentage volume reduction applied on a per hectare basis in proposed cut-blocks.

3.2 Adjacency Constraints

Consistent with the timber supply analysis, adjacency was addressed through greenup constraints that were applied separately to the coniferous and deciduous stands supporting the THLB within each landscape unit. Greenup constraints were also applied to all productive forest stands within each watershed. These constraints limit the amount of harvesting within geographic areas and ensure that the harvest is spread across the TFL. The TYP accounted for green-up constraints using the average green-up height for managed stand growths as predicted by the stand model TIPSY. The green-up ages applied to the TYP are consistent with the timber supply analysis, whereby an adjacency delay of ten years was used in deciduous-leading areas and 20 years in conifer-leading areas.

3.3 Scenic Areas

In the TYP, harvesting in scenic areas over then next 20 years is limited to only those retention, partial retention and preservation VQO areas where 5 metre greenup constraints have been met, generally after 30 years. This is consistent with the timber supply analysis. Recommended VQO restrictions were also applied to this 20-year plan.

3.4 Old Growth Constraints

Consistent with the timber supply analysis, old growth constraints were applied to each natural disturbance unit and sub-unit, (and by leading species in the Boreal Plains and Boreal Foothills - Valley). Old growth constraints were also applied to each NDU and BEC. Old seral stage constraints were applied to established ungulate winter range areas.

3.4 Dunlevy Creek Management Plan

The Dunlevy has within it several management areas that required special treatment when developing both the timber supply analysis and the TYP. The plan has within it six compartments, each of which has a prescribed plan for resource extraction activities. Basically, the management concept is to enter a compartment during a predetermined harvesting period; then leave and not schedule additional resource extraction until the next temporal entry period. The level of harvesting was also identified in the plan on an area harvest basis (rather than a volume basis). The spirit of this plan has been upheld in both the timber supply analysis and the TYP.

4.0 GUIDELINES

The guidelines followed in preparing the TYP are consistent with the harvest schedule derived through the timber supply analysis. They are also consistent with the Information Package used in the Timber Supply Analysis for MP # 4. These guidelines are:

4.1 Harvest Method and Silviculture System

The following harvest methods are considered for TFL 48:

- Conventional ground-based systems
- Mixed conventional / cable systems
- Overhead cable systems

The following silvicuture systems are considered for TFL 48:

- Clearcut
- Shelterwood

4.2 Utilization Standards

The following utilization specifications are consistent with the Information Package for MP #4:

- a maximum stump height of 30 cm for all species.
- a minimum top diameter of 10 cm for all species.
- a minimum DBH of 17.5 cm for spruce and balsam
- a minimum DBH of 12.5 cm for pine and deciduous.

4.3 Partitioned Cut

The net harvest level for the TFL was partitioned as follows. A partitioned cut level of 101,300 m^3 per year (506,500 cubic metres per 5-year period) for deciduous leading stands and 744,000 m^3 per year (3,720,000 cubic metres per 5-year period) for coniferous leading stands

4.4 Block Size and Shape

Block design and shape utilized existing polygon lines. Blocks were designed to a minimum size of 4 hectares and a maximum size of 942 hectares. Due to the fragmentation of the mature operable land base, polygons within a 200 metre adjacency distance were considered eligible for block amalgamation. This distance was applied because it became evident during the construction of the TYP that smaller distances and a minimum 4 hectare block target resulted in increased fragmentation of the landbase. This did not fit well with our current understanding of wildlife management and patch size objectives.

4.6 Net Operable Landbase

The Timber Harvesting Landbase (THLB) is identified in Appendix I (Map 1) at a scale of 1:200,000. Areas removed from the gross forested landbase include reductions for problem forest types, poor site quality, riparian reserves, recreation reserves and road buffers. These areas are not colored. The remaining net operable landbase is colour coded according to species, and site quality.

Blocks that have been proposed in the TYP have been located in the net operable land base, are colour coded by leading species (conifer vs. deciduous) and according to the 5-year period in which they could be scheduled for harvest. This harvest schedule is identified spatially in Appendix II through a set of 5 maps – one for each TFL block. The maps also identify existing and proposed roads. The proposed road network was developed for Canfor during the term of MP#3 using the THLB derived during the MP#3 analysis. The objective of this road network was to access all stands within the MP#3 THLB. Therefore the network exceeds that amount of proposed roads required during the next 20-year management term.

4.7 Harvest Age

The minimum harvest age, in both the TYP and the timber supply analysis, is the area-weighted culmination age of each analysis unit. The age of the stands within each block had to meet or exceed the minimum harvest age to be eligible for harvest in the period they were scheduled.

4.8 Harvest Volume

Both the timber supply analysis and the TYP calculated existing stand volumes using the MOF Variable Density Prediction (VDYP) model. To account for growth of timber over the term of the TYP, polygons and their associated volumes were aged in 5-year increments (as opposed to 10-year increments in the timber supply analysis). All volumes reported are net decay, waste and breakage. All volumes reported are net of reductions for wildlife tree patches (e.g. 4.4%).

Shelterwood stands had their volumes reduced by an additional 10 percent beyond the WTP objective, to account for the merchantable volume of stems left on-site

5.0 HYPOTHETICAL 20-YEAR DEVELOPMENT PLAN

Map Set 2 (Appendix II) identifies areas proposed for harvesting and road development during a 20-year time period (2006 to 2026). Figure 2 following depicts this harvest plan at a very coarse scale. Figure 3 reveals the area distribution of cut-blocks across the TFL for all 4 periods by size of block.

.

5.3 Harvest Schedule and Targets

The timber supply analysis completed in support of a preferred management scenario resulted in an a-spatial harvest schedule. This schedule was created using the Remsoft model "Woodstock" and the linear programming model "Mosek". The model was run for 25 periods with each period equivalent to 10 years. The objective of the model was to derive a sustainable non-declining coniferous harvest level, and a sustainable non-declining deciduous harvest level. Constraints included seral constraints, operability constraints, the requirement for a non-declining THLB growing stock in the long-term, and the short term objective of directing 70 percent of the coniferous harvest into lodge-pole pine. The result of this analysis was a coniferous harvest of 744,000m^3/year and a deciduous harvest of 101,300m^3/year (net of non-recoverable losses).

The model was then modified to run using 5-year periods. The deciduous and coniferous harvest objectives were set to be 3,720,000 and 506,600m3/period respectively (the annual harvest level multiplied by 5 years), and then each target was increased by an additional 3 percent to account for model inefficiencies and provide for future flexibility. The Woodstock program was then run for four 5-year periods with all constraints applied, to develop a 20-year plan harvest flow schedule for the TFL48 forest estate model. The resultant harvest schedule was then linked to spatially explicit polygon attributes. Utilizing the Remsoft model "Stanley" cut-blocks were created and scheduled through an iterative automated process, thereby producing a hypothetical twenty-year harvest plan.

Map Set 2 in Appendix II presents the result of this harvest plan.

Table 2 show the result of this plan by 5-year period. Table 2 also identifies the amount of pine volume harvested from all coniferous-leading stands for each 5-year period.

Figure 2 Location of 20-year plan cut-blocks

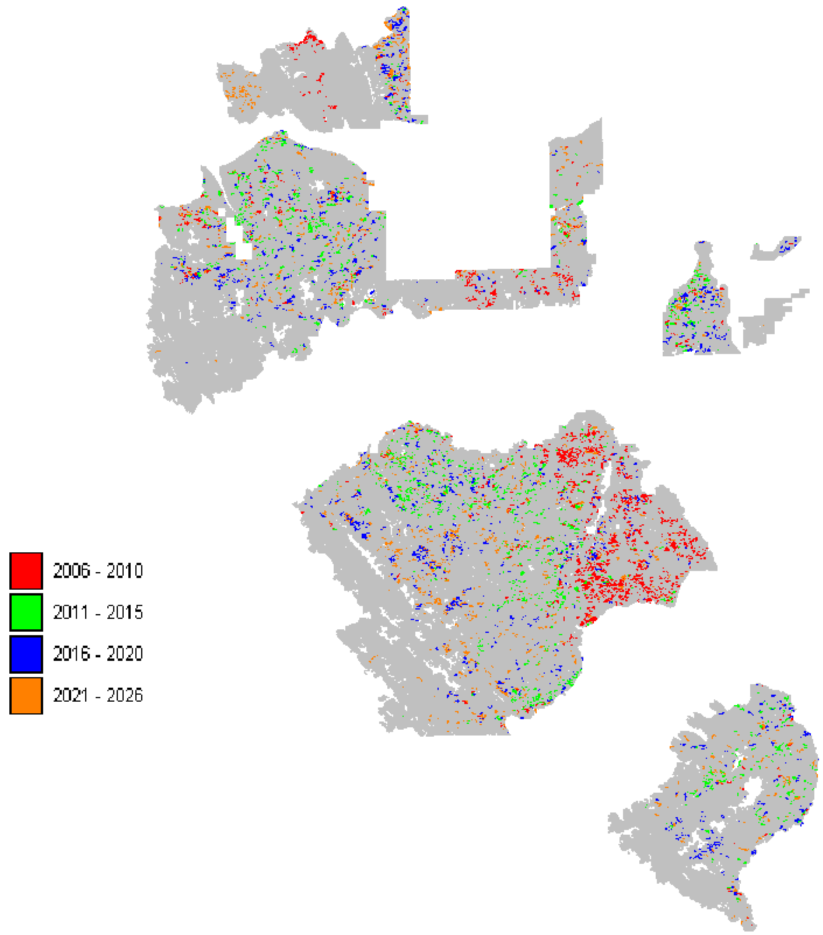

Figure 3 Cut-block THLB Area by Size Class

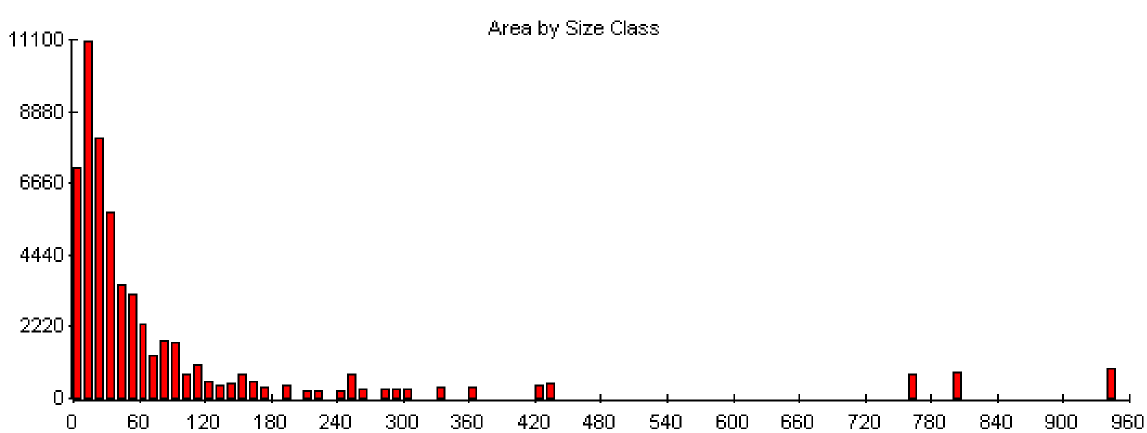

Table 2 Harvest Schedule by 5-year period [1]

Period (years)	Coniferous-leading Stands (m^3/5-year period)	Pine Component (m^3/5-year period)	Percent pine	Deciduous-leading stands (m^3/5-year period)	Total Harvest (m^3/5-year period)
1 (2006-2010)	3,725,066	2,621,553	70.4%	509,811	6,856,431
2 (2011-2015)	3,724,450	2,617,780	70.3%	508,363	6,850,594
3 (2016-2020)	3,726,748	758,229	20.3%	508,988	4,993,965
4 (2021-2025)	3,720,811	1,477,210	39.7%	507,837	5,705,858
Total	14,897,075	7,474,772	50.2%	2,034,999	24,406,847

Note: 1 The coniferous target was 3,720,000m^3/period, deciduous target was 506,600m^3/period and the pine target was 70% for the first 10 years.

5.4 Harvest Methods

Harvest method was not modeled explicitly in the timber supply analysis. Rather, the operability of all stands was assessed through a review of the existing and expected volume per hectare at culmination age. If the stands achieved 120m^3/ha, 150m^3/ha or 200m^3/ha for conventional, mixed and cable operability at culmination age respectively, they were eligible for inclusion in the THLB. Deciduous leading stands were only considered operable if they were on conventional ground. The cut-blocks produced in Map 2 were intersected with the operability cover for TFL 48 to produce the following summary of harvest area by period, and by harvest method (i.e. operability classification). Table 4 shows the amount of harvest forecast to occur by leading species and by period.

Table 3 Harvest Schedule by Operability Classification

Operability Classification	Period 1		Period 2		Period 3		Period 4	
	Conifer	Decid	Conifer	Decid	Conifer	Decid	Conifer	Decid
Cable	899	0	1,370	0	1,344	0	1447	0
Mixed	593	0	781	0	910	0	834	0
Conventional	11,098	2,378	9,761	2,356	9,714	2,213	9,860	2,101
Inoperable	0	0	0	0	0	0	0	0
Sub-Total	12,590	2,378	11,912	2,356	11,968	2,213	12,141	2,101
Total	14,968		14,268		14,181		14,242	

Table 4 Species Volume Summary by Period

Period	# of Blocks	Volume Harvested by Leading Species					Total	average vol/ha
		Aspen	Cottonwood	Balsam	Spruce	Pine		
1	463	462,601	47,210	13,454	598,863	3,112,749	4,234,877	296
2	697	292,823	215,540	69,786	291,966	3,362,697	4,232,811	310
3	659	262,476	246,512	298,541	2,521,570	906,637	4,235,736	321
4	768	388,593	246,512	638,498	1,330,064	1,752,248	4,355,914	316

5.4 Natural Range of Variation Seral Stage Objectives

With respect to landscape biodiversity, the principle objective modeled in this analysis was the maintenance of natural range of variability seral stage objectives. The objectives were addressed through the application of forest cover constraints applied to natural disturbance units, subunits, by leading species and by biogeoclimatic zone. Table 5 and Table 6 show the impact of the 20-Year harvest plan with respect to achieving the targets applied to forested areas within each NDU and within each NDU and BEC area.

Table 5 Future Old Forest Condition by NDU resulting from the Proposed TYP

Natural Disturbance Unit		Boreal Foothills Mountain	Boreal Foothills – Valley Conifer	Boreal Foothills – Valley Decid.	Omineca Mountain	Omineca Valley	Wet Mountain	Boreal Plains Upland Conifer	Boreal Plains Upland Decid.
Forest Area (ha)		177,423	125,200	39,669	13,220	6,210	92,738	68,120	43,814
Targeted amount of old area (ha)		58,550	28,796	3,967	7,668	1,428	77,900	11,580	4,381
End of 5-Year Harvest Period	Existing condition	56,379	30,460	15,273	4,254	1,478	53,580	8,185	15,223
	Period 1	63,067	36,656	15,902	4,801	1,701	55,037	11,283	15,644
	Period 2	67,856	42,651	18,118	5,728	2,222	56,294	15,733	18,042
	Period 3	69,432	43,122	19,829	6,264	2,459	58,084	15,772	19,228
	Period 4	70,052	45,903	19,974	6,826	2,503	59,709	17,103	19,666

Table 6 Future Old Forest Condition resulting from the Proposed TYP - NDU/BEC

Natural Disturbance Unit	BEC	Forest Area (ha)	Targeted amount of old forest	Old Forest Area (ha)				
				current condition	Period 1	Period 2	Period 3	Period 4
Boreal Plains Deciduous	BWBSmw1	39028	3,903	14,132	14,526	16,523	17,198	17,454
	BWBSwk1	4217	422	946	968	1,328	1,749	1,855
	ESSFmv2	510	51	98	104	150	240	315
Boreal Foothills Valley - Deciduous	BWBSmw1	23129	2,313	9,133	9,533	10,817	11,684	11,701
	BWBSwk1	1606	161	384	397	398	509	516
	BWBSwk2	5082	508	2,882	2,863	3,187	2,752	2,535
	SBSwk2	9866	987	2,888	3,122	3,730	4,898	5,236
Boreal Plains - Conifer	BWBSmw1	31425	1,571	2,370	3,432	6,268	5,586	6,080
	BWBSwk1	23531	1,177	2,291	3,659	5,015	5,351	5,964
	ESSFmv2	12959	648	3,507	4,174	4,433	4,813	5,041
Boreal Foothills Valley - Conifer	BWBSmw1	30912	2,164	6,318	8,074	10,556	10,854	11,879
	BWBSwk1	5294	371	1,803	2,263	2,293	2,397	2,465
	BWBSwk2	7438	521	694	804	1,300	1,356	1,888
	SBSwk2	81537	5,708	21,627	25,496	28,483	28,497	29,653
Boreal Foothills - Mountain	ESSFmv2	106082	10,608	39,044	42,875	46,053	47,248	48,657
	ESSFmv4	11756	1,176	1,333	1,485	2,022	2,310	2,694
	ESSFwc3	24543	2,454	7,621	9,028	9,303	9,342	7,861
	ESSFwk2	26406	2,641	6,768	7,735	8,343	8,004	8,121
Omineca Valley	SBSwk2	6179	433	1,474	1,697	2,218	2,456	2,499
Omineca Mountain	ESSFmv2	13188	2,242	4,251	4,798	5,721	6,257	6,819
Wet Mountain	ESSFmv2	16256	4,064	9,327	9,508	9,985	10,135	10,673
	ESSFwc3	32389	8,097	20,902	21,702	22,047	23,066	23,405
	ESSFwk2	26163	6,541	17,195	17,467	17,624	17,905	18,160
	SBSwk2	11558	2,890	4,505	4,557	4,618	4,655	5,079

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TFL 48

APPENDIX I

Species and Site Quality THLB Overview Map

TFL 48

APPENDIX II

20 Year Harvest Schedule Maps by TFL Block

Appendix 8 – Chief Forester's Rationale for AAC Determination

(Not included with Proposed SFMP)

Appendix 9 – TFL 48 Vegetation Resource Inventory Statistical Adjustment

Tree Farm Licence 48
Vegetation Resources Inventory
Statistical Adjustment

Prepared for

Don Rosen
Canadian Forest Products Ltd.
Peace Operations
Chetwynd, BC

Project: CFC-012

March 16, 2005

J.S. Thrower & Associates Ltd. *Consulting Foresters*
Vancouver – Kamloops, BC

Executive Summary

Canadian Forest Products Ltd. – Peace Operations (Canfor) initiated a Vegetation Resources Inventory (VRI) program on Tree Farm Licence (TFL) 48 in 1997. The Phase I (photo-interpretation) was completed in time for the second timber supply review (TSR) in 2001, while the Phase II (ground sampling) and Net Volume Adjustment Factor (NVAF) sampling were completed in 2002 and 2004, respectively. The statistical adjustment was the last component required to complete the VRI program and make the adjusted VRI available for TSR III.

While TFL 48 covers 643,248 ha, only Vegetated Treed polygons, regenerated before 1971 and not under a shelterwood silvicultural system (517,587 ha, 81% of the TFL) were statistically adjusted in this project. One hundred and twenty-eight (128) VRI Phase II plots, established in the target population, were used for the statistical adjustment.

Forty-four (44) trees were sampled in the NVAF component of the VRI program. The NVAF results showed that taper equations and net factor rules under-estimated the true net merchantable volume by 6 to 9% for all species except mature spruce (1% under-estimation).

The target population was stratified into three priority areas: High, Moderate, and Low. The High priority stratum covered areas most likely to be included in the timber harvesting land base (THLB) for Management Plan (MP) 4. Moderate and Low priority strata covered areas less likely to be included in the THLB.

Height, age, and net merchantable volume were the only attributes adjusted in this project. The TSR volume was derived from the adjusted net merchantable volume. TSR volume is defined as the net merchantable volume at the 12.5 cm+ utilization level in lodgepole pine-leading stands and the 17.5 cm+ level in all other stands. After adjustment, the average height increased by 5%, age decreased by 7%, and TSR volume increased by 34%. The TSR volume increased by 18% in the High priority areas.

Priority	Area (ha)	Height (m) Phase I	Adjusted	Diff.	Age (yrs) Phase I	Adjusted	Diff.	TSR Volume (m^3/ha/yr) Phase I	Adjusted	Diff.
High	257,583	22.9	23.2	1%	128	121	-6%	219.2	259.7	18%
Moderate	50,549	13.2	13.8	5%	52	59	16%	54.1	93.8	73%
Low	209,454	14.2	15.9	12%	149	133	-10%	87.6	152.6	74%
All	*517586*	*18.5*	*19.3*	*5%*	*129*	*120*	*-7%*	*149.8*	*200.1*	*34%*

Site index was not directly adjusted, but rather derived from adjusted height and age. Site index increased from 11.4 to 12.4 m, on average, after adjustment; however, the site index obtained after adjustment is probably still a poor indicator of potential site productivity, especially for future managed stands. Canfor should investigate methods to improve site productivity estimates for TSR III.

The adjusted VRI database represents the state of the inventory as of 2000. The inventory must be projected to 2005 to be used in TSR III.

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1. INTRODUCTION

1.1 BACKGROUND

1.1.1 Vegetation Resources Inventory Overview

The Vegetation Resources Inventory (VRI) is the Ministry of Sustainable Resource Management's (MSRM) forest inventory standard for public lands in BC. Forest licensees should use the VRI standard in their data package when submitting an application for an allowable annual cut (AAC) determination to the Ministry of Forests (MOF).

The VRI is a four-step process (Figure 1):

1. Phase I (unadjusted inventory data) – Polygon attributes are estimated, generally using photo-interpretation.
2. Phase II (ground sample data) – Measurements are taken from randomly located ground samples.
3. Net Volume Adjustment Factor (NVAF) sampling – Random trees are selected from the Phase II ground samples for stem-analysis studies to develop adjustment ratios that correct volume for taper and decay estimation bias.
4. Adjustment Phase – The Phase I estimates are adjusted using the NVAF-corrected Phase II ground samples to provide an adjusted unbiased estimate of forest inventory attributes. The final product is an adjusted VRI database.

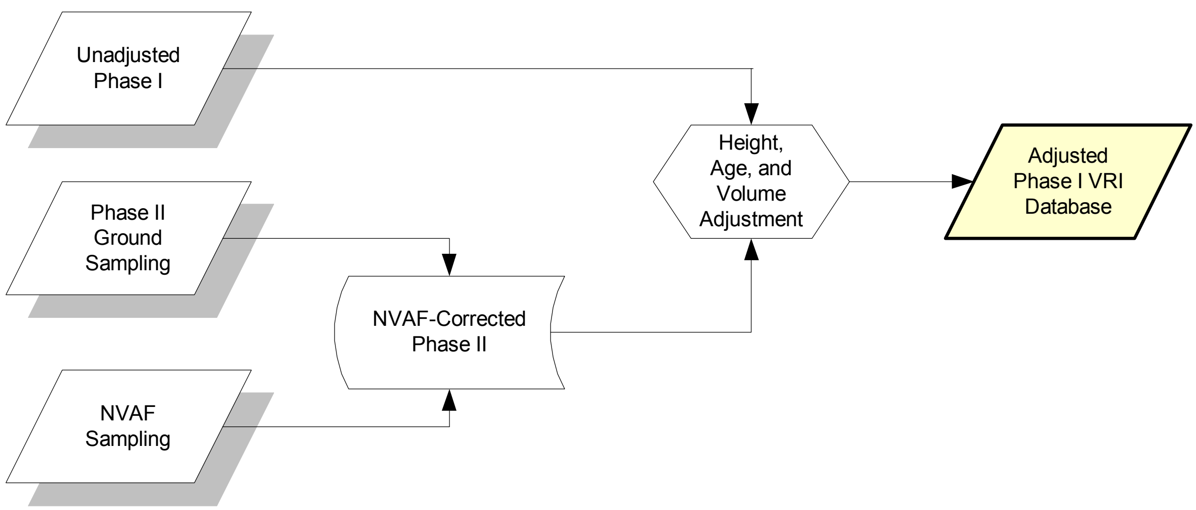

Figure 1. VRI flowchart.

1.1.2 TFL 48 VRI Program

Canadian Forest Products Ltd. – Peace Operations (Canfor) initiated a VRI program on Tree Farm Licence (TFL) 48 in 1997, in response to the Chief Forester's request in the 1996 rationale for AAC determination.[1] Canfor completed Phase I in time for the second timber supply review (TSR),[2] and

[1] Pedersen, L. 1996. Tree Farm Licence 48 Canadian Forest Products Ltd. Rationale for Allowable Annual Cut Determination. December 31, 1996. 37 pp. + app.

intends to complete the entire VRI program in time for TSR III, due in 2006. Phase II ground sampling was completed between 1998 and 2002, and the NVAF program was completed in 2004. The VRI statistical adjustment is, therefore, the last component to finalize the VRI program on TFL 48.

1.2 PROJECT OBJECTIVES

The project objectives were to:

1. *Estimate the total and average height, age, net merchantable volume at the 12.5 cm+ utilization level (volume 12.5+), and net merchantable volume at the 17.5 cm+ utilization level (volume 17.5+) by priority area for the Vegetated Treed (VT) polygons.*
2. *Achieve a 95% sampling error of ±10% in net merchantable volume in the High and Moderate priority areas.*
3. *Distribute the estimated total of each attribute of interest among all the polygons within the target population.*

1.3 DOCUMENT OBJECTIVES

The objectives of this document were to:

1. *Summarize the VRI activities implemented on TFL 48 since 1997.*
2. *Document assumptions and analytical methods used to adjust the VRI database.*
3. *Present the VRI statistical adjustment results.*
4. *Discuss the risks and uncertainties related to the TFL 48 VRI statistical adjustment for the upcoming TSR.*

J.S. Thrower & Associates Ltd. (JST) completed an interim VRI statistical adjustment of TFL 48 in March 2003.[3] The present document supersedes the 2003 report.

1.4 TERMS OF REFERENCE

This VRI statistical adjustment report was prepared for Don Rosen of Canfor. Guillaume Thérien, *PhD* (JST) completed the analysis and report writing. This report was prepared as an internal document for Canfor.

[2] Baker, K. 2001. Tree Farm Licence 48 Canadian Forest Products Ltd. Rationale for Allowable Annual Cut (AAC) Determination. September 20, 2001. 42 pp. + app.

[3] J.S. Thrower & Associates Ltd. 2003. Tree Farm Licence 48 Vegetation Resources Inventory Statistical Adjustment. Unpublished Report, Contract No. CFC-007, March 31, 2003. 14 pp.

2. METHODS

2.1 LANDBASE

TFL 48 is located around the town of Chetwynd in the Dawson Creek Forest District of the Northern Interior Forest Region (Figure 2). The total area of the TFL has changed since the last TSR in 2001, as some areas have been added while others have been removed. The new total area of the TFL is 643,238 ha.

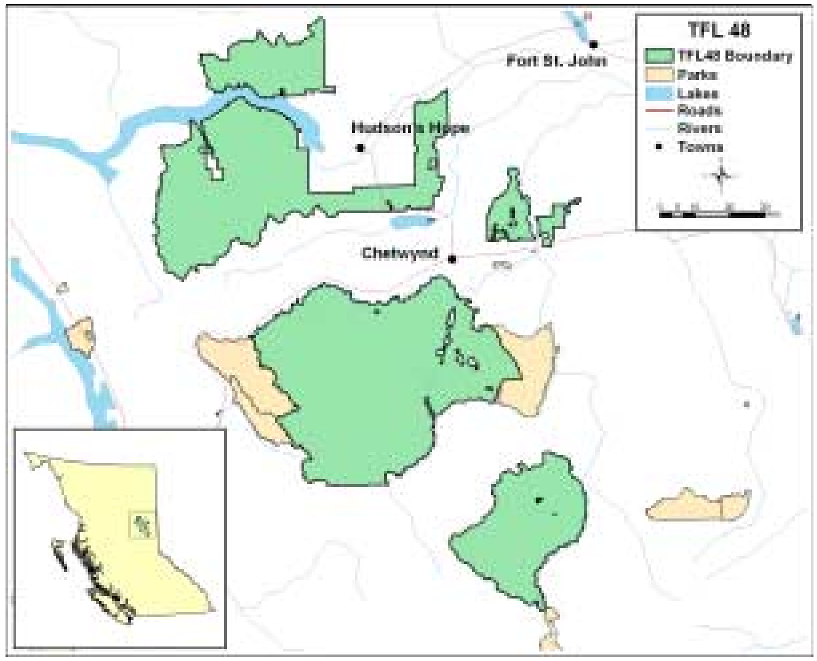

Figure 2. TFL 48 location.

The TFL lies within the Engelmann Spruce-Subalpine Fir (ESSF), Sub-Boreal Spruce (SBS), Boreal White and Black Spruce (BWBS), and Alpine Tundra (AT) biogeoclimatic zones. The main stand types are pure lodgepole pine (Pl) and balsam fir (Bl) stands, and mixed Bl-spruce (Sx) and Pl-Sx stands. The TFL area is evenly distributed among immature, mature, and over-mature stands.

2.2 TARGET POPULATION

The total area of the TFL where Phase I was completed as of January 1, 2005 totaled 641,462 ha (Table 1). A small area around Stewart Lake (1,776 ha) has not been inventoried because it was just recently added to the TFL.

The target population for the VRI adjustment excludes non-VT areas, stands that were established after 1970 (<30 years in 2000), and stands under the shelterwood silvicultural system. The target population for the VRI adjustment represented 517,586 ha (81% of the entire TFL).

Table 1. Target population net-down.

Land Class	Area (ha)	(%)
Total TFL	643,238	100%
Stewart Lake	1,776	0%
Inventoried areas	641,462	100%
Non-VT areas	76,701	12%
VT areas	564,761	88%
Below 30 years old	46,170	7%
30 years old+	518,591	81%
Shelterwood	1,004	0%
Target Population	*517,586*	*81%*

2.3 Stratification

The target population was stratified to reflect the likelihood of a polygon being included in the timber harvesting landbase (THLB) in the next TSR (Table 2). High priority areas include polygons most likely to be included in the THLB and represented 50% of the target population. Moderate priority areas (10% of the target population) were polygons that might also be included in the THLB, whereas Low priority areas were polygons that will probably not be included in the THLB.

Table 2. Target population area by priority class.

	Area (ha)	(%)
High	257,583	50%
Moderate	50,549	10%
Low	209,454	40%
Total	*517,586*	*100%*

2.4 Phase I

2.4.1 Update and Projections

Canfor completed the Phase I using aerial photography taken between 1993 and 1997. The Phase I data were updated for depletion to 2005 and projected for growth to January 1, 2000 (Figure 3).[4] The statistical adjustment presented in this report was completed on the 2000 population. Thus, report statistics indicate the state of the 2000 population. The adjusted Phase I data should be projected to January 1, 2005 for inclusion in TSR III.[5]

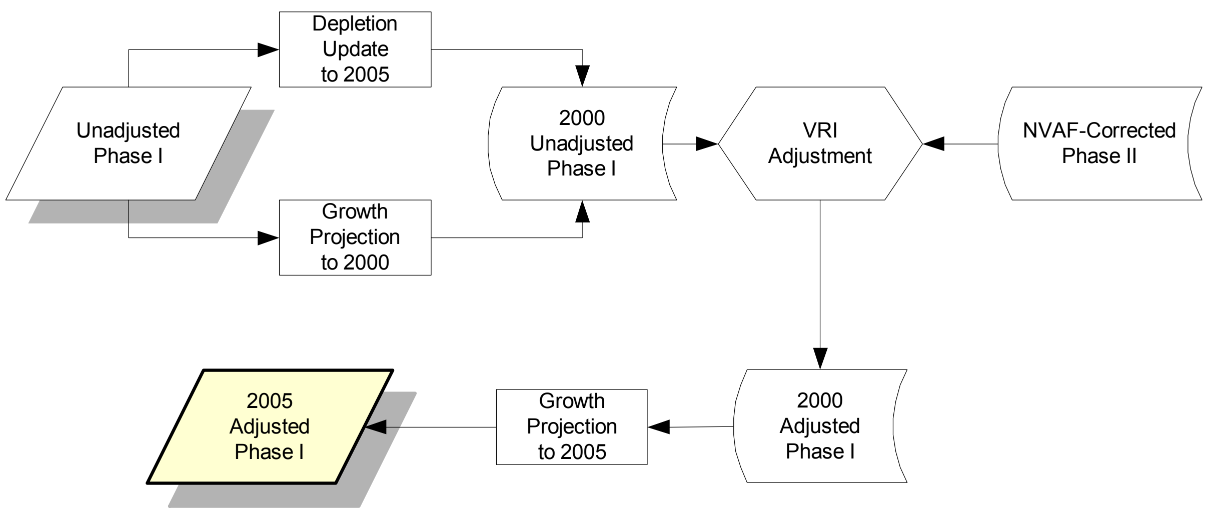

Figure 3. Update, adjustment, and projection of the TFL 48 Phase I inventory.

2.4.2 Statistics

The average Phase I volume 12.5+[6] in the High priority areas was approximately 227 m^3/ha while the average site index was 14.0 m (Table 3). The average mean annual increment (MAI) 12.5+, computed as the average volume divided by the average age, was approximately 1.8 m^3/ha/year. In the Moderate

[4] Year 2000 was selected because it represented the median year among the measurement dates of all the Phase II sample plots.

[5] This could be done with the VDYP7 growth model when it becomes available.

[6] Phase I volumes presented in this report were merchantable volume less decay, waste, and breakage as estimated by *VDYP version 6.6d.*

priority areas (mostly younger stands), the average site index was higher than in the High priority areas (15.4 m), while the average MAI was 1.2 m^3/ha/year (at 52 years).

Table 3. Phase I statistics by priority class for the target population.

Priority Class	Area (ha)	Height (m)	Age (yrs)	SI (m)	Vol. 12.5+ (m^3/ha)	Vol. 17.5+ (m^3/ha)
High	257,583	22.9	128	14.0	226.7	209.1
Moderate	50,549	13.2	52	15.4	62.6	41.6
Low	209,454	14.2	149	7.0	99.7	83.6
Total	*517,586*	*18.5*	*129*	*11.3*	*159.3*	*142.0*

2.5 Phase II Ground Sampling

2.5.1 History

The Phase II ground sampling was completed in four different projects (Table 4). One hundred and fifty-four (154) plots were established on TFL 48 over four years. The Phase II projects used different sample selection procedures, different target populations, and different inventories.

Table 4. Number of Phase II plots by year and project.

Year	Project				Total
	4741	4742	DDCA	DDCB	
1998	65		4	6	75
1999			7		7
2001		71			71
2002		1			1
Total	*65*	*72*	*11*	*6*	*154*

In 1998, prior to the new Phase I, Canfor established 65 Phase II ground plots in mature polygons for inventory audit purposes (project 4741).[7] These plots were selected systematically using a sorted list based on the previous mature forest inventory. These plots were revisited after the new Phase I was completed to determine which auxiliary plots were located in the new polygons.

In 1998, the MOF started to implement a VRI program across the Dawson Creek Forest District (projects DDCA and DDCB).[8,9] Seventeen (17) plots were established on TFL 48 before the stakeholders re-assessed their business needs and decided to sample only crown lands outside of the TFL.[10] These MOF plots were systematically selected from a random list based on the previous inventory. These plots were not revisited after the new Phase I was completed; however, to make these plots compatible with the new Phase I, auxiliary plot locations were checked using a Geographic Information System (GIS). Auxiliary plots not in the same polygon as the Integrated Plot Centre were deleted. Three auxiliary plots outside of an originally sampled polygon (and therefore not sampled) were located within a new polygon. The data for these plots were considered missing (or a non-response) and, therefore, represented a small potential bias.

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[7] Canadian Forest Products Ltd. 1998. Dawson Creek Forest District Vegetation Resources Inventory Ground Sampling Plan TFL 48 Management Unit Inventory. Unpublished Report, November 6 1998, Amended March 15, 1999. 11 pp.

[8] J.S. Thrower & Associates Ltd. 1997. Dawson Creek Forest District Vegetation Resources Inventory Ground Sampling Plan Revised Final Report. Unpublished Report, Contract No. MFI-401-033, October 8, 1997. 37 pp.

[9] J.S. Thrower & Associates Ltd. 1997. Dawson Creek Forest District Vegetation Resources Inventory Ground Sampling Plan Revised Final Report Addendum. Unpublished Report, Contract No. MFI-401-033, October 20, 1997. 3 pp.

[10] Matt Makar, personal communication, November 2, 2004.

In 2001, Canfor implemented another VRI ground sampling program on the TFL to increase the sample size in specific areas of interest (project 4742).[11] Seventy-two (72) plots were selected across the entire landbase using probability proportional to size with replacement (PPSWR) based on the new Phase I.

Table 5. Number of Phase II plots by year and project used for analysis.

Year	4741	4742	DDCA	DDCB	Total
1998	61		1	6	68
1999			6		6
2001		53			53
2002		1			1
Total	*61*	*54*	*7*	*6*	*128*

2.5.2 Sample Size

While 154 Phase II ground plots were established on the TFL, only 128 of these were used in the analysis (Table 5). Two plots were no longer in the TFL, 12 plots were located in non-VT polygons, one plot was located in a partially-harvested stand, and 11 plots were located in stands established after 1970. The sample plots were geographically distributed across the entire target population (Figure 4).

2.5.3 Sampling Weight

Approximately 60% of the 128 plots used in the analysis were selected systematically from a sorted list based on the previous forest inventory (projects 4741, DDCA, and DDCB). The remaining 40% were selected using PPSWR based on the new Phase I inventory. To simplify the analysis, we assumed that all plots were selected using PPSWR with the same stratification used in project 4742,[12] where polygons were stratified by priority class and leading species.

The sampling weights were computed using the total area of the stratum divided by the number of plots in that stratum used for analysis (Table 6). In the High and Moderate priority areas, Bl and Sx leading stands were combined in the Others species group. In the Low priority areas, deciduous stands were grouped with Sx stands in Others. Finally, larch (Lw) leading stands in the Low priority areas were combined with the Pl group. Stands in the Moderate priority areas were sampled with the highest sampling intensity (approximately 2,300 ha/plot). Each plot in the High priority areas represented approximately 3,000 ha, while plots in the Low priority areas represented over 10,000 ha each.

Table 6. Sampling weight by species group and priority class.

Species	High			Moderate			Low		
Group	Area (ha)	Plots	Area/Plot	Area (ha)	Plots	Area/Plot	Area (ha)	Plots	Area/Plot
Deciduous	48,801	10	4,880	9,738	4	2,435			
Bl							107,023	8	13,378
Pl	99,808	39	2,559	24,094	11	2,190	32,161	7	4,594
Sx									
Others	108,974	37	2,945	16,716	7	2,388	70,270	5	14,054
Total	*257,583*	*86*	*2,995*	*50,549*	*22*	*2,298*	*209,454*	*20*	*10,473*

[11] J.S. Thrower & Associates Ltd. 2000. Vegetation Resources Inventory Sampling Plan. Canadian Forest Products Ltd. Tree Farm Licence 48. Unpublished Report, Contract No. CFC-012-002, August 22, 2000. 18 pp.

[12] Sam, Otukol, *PhD* (MSRM – Resource Information Branch), personal communication, November 16, 2004.

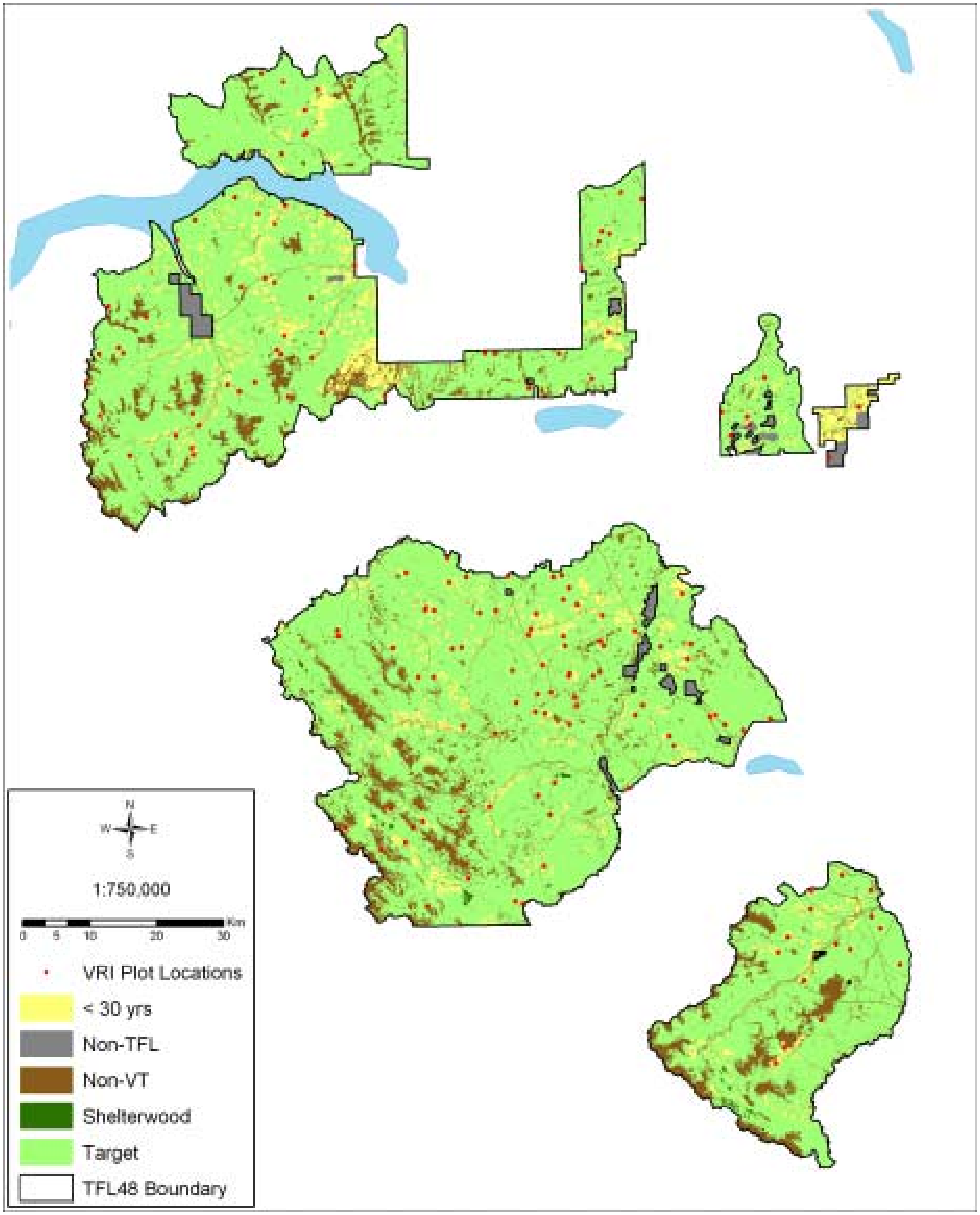

Figure 4. Phase II plot locations.

2.6 NVAF SAMPLING

2.6.1 Stratification

Forty-four (44) NVAF sample trees were selected by maturity class and species group from the Phase II ground sample.[13] Deciduous-leading polygons were considered immature if established in or after 1920 (≤80 years in 2000), and mature if established before 1920. Conifer-leading polygons established in or after 1880 (≤120 years in 2000) were immature, and mature otherwise. Species groups included Pl, Sx, and Others.

2.6.2 Ratio Estimation Algorithm

The NVAF ratios were computed using the model-based approach recommended by the MSRM.[14] The NVAF compiler provided by the MSRM on August 13, 2004 was used to compute the NVAF ratios.

2.6.3 NVAF Ratios and 95% Sampling Error

Most maturity class/species group combinations had similar NVAF ratios, around 1.07 (Table 7, Appendix I). Only mature Sx showed an NVAF ratio of 1.01. Thus, the net merchantable volume of trees in the immature, mature Pl, and mature Others strata were under-estimated by 6-9% by the taper equations and net factors. The under-estimation was 1% in mature Sx. The 95% relative sampling error was below 7% for all strata.

Table 7. NVAF adjustment ratios.

Maturity Class	Species Group	Sample Size	NVAF Ratio	95% E%
Immature	All	10	1.087	6.9
Mature	Pl	10	1.067	5.9
	Sx	12	1.008	2.7
	Others	12	1.060	6.8

2.7 PHASE II DATA COMPILATION

The Phase II ground data were summarized using the data provided by the MSRM on October 19, 2004. The sampled polygons were identified using the most recent version of the unadjusted Phase I and the plot locations. JST did not have access to the Phase II plot cards; hence, quality control for the data entry was the MSRM's responsibility. Measured height and net factoring from enhanced trees were used when available. The NVAF ratios were applied to the tree-level whole-stem volume less top, stump, cruiser-called decay, waste, and breakage, and these NVAF-corrected volumes were used for the VRI statistical adjustment.

Average volume 12.5+ was higher in the High priority areas than in the Moderate priority areas because these stands were older (Table 8). Average site index was also slightly higher in the High priority areas compared to Moderate priority areas. An opposite site index relationship occurred between the two priority areas in the Phase I data (Table 3).

Table 8. Phase II ground sampling statistics by priority class for the target population.

Priority Class	Sample Size	Height (m)	Age (yrs)	SI (m)	Vol. 12.5+ (m^3/ha)	Vol. 17.5+ (m^3/ha)
High	86	23.5	119	15.3	281.0	268.1
Moderate	22	15.2	70	14.1	118.5	79.0
Low	20	17.5	136	9.6	190.4	168.6
Total	*128*	*20.2*	*122*	*12.9*	*228.5*	*209.4*

[13] J.S. Thrower & Associates Ltd. 2004. Tree Farm Licence 48 Net Volume Adjustment Factor Sample Plan. Unpublished Report, Contract No. CFC-010, July 16, 2004. 7 pp.

[14] Will Smith, *RPF* (MSRM – Terrestrial Information Branch), personal communication, August 8, 2004.

This indicated that Phase I site index was poorly correlated with the actual ground site index. The average MAI 12.5+ was approximately 2.4 and 1.7 m^3/ha/year in the High and Moderate priority areas, respectively.

2.8 ADJUSTMENT PROCEDURE

The most recent MSRM VRI statistical adjustment standards were used for this project.[15] The MSRM adjustment process assumes that the Phase I volume is biased due to two sources of error:

1. An attribute bias associated with the photo-interpreted height and age; and
2. A model bias inherent to the growth and yield model used to estimate volume (*VDYP version 6.6d*).

Three attributes required for volume prediction are not directly adjusted. A new stocking class is derived by VDYP using adjusted age, while the MSRM has not developed methods to adjust species composition and crown closure. Leaving these attributes unadjusted is assumed to create a negligible bias.

The attribute adjustment procedure is a two-step process called the Fraser Method (Figure 5) and can be described as follows:

- In the first step, the biases in the Phase I height and age are corrected using adjustment ratios calculated from the Phase I and Phase II data. An attribute-adjusted volume can then be estimated using *VDYP* with the adjusted height and age.
- In the second step, an adjustment ratio estimated from the attribute-adjusted volume and the Phase II volume is calculated, and this ratio is used to correct the model bias in the attribute-adjusted volume.

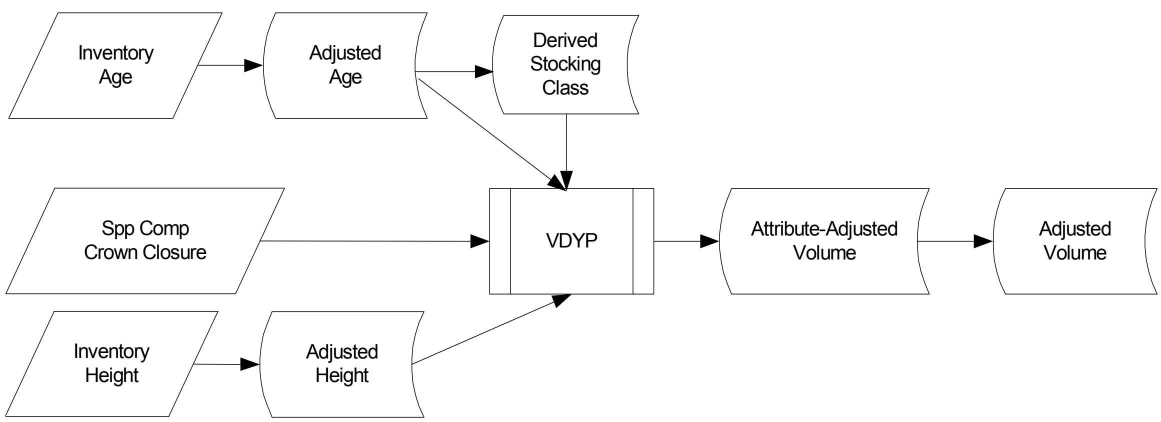

Figure 5. Fraser Method.

Post-stratification is a common technique used to improve the precision of the estimates. However, post-stratification was not attempted for this analysis since the sample selection was already based on a detailed pre-stratification.

[15] Ministry of Sustainable Resource Management. 2004. Vegetation Resources Inventory Procedures and Standards for Data Analysis Attribute Adjustment and Implementation of Adjustment in a Corporate Database. Unpublished Report, March 2004. 77 pp.

Height and age were adjusted using the ratio of means (ROM) method and the confidence index.[16] The confidence index is used to better distribute the adjusted average. For each individual stand, a confidence coefficient (k) can be computed for height or age using the confidence index for the stand (CI) and the average confidence index for all stands within the stratum ($\overline{CI}$) (Table 9):

Table 9. Average confidence index by stratum.

Priority Class	Confidence Index Height	Confidence Index Age
High	5.23	5.21
Moderate	5.54	5.65
Low	5.20	5.14

$$k = \frac{9 - CI}{9 - \overline{CI}}$$

The equation used to compute the adjusted Phase I is then:

$$\text{Adj. Phase I} = \text{Phase I} \times \left[(1-k) + (ROM \times k)\right]$$

If the confidence index for a stand is equal to the average index for the stratum, k is 1 and the adjusted Phase I estimate is equal to the unadjusted Phase I multiplied by the ROM. If the confidence index is 9, the Phase I estimate is assumed to be known without error. The coefficient k is therefore 0, and the adjusted Phase I estimate is equal to the unadjusted Phase I.

There is no confidence index for volume in the VRI Phase I. Therefore, volume was adjusted using only the ROM.

[16] Using confidence index is not part of the statistical adjustment standards. However Sam Otukol, PhD (MSRM biometrician) authorized a variance on February 18, 2005, as allowed by the standards.

3. RESULTS

3.1 HEIGHT

Height for the leading ground species was not always available or suitable for height adjustment. In two cases, species between Phase I and Phase II data could not be matched; in 13 cases, suitable Phase II heights were not available; and in one case, the height measured on the ground belonged to a different layer than the main Phase I layer (project 4741, sample no. 110). When Phase II height was unavailable for the site trees, we tried to obtain a match using the additional trees measured on the plot (X and O trees); however, no additional matches were found. Therefore, 112 height observations were left for analysis.

Height in the High priority areas was slightly under-estimated (by approximately 1%) in the Phase I data (Table 10, Appendix II). The ROM estimator was very precise in this stratum with a 95% sampling error of less than 4%. All species groups in the High priority areas showed similar relationships between Phase II and Phase I data. In the Moderate priority areas, height was under-estimated by approximately 4% on average; however, the under-estimation varied among species group. The among-species variation could be due to the small sample size used for each species group. The 95% sampling error in the Moderate priority areas was 10%. When the entire target population was considered, average Phase I height was under-estimated by 5%.

Table 10. Height adjustment statistics by priority class and leading species.

Priority Class	Spp.	Area (ha)	Sample Size	Height (m)			ROM	Adj. Pop (m)	95% E	
				Pop Avg.	Sample Avg. Ground	Sample Avg. Map			(m)	%
High	Decid.	48,801	9	23.9	24.1	23.9	1.006			
	Pl	99,808	35	21.0	22.7	22.1	1.028			
	Others	108,974	31	24.2	24.4	24.3	1.004			
	All	*257,583*	*75*	*22.9*	*23.7*	*23.4*	*1.013*	*23.2*	*0.8*	*3.6*
Moderate	Decid.	9,738	3	15.9	19.6	17.6	1.112			
	Pl	24,094	10	13.7	14.3	14.7	0.974			
	Others	16,716	6	11.0	11.9	10.6	1.126			
	All	*50,549*	*19*	*13.2*	*14.5*	*13.9*	*1.044*	*13.8*	*1.4*	*10*
Low	Bl	107,023	7	11.7	16.3	13.2	1.233			
	Pl	32,161	6	13.3	15.3	13.0	1.174			
	Others	70,270	5	18.5	20.0	20.0	1.001			
	All	*209,454*	*18*	*14.2*	*17.5*	*15.7*	*1.117*	*15.9*	*2.9*	*18.2*
All	*All*	*517,586*	*112*	*18.5*	*20.3*	*19.3*	*1.048*	*19.3*	*1.5*	*7.6*

3.2 AGE

Age for the leading ground species was not always available or suitable for age adjustment. In two cases, species between Phase I and Phase II data could not be matched; in nine cases, suitable Phase II ages were not available; and sample no. 110 from project 4741 was also deleted for the age adjustment. When Phase II age was unavailable for site trees, we tried to obtain a match using the additional trees measured on the plot (X and O trees); however, no additional matches were found. Therefore, 116 age observations were left for analysis.

In the High priority areas, Phase I age was over-estimated by approximately 6%, on average (Table 11, Appendix III). The 95% sampling error in this stratum was very small relative to the other strata (5.8%). The over-estimation was consistent among all species groups in the High priority areas. In the Moderate areas, Phase I age was under-estimated by approximately 16%. The 95% sampling error was relatively high at 15%. When the entire target population was considered, the average Phase I age was over-estimated by approximately 7%.

Table 11. Age adjustment statistics by priority class and leading species.

Priority Class	Spp.	Area (ha)	Sample Size	Age (yrs) Pop Avg.	Age (yrs) Sample Avg. Ground	Age (yrs) Sample Avg. Map	ROM	Adj. Pop (yrs)	95% E (yrs)	95% E %
High	Decid.	48,801	9	103	94	106	0.887			
	Pl	99,808	36	122	117	125	0.940			
	Others	108,974	32	145	137	143	0.959			
	All	*257,583*	*77*	*128*	*121*	*129*	*0.940*	*121*	*7.0*	*5.8*
Moderate	Decid.	9,738	3	46	60	51	1.172			
	Pl	24,094	10	54	59	55	1.070			
	Others	16,716	6	52	79	62	1.281			
	All	*50,549*	*19*	*52*	*66*	*57*	*1.155*	*60*	*9.0*	*15.0*
Low	Bl	107,023	8	140	107	144	0.744			
	Pl	32,161	7	117	119	107	1.116			
	Others	70,270	5	177	187	182	1.024			
	All	*209,454*	*20*	*149*	*136*	*151*	*0.897*	*133*	*28.4*	*21.3*
All	*All*	*517,586*	*116*	*129*	*123*	*131*	*0.929*	*120*	*10.3*	*8.6*

3.3 VOLUME

3.3.1 Attribute-Adjusted Volume

Volume 12.5+ increased by 7%, on average, after height and age adjustment (Table 12). This increase in volume was due to removing the bias in the growth model input. The age bias had little impact on the volume estimation since age decreased by 7% on average while volume increased by 7%. We can conclude that the volume bias was influenced more by the height than age bias.

Table 12. Change in volume 12.5+ due to height and age adjustment.

Priority Class	Area (ha)	Unadjusted Phase I (m^3/ha)	Attribute Adjusted (m^3/ha)	Diff. (%)
High	257,583	226.7	231.0	2%
Moderate	50,549	62.6	68.5	9%
Low	209,454	99.7	120.7	21%
Total	*517,586*	*159.3*	*170.5*	*7%*

3.3.2 Net Merchantable Volume

Sample 110 from project 4741 was again rejected, leaving 127 plots for analysis. Volume 12.5+ increased by more than 16% over the attribute-adjusted volume in the High priority areas (Table 13, Appendix IV). The 95% sampling error achieved in this stratum was slightly less than 11%. In the Moderate priority areas, volume 12.5+ increased by almost 60%, but the 95% sampling error was high at 38%. When only High and Moderate priority areas were considered, volume increased by approximately 19%. The 95% sampling error for the combined High and Moderate priority areas was 10.3%, marginally higher than the 10% target.

Table 13. Volume 12.5+ adjustment statistics by priority class and leading species.

Priority Class	Spp.	Area (ha)	Sample Size	Volume (m^3/ha)			ROM	Adj. Pop (m)	95% E	
				Pop Avg.	Sample Avg. Ground	Sample Avg. Map			(m)	%
High	Decid.	48,801	10	176.4	196.3	165.6	1.186			
	Pl	99,808	39	233.9	294.8	244.7	1.205			
	Others	108,974	37	252.7	306.3	272.2	1.125			
	All	*257,583*	*86*	*231.0*	*281.0*	*241.3*	*1.164*	*268.9*	*29.1*	*10.8*
Moderate	Decid.	9,738	4	63.2	218.0	73.4	2.970			
	Pl	24,094	11	77.1	82.9	70.3	1.180			
	Others	16,716	6	59.1	87.5	69.2	1.264			
	All	*50,549*	*21*	*68.5*	*112.2*	*71.3*	*1.574*	*107.8*	*40.9*	*38.0*
Low	Bl	107,023	8	96.2	147.8	100.6	1.469			
	Pl	32,161	7	112.0	194.2	86.9	2.234			
	Others	70,270	5	162.0	254.1	208.5	1.219			
	All	*209,454*	*20*	*120.7*	*190.6*	*134.7*	*1.415*	*170.8*	*61.3*	*35.9*
All	*All*	*517,586*	*127*	*170.5*	*227.9*	*181.6*	*1.252*	*213.5*	*36.0*	*16.9*

Volume 17.5+ increased by almost 20% in the High priority areas, while the 95% sampling error was slightly less than 12% (Table 14, Appendix V). In the Moderate priority areas, volume 17.5+ increased by 68%, with a 95% sampling error of 55%. When only High and Moderate priority areas were considered, volume increased by 21%. The 95% sampling error for the combined High and Moderate priority areas was 12%.

Table 14. Volume 17.5+ adjustment statistics by priority class and leading species.

Priority Class	Spp.	Area (ha)	Sample Size	Volume (m^3/ha)			ROM	Adj. Pop (m)	95% E	
				Pop Avg.	Sample Avg. Ground	Sample Avg. Map			(m)	%
High	Decid.	48,801	10	167.3	186.2	154.4	1.206			
	Pl	99,808	39	206.9	273.6	220.5	1.241			
	Others	108,974	37	238.2	299.8	259.1	1.157			
	All	*257,583*	*86*	*212.6*	*268.1*	*224.3*	*1.195*	*254.1*	*30.1*	*11.8*
Moderate	Decid.	9,738	4	44.7	165.7	50.4	3.288			
	Bl	4,141	2	33.7	38.3	8.6	4.448			
	Pl	24,094	11	47.6	48.5	41.0	1.183			
	Sx	12,575	4	46.1	70.6	65.5	1.079			
	All	*50,549*	*21*	*45.5*	*76.0*	*45.2*	*1.680*	*76.5*	*41.9*	*54.7*
Low	Bl	107,023	8	79.2	129.5	81.4	1.590			
	Pl	32,161	7	83.4	143.4	59.8	2.400			
	Others	70,270	5	149.5	239.8	191.2	1.254			
	All	*209,454*	*20*	*103.4*	*168.6*	*114.9*	*1.467*	*151.8*	*62.5*	*41.2*
All	*All*	*517,586*	*127*	*152.1*	*209.1*	*162.6*	*1.284*	*195.4*	*39.0*	*19.9*

The average Phase I volume 12.5+ of 159 m^3/ha increased to an overall average of 214 m^3/ha after adjustments, a total increase of 34% (Table 15). The same level of overall increase was observed for volume 17.5+. When only High and Moderate priority areas were taken into account, volume 12.5+ increased 21% over Phase I unadjusted volume.

Table 15. Net merchantable volume change after adjustment.

Priority	Area	Volume 12.5+			Volume 17.5+		
Class	(ha)	Phase I	Adj.	Diff.	Phase I	Adj.	Diff.
High	257,583	226.7	268.9	19%	209.1	247.5	18%
Moderate	50,549	62.6	107.8	72%	41.6	71.6	72%
Low	209,454	99.7	170.8	71%	83.6	146.4	75%
All	*517,586*	*159.3*	*213.5*	*34%*	*142.0*	*189.4*	*33%*

3.3.3 2005 TSR Volume

The volume used in TSR is based on utilization standards of 12.5 cm+ for Pl-leading stands and 17.5 cm+ for all other stands. In the last AAC determination, the AAC was split into volume from conifer- and deciduous-leading stands. Therefore, we looked at the impact of the statistical adjustment on TSR volume by forest cover type. Only High and Moderate priority areas were included in this analysis since these two strata will most likely make up the THLB in TSR III.

Average TSR volume/ha increased by approximately 21% after adjustment in both conifer- and deciduous-leadings stands (Table 16). MAI increased by about 0.5 m^3/ha/year (29%), and showed similar relative increases in both conifer- and deciduous-leading stands. There were an additional 189 million (MM) m^3 of standing volume after adjustment (158 and 31 MM m^3 in conifer- and deciduous-leading stands, respectively). These results confirm that there should be more volume available on TFL 48 for TSR III.

Table 16. TSR volume/ha, MAI, and total volume by leading forest cover type.

Cover	Priority	Area	Volume/ha (m^3/ha)			MAI (m^3/ha/yr)			Total Volume (MM m^3)		
Type	Class	(ha)	PhaseI	Adj.	Diff.	PhaseI	Adj.	Diff.	PhaseI	Adj.	Diff.
Conifer	High	208,782	231.6	274.9	19%	1.8	2.2	26%	729	863	18%
	Medium	40,810	59.5	99.4	67%	1.0	1.5	50%	35	59	68%
	All	249,593	203.5	246.2	21%	1.6	2.1	28%	764	922	21%
Deciduous	High	48,801	166	194.7	17%	1.6	2.0	24%	138	161	17%
	Medium	9,738	31.4	70.4	124%	0.6	1.2	97%	7	15	109%
	All	58,539	143.6	174	21%	1.4	1.9	30%	145	176	22%
All	High	257,583	219.2	259.7	18%	1.7	2.2	26%	867	1,025	18%
	Medium	50,549	54.1	93.8	73%	0.9	1.4	56%	42	73	75%
	Total	308,132	192.1	232.5	21%	1.6	2.1	29%	909	1,098	21%

4. DISCUSSION

4.1 Sample vs. Population

Table 17. Proportion of the population below (above) the minimum (maximum) observed in the sample.

Priority Class	Expected Proportion	Height Below	Height Above	Age Below	Age Above	Volume Below	Volume Above
High	0.6%	0.8%	1.6%	0.1%	3.2%	1.8%	0.2%
Moderate	2.3%	5.9%	6.8%	0.0%	0.4%	0.0%	1.3%
Low	2.5%	4.2%	12.8%	2.6%	9.4%	0.0%	7.4%

A sample must adequately cover the range of observed values in the population to avoid extrapolating information to areas that were not sampled. We expect that a minimal amount of extrapolation will be required with a random sample since the minimum and maximum values observed in the population will not always be included in the sample. With a random sample of size n, one would expect on average that 100%/2*n of the population is below (above) the minimum (maximum) observed in the sample.

In the High priority areas, the sample generally covered the range of height, age, and volume (Table 17). In the Moderate priority areas, the sample did not adequately cover the range of heights (6% of the population was below the minimum observed in the sample and 7% was above the maximum). Therefore, adjusted heights at the extremities of the range in this stratum (below 6.6 m, above 19.9 m) were extrapolated beyond the sampled range, and could be biased. Similarly, in the Low priority areas, stands at the upper end of the range of height, age, and volume required extrapolation and could be biased.

4.2 95% Sampling Error

The targeted 95% sampling error for volume 12.5+ was 10% for the High and Moderate priority areas. The sampling error achieved on TFL 48 (10.3%) was marginally higher than the target. Therefore, while the target error was not met, the precision of the adjusted volume should not be a cause for concern in TSR III. The sampling errors for height, age, and NVAF ratios were all within acceptable limits for timber supply analysis.

4.3 Impact of Change

4.3.1 Age

There was little change in the age distribution after adjustment (Figure 6). The largest differences were observed in age classes 5 and 8 (based on Phase I age), where the area proportion increased by 5% and decreased by 6%, respectively.

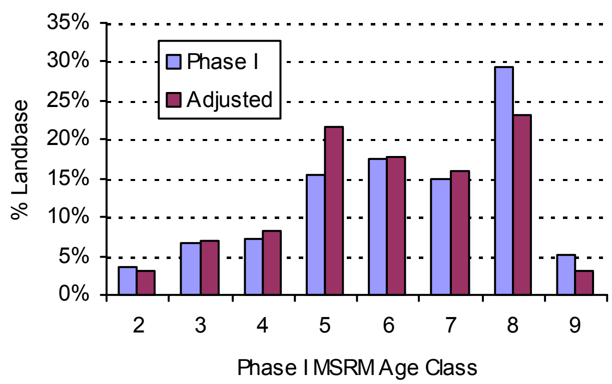

Figure 6. Change in the MSRM age class distribution after adjustment.

4.3.2 Volume

The overall 34% increase in volume 12.5+ was relatively consistent across all age classes (Table 18). The increases in age classes 3 and 9 were significantly more important but these two age classes represent relatively small areas.

Table 18. Change in volume 12.5+ by age class due to adjustment.

Age	Phase I		Adjusted		Vol.
Class	Area (ha)	Vol. (m^3/ha)	Area (ha)	Vol. (m^3/ha)	Diff.
2	18,674	11.8	16,365	15.8	34%
3	34,690	37.5	35,525	60.3	61%
4	36,760	93.7	43,125	129.0	38%
5	80,449	124.6	111,449	172.6	39%
6	91,084	162.2	91,788	217.6	34%
7	77,747	198.1	82,865	267.8	35%
8	151,550	204.6	120,167	290.4	42%
9	26,632	236.2	16,303	382.1	62%
Total	*517,586*	*159.3*	*517,586*	*213.5*	*34%*

4.3.3 MAI

MAI (12.5+) increased 42% on average after adjustment (Table 19). The MAI increased mostly in age classes 4 and 5, age classes where MAI culminates in most stands. The MAI increase is an indication that *VDYP version 6.6d* is under-estimating volume growth and yield on TFL 48. This could become a serious problem if yield tables for the next management plan are generated using *VDYP version 6.6d.* Canfor should investigate using a different model, such as VDYP7 if it is available, for generating natural stand yield tables for Management Plan (MP) 4.

Table 19. Change in MAI 12.5+ by age class due to adjustment.

Age	Phase I		Adjusted		MAI
Class	Area (ha)	MAI (m^3/ha/yr)	Area (ha)	MAI (m^3/ha/yr)	Diff
2	18,674	0.3	16,365	0.4	13%
3	34,690	0.7	35,525	1.1	58%
4	36,760	1.3	43,125	1.8	62%
5	80,449	1.4	111,449	1.9	96%
6	91,084	1.5	91,788	2.0	36%
7	77,747	1.5	82,865	2.1	45%
8	151,550	1.2	120,167	1.7	10%
9	26,632	0.8	16,303	1.4	2%
Total	*517,586*	*1.2*	*517,586*	*1.8*	*42%*

4.3.4 Site Index

Site index was not directly adjusted. Instead, it was derived from the adjusted height and adjusted age of the leading species using the MOF program Sindex version 1.21. Overall, site index increased by approximately 10% after adjustment (Table 20); however, most of the adjustment occurred in the older age classes (8 and 9) where a change in site productivity has no impact in timber supply analysis since yield tables for these age classes are usually flat-lined at the current volume.

Table 20. Change in average site index by age class due to adjustment.

Age Class	Area (ha)	Phase I SI (m)	Adj. SI (m)	Diff.
2	18,094	14.2	13.3	-6%
3	34,576	13.9	13.7	-1%
4	36,758	13.5	14.0	4%
5	80,437	12.1	13.4	10%
6	91,084	12.1	13.1	9%
7	77,747	12.2	13.2	9%
8	151,545	9.3	10.9	17%
9	26,632	6.4	8.5	33%
Total	*516,873*	*11.4*	*12.4*	*10%*

Note: polygons do not have a site index estimate if height is less than 1.3 m.

The increase in site index was observed across all major species groups (Table 21). In Pl-leading stands, site index increased by approximately 5% (from 13.3 to 13.9 m). Most Bl-leading stands were located in the Low priority areas. Site index increased by approximately 34% in these stands, but remained extremely low after adjustment at 8.3 m. Site index in Sx-leading stands increased by an overall average of 10% (from 10.8 to 11.9 m). Finally deciduous-leading stands increased the least (4%, from 15.6 to 16.3 m). Site index in stands in the High priority areas increased slightly (4%, from 14.0 to 14.6 m), while site index decreased in the Moderate priority areas (-7%, from 15.4 to 14.3 m). The Moderate priority areas covered only 50,549 ha.

Table 21. Average site index (m) before and after adjusting height and age by priority class and leading species.

Priority Class	Pl		Bl		Sx		Deciduous		All	
	Before	After	Before	After	Before	After	Before	After	Before	After
High	14.4	14.8	12.1	13.2	12.3	13.3	16.9	17.2	14.0	14.6
Moderate	14.6	14.1	13.2	11.3	15.7	13.9	18.1	16.9	15.4	14.3
Low	9.0	10.7	5.8	8.2	6.1	8.1	11.7	14.0	7.0	9.2
All	*13.3*	*13.9*	*6.2*	*8.4*	*10.8*	*11.9*	*15.6*	*16.3*	*11.4*	*12.4*

Note: Sx includes interior and black spruce; Pl includes small areas where Lw was leading.

4.4 Risks and Uncertainty

4.4.1 Height

The height residual graph (Appendix II) in the High priority areas shows a potential bias for predicted heights below 18 m and above 30 m. Adjusted height tended to under-estimate ground height (positive residuals) when the adjusted height was less than 18 m while it tended to over-estimate ground height (negative residuals) when the adjusted height was greater than 30 m. Predicted height was less than 18 m on 31,695 ha (12% of the stratum), and greater than 30 m on 15,450 m (6% of the stratum). No age bias could be detected in the High priority areas by looking at the age residual graph (Appendix III). Therefore, it is possible that site index is under-estimated in shorter stands and over-estimated in taller stands. A larger sample size in these areas would be required to confirm the potential bias.

4.4.2 Species composition

Species composition was not adjusted; therefore, the species proportions should be assumed to be biased. Methods exist to adjust species composition, but the MSRM has not yet approved a method for TSR. While unbiased species composition cannot be developed for TSR III, Canfor should consider implementing a species composition adjustment for internal forest management purposes.

4.4.3 Age Trend

Timber supply analysts in the MOF Forest Analysis Branch require that the inventory adjustment not distort the dynamic nature of the inventory data. They are concerned that adjustment ratios might be correlated with age, which would cause a bias if the ratios are not computed and applied by age class. The stratification used for adjustment was based on broad age classes and site index. Within each stratum, we tested if the volume residuals were correlated with age (Appendix IV and V). There was no significant correlation in the Moderate or Low priority areas; however, there was a positive correlation between volume residuals and age in the High priority areas. Volume will tend to be over-estimated at younger ages and under-estimated at older ages. In most cases, the bias should be less than 25 m^3/ha.

4.4.4 Site Index

Site index remained lower than expected after adjustment. For instance, site index in managed Pl-leading stands on TFL 48 should be approximately 18 m on average; however, the adjusted site index was between 12-13 m across most age classes (Figure 7). Future yield will be grossly under-estimated if these site index estimates are used to generate yield tables for future, managed stands. A few options exist to obtain more accurate potential site index estimates for managed stands.[17] Canfor should investigate these options before TSR III.

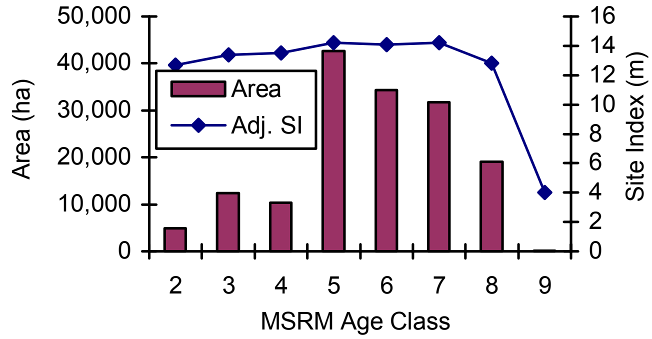

Figure 7. Average adjusted site index in Pl-leading stands.

[17] J.S. Thrower & Associates Ltd. 2003. Site productivity analysis for TFL 48. Version 2.0. Unpublished report, Contract No. CFC-006, July 15, 2003. 27 pp.

5. RECOMMENDATIONS

The TFL 48 VRI statistical adjustment showed that net merchantable volume increased by 34% after adjustment. The adjusted volume is an unbiased estimate of the volume on TFL 48 and should be used for the next MP for TSR III. Therefore, we recommend that:

The adjusted height, age, and volume be used in MP4.

The adjusted site index estimates do not reflect the potential site productivity on TFL 48 in most cases. Site productivity is one of the most important inputs for generating yield tables for a timber supply analysis. The under-estimated site index will translate into a lower long-run sustained yield than can be supported by the landbase. As a result, the potential AAC will probably be severely understated. A number of options for improving site index estimates exist. Therefore, we recommend that:

Canfor investigate methods to improve site index estimation on TFL 48.

The adjusted Phase I inventory represents the state of the inventory in the year 2000. The inventory must be projected forward to 2005 to be used in TSR III. The new version of VDYP (VDYP7) would be the ideal tool to project an adjusted inventory. If VDYP7 is not available, Canfor should discuss the best method to project an adjusted inventory with the MSRM. Therefore, we recommend that:

Canfor investigate options to project the adjusted Phase I inventory to 2005 in time for TSR III.

APPENDIX I – NVAF GRAPHS

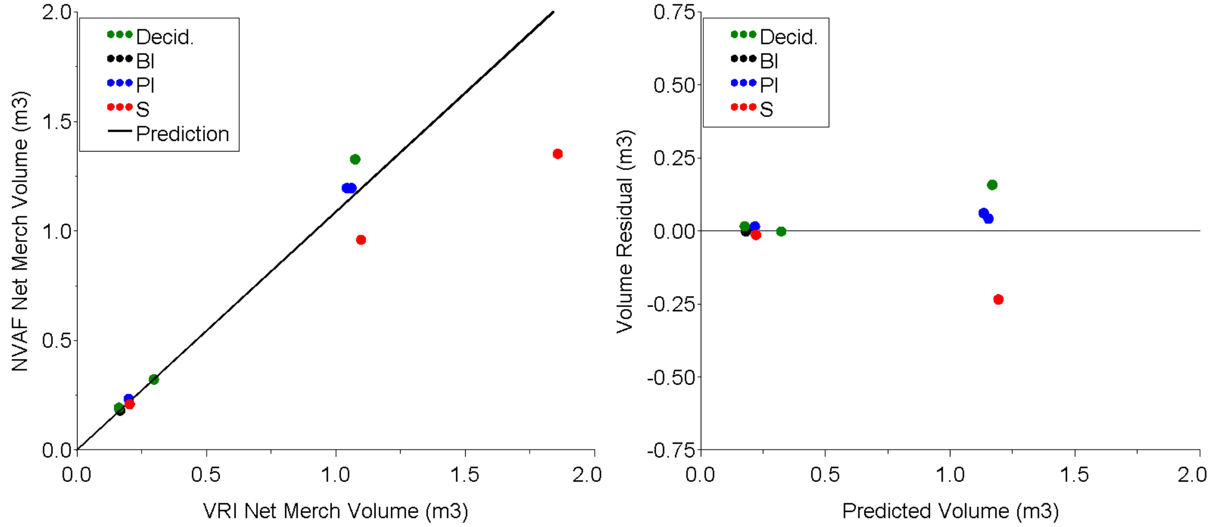

Figure 8. NVAF scattergram and residual plot for the Immature species group.

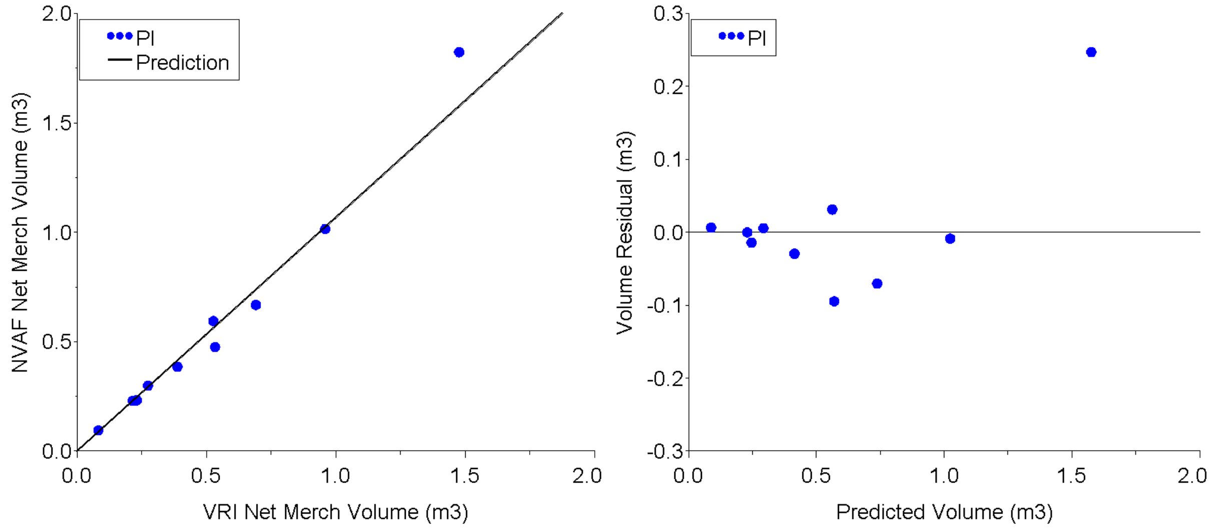

Figure 9. NVAF scattergram and residual plot for the Mature-Pl species group.

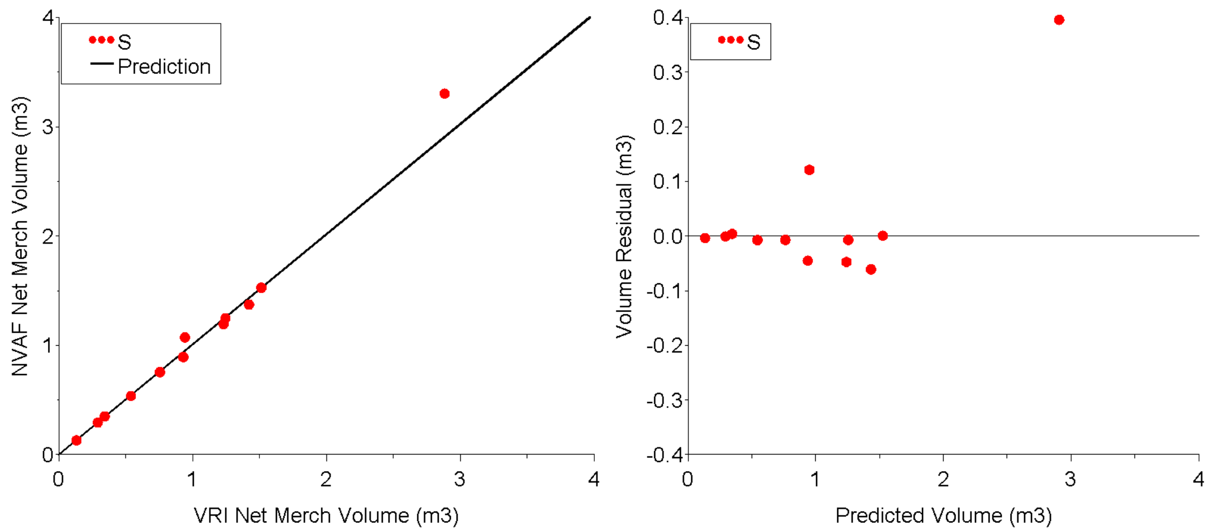

Figure 10. NVAF scattergram and residual plot for the Mature-S species group.

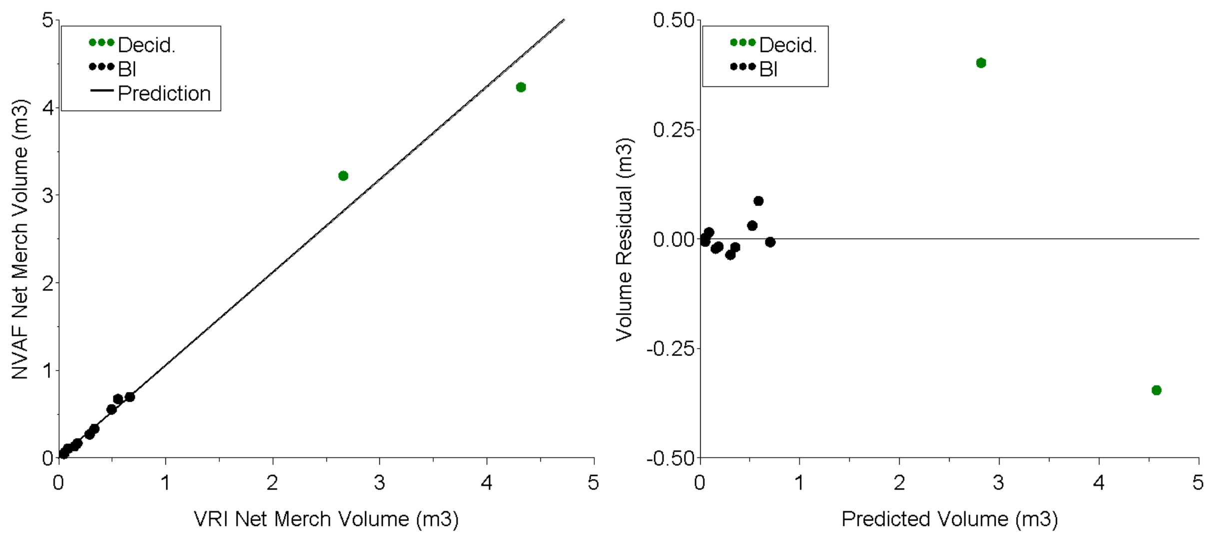

Figure 11. NVAF scattergram and residual plot for the Mature-Others species group.

APPENDIX II – HEIGHT ADJUSTMENT GRAPHS

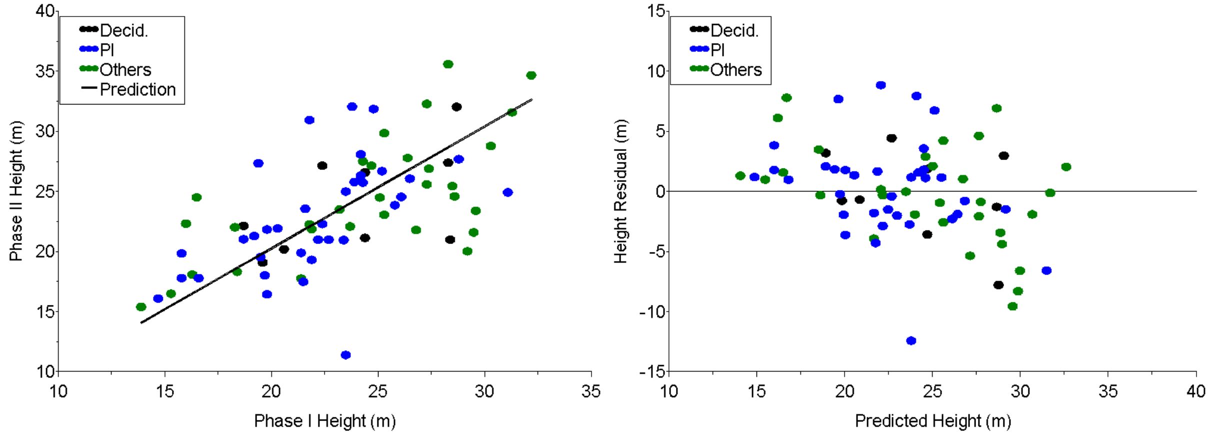

Figure 12. Height prediction and residual graphs for the High priority areas.

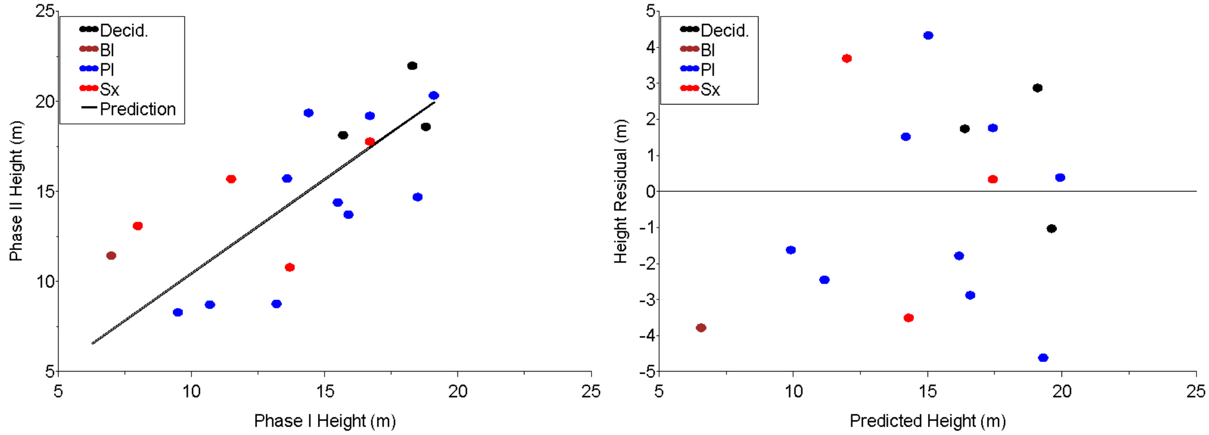

Figure 13. Height prediction and residual graphs for the Moderate priority areas.

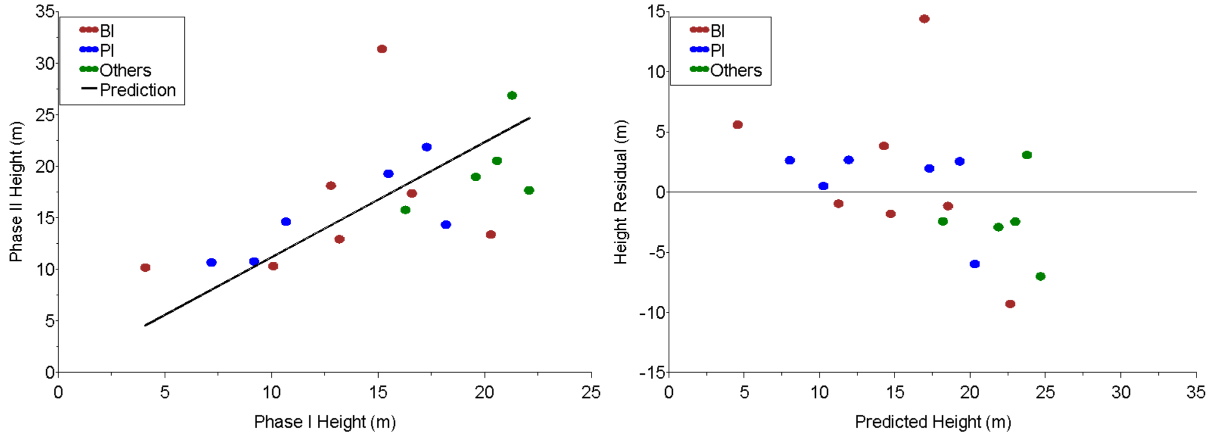

Figure 14. Height prediction and residual graphs for the Low priority areas.

APPENDIX III – AGE ADJUSTMENT GRAPHS

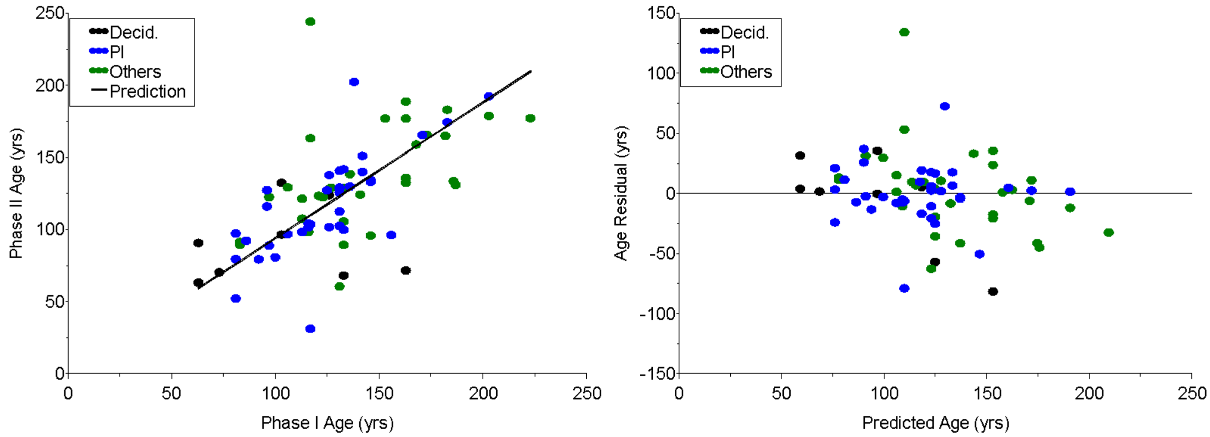

Figure 15. Age prediction and residual graphs for the High priority areas.

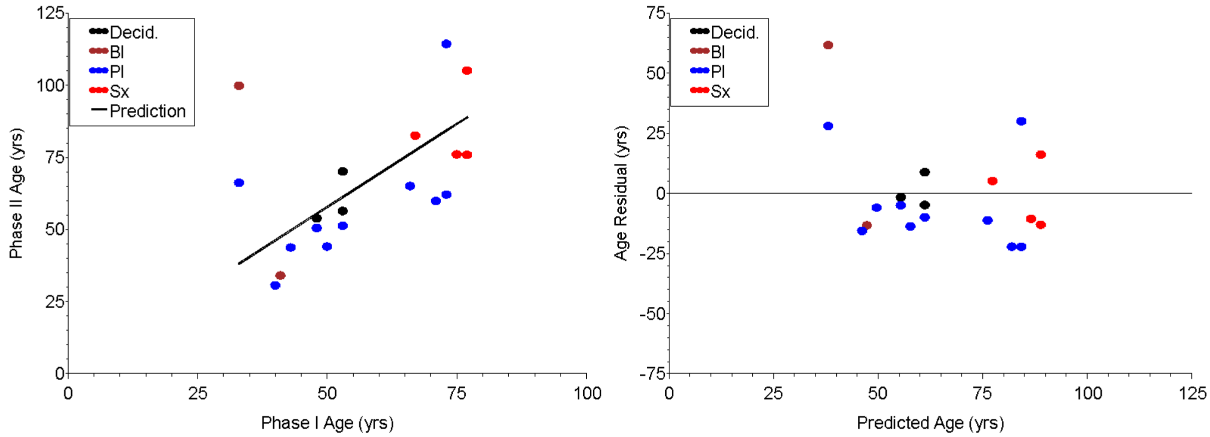

Figure 16. Age prediction and residual graphs for the Moderate priority areas.

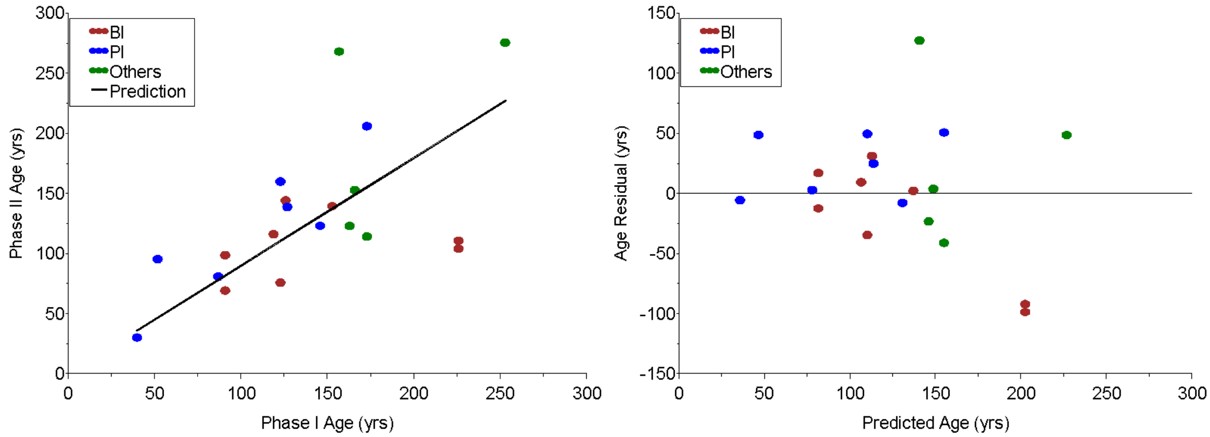

Figure 17. Age prediction and residual graphs for the Low priority areas.

APPENDIX IV – VOLUME 12.5+ GRAPHS

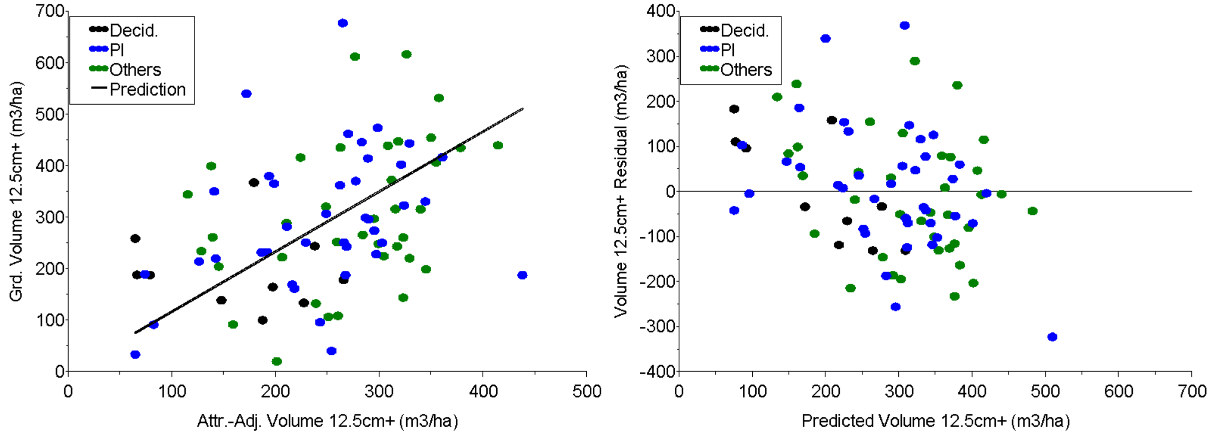

Figure 18. Volume 12.5+ prediction and residual graphs for the High priority areas.

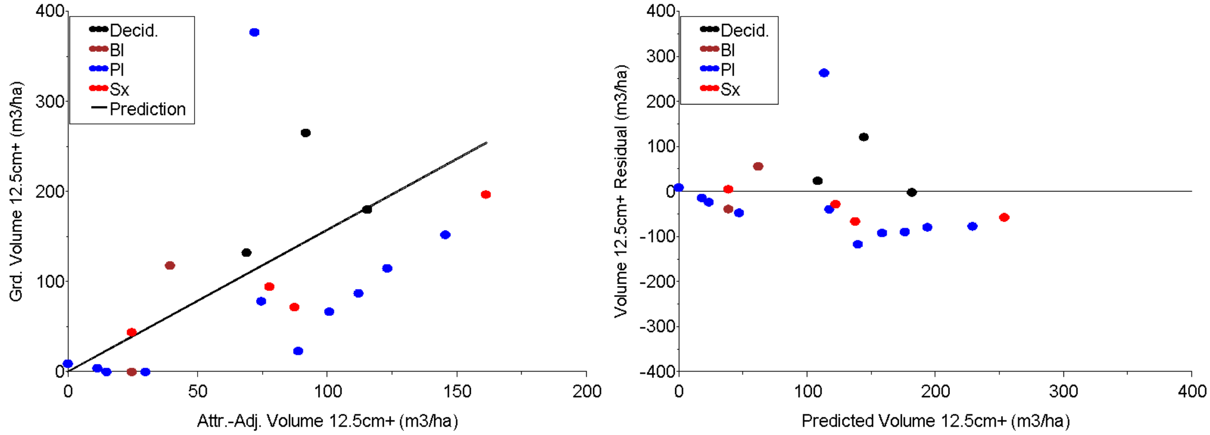

Figure 19. Volume 12.5+ prediction and residual graphs for the Moderate priority areas.

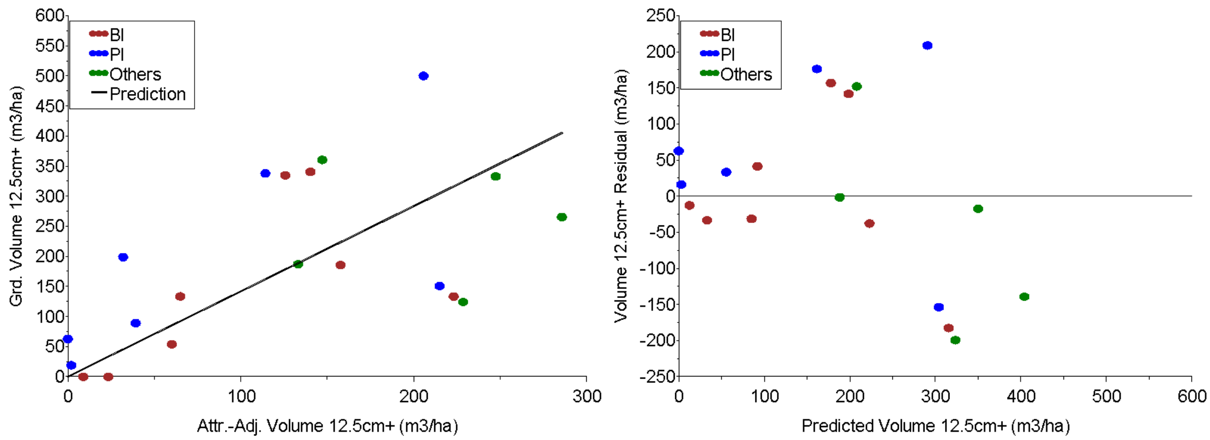

Figure 20. Volume 12.5+ prediction and residual graphs for the Low priority areas.

APPENDIX V – VOLUME 17.5+ GRAPHS

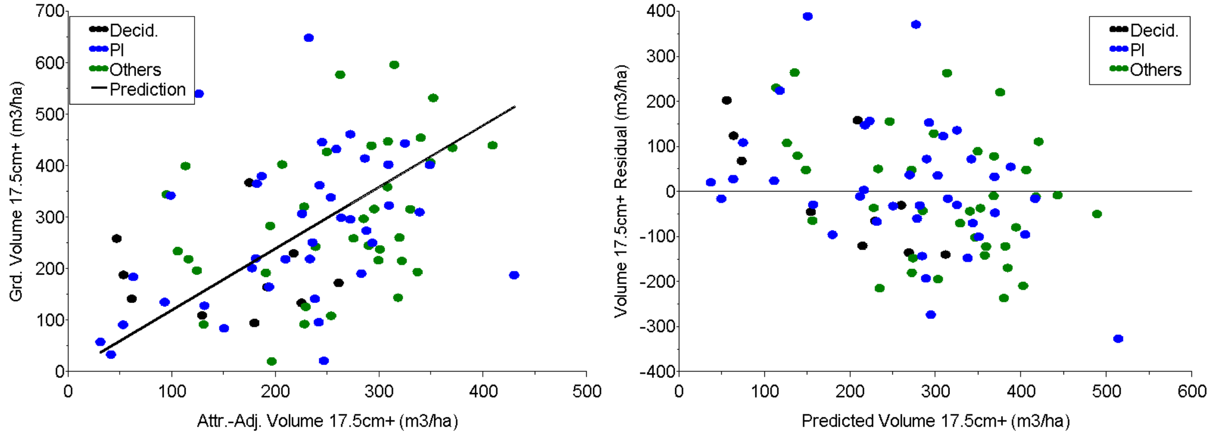

Figure 21. Volume 17.5+ prediction and residual graphs for the High priority areas.

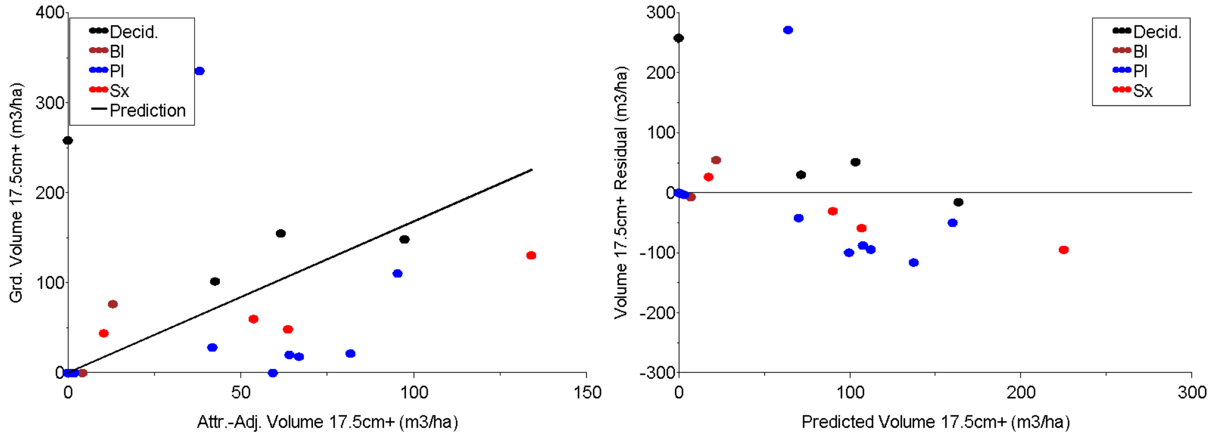

Figure 22. Volume 17.5+ prediction and residual graphs for the Moderate priority areas.

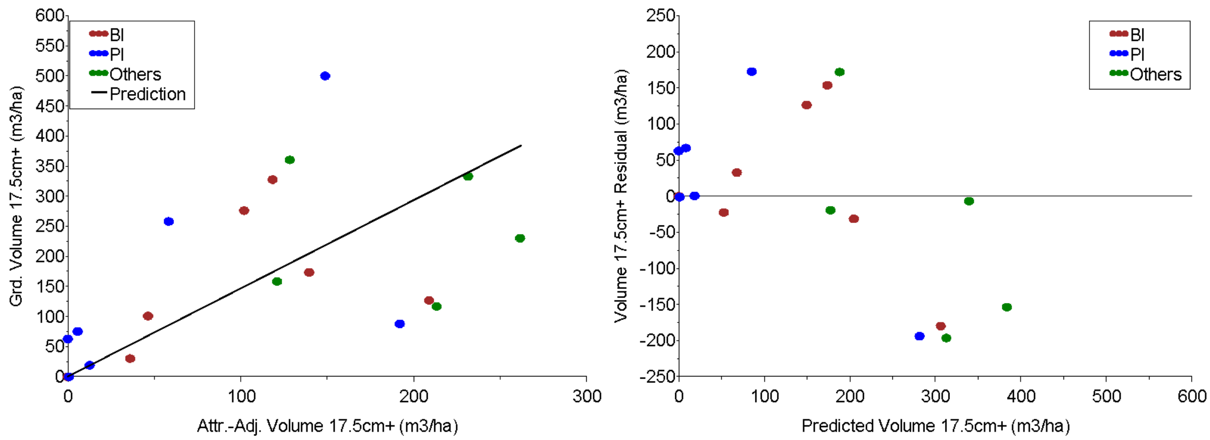

Figure 23. Volume 17.5+ prediction and residual graphs for the Low priority areas.

Appendix 10 – TFL 48 Change Monitoring Inventory Sample Plan

TFL 48
Change Monitoring Inventory
Sample Plan

Prepared for

Don Rosen, RPF
Canadian Forest Products Ltd.
Chetwynd, B.C.

Project: CFC-014

September 20, 2005

J.S. Thrower & Associates Ltd. *Consulting Foresters*
Vancouver – Kamloops, BC

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1. INTRODUCTION

1.1 BACKGROUND

Canadian Forest Products Ltd. Chetwynd Division (Canfor) is implementing a Change Monitoring Inventory (CMI) program in a continued effort to improve management of the forest resources of Tree Farm License (TFL) 48. Canfor achieved registration under the CSA sustainable forest management (SFM) system for TFL 48 in 2000. Canfor completed a Vegetation Resources Inventory (VRI) in 2000, with statistical adjustment in 2003 using the Phase II ground measurements. Canfor also explored opportunities for a site productivity program to develop improved site index information for TFL 48.

The volume in most post-harvest-regenerated (PHR) stands is projected to be higher than natural stands on the same sites. Increased projected yields exert upward pressure on forecasted timber supply, thus it is important that the G&Y of these stands is closely monitored to ensure this growth is achieved on the landbase.

The CMI program complements other programs as it help track G&Y attributes for the SFM plan, provides a broad-level check of G&Y attributes to identify potential problems with the G&Y model predictions, provides information for other internal management functions such as fiber allocation, and helps develop more accurate managed stand yield tables for the next timber supply review.

1.2 PROGRAM GOALS & OBJECTIVES

Canfor's goal for the CMI program is to monitor and track changes in key G&Y attributes over time in PHR stands on the TFL. The key attributes include volume, mean annual increment, site index, top height, and species composition. The intent is that the data from this G&Y monitoring program will be used to compare the predicted and actual productivity of PHR stands to support future timber supply analyses and SFM plans.

The objectives to achieve that goal are to:

1. Design a CMI sampling program that meets Canfor's goals and that is sufficiently flexible to address potential future changes in conditions, funding, and program objectives.
2. Install CMI ground plots at the establishment year.
3. Install new CMI ground plots and re-measure existing plots in the future re-measurement year as determined by this sample plan, available funding, and information needs at the time.
4. Analyze the data periodically to support future timber supply analyses on the TFL.

1.3 SAMPLE PLAN OBJECTIVES

The objective of this sample plan is to guide Canfor in the initial installation of CMI plots on the TFL and in future installation and remeasurements. This report will also provide information needed in the future statistical analyses of the CMI data.

1.4 TERMS OF REFERENCE

J.S. Thrower & Associates Ltd (JST) completed this CMI sample plan for Canfor on TFL 48. Don Rosen, *RPF* is the project leader for Canfor. René de Jong, *RPF* (JST) is the project manager, and Jim Thrower, *RPF*, PhD is the project advisor.

2. SAMPLE DESIGN

2.1 OVERVIEW

The key features of the sample design are:

1. Sample points are located on a 2,000 m grid based on NAD 83 UTM coordinates.
2. Plots are established at these sample grid points and located in PHR stands older than 15 years of age since harvest.
3. Plots are 11.28 m radius (400 m^2) circular plots as per the Ministry of Forests and Range (MOFR) CMI standards.[1]
4. Plot re-measurement and installation of new plots will be done on a 10-year interval.

2.2 TARGET POPULATION

The target population for the CMI program is all PHR stands[2] in the TFL. All species (including conifer and deciduous) and silviculture systems (including clearcut and shelterwood) are in the target population. A minimum age of 15 years is required to ensure that establishment plots have measurable merchantable volumes. Therefore, for the purposes of CMI plot establishment the target population is represented by PHR stands at least 15 years of age.[3] These stands are approximately 7% of the entire vegetated treed landbase (Appendix II and Appendix III).[4]

2.3 PLOT LOCATION

The CMI plots will be located in the target population on a 2,000 m grid based on NAD 83 UTM coordinates (evenly divisible by 2,000).[5] The advantage of locating plots on a grid instead of randomly is the convenience of locating sample points in the future. Statistical properties of the systematic samples and difference from random samples are known and can be addressed in future data analyses and reporting.

2.4 ESTABLISHMENT SAMPLE SIZE

The 2,000 m grid results in 60 grid points within the target population (Appendix IV). Additional grid points will only be excluded if a permanent road[6] has subsequently been established over a grid point. No exclusion will be made for grid points that fall within riparian management areas.[7]

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[1] Ministry of Agriculture and Land (previously Sustainable Resource Management (MSRM)) - National Forest Inventory BC Change Monitoring Procedures for Provincial and National Reporting ver. 1.4 March 2005. http://srmwww.gov.bc.ca/vri/standards/#cmi.

[2] All harvested cutblocks from Canfor's spatial cutblock coverage were used to define PHR stands. Digital coverage was provided by Don Rosen August 18, 2005.

[3] Stand age is based on the years between the harvest year from Canfor's spatial cutblock coverage relative to 2005.

[4] The spatial coverage for TFL 48 was based on the vegetated treed portion of the VRI inventory. This same spatial coverage was used for the recent VRI phase 2 adjustment project completed by JST in March 2005. For this CMI program, unadjusted attributes were used.

[5] Possible grid sizes ranged from 1,000 m to 2,000 m in increments of 200 m. The 2,000 m grid was agreed to following discussion of sample sizes and future recruitment rates using the different grid size options. In addition, grid sizes were divisible by 200 m to ensure consistency with Canfor's enhanced survey methods used in Ft. St. John. (per. comm. with Don Rosen June 29, 2005).

[6] Permanent roads include mainlines and mainline right-of-ways, and in-block permanent access structures. These exclusions ensure consistency with THLB netdown assumptions.

The large sample size of CMI plots will enable post-stratification of the data for analysis at the establishment phase. Post stratification is of value to assess attribute differences between strata such as species types.

2.5 PLOT DESIGN

The plot design is based on MOFR-approved CMI standards (Figure 1). The main plot is 400 m^2 (11.28 m radius) where all trees greater than 4 cm diameter at breast-height (DBH) are measured and tagged. Trees between 4 and 9 cm are measured and tagged in the small-tree plot (100 m^2, 5.64 m radius), and all trees taller than 30 cm but less than 4 cm DBH are measured and tallied by species in the regeneration plot (19.6 m^2, 2.50 m radius).

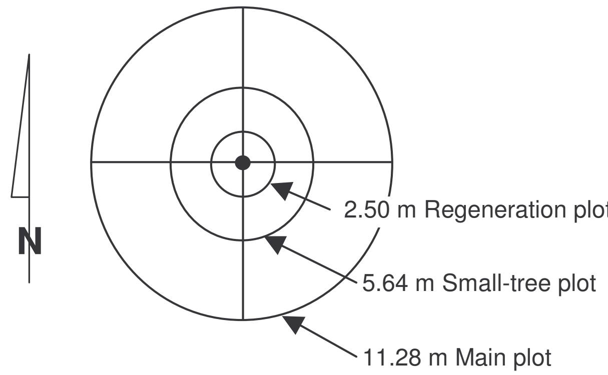

Figure 1. CMI sample plot.

2.6 PLOT MEASUREMENTS

The majority of CMI field procedures will be followed for this project, with the exception of modifications discussed below. These are also summarized in Appendix I.

2.6.1 Coarse Woody Debris

The 2005 CMI Standards will not be followed. Instead, the 2002 CMI standards[8] for CWD transects will be followed, where 2 X 24m transects are established, and only CWD data collected (ie., SWD not included).

2.6.2 Range Data

Shrub transect data will not be collected.
Standard forage production clipping plots will be collected along each CWD transect.

2.6.3 Ecology Data

Complete ecological data will be collected during establishment phase by a certified ecology sampler.

2.6.4 Top Height / Site Trees

There will be no change from standards in the way top height trees ('T' trees) are measured. For leading and secondary species ('L' and 'S' trees), the age and height of the largest diameter, dominant or co-dominant tree of every species present in each plot quadrant will be measured. This ensures the data for both the leading and second species are collected, plus it provides additional valuable data to examine site index relationships between species.[9]

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[7] While these areas represent the current state of these older PHR stands, the need for their inclusion may change in the future, as current management practice is to exclude the RRZ, and portions of the RMZ from the net area to be reforested.

[8] MSRM CMI Ground sampling procedures for the provincial CMI program. March 29, 2002. Ver. 1.2.

[9] Collection of this information supports the need to localize site index conversion equations, an issue previously raised by government in other related projects.

2.6.5 Other Height Trees

Other potential site trees will also be identified where the largest diameter tree is deemed unsuitable as a site tree. This includes provision for stepping-down the DBH list until a suitable site tree is identified. Such trees will be recorded as 'O' trees. While these trees will not be used in the CMI compilation program, their collection will ensure a site index estimation is taken for every plot, which would not otherwise be collected under CMI standards.

2.6.6 Tree Tagging

Blue tree tags are affixed at breast height rather than at stump. This simplifies installation and re-measurement without making the plot unduly visible.

2.6.7 Portion of Plots Outside Target Population

If a portion of a plot overlaps with an adjacent stand outside the target population (eg., mature / old growth) then site trees will be sampled from each stand type.[10] A drawing of the plot will be used to estimate the target population boundary line, and will be based on the 1:5,000 sample package maps.

2.7 Quality Control

Third-party quality assurance will be completed and follow current Ministry standards[11].

2.8 Data Entry

Data will be recorded on field cards and checked each night during the field sampling phase. Once field sampling is completed, data entry will use TIMVEG, the data entry software supported by MOFR.

2.9 Data Compilation

Data will be compiled using the MOFR CMI data compiler.[12]

2.10 Analysis and Interpretation

Data analysis is not a part of this project, however, an establishment report will be completed that describes the sample design, plot installation methods, and some basic summaries of the compiled measurements.

2.11 Re-measurement Schedule

Canfor will base its CMI re-measurement on a 10-year cycle to be consistent with Canfor's PSP re-measurement cycle.[13] The re-measurement period can be shortened if desired to be consistent with 5-year management plan cycle. Re-measurements will provide new information to check the PHR yield curves for each subsequent timber supply analysis. The recruitment rate of new CMI plots entering the minimum 15 year threshold age will be approximately 42 CMI plots over each ten-year period, based on the 2,000 m grid size.

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[10] Although we are interested primarily with PHR stands, suitable site trees originating from adjacent older stands outside the target population should also be measured (email from V. Sundstrom, MSRM, October 2, 2003).

[11] MSRM Change Monitoring Inventory – Ground Sampling Quality Assurance Standards ver. 1.1 March 29, 2002.

[12] This publicly available software was originally written by MSRM to compile both VRI and CMI data, and has been updated to June 27, 2002.

[13] per. comm. with Don Rosen June 23, 2005.

2.12 Future Modifications

Future modifications to the CMI program may include:

1) **Changes to sample intensity**
   Sampling intensity can be decreased or increased in the future as more plots are located in PHR stands. The number of plots in the CMI program will increase as more natural stands are harvested, regenerated, and reach 15 years of age. At some point in the future, the cost of the program may become too high and Canfor may want to reduce costs. This can be done by randomly dropping some plots in older PHR stands where the comfort on predicting stand yield is higher.

2) **Decreasing measurement period**
   A five-year measurement period is convenient because it corresponds to the MP schedule and would provide monitoring results sooner. However, this would substantially increase the CMI program costs.

3) **Re-defining the Target Population**
   Post-stratification of the CMI plots in the future may identify a need to concentrate on just a subset of the data (eg., specific species), and thereby reduce or remove CMI plots occurring in other strata types. Existing stands may have been harvested under varying historical standards, and some may be considered for future exclusion (eg, CMI plots located within riparian management zones may be excluded if the THLB netdown process also excluded these areas).

4) **Establishing linkages with other programs**
   Extend the CMI program to mature stands and possibly have links to VRI Phase II ground sampling.

   Provide a link with silviculture surveys designed to monitor the first 15 years of post-harvest.

5) **Combine with other CMI data**
   Utilize other previously collected CMI data from similar sites to increase statistical confidence of analyses.

6) **Adding other information**
   New tree measurements can be added to the CMI program at any time in the future. For example, measurements of branch size, tree taper, or wood quality could be included in the next measurement cycle. This would provide the same representative sample, but change estimates could not be computed until two or more measurements of the same attribute were taken. Future additions could also include more detailed ecological descriptions.

APPENDIX I – SAMPLING METHODS VARIANCE FROM CMI STANDARDS

For the most part, MOFR Monitoring procedures should be followed to establish the plots. This appendix outlines proposed changes to these procedures (by VRI / CMI card number) for consideration for use on TFL 48. It should be noted that any change may require modification of the CMI compilation procedures.

Header Card (CH – card 1)

Plot number – There are four spaces to enter a plot number on this card. It is recommended that plot numbers incorporate the UTM coordinates of the plot to ensure unique plot numbers over time. This also allows for easy location of the plot. A plot number based on UTM coordinates could be recorded in the notes section. A sequential plot number (for plots established in any given year) could be entered in the plot sample # field. This information along with the date of establishment will be stored in the database, allowing plot XXXX-XXXX to be cross-referenced as the Yth plot established in year Z.

Compass Card (CP – card 2)

Complete following 2005 CMI standards.

Cluster Layout Card (CL – card 3)

Complete following 2005 CMI standards.

If plot boundary overlaps with adjacent polygon outside target population (eg., mature / old growth stand, permanent road), map portion of plot outside target population using plot detail map. Reference the boundary line from the sample package map (based on ortho image X forest cover).

Range Sampling Shrub Transect 1 (RS – card 4)
Range Sampling Shrub Transect 2 (RT – card 5)

Do not sample shrub transects.

Sample standard forage production clipping plots along each CWD transect.

Coarse Woody Debris Transect 1 (EW – card 6)
Coarse Woody Debris Transect 2 (EC – card 7)

Do not follow 2005 CMI standards.

Follow 2002 CMI standards, where 2 X 24m CWD transects are established, and only CWD is sampled (ie., SWD not included).

Tree Details (TD – card 8)

Complete following 2005 CMI standards.

Tags will be nailed at breast height. Tagging sector (1-8) will be recorded in column S1 of Card 8.

Where the plot boundary overlaps with adjacent stand outside target population, then identify trees outside the target population in column S2 of card 8 (I=in, O=out).

Tree Loss Indicators (TL – card 9)

Complete and enter following CMI procedures with the exception of stem mapping.

Small Tree, Stump and Site Tree Data (TS – card 10)

Top height tree - measured as per 2005 CMI standards.

Leading and second species - not pre-determined, instead, potential site trees are measured from each species in each 11.28 m radius quadrant. Record as 'S' tree. Where the plot boundary overlaps with adjacent stand outside target population and the 'S' tree is determined outside the target population, then two 'S' trees are measured (one from the stand outside target population and one from PHR stand inside target population).

Other site trees - Additional potential site trees are measured from the next largest DBH tree of each conifer species in each 11.28 m quad, if the largest DBH tree is deemed unsuitable for site index. Record as 'O' tree. Note that these trees are not used as part of the CMI compilation procedures.
Where plot boundary overlaps with adjacent mature / old growth stand, do not sample 'O' tree from the adjacent older stand.

Auxiliary Plot Card (TA – card 11)

Not used.

Ecological Description 1 (EP – card 12)
Ecological Description 2 (ED – card 13)

Complete following 2005 CMI standards.

Tree and Shrub Layers (ET – card 14)

Complete following 2005 CMI standards except use the 11.28 m radius plot was instead of a 10.0 m radius plot.

Herb and Moss Layers (EH – card 15)

Complete following 2005 CMI standards.

Succession Interpretations (EO – card 16)

Complete following 2005 CMI standards.

APPENDIX II – TFL 48 LANDBASE

Canfor's TFL 48 covers approximately 643,000 ha, of which 565,000 ha (88%) are vegetated treed (Table 1). White spruce (Sw), Lodgepole pine (Pl) and subalpine fir (Bl) account for 83% of all leading species in the productive forest of the TFL (Table 2). Approximately 10% of the area is covered by stands up to 40 years of age, while 50% of the area is 121 years and older.

Table 1. TFL 48 area distribution.

Landbase	Area (ha)	(%)
Entire Landbase	643,238	100
Non-vegetated treed	76,701	12
Vegetated tree portion	564,761	88

Table 2. TFL 48 Area distribution by leading species and age class.[14]

	Age Class										Total	
Spp	0	1	2	3	4	5	6	7	8	9	(ha)	(%)
AC		1,973	910	1,895	2,171	3,195	5,600	3,026	2,868	8	*21,647*	*4%*
AT	19	4,730	4,768	8,724	10,241	15,035	14,267	7,470	932		*66,186*	*12%*
BL	1	5,373	2,187	8,502	4,075	15,527	13,218	18,960	50,283	3,564	*121,691*	*22%*
EP		240	378	1,051	867	445	260	103			*3,344*	*1%*
LT		6	34	150	67	129	64	13	64		*527*	*0%*
PL	289	6,888	3,757	14,257	9,797	22,747	30,059	34,305	41,409	171	*163,679*	*29%*
SW	1,008	18,614	2,291	6,350	3,439	12,632	15,167	26,515	68,593	26,021	*180,630*	*32%*
SB		3	311	926	354	903	1,041	1,115	2,360	44	*7,057*	*1%*
Total	*1,317*	*37,828*	*14,635*	*41,856*	*31,012*	*70,614*	*79,676*	*91,507*	*166,509*	*29,808*	*564,761*	*100%*
	0%	*7%*	*3%*	*7%*	*5%*	*13%*	*14%*	*16%*	*29%*	*5%*	*100%*	

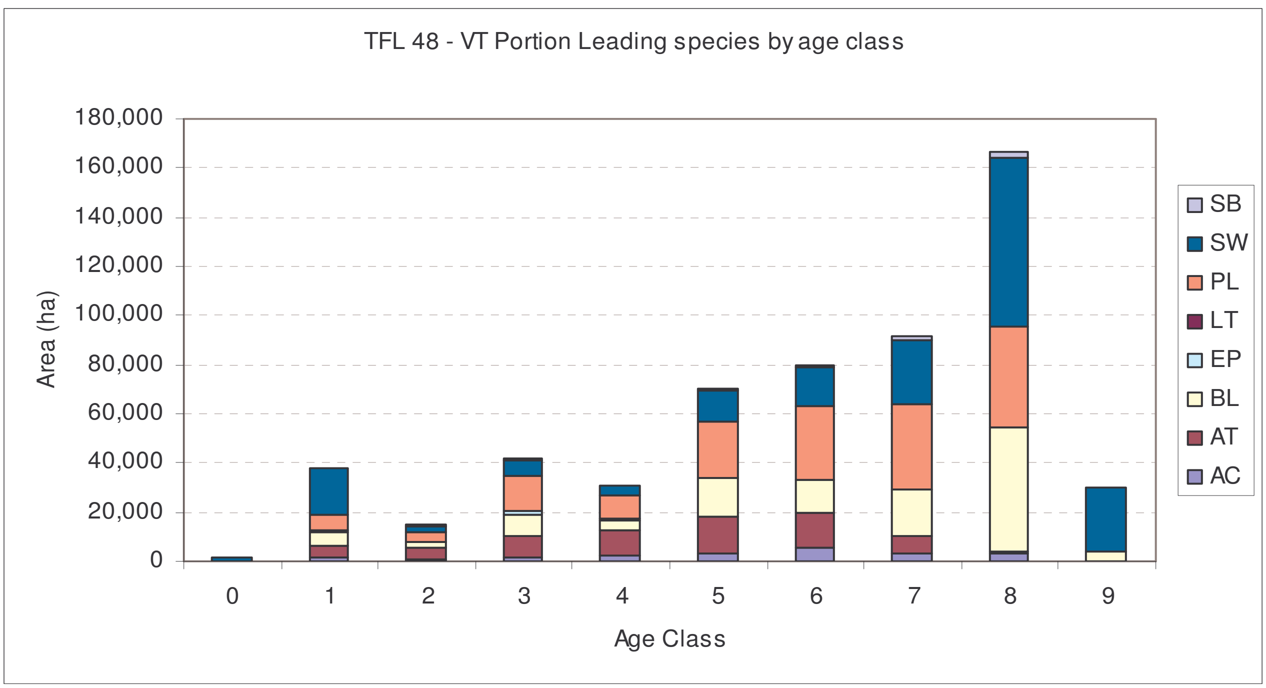

Figure 2. TFL 48 Vegetated treed area distribution by leading species and age class.

[14] Age class attributes are projected in the inventory file to the year 2004.

APPENDIX III – AREA DISTRIBUTION OF PHR STANDS

Table 3. TFL 48 Area distribution by leading inventory species and age[15] (ha).

Age range	Leading Inventory Species								*Total*	*%*
	Blank	AC	AT	EP	BL	PL	SW	SB		
0 – 4	603	252	1,306	1	578	2,045	6,155	131	*11,072*	*22%*
5 – 9	627	620	1,542	9	1,837	1,751	4,259	53	*10,697*	*21%*
10 – 14	501	341	690	4	2,292	442	2,736	3	*7,009*	*14%*
15 - 19	577	213	1,033	23	1,430	2,005	3,465		*8,746*	*17%*
20 – 24	346	519	458	36	1,014	1,179	2,371		*5,923*	*12%*
25 – 29	318	140	324	349	1,079	560	2,416	7	*5,192*	*10%*
30 – 34	34	95	219		17	72	739		*1,176*	*2%*
35 - 39	5				132	52	112		*301*	*1%*
40 – 44	1				10	23	17		*51*	*0%*
45 – 49	3		18			19	215		*254*	*1%*
Total	*3,014*	*2,180*	*5,589*	*422*	*8,389*	*8,148*	*22,485*	*195*	*50,422*	*100%*
%	*6%*	*4%*	*11%*	*1%*	*17%*	*16%*	*45%*	*0%*	*100%*	

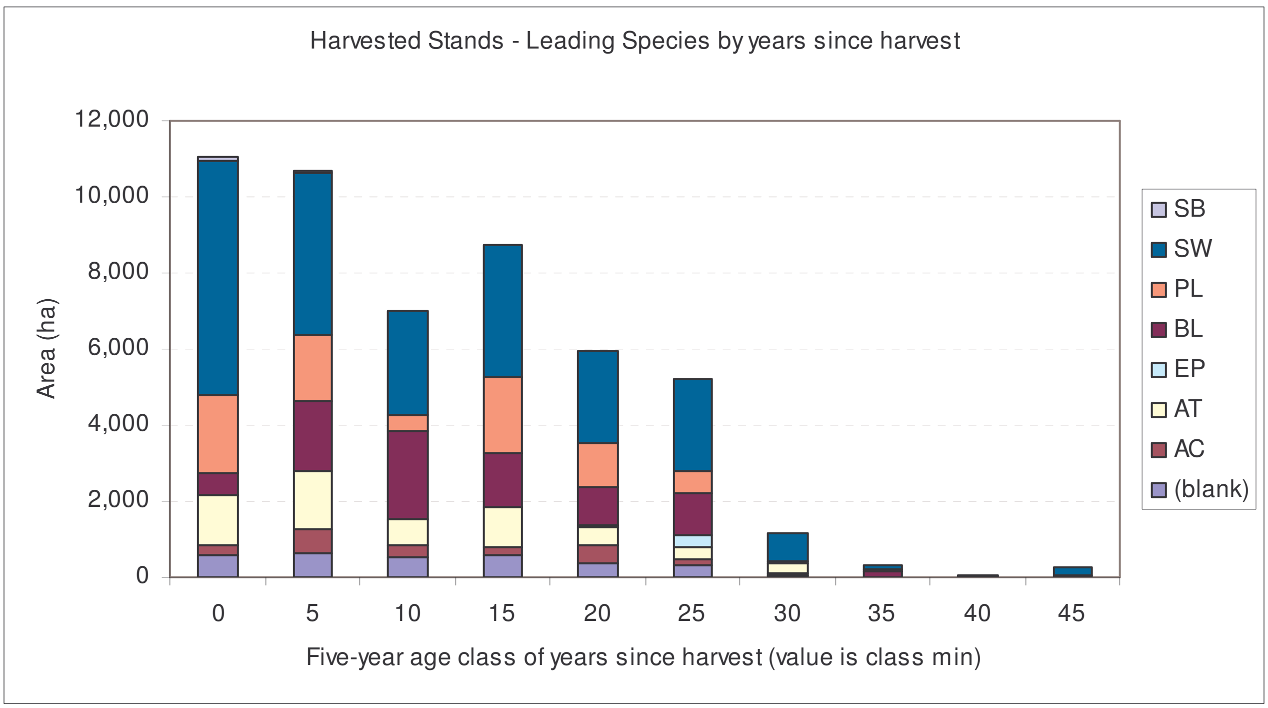

Figure 3. TFL 48 Area distribution of harvested stands by species and age.

[15] Age class for harvested stands is based on the number of years since harvest start date, relative to 2005.

APPENDIX IV – TFL 48 CMI ESTABLISHMENT SAMPLE LIST

The following sample list is based on a 2,000 m grid size for all possible sample points located on PHR stands that are at least 15 years from the date of harvest (relative to 2005). No assessment has yet been made whether any grid point should be excluded (eg., located on mainline roads or mainline right of ways, safety).

Grid (m)	Plot number	Mapsheet	Polygon	VRI Population type	UTM Easting	UTM Northing	Species 1	Species 2	Species 1 %	Species 2 %	Harvest year	Harvest age	Inventory age
2,000	1	093O087	1853	Young	524000	6190000	PL	SW	61	19	1986	19	16
2,000	2	093P052	2508	Young	582000	6158000	SW	AC	63	13	1989	16	14
2,000	3	093O050	2296	Young	560000	6142000	BL	SW	80	20	1977	28	19
2,000	4	094B008	1656	Young	534000	6216000	AC	SX	40	20	1990	15	11
2,000	5	094B008	1652	Young	536000	6216000	PL	SX	50	30	1989	16	11
2,000	6	093P021	1851	Young	564000	6128000	SW	PL	47	35	1985	20	12
2,000	7	093P052	2584	Young	580000	6156000	PL	SW	69	28	1986	19	15
2,000	8	094B009	860	Young	542000	6212000	SW	AC	37	26	1985	20	15
2,000	9	093O098	1639	Young	530000	6204000	BL	SW	60	30	1987	18	16
2,000	10	093O077	1630	Young	520000	6180000	SW	BL	50	30	1990	15	12
2,000	11	093O099	1611	Young	540000	6204000	AC	SW	30	28	1980	25	9
2,000	12	094B008	1771	Young	530000	6212000	SW	BL	44	23	1984	21	16
2,000	13	093P043	1844	Young	592000	6148000	SW	AT	54	41	1989	16	14
2,000	14	093I093	1445	Young	598000	6092000	SW	BL	56	43	1987	18	15
2,000	15	093P052	2627	Young	576000	6156000	PL	SW	91	7	1985	20	15
2,000	16	093O089	1535	Non-VT	544000	6194000					1972	33	
2,000	17	093O089	1644	Young	548000	6192000	PL	AC	94	6	1985	20	18
2,000	18	093P043	1803	Young	592000	6150000	AT	SW	60	20	1990	15	13
2,000	19	093O049	2083	Young	540000	6142000	BL	SX	60	40	1989	16	14
2,000	20	093P015	1540	Young	618000	6110000	SW	AC	64	19	1986	19	14
2,000	21	093O089	573	Young	548000	6190000	SW	AC	30	30	1986	19	17
2,000	22	093O099	1737	Young	540000	6198000	SW	AC	43	27	1986	19	15
2,000	23	093O099	1628	Young	540000	6202000	PL	AT	72	15	1984	21	19
2,000	24	093O077	1585	Young	514000	6182000	SW		100	0	1990	15	8
2,000	25	093O049	400	Non-VT	542000	6140000	BL	SW	80	20	1984	21	21
2,000	26	094B018	1191	Young	534000	6228000	SW	BL	46	38	1983	22	19
2,000	27	093P051	2411	Young	572000	6154000	BL	SW	50	30	1983	22	22
2,000	28	093P014	939	Young	612000	6114000	SW	AC	50	30	1988	17	12
2,000	29	093O097	1970	Young	524000	6196000	SW	BL	55	20	1985	20	18
2,000	30	093O098	1724	Young	534000	6198000	SW	BL	40	30	1983	22	14
2,000	31	093O029	1262	Young	550000	6122000	BL	SX	74	26	1990	15	13
2,000	32	093O020	1583	Shelter	560000	6114000	BL	SX	60	40	1978	27	86
2,000	33	093P052	2438	Young	578000	6160000	PL	SW	61	25	1986	19	15
2,000	34	093P042	760	Target	576000	6146000	SW	PL	70	20	1978	27	182
2,000	35	093O089	1702	Young	550000	6190000	AC	SW	50	43	1974	31	28

Grid (m)	Plot number	Mapsheet	Polygon	VRI Population type	UTM Easting	UTM Northing	Species 1	Species 2	Species 1 %	Species 2 %	Harvest year	Harvest age	Inventory age
2,000	36	093O050	2264	Young	558000	6144000	BL	SX	80	20	1979	26	24
2,000	37	093P004	1997	Non-VT	612000	6104000					1976	29	
2,000	38	093P033	1065	Young	600000	6136000	PL	BL	70	20	1990	15	14
2,000	39	093P092	915	Young	582000	6200000	SW	AT	70	20	1975	30	17
2,000	40	093P004	1957	Target	614000	6106000	SW	PL	50	40	1957	48	40
2,000	41	093O039	1722	Young	548000	6138000	SW	BL	60	40	1983	22	15
2,000	42	093O039	1735	Young	548000	6136000	SW	BL	70	30	1983	22	16
2,000	43	093O099	1842	Young	546000	6196000	PL	SW	49	29	1979	26	25
2,000	44	093O099	1745	Young	542000	6198000	PL	SW	58	29	1984	21	17
2,000	45	093O089	1636	Young	546000	6192000	PL	SW	64	23	1980	25	17
2,000	46	093P084	1318	Young	604000	6190000	EP	AT	42	21	1977	28	24
2,000	47	093P053	1611	Young	592000	6160000	SW	AT	50	20	1988	17	15
2,000	48	093O089	363	Young	542000	6192000	PL	SX	50	30	1986	19	14
2,000	49	093P014	943	Young	614000	6112000	PL	AC	50	30	1988	17	15
2,000	50	093O059	2290	Young	546000	6160000	PL	SX	80	11	1990	15	14
2,000	51	093O076	1026	Young	512000	6182000	PL	SX	60	30	1990	15	11
2,000	52	093O089	1696	Young	540000	6190000	PL	SW	80	10	1986	19	15
2,000	53	093O089	1710	Young	546000	6190000	PL	SW	43	28	1979	26	18
2,000	54	093P053	1579	Young	592000	6162000	SW	PL	70	20	1981	24	20
2,000	55	094B040	115	Young	550000	6242000	SW		100	0	1981	24	19
2,000	56	094B009	834	Young	538000	6214000	PL	SW	45	36	1986	19	16
2,000	57	093I094	1686	Young	610000	6092000	PL	AT	80	10	1990	15	13
2,000	58	094B009	904	Young	542000	6210000	SW	AC	70	24	1979	26	20
2,000	59	093O089	1509	Young	546000	6194000	AT	SW	48	23	1971	34	19
2,000	60	093P031	2841	Young	566000	6130000	SW	BL	50	30	1985	20	15

APPENDIX V – TFL 48 CMI 10-YEAR RE-CRUITMENT SAMPLE LIST

The following sample list is based on a 2,000 m grid size for all possible recruitment sample points in ten year's time, located on stands between 5 and 14 years of age (relative to 2005). No assessment has yet been made whether any grid point should be excluded (eg., located on mainline roads or mainline right of ways, safety).

Grid (m)	Plot number	Mapsheet	Polygon	VRI Population type	UTM Easting	UTM Northing	Species 1	Species 2	Species 1 %	Species 2 %	Harvest year	Harvest age	Inventory age
2000	1	093O086	1021	Young	510000	6192000	BL	SX	50	50	1993	12	8
2000	2	093O059	2359	Young	550000	6152000	SW	BL	90	10	1999	6	4
2000	3	093P092	964	Young	578000	6198000	SW	PL	50	30	1994	11	12
2000	4	093P042	2139	Young	588000	6148000	SW	AT	80	10	1996	9	8
2000	5	093O060	2532	Young	560000	6152000	SW	PL	70	20	1997	8	6
2000	6	093P051	1526	Target	570000	6154000	PL	SW	55	45	1996	9	131
2000	7	093I083	220	Target	600000	6082000	BL	SW	70	30	1999	6	172
2000	8	093O098	1669	Young	530000	6200000	BL	SX	20	8	1998	7	1
2000	9	093O099	1827	Young	538000	6196000	SW	BL	60	20	1996	9	7
2000	10	094B018	1247	Young	528000	6220000	AT	EP	50	30	1995	10	10
2000	11	093O029	1236	Shelter	548000	6124000	BL	SX	90	10	1998	7	43
2000	12	093P092	844	Non-VT	582000	6198000					1992	13	
2000	13	093O097	1836	Young	520000	6206000	AT	PL	50	40	1999	6	4
2000	14	093P052	1573	Target	582000	6154000	SW	AC	85	5	1996	9	156
2000	15	093P051	2496	Young	570000	6152000	BL	SX	60	30	1996	9	7
2000	16	093O060	2526	Non-VT	562000	6152000					1998	7	
2000	17	093I095	637	Target	618000	6090000	SW	ACT	90	10	1996	9	191
2000	18	093P085	687	Young	618000	6188000	SW		15	0	2000	5	3
2000	19	093P033	1080	Young	590000	6136000	SW	BL	50	40	1997	8	5
2000	20	093P042	2197	Young	584000	6142000	AT	AC	90	10	1999	6	5
2000	21	093I093	1470	Young	596000	6090000	SW	BL	60	40	1996	9	1
2000	22	093I084	1247	Young	606000	6082000	SW	BL	70	30	1993	12	8
2000	23	094B018	1002	Non-VT	530000	6218000					1991	14	
2000	24	093P032	1788	Non-VT	580000	6136000					1992	13	
2000	25	093O040	2453	Shelter	562000	6136000	BL	SX	60	40	1999	6	77
2000	26	093P084	1397	Young	602000	6186000	SW	PL	60	30	1997	8	7
2000	27	094B009	242	Non-VT	538000	6210000					1992	13	
2000	28	093P075	455	Young	614000	6182000	AC	AT	40	23	2000	5	1
2000	29	093I094	1710	Young	608000	6090000	SW	BL	60	30	1992	13	9
2000	30	093I094	1739	Young	606000	6088000	BL	SX	70	30	1993	12	6
2000	31	093P075	405	Young	614000	6184000	AC	AT	63	21	2000	5	6
2000	32	093P074	889	Young	602000	6184000	SW	AC	70	20	1997	8	7
2000	33	093O099	853	Target	544000	6196000	SW	PL	50	30	1999	6	158
2000	34	093O087	1823	Young	514000	6194000	SW	BL	80	20	1993	12	11
2000	35	093P085	748	Young	614000	6186000	AC	SX	39	38	2000	5	1

Grid (m)	Plot number	Mapsheet	Polygon	VRI Population type	UTM Easting	UTM Northing	Species 1	Species 2	Species 1 %	Species 2 %	Harvest year	Harvest age	Inventory age
2000	36	093O060	2258	Young	562000	6160000	SW	PL	60	40	1998	7	6
2000	37	093O060	2519	Young	556000	6152000	SW	BL	59	41	2000	5	3
2000	38	093P022	1103	Young	580000	6124000	BL	PL	50	30	1991	14	10
2000	39	093P032	1896	Young	582000	6138000	AT		100	0	1991	14	10
2000	40	093I083	407	Shelter	598000	6082000	BL	SX	70	30	1999	6	38
2000	41	093O097	1869	Young	522000	6204000	PL	BL	50	30	1997	8	6
2000	42	093P092	1030	Young	582000	6196000	SW	AC	50	30	1991	14	12

APPENDIX VI – ESTABLISHMENT SAMPLE LIST SPECIES DISTRIBUTION

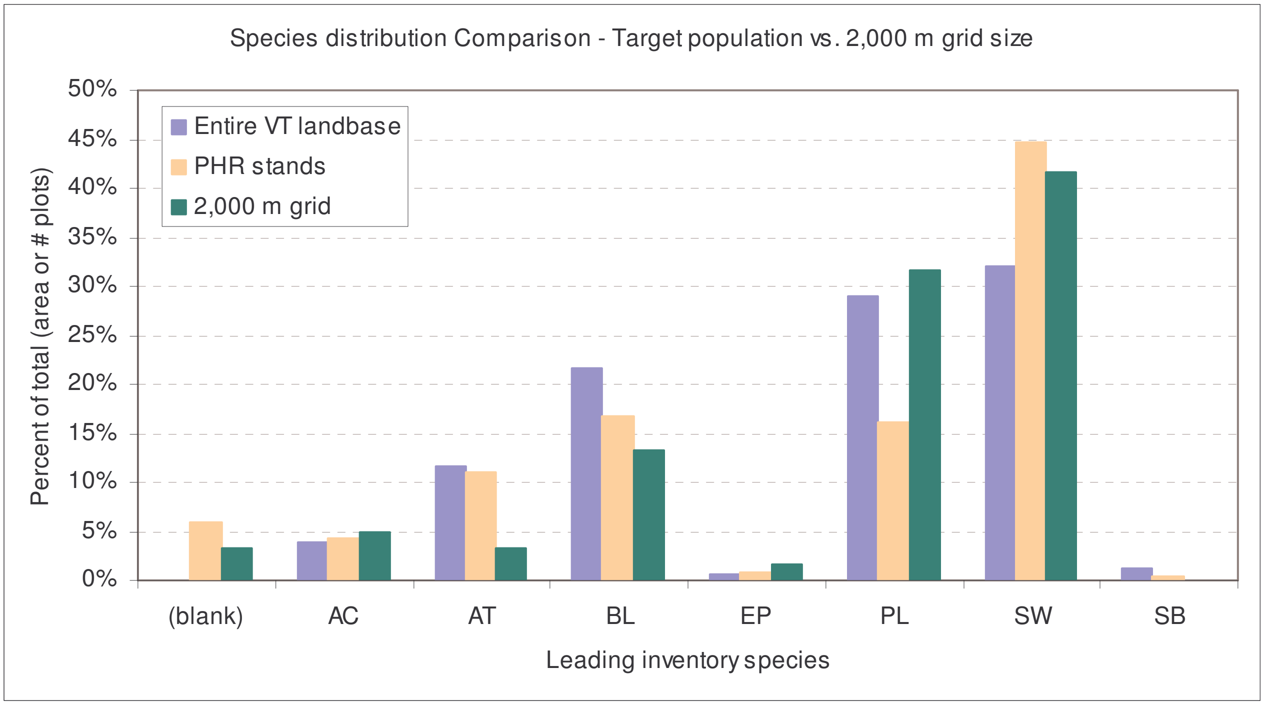

Figure 4. TFL 48 Comparison of species distribution between entire PFLB, PHR stands, and sample points based on a 2,000 m grid.

APPENDIX VII – CMI ALTERNATE SAMPLING OPTIONS

A range of grid sizes were assessed to evaluate the species distribution, current establishment sample sizes, and recruitment rates. Note that sample sizes are based on spatial grid overlays, and costs are estimated at $2,500 / plot (sample plan + establishment) and $1,250 / plot (re-measurement). Shaded cells include the chosen grid size for TFL 48.

Grid based sample sizes						Year 0 cost		Year 10 cost			
Grid (m)	establishment age range	recruitment age range	Grid area representation (ha / plot)	Establishment sample size – spatial grid (# plots)	10yr recruitment sample size – spatial grid (# plots)	Total # plots	Total cost	Total # plots	Establishment cost	Re-measurement cost	Total cost
1000	15-44	5-14	100	218	162	218	***$545,000***	380	405,000	273,000	***$678,000***
1200	15-44	5-14	144	158	103	158	***$395,000***	261	258,000	198,000	***$456,000***
1400	15-44	5-14	196	103	87	103	***$258,000***	190	218,000	129,000	***$347,000***
1600	15-44	5-14	256	89	69	89	***$223,000***	158	173,000	111,000	***$284,000***
1800	15-44	5-14	324	87	54	87	***$218,000***	141	135,000	109,000	***$244,000***
2000	15-44	5-14	400	60	40	60	***$150,000***	100	100,000	75,000	***$175,000***

Appendix 11 – Linkages of SFMP 4 to Dawson Creek LRMP

Relationship of the Sustainable Forest Management Plan to Higher-Level Strategic Plans

Dawson Creek Land and Resource Management Plan

The Dawson Creek Land and Resource Management Plan provides strategic direction for the sustainable use of Crown land and resources. The plan guides a wide variety of resource management issues:

- access
- agriculture and range
- air quality
- archaeology and palaeontology resources
- biodiversity
- coal and minerals
- communications, transportation and utilities
- energy, including oil and gas
- First Nations interests
- fish and wildlife
- forestry
- heritage and culture
- jobs, community stability and quality of life
- protected areas
- recreation and tourism
- soil conservation
- trapping and guiding
- visual quality
- water

Management guidance is provided through the establishment of strategic objectives and strategies. Many of the above resources and values are significantly related to, or influenced by forest management. Thus it is the intention of this Sustainable Forest Management Plan to describe how the strategic direction set forth in the LRMP is carried out in the planning and practices on TFL 48.

In this SFMP, the linkage from higher-level strategic plans to the SFMP is demonstrated in the following tables. A series of tables (Tables 1 – 5) lists the objectives of the LRMP and the Resource Management Zones where they apply, and identifies which SFMP indicators are related to the LRMP objective. The objectives have been extracted directly from the LRMP with only minor changes made to abbreviate the statements.

The following list of LRMP objectives were not included in this series of tables because they are unrelated to Canfor’s authority, planning and/or practices on the TFL.

1. Fish and Wildlife:
    a. Provide opportunities for the sustainable harvest of fish and wildlife resources. General Management Direction.
    b. Manage populations and distributions of regionally important wildlife species to reduce conflicts with range use and/or agriculture. RMZ specific direction.

2. Agriculture and Range:
    a. Plan and manage for potential agricultural growth on arable lands within the ALR. General Management Direction.
    b. Manage the forage resource to sustain its productivity and availability for use by domestic livestock. RMZ specific direction.
    c. Provide opportunities for agricultural growth. RMZ specific direction.
    d. Forage requirements for livestock will be given preference over those for wildlife within grazing tenures. RMZ specific direction.
    e. Sustain/manage wildlife and critical wildlife habitat to reduce wildlife-agriculture/range conflicts

3. Coal and Minerals:
    a. Develop, maintain, and upgrade utility corridors with sensitivity to high capability wildlife habitat, recreational values and visual quality objectives. General Management Direction.
    b. Rehabilitate unused corridors, where feasible. General Management Direction.
    c. Provide opportunities for environmentally responsible exploration and development of surface and subsurface resources. RMZ specific direction.
    d. Plan and manage coal, mineral and aggregate exploration and development activities with sensitivity to Identified Wildlife (e.g., bighorn sheep, mountain goat) and recreation values. RMZ specific direction.

4. Recreation:
    a. Plan and manage recreation and development activities with sensitivity to aboriginal, cultural and natural heritage values within Maurice Creek subzone. RMZ specific direction.
    b. Plan and manage recreation and development activities with sensitivity to agricultural and range. RMZ specific direction.
    c. Manage public and commercial recreation in natural or 'natural appearing' conditions. RMZ specific direction.
    d. Integrate recreational activities with grazing and resource extraction. RMZ specific direction.

5. Energy:
    a. Honour existing oil and gas tenures
    b. Provide opportunities and access for hydro-electric development and transmission
    c. Provide opportunities for the development of alternative energy sources (e.g., ethanol)

6. First Nations:
    a. Encourage the collection of traditional use information within the Twin Sisters RMZ. RMZ specific direction.

Table 1a. Ecological LRMP and SFMP linkages. LRMP Resource Values and objectives associated with ecological issues. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	RMZ Objective	RMZ Applicability				SFMP Indicator Applicability
Biodiversity	• Conserve the biodiversity of natural ecosystems	All				1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,54,55
	• Sustain healthy functioning ecosystems	MRC	SP	FH	PL	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23, 24,25,26,27,28,29,30,31,32,33,39,54,55
		WW	WC	AG	GR	
		ALT	ES	TS		
Soil Conservation	• Conserve soil productivity of forest, range and agricultural lands	All				21,23,24,25
Fish And Wildlife	• Sustain/manage wildlife habitat for red, blue and yellow-listed species	All				1,2,3,4,5,6,7,8,9,10,11,14,15,54,55
	• Sustain/manage fish habitat and water quality for red, blue and yellow-listed species	All				7,11,26,27,28,29,30
	• Sustain/manage habitat for resident and migratory wildlife species	All				1,2,3,4,5,6,7,8,9,10,11,14,15,54,55
	• Manage critical ungulate habitat to assist in sustaining viable, healthy ungulate populations	MRC	SP	FH	PL	10,15,54,55
		WW	WC		GR	
		ALT	ES	TS		
	• Manage medium and/or high capability grizzly bear habitat to assist in sustaining a viable, healthy population	MRC	SP	FH		10,11,15,20,37,54,55
		WW	WC			
		ALT	ES	TS		
	• Manage critical habitat for furbearers to assist in sustaining viable, healthy populations	MRC	SP	FH	PS	1,2,3,4,5,6,7,8,9,10,11,15,54,55
					GR	
		ALT	ES	TS		
	• Manage critical habitat for red- and blue- listed migratory songbirds to assist in sustaining viable, healthy populations (Pine/Murray R., Parkland, Kiskatinaw, and Pine R. subzones)	MRC	SP	FH	PL	1,2,3,4,5,6,7,8,9,11,15,54,55
				AG	GR	
	• Manage access to high quality fisheries to assist in sustaining viable, healthy sport fish populations	MRC	SP	FH		15,20
		WW	WC			
		ALT	ES	TS		

Table 1b (Continued). Ecological LRMP and SFMP linkages. LRMP Resource Values and objectives associated with ecological issues. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	LRMP Objective	RMZ Applicability				SFMP Target Applicability
Fish and Wildlife Continued	• Manage critical habitat for trumpeter swans to assist in sustaining viable, healthy trumpeter swan populations		SP		PL	7,15
				AG		
		ALT				
	• Manage critical high elevation caribou habitat to assist in sustaining viable, healthy populations			FH		1,3,4,9,10,11,14,15
		WW	WC			
			ES	TS		
	• Manage critical low elevation caribou habitat to assist in sustaining viable, healthy populations					1,3,4,9,10,11,14,15
		WW	WC			
		ALT				
	• Manage and sustain water quality and fish habitat for red- and blue- listed fish species and/or sport fish					7,11,26,27,28,29,30
				TS		
	• Sustain and manage wildlife habitat for regionally important wildlife (marmot, Stone's sheep, caribou, grizzly bear, Rocky Mountain goat, wolverine and furbearers, ptarmigan and blue grouse, porcupine, hares, pikas, moose, wolves, black bear, lynx, rainbow trout, grayling, bull trout, kokanee, white fish, harlequin duck, raptors, elk, mule deer and whitetail deer)					1,2,3,4,5,6,7,8,9,10,11,14,15,26,27,28,29,30
				TS		
Air Quality	• Meet or voluntarily exceed the provincial air quality standards established and monitored by the Ministry of Environment, Lands and Parks (MELP)	All				31,32

Table 2. Social LRMP and SFMP linkages. LRMP Resource Values and objectives associated with social issues. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	RMZ Objective	RMZ Applicability				SFMP Target Applicability
Recreation and Tourism	• Sustain/manage a spectrum of public, commercial and tourism-related recreation values, opportunities and activities	All				14,15,35,36,37,38,45
	• Provide for quality public and commercial recreational opportunities and values	MRC	SP	FH	PL	14,15,20,35,36,37,38,45
		WW	WC			
		ALT	ES	TS		
	• Manage recreation activities which may impact the probability of experiencing solitude and closeness to nature, and which may impact the Klin-se-za Protected Area					14,37,45,46
				TS		
Visual Quality	• Manage scenic values in visually sensitive areas	All				35,36
	• Identify/manage the scenic views as seen from Klin-se-za PA					35,36
				TS		
First Nations	• Avoid unjustifiable infringement of aboriginal/Treaty rights	All				46,47
	• Provide opportunities for the pursuit of traditional uses	All				14,45,46,47
	• Enhance First Nations participation in resource planning	All				46,47,49,51,52,53
	• Manage/maintain spiritual values along traditional access corridors					37,46,47
				TS		
Culture and Heritage	• Recognize and conserve cultural heritage resources	All				35,36,37,38,45,46,47
	• Provide opportunities for the enjoyment of spiritual/cultural values	All				35,36,37,38,45,46,47
	• Conserve significant natural heritage resources (i.e., paleontological features)	All				37,38,45,46,47
Water	• Sustain and manage water supplies for domestic water users and community waterworks licensees	All				7,26,27,28,29,30
	• Sustain/manage, where possible and appropriate, the natural stream flow regime for identified watercourses	All				29,30
	• Manage land and resource developments within community domestic water supply areas to sustain water quality/quantity	All				7,26,27,28,29,30
	• Maintain the water quality and quantity within the headwater reaches of rivers and streams					7,26,27,28,29,30
				TS		

Table 3. Non-timber resource use LRMP and SFMP linkages. LRMP Resource Values and objectives associated with non-timber/timber management interactions. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	RMZ Objective	RMZ Applicability	SFMP Target Applicability
Agriculture and Range	• Sustain or enhance existing grazing tenures, and provide new grazing opportunities where appropriate	All	34
Coal and Minerals	• Provide opportunities and access for mineral, coal and aggregate exploration, development and transportation	All	20,33,45,49,53
Energy	• Provide opportunities and access for oil and gas exploration, development and transportation	All	20,33,45,49,53
Communications, Transportation and Utilities	• Provide opportunities for communication, transportation and utility corridors and sites	All	20,33,45,49,53
	• Provide opportunities for access and infrastructure to provide for transportation and utility corridors, ensuring future development utilizes existing corridors and sites wherever possible	All	20,33,45,49,53
Trapping	• Recognize existing trapping tenures, manage furbearer habitats/populations (considering enhancement at the landscape unit and operational levels) to provide long term opportunities for trapping.	All	1,2,3,5,6,7,9,10,11,15,45,54
	• Recognize trapping/trapping areas as a way of life and of special year-round cultural significance to First Nations	All	45,46,47
Guide Outfitting	• Sustain and manage existing guide outfitting opportunities	All	1,2,3,4,5,6,7,8,9,10,11,14,15,35,36,37,38,45

Table 4a. Forest management LRMP and SFMP linkages. LRMP Resource Values and objectives associated with timber management. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	RMZ Objective	RMZ Applicability	SFMP Target Applicability
Forestry	• Sustain/enhance existing forest management, and provide new opportunities for forest management activities	All	2,3,4,12,13,16,17,18,19,20,21,22,23,24,33,39,40,41,42,54,55
	• Manage for a sustainable forest resource	All	2,3,4,12,13,16,17,18,19,20,21,22,23,24,33,39,40,41,42,54,55
	• Where feasible, increase the area of the operable forest land base	All	20,41,55
	• Where feasible, increase the productivity of the operable forest land base	All	21,55
	• Minimize risk to proposed and existing forestry investments while recognizing agricultural investment and potential on Crown ALR land	All	2,12,13,16,17,18,19,20,21,22,33,39
	• Ensure the availability of the short-term timber supply without compromising future sustainability and other resource values	All	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23, 24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,45,46,47 54,55
	• Provide opportunities for environmentally responsible development of forest resources to sustain LTSY	FH PL ALT ES	2,3,4,5,6,7,8,9,12,13,16,17,18,19,21,22,39,40,41,42,54,55
	• Maintain chances for forest management recognizing that low impact activities will be required to retain First Nations values	TS	14,36,37,45,46,47
	• Enhance timber harvesting and forest resource management to sustain long-term timber supply	SP GR	2,3,4,12,13,16,17,18,19,20,21,22,33,39,54,55

Table 4b. Forest management LRMP and SFMP linkages. LRMP Resource Values and objectives associated with timber management. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	RMZ Objective	RMZ Applicability				SFMP Target Applicability
NDT 1 (ESSF wk2)	• Sustain/manage structural diversity within landscape units					1,2,3,4,5,6,7,8,9,14,15,54,55
		WW	WC			
			ES	TS		
	• Sustain/manage mature forest attributes in landscape units					3,4,7,54,55
		WW	WC			
			ES	TS		
	• Sustain/manage rare forest stand types over the rotation					1
		WW	WC			
			ES	TS		
	• Sustain/manage a range of similarly aged forest patches while avoiding fragmentation at the landscape unit level					4
		WW	WC			
			ES	TS		
	• Recognize seral and climax species in the application of silviculture systems					2,12,13
		WW	WC			
			ES	TS		
	• Recognize natural succession in the regeneration of seral species					2
		WW	WC			
			ES	TS		
NDT 2 (ESSFmv2, SBSwk2)	• Sustain/manage seral stage distribution in a variety of patch sizes within landscape units	MRC	SP	FH	PL	4
		WW	WC			
		ALT	ES	TS		
	• Manage forest activities to simulate natural disturbances while avoiding fragmentation at the landscape unit level	MRC	SP	FH	PL	2,3,4,5,6,7,8,9
		WW	WC			
		ALT	ES	TS		
	• Sustain/manage for mature forest attributes in landscape units	MRC	SP	FH	PL	2
		WW	WC			
		ALT	ES	TS		
	• Sustain/manage rare forest types over the rotation	MRC	SP	FH	PL	1
		WW	WC			
		ALT	ES	TS		
	• Recognize seral and climax species in the application of silviculture systems	MRC	SP	FH	PL	2,12,13
		WW	WC			
		ALT	ES	TS		
	• Recognize natural succession in the regeneration of seral species	MRC	SP	FH	PL	2
		WW	WC			
		ALT	ES	TS		

Table 4c. Forest management LRMP and SFMP linkages. LRMP Resource Values and objectives associated with timber management. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	RMZ Objective	RMZ Applicability				SFMP Target Applicability
NDT 3 (BWBSmw1, wk2)	• Sustain and manage seral stage distribution in a mosaic of even-aged stands of different ages within landscape units	MRC	SP	FH	PL	3,4
		WW	WC	AG	GR	
		ALT				
	• Recognize seral and climax species in the application of silviculture systems	MRC	SP	FH	PL	2,12,13
		WW	WC	AG	GR	
		ALT				
	• Recognize natural succession in the regeneration of seral species	MRC	SP	FH	PL	2
		WW	WC	AG	GR	
		ALT				
	• Sustain and manage mixed species stands within landscape units	MRC	SP	FH	PL	2
		WW	WC	AG	GR	
		ALT				
	• Recognize the contribution of mixed species stands to the respective timber harvesting land base	MRC	SP	FH	PL	2
		WW	WC	AG	GR	
		ALT				
	• Sustain/enhance the harvest profile within mixed species stands	MRC	SP	FH	PL	2
		WW	WC	AG	GR	
		ALT				
	• Sustain/manage rare forest stand types over the rotation	MRC	SP	FH	PL	1
		WW	WC	AG	GR	
		ALT				

Table 5. Access LRMP and SFMP linkages. LRMP Resource Values and objectives associated with access management. RMZ objective statements are exactly as they appear in the Dawson Creek LRMP. RMZ Applicability identifies the RMZ where the objective statements apply: MRC – Major River Corridors, SP – South Peace, FH – Foothills, PL – Plateau, WW – Wildlife Habitat/Wilderness Recreation, WC – Wildlife/Coalfield, AG – Agriculture/Settlement, GR – Grazing Reserves, ALT – Alberta Plateau, ES – East Slopes, TS – Twin Sisters. SFMP Indicator Applicability lists the SFMP indicators from TFL 48 SFM matrix that meet or partially meet the LRMP objectives and strategies (not shown).

LRMP Resource Values	RMZ Objective	RMZ Applicability				SFMP Target Applicability
Access	• Plan/manage access to Crown land using landscape unit level and operational planning	All				20,37,45,49
	• Maintain existing recreational access routes including specified and/or designated trails	MRC				15,37,38
	• Optimum Access Management direction	MRC	SP	FH	PL	20,33,46
					GR	
		AL	ES			
	• Sustained Access Management direction	MRC	SP			20,33,46
				AG		
	• Sensitive Access Management direction to minimize fragmentation of and disturbance	MRC	SP	FH	PL	20,33,37,46
		WW	WC			
		AL	ES			
	• Utilize Sensitive Access Management direction to assist in sustaining existing levels of public motorized access corridors within Murray River 3D subzone	MRC				20,33,46
	• Manage landscape to minimize the impact to natural wilderness conditions					37
		WW	WC			
	• Through enhanced consultation, ensure pre-existing recreational routes and levels of access are maintained					37,45,46
		WW	WC			
	• Maintain existing motorized access corridor within the Twin Sisters mountain and headwaters subzone					20,37,45,46,47
				TS		
	• Limit new industrial and recreational access to a specified range of conditions					20,37,45,46,47
				TS		

Appendix 12 – Map Folio