



West Fraser Mills Ltd

Tree Farm Licence 52

Bowron - Cottonwood Tree Farm Licence

**Consolidated with Tree Farm Licence 5
Mackenzie-Cariboo Tree Farm Licence
1950 - 2006**

Draft Management Plan 4

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List of Acronyms

AAC	Allowable Annual Cut
AT	Alpine Tundra biogeoclimatic subzone
BEC	Biogeoclimatic Ecosystem Classification
BCTS	BC Timber Sales
CoC	Chain of Custody
CCLUP	Cariboo-Chilcotin Land Use Plan
CMI	Change Monitoring Inventory
EMS	Environmental Management System
ESSF	Engelmann Spruce – Sub-alpine Fir biogeoclimatic subzone
FDP	Forest Development Plan
FDU	Forest Development Unit
FPC	Forest Practices Code
FPPR	Forest Planning and Practices Regulation
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan <i>or</i> Fibre Saturation Point
GAR	Government Actions Regulation
G&Y	Growth and Yield
ICH	Interior Cedar Hemlock biogeoclimatic subzone
LRUP	Local Resource Use Plan
LU	Landscape Unit
MAI	Mean Annual Increment
MDF	Medium Density Fibreboard
MoFR	Ministry of Forests and Range
MP	Management Plan
MPB	Mountain Pine Beetle
MSYT	Managed Stand Yield Tables
NSR	Not Sufficiently Restocked
NVAF	Net Volume Adjustment Factor
OGMA	Old Growth Management Area
PEM	Predictive Ecosystem Mapping
PSYU	Public Sustained Yield Unit
SBFEP	Small Business Forest Enterprise Program
SBS	Sub-Boreal Spruce biogeoclimatic subzone
SFI	Sustainable Forestry Initiative
SRP	Sub-Regional Plan
TASS	Tree and Stand Simulator
TEM	Terrestrial Ecosystem mapping
TFL	Tree Farm Licence
THLB	Timber Harvesting Land Base
TRIM	Terrestrial Resource Information Management
TSM	Terrain Stability Mapping
TSA	Timber Supply Analysis <i>or</i> Timber Supply Area
VQO	Visual Quality Objectives
VRI	Vegetation Resource Inventory

1. Introduction

On January 1, 2005, West Fraser Timber Co. Ltd., the parent company of West Fraser Mills Ltd., acquired Weldwood of Canada which held the Mackenzie – Cariboo Tree Farm Licence 5. In November 2005, West Fraser requested that TFL 5 and the Bowron - Cottonwood Tree Farm Licence 52 be consolidated into one licence. This process was completed in December 2006. Management Plan 4 (MP 4) is intended to supplant the existing Management Plan 10 for TFL 5 and meet West Fraser's obligations for the consolidated TFL 52. Hereafter, the former TFL 5 is referred to as "Block B" of TFL 52; the original TFL 52 is referred to as "Block A."

The preparation of this Management Plan was undertaken in the midst of considerable change and uncertainty.

The epidemic of mountain pine beetle (MPB) that swept the central interior of BC has killed greater than 80% of the mature lodgepole pine and a significant proportion of age class 2 and 3 pine. The *Forest and Range Practices Act* and related regulations have introduced Forest Stewardship Plans (FSP), which have content requirements that overlap the traditional TFL Management Plan. The *Forest Revitalization Act* (2003) resulted in an area/volume allocation to BC Timber Sales from Block A and a volume allocation from Block B. In addition, resolution of mountain caribou habitat requirements continues to be elusive.

The approach taken in this Management Plan to address these uncertainties is:

- To address the content requirements specified in the tree farm licence document that are not addressed in the FSPs for Blocks A and B;
- To incorporate the FSPs for Blocks A and B as appendices to the Management Plan;
- To undertake a timber supply analysis for both for Blocks A and B and to summarize both as a single entity, and;
- To address the short and mid-term timber supply created as a result of the MPB epidemic.

1.1. Content Requirements

The following table lists the content requirements for management plans as stated in the licence document and indicates whether or not each is addressed in the FSP.

Table 1. Contents of Management Plan – FSP

TFL Licence Sec.	Requirement	In FSP?
2.09(c)(i)	Include inventories of...the forest and recreation resources.....	No
2.09(c)(ii)the fisheries, wildlife, range and cultural heritage resources.....	No
2.09(d)proposals for updating the inventories....	No
2.09(e)(i)	...propose management objectives regarding timber resources...including harvesting methods...and utilization	Partial

TFL Licence Sec.	Requirement	In FSP?
	specifications....	
2.09(e)(ii)	...propose management objectives regarding protection and conservation of non-timber values...including visual quality, biological diversity, soils, water, recreation resources, cultural heritage resources, range land and wildlife and fish habitats.	Yes
2.09(e)(iii)	...propose management objectives regarding integration of harvesting...with use...for purposes other than timber...including trappers, guide outfitters, range tenure holders and other licenced resource users, and aboriginal people....	Partial
2.09(e)(iv)	...propose management objectives regarding forest fire prevention and suppression, prescribed fire and fuel management.	No
2.09(e)(v)	...propose management objectives regarding forest health, including disease and pest management.	No
2.09(e)(vi)	...propose management objectives regarding silviculture	Partial
2.09(e)(vii)	...propose management objectives regarding road construction, maintenance and deactivation.	No
2.09(f)	...proposals for meeting management objectives referred to in subparagraph (e), including measures to be taken and specifications to be followed....	Partial
2.09(g)	...measures to be taken...to identify and consult with persons..., trapper, guide outfitters, range tenure holders and other licenced resource users.	No
2.09(h)	Assess the impact the draft management plan may have....	No
2.09(i)	Highlight the key similarity and differences....	No
2.09(j)	...provide that part of the allowable annual cut will be harvested from a specified part of the Licence Area....	No

The Management Plan will address the content requirements that are either partially addressed or not addressed in the Forest Stewardship Plans for TFL's 5 and 52. For the most part, objectives, results and strategies for non-timber values are included in the FSPs. The FSPs are included in Appendix III and IV.

1.2. Description of Tree Farm Licence 52 – Block A

Block A of TFL 52 is located east of Quesnel in the Quesnel Forest District of the Southern Interior Forest Region. Many lakes and rivers are found throughout the licence area. It contains the headwaters of the Cottonwood, Bowron and Willow Rivers, all of which flow directly into the Fraser River. The landscape of the eastern portion of Block A is dominated by the Cariboo Mountains of the Quesnel Highlands Ecoregion (Columbia Highlands Ecoregion), while in the west gently rolling plateaus typical of the Quesnel Lowlands Ecoregion (Fraser River Plateau Ecoregion) near the Fraser River are common.

The two major forested areas found on Block A are the sub-boreal spruce (SBS) and the Engelmann spruce-sub-alpine fir (ESSF) biogeoclimatic zones. The sub-boreal spruce

zone is generally found at elevations below 1200 meters and has a climate of cool, snowy winters and warm summers. The Engelmann spruce-sub-alpine fir zone is generally found above 1200 meters, and has a climate of long, cold winters and short, cool summers. Two minor biogeoclimatic zones are the Interior Cedar Hemlock (ICH), found in the eastern corner of Block A, and the Alpine Tundra (AT) found on the highest parts of the Cariboo Mountains near Wells and Barkerville. The dominant tree species on the TFL are white spruce (51%), lodgepole pine (28%), sub-alpine fir (18%), and Douglas fir (1%). Species such as western red cedar, western hemlock and paper birch are found in localized areas while trembling aspen and cottonwood are widespread throughout the TFL.

The gross area of Block A is 258,866 hectares; the net operable land base is 171,662 hectares which represents 72% of the productive forest area. There are 10 landscape units covering the TFL, only two of which are entirely within the boundary of Block A. The other eight overlap into the Quesnel Timber Supply Area or into Bowron Lake Provincial Park.

Primary access to Block A is provided by Highway 26 between Quesnel and Bowron Lake Provincial Park. Almost all forest roads into the area originate from Highway 26. This provides excellent year-round access for both forest management and recreational activities.

The communities directly associated with Block A are the City of Quesnel (city and outlying population of about 25,000) and the Municipal District of Wells (population of about 300). Small numbers of people also live in unorganized areas at Cottonwood and Bowron Lake.

Barkerville Historic Town, which is situated near the centre of Block A, is a significant tourist attraction during the summer months. The town had its origins in the 1860's Cariboo Gold Rush and in 1958 was designated an historic provincial park. It is now one of the largest heritage parks in western Canada. Both Wells and Barkerville are located within the licence area.

Bowron Lake Provincial Park forms the eastern boundary of the block. This park is a destination for wilderness seekers who use the chain of lakes for a 120 km canoeing and camping experience

1.3. Description of Tree Farm Licence 52 – Block B

Block B is located about 40 km north of Quesnel along the east and west sides of the Fraser River. The two dominant landforms are the Fraser River escarpment and the interior plateau. The escarpment is part of the Quesnel Lowland Ecoregion (Fraser Plateau Ecoregion), and is characterized by steep slopes, gullies and ridges interspersed with small flat benches along the main valley of the Fraser River. The highly dissected terrain and variety of slopes and aspects has produced a patchwork of small, distinct

habitat types. The plateau is part of the Nazko Upland Ecosection (Fraser Plateau Ecoregion) and is characterized by rolling terrain influenced by past glaciation.

The Cottonwood River marks the southern limits of Block B east of the Fraser River and the Blackwater River forms part of the southern boundary west of the Fraser. The most significant recreational/historical feature is the Alexander Mackenzie Heritage Trail which is the route used by Mackenzie on his trek to the Pacific Ocean from Canada in 1794. This route commences near the confluence of the Blackwater with the Fraser River and is marked by a commemorative brass plaque and a recreation site.

The gross area of Block B is 34,619 hectares which is entirely within the Ahbau Landscape Unit. The timber harvesting landbase is 27,713 hectares in size, representing 85% of the productive forest area.

The forest types all belong to the Sub-Boreal Spruce biogeoclimatic zone with the SBSmw (moist warm) found in the plateau area and SBSmh (moist hot) found generally along the escarpments. The dominant conifer tree species are Douglas-fir (34.3%), white spruce (26.1%), and lodgepole pine (23.0%). Minor species are birch (7.8%), balsam (1.5%), aspen (1.7%), and cottonwood (1%).

The communities directly associated with Block B are Quesnel and Hixon as well as the hamlets of Cinema and Strathnaver. Each of these communities is situated along Highway 97 and none of them are within the TFL. Access to the portion of Block B west of the Fraser River is from the Blackwater Road; access to the eastern portion is primarily from Highway 97.

1.4. History of TFL 52 – Block B

Forest Management Licence 5 was originally granted to Western Plywood Ltd. in 1950 to provide a supply of logs for the first venture into plywood manufacturing in the BC interior. Production from a new mill started in 1951. In 1964, the licence was re-designated as Tree Farm Licence 5 and was transferred to Weldwood of Canada Ltd.

The original Allowable Annual Cut (AAC) was 42,475 m³; in 1956 the AAC was increased to 70,792 m³ as a result of an improved inventory and a reduction in rotation age from 150 to 130 years. In 1970 the AAC was increased again to 124,594 m³ to reflect the improved utilization due to smaller tops, lower stumps and smaller trees. In 1980, the AAC peaked at 134,788 m³. The AAC subsequently decreased in three periods to 110,000 m³ in 1987. In 1998, the AAC was increased to 122,800 m³, with an allocation of 5,454 m³ (increased to 6,747 in 2006) to the Small Business Forest Enterprise Program. In 2003, the AAC was dramatically increased to 300,000 m³ to address an epidemic of mountain pine beetle.

In the early years of TFL 5, forest development was concentrated on road building in the southern portion of the block east of the Fraser. Logs were hauled to the Fraser River, skylined across the river at Cottonwood Canyon, and then hauled by truck to Quesnel;

here they were then skylined back across the Fraser to the plywood plant. By 1956, this log delivery process was replaced with a log drive down the Fraser River to the mill, first in log booms, then by free-floating logs. The log drive ended in 1988 with all timber hauled by trucks to the mill sites.

A sawmill was established adjacent to the plywood mill in 1962 to utilize logs that were not suitable for the plywood plant. This mill ran with a number of major upgrades until 1997 when it was dismantled. A new sawmill, specializing in cutting Douglas-fir, was constructed in a new location adjacent to the Cariboo Pulp and Paper Co. mill. In 2006 the new mill was converted to cutting pine and spruce as part of West Fraser's effort to increase utilization of beetle-attacked wood.

The consolidation of TFL 5 and TFL 52 in December 2006 effectively marked the end of a productive successful history of TFL 5 as a separate management entity.

1.5. History of TFL 52 – Block A

West Fraser originated in 1955 when three brothers, Henry H. Ketcham Jr., William P. Ketcham and Samuel K. Ketcham, acquired a small lumber planing mill in Quesnel. From 1955 to 1979 the business expanded through the acquisition of a number of sawmills and related timber quotas throughout the interior of BC. The Company has continually grown since that time to become one of the largest integrated forest products companies in the Canada, producing lumber, medium density fibreboard, plywood, pulp, linerboard, kraft paper, and newsprint.

Much of the area east of Quesnel has a long history of natural resource development. Mining boomed in the late 1800's and again in the 1930's. Today, mining is common throughout the TFL but on a smaller scale than earlier years. The level of activity fluctuates greatly with the market value of gold. Logging and accompanying milling operations which provided for local consumption began in the late 1800's. By the 1930's and 1950's, larger milling facilities were providing forest products for consumers outside the Cariboo. As a consequence of these past activities, the licence area has been extensively modified by human activity and has a well developed transportation network.

West Fraser and its predecessor companies have a history of forestry activities in the forests east of Quesnel dating back to the early 1950's. During the period from 1954-1957, quotas were established for operators in the Cottonwood, Big Valley, Bowron and Naver Public Sustained Yield Units (PSYU's). These quotas, originally held as Timber Sales, have been continually maintained in various forms of tenure to the present. In the early 1970's, West Fraser embarked on a major program of purchasing small forest companies and consolidating forest tenures. This was combined with the construction of an efficient sawmill in Quesnel designed to optimize recovery from the wood profile in the PSYU's where West Fraser's cutting rights were located. West Fraser and its predecessors have maintained continuous operations in the Cottonwood PSYU since 1950, Naver PSYU since 1952, Big Valley PSYU since 1953, and Bowron and Narcosli PSYU's and Prince George Special Sale Area since 1954.

In 1980, West Fraser applied for a Tree Farm Licence as the Company believed it to be the most effective form of tenure for providing a secure log supply. During the subsequent ten years, West Fraser and the Ministry of Forests, with considerable public involvement, negotiated the licence agreement. TFL 52 was issued in January 1991 with West Fraser having to give up its licence holdings in the Prince George Forest Region and a portion of its forest licence in the Quesnel Forest District. The original allowable annual cut was established at 518,952 m³ in Management Plan 1. This was subsequently raised to 549,000 m³ in 1996 and to 579,000 m³ in 2001, primarily because of a new forest inventory and updated growth and yield predictions. Throughout the period of 1991 to the present, 35,239 m³ of the AAC was allocated to the Small Business Forest Enterprise Program (now the BC Timber Sales Program (BCTS)). In 2006 the BCTS allocation was increased to 75,239 m³.

During 2005-2006 West Fraser arrived at agreement with government on areas within TFL 52 that would be subject to the 'take-back' provisions of legislation designed to re-allocate timber volume held by major licencees to First Nations, Community Forests, Woodlots, and BC Timber Sales. This is expected to have an eventual effect of removing 81,986 m³ from the AAC once the BCTS tracts are legally removed from the TFL land base.

1.6. Manufacturing Facilities

Timber from TFL 52 provides raw material for Quesnel Plywood, Northstar Lumber and West Fraser Quesnel mills. Byproducts from the mills such as chips, chip rejects, sawdust, and bark provide fibre for Cariboo Pulp and Paper Co Ltd., Quesnel River Pulp, and Westpine MDF as well as fuel for energy systems for dry kilns. A new sawmill was constructed with production starting in January 2007. Table 2 provides a summary of employment and production created by West Fraser's facilities in Quesnel.

Table 2. Manufacturing and Employment

Manufacturing Plant (year built)	Employees	Consumption (m ³ /year)	Production	Gross Value of Production (2005)
Quesnel Plywood (1951)	260	365,250	222 million sq ft	\$85.9 million
Northstar Lumber (1997)	150	602,500	158 million fbm	\$55.8 million
Quesnel Sawmill (1972)	240	1,600,000	500 million fbm	\$129.2 million
Cariboo Pulp ¹ (1976)	300	byproduct	162,000 T	\$104.7 million
Quesnel River Pulp (1983)	220	byproduct	333,000 T	\$215.1 million
Westpine MDF (1996)	110	byproduct	136 million sq ft	\$56.3 million
Quesnel Laminators (1994)	15	byproduct	15 million fbm	\$5.3 million
Administration	60			
Total	1,655			\$652.3 million

¹ employment, production and value based on West Fraser's 50% ownership

The consumption and production figures in the table apply to the old Quesnel Sawmill. Figures for the new mill are not available as it is not expected to reach full production until late 2007.



Figure 2. Quesnel Mill Site and Offices.

The AACs for Block B and Block A are currently 300,000 m³ (based on the 2003 uplift for TFL 5) and 570,000 m³ respectively. Less than 40% of the mill consumption is supplied by these licences. Other replaceable and non-replaceable forest licences are currently providing about 40% of consumption. However, once the non-replaceable licences have expired, West Fraser will have to purchase approximately 20-30% of its needs.

The number of persons employed directly or indirectly by West Fraser has grown steadily over the years. In Quesnel by 1978, the Company directly or indirectly employed slightly less than 400 persons. By 1991 when TFL 52 was awarded, that number had grown to about 550. Today, there are 1655 people employed directly in West Fraser manufacturing plants, forestry and administration, and another 325 full-time-equivalent positions in forest consulting, contract harvesting, trucking and silviculture operations. The employment increases are due to construction of new manufacturing facilities over the years as well as by the acquisition of the Weldwood operations.

Quesnel is also a corporate head office for solid wood manufacturing, Canadian lumber, plywood and MDF sales, and Information Technology. Approximately 100 people are employed in corporate positions that are not directly related to Quesnel operations.

1.7. TFL Land Base Classification

Tables 3.1, 3.2 and 3.3 present the results of the land base classification process to identify the timber harvesting land base (THLB) for use in timber supply analysis. Volume estimates include only coniferous species.

There are differences in the land base reductions and ultimately to the THLB since the previous management plans. Changes in areas removed for roads, wildlife tree patches, riparian management areas, wildlife habitat and old growth management areas are the result of revised procedures or features, changes in assumptions or improvements in inventories, and mapping data.

1.7.1. TFL 52 Block B

The recent VRI reclassification of some of the land within Block B resulted in an increase in the non-productive area. Similarly, there has been an increase in the classified road area for the Block. There is no longer any reduction for terrain class IV (TC IV) which was subject to a 25% reduction in the timber supply analysis for Management Plan (MP) 10. This is the result of overlap between TC IV and other productive exclusions. The designation of old growth management areas (OGMAs) has also been introduced since MP 10. Table 3.1 shows the THLB determination for Block B.

Table 3.1 – TFL 52 Block B Base Case Timber Harvesting Landbase Determination

Land Classification	Total Area (ha)	Reduction		Net Remainder	
		Area (ha)	Volume (1000s m ³)	Area (ha)	Volume (1000s m ³)
Total area	34,619			34,619	5,043.8
Non-productive, non-forest		1,275	0.6		
Existing roads		695	97.6		
Productive forest				32,649	4,945.6
Non-commercial brush		167	0.2		
Moose calving habitat		315	45.0		
Riparian reserve zones		317	70.3		
Riparian management zones		198	43.0		
Terrain class V		339	78.7		
Deciduous		1,023	57.1		
Wildlife tree patches (WTP)		620	169.3		
OGMA		1,956	501.3		
Total productive reductions		4,936	965.0		
Current THLB				27,713	3,980.6

1.7.2. TFL 52 Block A

As described for Block B, there has been a new land base classification process associated with the VRI since the MP 3 timber supply analysis. Therefore more area has been classified as productive land. Other significant changes to the netdown process include:

- Updated caribou no-harvest areas
- Revised WTP methodology
- Designation and subsequent removal of OGMAs.

Road areas have been reduced compared with MP 3. Since the completion of MP 3 many roads have been reviewed; where the surveys clearly indicate that these roads and trails are back in production and supporting stands of young trees, the area has been included in the productive land base. Table 3.2 shows the THLB determination for TFL 52 Block A; Table 3.3 shows the THLB for the consolidated TFL.

Table 3.2 – TFL 52 Block A Base Case Timber Harvesting Land Base Determination

Land Classification	Total Area (ha)	Reduction		Net Remainder	
		Area (ha)	Volume (1000s m ³)	Area (ha)	Volume (1000s m ³)
Total area	258,866			258,866	43,821.7
Non-productive, non-forest		17,246	2.4		
Existing roads		4,054	370.3		
Productive forest				237,566	43,449.0
Non-commercial brush		54	0		
Riparian reserve zones		7,089	1,693.7		
Riparian management zones		5,984	1,357.4		
Caribou no-harvest		19,626	3,709.3		
Inoperable		3,494	786.8		
Low productivity		2,969	430.3		
Deciduous		2,274	81.4		
Non-merchantable		5,291	171.8		
Preservation VQO		87	23.8		
Wildlife tree patches (WTP)		1,526	446.7		
OGMA		17,511	4,886.1		
Total productive reductions		65,904	13,587.1		
Current THLB				171,662	29,861.9

Table 3.3 – Consolidated TFL 52 Base Case Timber Harvesting Land Base Determination

Land Classification	Total Area (ha)	Reduction		Net Remainder	
		Area (ha)	Volume (1000s m ³)	Area (ha)	Volume (1000s m ³)
Total area	293,485			293,485	48,865.5
Non-productive, non-forest		18,521	3.0		
Existing roads		4,749	468.0		
Productive forest				270,215	48,394.5
Non-commercial brush		221	0.2		
Riparian reserve zones		7,406	1,764.0		
Riparian management zones		6,182	1,400.4		
Moose / Caribou no-harvest		19,941	3,754.3		
Inoperable & terrain class V		3,832	865.4		
Low productivity		2,969	430.3		
Deciduous		3,297	138.5		
Non-merchantable		5,291	171.8		
Preservation VQO		87	23.8		
Wildlife tree patches (WTP)		2,146	616.1		
OGMA		19,467	5,387.4		
Total productive reductions		70,839	14,552.0		
Current THLB				199,376	33,842.5

1.8. Ownership and Administration

West Fraser Mills Ltd. is a wholly owned operating subsidiary of West Fraser Timber Co. Ltd., a publicly traded Canadian forest products company. The Company carries on its operations through subsidiary companies and joint ventures collectively referred to as “West Fraser.” Executive offices are located in Vancouver, BC. The President of Solid Wood Products and the Vice-President, Lumber Sales are based in Quesnel as is the Chief Forester for BC Woodlands. The Quesnel division of West Fraser Mills Ltd. operates as an individual business unit

On January 1, 2005, West Fraser acquired Weldwood of Canada Ltd. which included a number of manufacturing facilities in BC and Alberta as well as the associated timber tenures. In Quesnel, the manufacturing facilities acquired with the Weldwood purchase were Northstar Lumber, Quesnel Plywood, and 50% of Cariboo Pulp and Paper Ltd..

As of May 1, 2007, West Fraser employed approximately 9,100 people throughout the Company. Acquisition of facilities outside of BC has significantly increased West Fraser’s operations. A list of current holdings is provided on the following page.

Sawmills:

- West Fraser Mills Ltd. – Quesnel
- Northstar Lumber – Quesnel (acquired 2005)
- West Fraser Timber Ltd. - Williams Lake
- Williams Lake Plywood – Williams Lake (acquired 2005)
- Chetwynd Forest Industries - Chetwynd
- Fraser Lake Sawmills – Fraser Lake
- Houston Forest Products Ltd. – Houston (acquired 2005)
- Pacific Inland resources - Smithers
- Skeena Sawmills - Terrace
- Blue Ridge Lumber Inc. – Whitecourt, AB (acquired 1995)
- West Fraser (South) Inc. – Joyce, Louisiana (acquired 2000)
- West Fraser (South) Inc. – Huttig, Arkansas (acquired 2000)
- Sundre Forest Products Inc. – Sundre, AB (acquired 2005)
- Hinton Wood Products – Hinton, AB (acquired 2005)
- Chasm Sawmill – Chasm, BC (acquired 2001)
- 100 Mile Lumber – 100 Mile House (acquired 2005)

Pulp and Paper:

- Eurocan Pulp and Paper Co. Ltd. – Kitimat
- Quesnel River Pulp – Quesnel (built 1979)
- Slave Lake Pulp Holdings Ltd. – Slave Lake, AB (acquired 1999)
- Hinton Pulp – Hinton, AB (acquired 2005)
- 50% interest in Cariboo Pulp and Paper Co. Ltd. – Quesnel (acquired 2005)
- 50% interest in Alberta Newsprint Company Ltd. – Whitecourt, AB (built 1989)

Manufactured Wood Products:

- Quesnel Laminators – Quesnel
- Westpine MDF – Quesnel (built 1996)
- Quesnel Plywood – Quesnel (acquired 2005)
- Williams Lake Plywood – Williams Lake (acquired 2005)
- Ranger Board MDF – Whitecourt and Calgary, AB (acquired 1995)
- Alberta Plywood Ltd. – Edmonton and Slave Lake, AB (acquired 1999)
- West Fraser LVL – Rocky Mountain House, AB (acquired 2005)

United States - Sawmills acquired from International Paper, 2007 (exc. Huttig and Joyce)

▪ Arnour, North Carolina	▪ Augusta, Georgia
▪ Citronelle, Alabama	▪ Folkston, Georgia
▪ Henderson, Texas	▪ Huttig, Arkansas (2000)
▪ Joyce, Louisiana (2000)	▪ Leola, Arkansas
▪ Maplesville, Alabama	▪ McDavid, Florida
▪ Newberry, South Carolina	▪ New Boston, Texas
▪ Opelika, Alabama	▪ Seaboard, North Carolina
▪ Whitehouse, Florida	▪ West Monroe, Louisiana
▪ Nashville, Tennessee (Regional Office)	

2. Environmental Certification

West Fraser is fully committed to responsible stewardship of the environment and has always operated on the principles of sustainability. Certification of Environmental Management Systems (EMS) is an important foundation of West Fraser's woodlands stewardship. Being certified within one of the recognized Environmental Management Systems verifies that those aspects of our operations that have the potential to have a negative effect on the environment have been assessed, that procedures to address them are in place and being followed, and that continual improvement is being pursued.

West Fraser's EMS is certified to the standards of ISO 14000 (International Organization for Standardization environmental management system) and the American-based Sustainable Forestry Initiative. West Fraser has recently undertaken a 'chain of custody' program which was introduced through the Quesnel Division in 2006.

EMS Certification provides assurance that West Fraser is living up to its environmental commitments

2.1. ISO 14000

In 2001, West Fraser's Quesnel division was certified to the ISO 14001 environmental management system standard. The ISO 14001 is the most common EMS and provides the foundation for other systems. It provides a framework for a rigorous review of all activities that may have an environmental impact, an assessment and ranking of risks, and development of control procedures to manage those risks. An internal and third-party audit program monitors performance and encourages improvement.

2.2. Sustainable Forestry Initiative (SFI)

The SFI standard is a sustainable forest management system developed by the American Forest and Paper Association (AF&PA). It is based on the following five guiding principles:

1. Protection of wildlife
2. Protection of plants
3. Protection of soil
4. Protection of air quality
5. Protection of water quality

SFI was selected as the sustainable forest management certification scheme for Quesnel because of its flexibility for use on different forest tenures and because of its recognition in the American market place. A copy of West Fraser's Sustainable Forest Management Plan under SFI is included in Appendix XII.

2.3. Chain of Custody

Some forest products buyers groups have asked West Fraser to provide verification that products they are purchasing originate from sustainably managed forests. As West Fraser sources wood from companies with various certifications and from uncertified sources such as private land or timber sales, verifying a chain of custody (CoC) is difficult. In 2006, West Fraser implemented a chain of custody process through the *Programme for the Endorsement of Forest Certification (PEFC)* which is verified by third-party auditors. The PEFC Council is an independent non-profit, non-governmental organization founded in 1999 to promote sustainable forest management.

West Fraser uses scale data and timber marks which are unique to each source of timber as the basis for the CoC tracking system. Conversion factors are used to convert the weight of raw logs to 'certified credits' for products sold as originating from an EMS-certified source. As wood from certified sources is scaled, certified credits are produced; when a mill product (lumber, pulp, plywood) is sold as 100% certified, certified credits are depleted. If there are not enough certified credits available to fill an order, the product cannot be sold as certified.

3. Planning

A hierarchy of plans exists with each level having an influence on development of operational plans. The Cariboo-Chilcotin Land Use Plan has been undergoing implementation in stages since its inception in 1994 with significant success in management of caribou and mule deer habitat, old growth, biodiversity, and visual landscapes. The Quesnel Sub-Regional Plan, which will have effect over the area of TFL 52, is expected to be approved by government sometime in 2008. Other area-specific plans that affect parts of the TFL will either be incorporated into or superseded by the Quesnel SRP.

3.1. Existing Higher Level Plans

3.1.1. Cariboo-Chilcotin Land Use Plan

The Cariboo-Chilcotin Land Use Plan (CCLUP) was designated by the Government in 1994 as a 'higher level plan' under the previous Forest Practices Code Act of BC. A "Ninety-Day Implementation Process – Final Report," produced in February 1995, identifies resource targets for each resource development zone that overall meet the intent of balancing social, economic and environmental goals across the region.

In 2005 a "*Summary of CCLUP Legal Requirements and Selected Non-Legal Direction*" (Appendix VII) was approved by the Cariboo Managers Committee (formerly the Inter-Agency Managers Committee) for use by licencees when preparing Forest Stewardship Plans (FSPs). This report and related information specific to the Quesnel Forest District helped to ensure that all objectives specified in the CCLUP that apply to the landbase encompassed by TFL 52 are addressed in the FSPs.

The timber supply analysis incorporates all the constraints that apply to the landbase and timber availability that flow from the CCLUP and the draft Quesnel Sub-Regional Plan.

3.1.2. Quesnel Sub-Regional Plan

The draft Quesnel Sub-Regional Plan (QSRP) is a planning sub-set of the CCLUP, which provides more detailed direction for resource development in the Quesnel Forest District. As it has not yet been formally approved, it was used as a guidance document during the preparation of FSPs for TFL 52 Block A and Block B (previously TFL 5). The "*Summary of CCLUP Legal Requirements and Selected Non-Legal Direction*" also provided links to the QSRP, so there is a high degree of inclusion in the FSPs. The QSRP is presently before the Cariboo Managers Committee for final approval. If changes are made to the QSRP that result in additional legal obligations, then the FSPs will have to be amended into compliance.

3.1.3. Lower Blackwater Local Resource Use Plan

The Lower Blackwater Local Resource Use Plan (LBLRUP) was approved by the Ministry of Forests in 1998. This plan provides supplementary planning information for Block B, primarily in the areas of recreation and visual resource management along the Alexander Mackenzie Heritage trail and Blackwater River. This plan

remains in effect until it is replaced by or incorporated into the Quesnel Sub-Regional Plan.

3.2. Forest Stewardship Plans

Legislative changes have altered the planning process considerably since the last Management Plans were prepared and approved for TFL 52. The Forest and Range Practices Act (FRPA) and the Forest Planning and Practices Regulation (FPPR) have changed the forest management environment from a style that was regulatory process driven (under the previous Forest Practices Code) to one that focuses on achieving results derived from strategies or management regimes for a specified forest unit. This shift is from a focus on specific cut blocks and roads (Forest Development Plan) to a focus on overall stewardship conditions and practices.

Government objectives identified in the Government Actions Regulation (GAR) and the FPPR address forest features and values, fish and wildlife habitat, biodiversity, water quality, visual quality, recreation, soils, cultural heritage values, range use, and timber. The content requirements of the FSP state that intended results or strategies must be consistent with objectives set by government and, in this case, with timber harvesting rights granted by government in a Tree Farm Licence (*FRPA Sec 5(1) and (2)*). The FPPR and GAR include the resource management objectives and many of the practice requirements and default standards for certain objectives. If an FSP undertakes to meet or follow a default standard, then the FSP does not need to specify results or strategies for the related objective. Stocking standards for reforestation are also a content requirement for the FSP.

The results, strategies, and stocking standards are the key content items in the FSP and establish commitments to forest stewardship. They are expected to incorporate the most recent knowledge and must be measurable and verifiable. Review of the FSP prior to approval focuses on these commitments rather than on specific development activities (as was the case with the Forest Development Plan). Once the FSP is approved, the measures within it become binding and it is an obligation of the FSP holder to meet those commitments. The holder of a FSP must ensure that the intended strategies specified in the plan are carried out and the results described in the plan are achieved. (*FRPA Sec.21*)

There is a public review process in the development of FSPs, but it is limited to the stewardship aspects; the “on the ground” detail is not displayed. This presents a significant change for other resource users as specific activities most likely to directly affect them such as proposed road building or cut blocks were shown in FDPs. As a matter of professional practice, West Fraser foresters provide road and cutblock information to other forest resource users as a means of maintaining working relationships.

A Forest Stewardship Plan for Block B was approved on February 23, 2006 for a period of five years. It covers a Defined Forest Unit (FDU) as defined in the FPPR, corresponding to the boundaries of Block B as it existed at the time of submission under the previous TFL 5 tenure. A Forest Stewardship Plan for TFL 52 (Block A) was

approved in November 2006. It covers a Defined Forest Unit (as defined in the FPPR) that corresponds to TFL 52 as it existed at the time of submission. The FSPs and the corresponding FDUs will be maintained in their current status for the near future. During the term of this Management Plan, an evaluation will be done on the utility of having a single FSP and of having one or two FDUs.

All land base exclusions and timber access constraints resulting from the FSPs are included in the netdowns and modeling in the timber supply analysis.

4. Inventories

Blocks A and B have a similar inventory status with much of the forest inventory and growth and yield work having been done by the same consultants.

The following table lists the inventories that have been done or that apply to the TFL.

Table 4. Inventory Status

Block A		Block B		
Forest Resource Inventory	Year	Consultant	Year	Consultant
Vegetation Resource Inventory (Phase I)	2001	Timberline	2002	Timberline
VRI (Phase II)	2002/03	JS Thrower & Assoc. Timberline	2005	JS Thrower & Assoc. Timberline
Net Volume Adjustment Factor	2005	JS Thrower & Assoc.	2007 (planned)	JS Thrower & Assoc.
Terrestrial Ecosystem Mapping	2001	Geowest	2006/07 (underway)	Landmapper Env. Solutions
Terrain Stability Mapping	2000	Geowest	1999	Pottinger-Gaherty
Fish/Fish Habitat	Ongoing	Carmanah Research	1998-2001	Triton
Recreation Features Inventory	Approved 1994; updated 1999	Timberline	2000	Timberline
Managed Stand Site Indices	May 2000	JS Thrower & Assoc	1994	JS Thrower & Assoc
Managed Stand Yield Tables	May 2000	JS Thrower & Assoc.	1996 updated '02	JS Thrower & Assoc
Terrain Resource Inventory Mapping (TRIM II)	1998; update in progress 2005-07	Base Mapping and Geomatic Services	2007	Base Mapping and Geomatic Services
Archaeology Overview Assessment	1999 Phase II Update	Arcas	1999	Ministry of Forests

4.1. Vegetation Resource Inventory

The VRI is a two-phase method of determining estimates of the quantity and quality of timber and vegetation resources on a forest estate. During the period 1995-2001, Phase I was completed; this phase consisted of aerial photography, delineation of homogeneous vegetated and non-vegetated complexes into uniform polygons, and interpretation of polygon characteristics.

The ground sampling phase (Phase II) was completed on Block A in 2003 and Block B in 2005; this phase provides the information necessary to determine how much of a given characteristic is within the inventory area. The VRI on Blocks A and B has been updated annually to register new harvesting and changes in forest cover identified in silviculture surveys.

4.2. Net Volume Adjustment Factor

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.

The NVAF sampling and analysis was completed on TFL 52 in 2005. The overall increase in net merchantable volume from the two programs was 10% when compared to the net merchantable volumes used in the MP 3 timber supply analysis. The VRI Phase II and NVAF adjustments were estimated to have an upward effect on volume of 8% and 2% respectively.

The NVAF field sampling was completed on Block B in 2007; the analysis will be done in 2008. The sampling will also supplement that done on TFL 52 in the SBSmw BEC subzone.

4.3. Ecosystem Mapping

Ecosystem mapping is the stratification of a land base into polygons having similar climate, physiography, surficial material, bedrock geology, soils, and vegetation which provides a biological and ecological framework for land management. Two different processes were used on the TFL: Terrestrial Ecosystem Mapping was completed on Block A in 2000; Predictive Ecosystem Mapping is nearing completion on Block B.

4.3.1. Block A

Terrestrial Ecosystem Mapping (TEM) uses a process of photo-interpretation complemented by extensive field sampling to confirm the interpreter's polygon delineation and description. The TEM project was started in 1996 and completed in 2000. It provides the spatial basis for all ecosystem-based field plans and for the application of growth and yield models such as yield curves which are used as one factor in estimating timber supply.

4.3.2. Block B

Predictive ecosystem mapping (PEM) is nearing completion (January 2008) as part of a project on the adjacent areas of the Quesnel TSA. PEM is a computer-generated ecosystem map based upon data tables generated by expert field ecologists and algorithms for computerized analysis of the attributes in the tables. Attributes include such factors as slope, aspect, texture of soil parent material, and biogeoclimatic subzone. Using this and other information in the tables, it is possible to make reasonably accurate predictions of ecosystem classifications used in forest management

The distribution of the biogeoclimatic subzones is shown in the following charts.

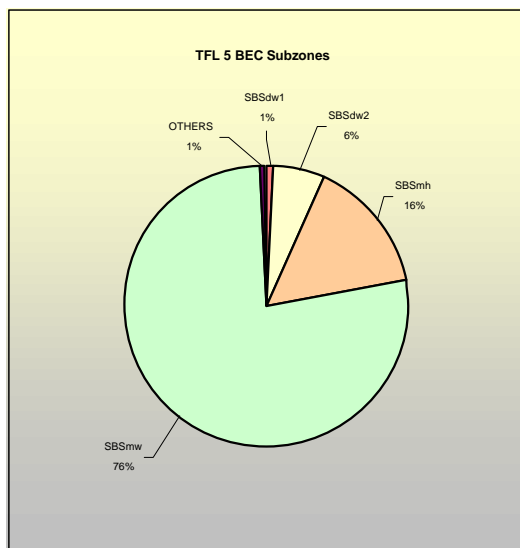


Figure 3.1. Block B BEC Subzones

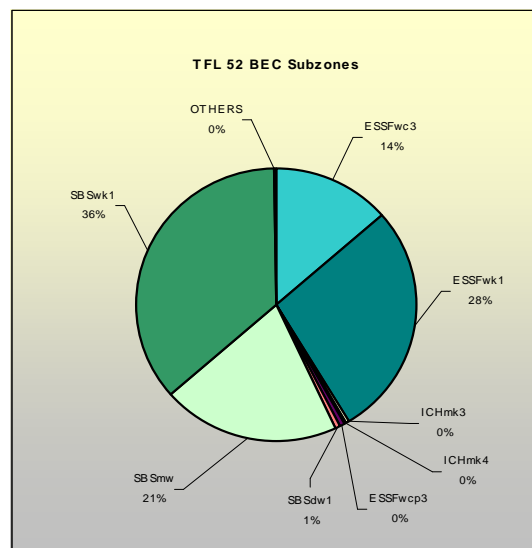


Figure 3.2. Block A BEC Subzones

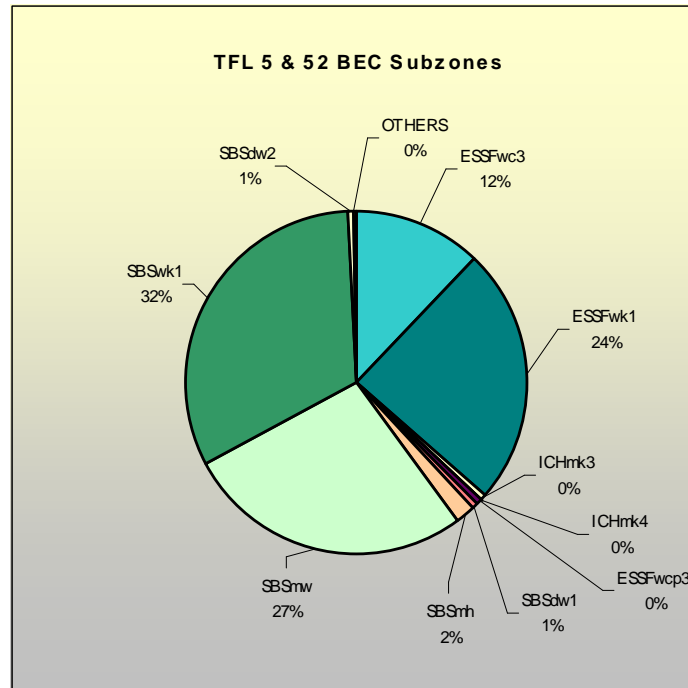


Figure 3.3. Consolidated TFL 52 BEC Subzones

4.4. Terrain Stability Mapping

4.4.1. Block A

Terrain stability mapping (TSM) delineates areas of the land base according to the potential for erosion and mass wasting. Detailed TSM (RIC Level “C”) was done in the mountainous portion of the TFL (Quesnel Highlands); reconnaissance level TSM (RIC Level “D”) was done on the plateau portion. TSM was used to derive a first approximation of inoperable areas on the TFL. All Terrain Class IV (potentially unstable) and V (unstable) polygons were reviewed by West Fraser staff and a judgment made whether individual polygons were operable or not. Past performance and local knowledge were the main criteria used. All polygons deemed as inoperable were deleted from the contributing land base. The TSM is used operationally when planning roads and harvest blocks to identify sites where detailed stability assessments are needed.

4.4.2. Block B

“Detailed level” TSM was done over the Fraser River escarpment and on sites identified as having glaciolacustrine deposits; the remainder of the Block (predominantly Nazko Plateau) was mapped at a “reconnaissance level.” In 2001, a ground and air photo review was done over parts of the TFL east of the Fraser to confirm whether the areas classified as Terrain Class IV (potentially unstable) or Terrain Class V (unstable) were correct. For timber supply review purposes, areas mapped as Terrain Class IV are netted down by 50% and areas of Terrain Class V by 90%. The review concluded that the net down for Terrain Class V was reasonable, but the net down for Terrain Class IV on TFL 5 was overly conservative. Forest

operations could be carried out on 75% of the Terrain Class IV provided that further detailed assessments by a qualified professional were undertaken. As a result the netdowns for Terrain Class IV were adjusted to 25%. This applied to the analysis for TFL 5 Management Plan 10 and is being applied to Block B in the analysis being undertaken for the consolidated TFL 52.

No netdowns for inoperable ground have been made on Block B. Past harvesting history includes conventional ground-based systems, cable yarding, and helicopter yarding. Helicopters have been used on occasion since 1992-93 to remove beetle attacked timber on steep sensitive sites and in mule deer winter range where road access is not desirable.

4.5. Streams, Wetlands and Fisheries

4.5.1. Block A

Salmon, rainbow trout and bull trout are found in many streams throughout Block A. A reconnaissance level inventory of fish and fish habitat was undertaken in 1996 and was completed in 2001. This inventory provided information for operational planners on fish presence and basic measurements to permit preliminary estimates of stream classification. The stream classifications derived from this inventory were also used to buffer the streams with the appropriate riparian management widths so that area and volume netdowns could be calculated for the timber supply analysis.

In 2004, the Ministry of Environment and the federal Department of Fisheries and Oceans completed a “critical fish habitat” mapping project. This was essentially a GIS exercise using topographic data to identify areas adjacent to important fish-bearing streams that needed to be protected. After review and refinement, the areas deemed as critical habitat were either incorporated into riparian reserve zones or, more commonly, included in old growth management areas. The result, for example, was a significantly greater level of buffering along Willow, Bowron and Swift Rivers and Big Valley, Ketcham, Antler, Lightning, Victoria, and Umiti Creeks.

4.5.2. Block B

Areas adjacent to rivers, streams and other wetlands are classified as riparian. These riparian areas are important as thermal cover for fish-bearing streams, habitat for wildlife, and protection of streambeds from erosion. Stream classification for Block B was updated prior to MP 10 (TFL 5) to include all FPC classification criteria in addition to other criteria outlined in the Wildlife Plan.

A reconnaissance level (1:20,000) fish and fish habitat inventory was completed in 2001. The project included classification of streams, lakes, and wetlands according to the standards of the FPC. The most valuable fish habitat is limited to the lower reaches of Lakes, Marvin, Camp One, Landing Five, Saunders, and Tako Creeks near their confluence with the Fraser River. Other smaller creeks have limited habitat because of steep gradients coming down off the Fraser River escarpment.

Fish species that have been captured and identified on both Blocks A and B:

• Bull trout	(<i>Salvelinus confluentus</i>)	(A and B)
• Chinook salmon	(<i>Oncorhynchus tshawytscha</i>)	(A and B)
• Sockeye salmon	(<i>Oncorhynchus nerka</i>)	(A and B)
• Rainbow trout	(<i>Oncorhynchus mykiss</i>)	(A and B)
• Mountain whitefish	(<i>Prosopium williamsonii</i>)	(A and B)
• Leopard dace	(<i>Rhinichthys falcatus</i>)	(B)
• Longnose dace	(<i>Rhinichthys cataractae</i>)	(B)
• Northern pike minnow	(<i>Ptycheilus oregonensis</i>)	(A and B)
• Longnose sucker	(<i>Catostomus catostomus</i>)	(A and B)
• Largescale sucker	(<i>Catostomus macrocheilus</i>)	(A and B)
• Chiselmouth chubb	(<i>Acrocheilus alutaceus</i>)	(B)
• Peamouth chubb	((<i>Mylocheilus caurinus</i>)	(A and B)
• Redside shiner	(<i>Richardsonius balteatus</i>)	(A and B)
• Prickly sculpin	(<i>Cottus asper</i>)	(A and B)
• Slimy sculpin	(<i>Cottus cognatus</i>)	(A and B)
• Burbot	(<i>Lota lota</i>)	(A)

Management objectives and strategies for fish, fish habitat, and streams are specified in the Forest Stewardship Plans for Block B (TFL 5) (Appendix III) and Block A (TFL 52) (Appendix IV).

4.6. Terrain Resource Inventory Mapping

All maps used for resource planning are based on terrain resource information maps (TRIM) which show basic topology features such as contours, rivers, lakes and roads. The TRIM II was completed in 2000. A project to update the TRIM II to current standards was started in 2005 with the (partial) acquisition of new aerial photography and preparation of 1:20,000 orthophotos. This project will continue in 2007-08 over the entire TFL.

4.7. Recreation Features Inventory/Recreation Opportunity Spectrum

The recreation feature inventory identifies physical, biological and/or cultural features that have the potential to support recreational experiences. The recreation opportunity spectrum identifies, records and classifies the current state of naturalness, remoteness, and expected social experience and provides information about existing recreational opportunities so that it can be incorporated into land use decisions.

4.7.1. Block A

The initial inventory was completed in 1994. West Fraser utilized and built upon the *Quesnel Forest District Recreation Plan – Cottonwood East* (May 1998) to update the inventory and recreation opportunity spectrum in 1999 to current MOF standards. Recreational use opportunities are generally concentrated in the Quesnel Highlands

area near Wells and Barkerville where hiking, cross-country skiing, and snowmobiling are regionally significant activities.

4.7.2. Block B

A recreation opportunity spectrum inventory was completed in 2000. A Ministry of Forests and Range Recreation Site is located at Kilometre “0” of the Alexander Mackenzie Heritage Trail, near the confluence of the Blackwater and Fraser Rivers. Recreational opportunities and use are generally low although there is light use of four undesignated campsites near the Fraser River during the hunting season.

4.8. Managed Stand Site Index Adjustment

Site index, which is determined from inventory height and age data, is used as an estimate of site productivity. West Fraser believed there was a strong possibility that site indices for managed stands were under-estimated because the original data was taken from natural stands. The Chief Forester acknowledged this uncertainty in the last timber supply analysis.

A project was completed that provides reliable estimates of potential site index for post-harvest regenerated stands for pine and spruce on the ecosystems of the TFL. There is now the ability to apply site index to site series across the TFL rather than applying an average site index to all polygons. The results of this project, approved by the Ministry of Forests Research Branch in 2000, were used to develop Managed Stand Yield Tables for use in the timber supply analysis. The overall average potential site index for existing post-harvest regenerated stands (all species) is 19.7m. The overall average site index used for existing post-harvest regenerated stands in MP 2 was about 15.7m.

4.9. Inventory Monitoring

In conjunction with site index work completed on Block A in 2000, West Fraser initiated a Change Monitoring Inventory (CMI) program in 2001 to validate managed stand growth and yield estimates used in timber supply analysis. A similar program was initiated on Block B in 2003. The primary objectives for both of these programs are to:

- Monitor the net merchantable volume in managed stands
- Monitor the mean annual increment in managed stands
- Audit the site index estimates predicted from the managed stand site index adjustment (SIA) work.

On Block A, 75 fixed-area plots were installed (2001-2003) in managed stands of 15 to 40 years of age on a 2.0 km grid. The Block B program consisted of 30 fixed-area plots installed on a 1.0 km grid for a target population of managed stands 15 to 39 years of age. All of the plots will be re-measured in 5 year intervals. The data collected will be used to assess the validity of growth and yield predictions and to correct any biases identified by the analysis.

The testing for bias will be similar to the MoFR inventory audit procedures where comparisons are made of the differences between measured and predicted values within

each inventory monitoring plot. Overall difference between the measured and predicted values is called total bias; only total bias will be calculated for site index comparisons. Further analysis will be conducted to determine whether the bias originates in the attributes (data) or the model. Attribute bias is the volume difference between polygon attributes and plot attributes; model bias is the volume differences between plot prediction and plot measures using the same plot attributes.

Any bias identified will be used to revise the Managed Stand Yield Table (MSYT) assumptions and estimates. As well, the inclusion of growth rates from re-measurement data will provide valuable information to help in the evaluation and selection of growth curves to be used in future timber supply analysis for the TFL.

The CMI programs for Blocks A and B will be combined into a single program during the term of MP 4.

4.10. Growth and Yield

A problem analysis of Growth and Yield (G&Y) issues and opportunities was completed for Block A in 1996 and became the basis for the development of a G&Y program. A similar study was never initiated for Block B; however, the major issues of site index, inventory monitoring, and natural stand yields have been identified and addressed. To date, the main accomplishments of the two programs have been:

- SIA projects have produced statistically reliable estimates of site index for managed stands on both Blocks.
- MSYTs developed for previous analyses were based on more accurate estimates of site index.
- Inventory monitoring plots have been installed to validate growth and yield estimates for managed stands.
- VRI Phase II and NVAF program completed on Block A have provided statistically reliable estimates for natural stand yields.
- VRI Phase II field sampling was completed on Block B in 2007 with the analysis to be completed in 2008.

The primary goal of the G&Y program is to provide support for the timber supply analysis with a secondary goal of providing support for the silviculture program. The objectives of the Growth and Yield and Silviculture programs are to:

- Maintain or increase the AAC through the application of various sampling and statistical procedures
- Improve the accuracy of timber supply forecasting by reducing the bias of growth and yield estimates used in the timber supply analysis
- Develop strategies to mitigate the impacts of the MPB infestation, based on sample data collected by the G&Y program
- Evaluate and refine the current silviculture regimes in order to optimize managed stand yields.

A single G&Y program will be developed to cover the consolidated TFL. The G&Y program for the next two MP periods will continue to focus on identifying and evaluating opportunities to mitigate the impacts of pine mortality resulting from the MPB epidemic, refining silviculture strategies, supporting the inputs for timber supply analysis, and addressing issues of bias in growth and yield estimates.

5. Management Objectives

5.1. Management and Utilization of the Timber Resource

The forests of TFL 52 have a varied mix of coniferous and deciduous stands which are substantially different in composition than the majority of forests in the Quesnel TSA. The pine component of the coniferous volume on the timber harvesting land base of the TFL is about 25% compared to about 73% on the Quesnel TSA. The distribution of coniferous volume on the timber harvesting land base (THLB) of the TFL is shown in Table 5.

Table 5. Summary of Species Distribution (THLB)

	Douglas-fir	Spruce	Pine	Balsam
Block A	2%	56%	25%	17%
Block B	49%	25%	24%	2%
Combined	7%	53%	25%	15%

A complete summary of the species distribution is shown in Table 6.

The greater proportion of spruce, Douglas-fir and balsam on TFL 52 lessens the magnitude of the impact of MPB damage compared to the Quesnel TSA and presents a more positive outlook on long-term timber supply.

There are virtually no stands over 25 years old having a pine component on TFL 52 that have not been at least moderately damaged by MPB. The overriding forest management issue at the present time on both Blocks is the pine mortality caused by the mountain pine beetle and the need to salvage the value of the damaged stands. However, there is also a need to “stay on top” of relatively small but potentially serious infestations of spruce beetle and Douglas-fir beetle (see Sec.7.2).



Figure 4. Douglas-fir Beetle – Fraser River Escarpment.

Table 6. TFL 52 Volume Summaries by Species (1000s m³)

A - Block A

Species	Productive Area	Prod conifer volume	Prod pine volume	THLB Area	THLB conifer volume	THLB pine volume
No ID	6,295	0.0	0.0	5,930	0.0	0.0
Ac	665	27.3	6.9	332	8.1	1.4
At	5,982	309.2	138.7	3,266	159.3	67.8
Ep	678	18.1	1.8	254	8.0	0.5
Bl	55,938	9,311.0	107.1	28,789	5,077.5	72.9
Cw	88	30.7	0.1	86	30.3	0.1
Fd	2,256	633.3	69.7	1,774	467.8	48.4
Hw	64	25.5	0.0	64	25.5	0.0
Pl	54,450	9,743.3	7,510.7	44,843	7,346.4	5,675.9
Sb	939	65.1	4.0	175	20.1	1.5
Sx	110,211	23,285.7	1,890.6	86,148	16,718.9	1,406.6
Total	237,566	43,449.1	9,729.7	171,662	29,861.9	7,275.3

B - Block B

Species	Productive Area	Prod conifer volume	Prod pine volume	THLB Area	THLB conifer volume	THLB pine volume
No ID	1,497	0.0	0.0	1,405	0.0	0.0
Ac	249	16.3	0.0	0	0.0	0.0
At	577	13.4	0.7	356	1.2	0.4
Ep	2,538	84.0	1.7	1,512	28.6	0.3
Bl	470	99.0	0.9	403	78.0	0.8
Cw	0	0.0	0.0	0	0.0	0.0
Fd	11,205	2,364.5	192.8	9,781	1,934.3	172.4
Hw	0	0.0	0.0	0	0.0	0.0
Pl	7,507	1,056.4	797.6	7,147	963.5	732.6
Sb	101	7.2	0.2	50	2.5	0.1
Sx	8,505	1,297.4	92.7	7,060	967.3	75.6
Total	32,649	4,938.3	1,086.7	27,714	3,975.4	982.2

C – Consolidated TFL 52 Total

Species	Productive Area	Prod conifer volume	Prod pine volume	THLB Area	THLB conifer volume	THLB pine volume
No ID	7791.6	0.0	0.0	7334.5	0.0	0.0
Ac	913.9	43.6	6.9	331.8	8.1	1.4
At	6559.6	322.7	139.4	3622.0	160.5	68.2
Ep	3215.9	102.1	3.5	1766.2	36.6	0.8
Bl	56408.4	9410.1	107.9	29192.1	5155.4	73.7
Cw	87.8	30.7	0.1	86.4	30.3	0.1
Fd	13461.0	2997.8	262.5	11555.3	2402.1	220.9
Hw	64.0	25.5	0.0	64.0	25.5	0.0
Pl	61957.0	10799.7	8308.3	51989.8	8309.9	6408.6
Sb	1039.9	72.3	4.2	225.5	22.6	1.6
Sx	118715.9	24583.1	1983.4	93208.0	17686.2	1482.2
Total	270214.9	48387.4	10816.4	199375.6	33837.3	8257.5

5.1.1. Block A – Lodgepole Pine Component

Table 7 provides a summary of the coniferous volumes of stands containing a pine component within each age class on the timber harvesting land base of Block A of TFL 52. West Fraser's priority is to harvest stands with a pine component greater than 50% in age classes 5 to 9. With the current AAC of 570,000 m³ (including the BCTS component), it would take approximately 10 years to remove the Priority 1 volume.

The volumes in the Priority 2 stands consist of lower percentages of pine in mixed stands of spruce, balsam and Douglas-fir. Given that many stands have been damaged for a period of 2-3 years already and that shelf life (refer to Sec. 5.1.5) is expected to be about 8-10 years, it is believed that the Priority 1 and 2 stands could be salvaged within the expected shelf life with an uplifted AAC.

Priority 3 stands have the lowest pine component or are the youngest of the damaged stands. They are expected to provide harvestable volume of upwards of 250 m³/ha in 20-30 years time when a timber supply pinch point is expected to occur. It is expected that 80% of the pine component would be a non-recoverable loss due to unsalvaged mortality from MPB.

Section B of Table 7 demonstrates that there are slightly over 13 million m³ of mature volume (age class 5+) in stands having no pine component.

Table 7. TFL 52 Stand Harvest Priorities

A. TFL 52 Block A - Conifer Volume by Age Class (Stands with a Pine Component)											
% PI in stand		1	2	3	4	5	6	7	8	9	Total
1 - 10	1000 m3	0	13	137	330	606	398	325	2,269	36	4,114
11 - 20	1000 m3	0	11	14	126	233	158	162	910	21	1,635
21 - 30	1000 m3	0	4	27	164	293	198	220	1,039	0	1,945
31 - 40	1000 m3	0	17	12	149	157	159	156	542	2	1,194
41 - 50	1000 m3	0	29	8	114	126	153	219	400	0	1,049
51 - 60	1000 m3	0	25	5	92	244	136	214	451	1	1,168
61 - 70	1000 m3	0	14	3	79	185	157	273	378	0	1,089
71 - 80	1000 m3	0	14	4	180	280	232	172	290	3	1,176
81 - 90	1000 m3	0	26	4	84	249	280	379	136	0	1,158
91 - 100	1000 m3	0	15	4	72	413	373	789	73	0	1,739
	1000 m3	0	168	318	1,390	2,786	2,244	2,909	6,488	63	16,266
Priority 1						1,371	1,178	1,827	1,328	4	5,708
Priority 2						283	312	375	942	2	1,914
Priority 3					1,390	1,132	754	707	4,218	57	8,258
B. TFL 52 Block A - Conifer Volume by Age Class (stands having NO pine component)											
Age Class											
		1	2	3	4	5	6	7	8	9	Total
1000 m3		0	15	100	387	787	796	688	10,493	328	13,595
1000 m3	Volume			Age 5+		787	796	688	10,493	328	13,092

In 2000, the level of MPB activity was deemed to be at a manageable level east of the Fraser River and was expected to remain so. Cooler wetter summers and colder snowier winters were believed to leave the pine stands less susceptible to MPB. Meanwhile, the epidemic was spreading and intensifying in the predominantly pine forests west of the Fraser. With the support of the Regional Manager, harvesting capacity was shifted from TFL 52 to the Quesnel TSA. As the epidemic moved eastwards, harvesting capacity was moved back to the TFL and was concentrated in pine-leading stands.

5.1.2. Block B - Lodgepole Pine Component

Table 8 provides a summary of the coniferous volumes of stands having a pine component within each age class on the timber harvesting landbase of Block B. West Fraser's priority is to harvest stands with a pine component greater than 50% in age classes 5 to 9. Using the uplifted AAC of 300,000 m³ as set previously for TFL 5, it is estimated that it will take about 2.5 years to remove the Priority 1 volume and 3 years to remove the Priority 1 and 2 volumes.

Table 8. TFL 52 Block B - Stand Harvest Priorities

A. Block B - Conifer Volume by Age Class (Stands with a Pine Component)											
% Pl in stand		1	2	3	4	5	6	7	8	9	Total
1 - 10	1000 m3	0	30	26	151	149	75	122	405	0	958
11 - 20	1000 m3	0	2	5	100	152	76	77	57	0	469
21 - 30	1000 m3	0	1	1	42	75	50	49	16	0	234
31 - 40	1000 m3	0	1	3	44	21	7	22	24	0	122
41 - 50	1000 m3	0	0	0	24	62	25	16	15	0	142
51 - 60	1000 m3	0	1	1	7	21	47	55	6	0	138
61 - 70	1000 m3	0	1	0	20	48	17	14	0	0	100
71 - 80	1000 m3	0	1	0	21	49	35	37	15	0	158
81 - 90	1000 m3	0	2	0	27	25	20	48	8	0	128
91 - 100	1000 m3	0	0	0	20	61	115	83	13	0	292
Total	1000 m3	0	39	36	456	663	467	523	559	0	2,743
Priority 1						204	234	237	42	0	717
Priority 2						83	32	38	39	0	192
Priority 3					456	376	201	248	478	0	1,759
B. Block B - Conifer Volume by Age Class (stands having NO pine component)											
Age Class											
	1	2	3	4	5	6	7	8	9	Total	
1000 m3	0	76	49	57	129	72	201	624	27	1,235	
1000 m3		Volume	Age 5+		129	72	201	624	27	1,053	

Prior to consolidation, the AAC for the area of Block B was set at 300,000 m³, up from 122,800 m³ (including 6,747 m³ allocated to BCTS) in 2003. The previous licence holders were unable to harvest the uplifted AAC because of the inability of the associated plywood and saw mills to utilize the pine volume. The substantial drop

in volume harvested in 2005 was the result of West Fraser reconfiguring cutting permits and plans to focus more on pine-leading stands. Until that was completed, harvesting was curtailed.

Section B of Table 8 demonstrates that there are approximately 1.05 million m³ of mature volume (age class 5+) in stands having no pine component. This volume will be available for harvest once salvage of damaged stands is completed.

During the period from 2001-2005, the following volumes were harvested from Block A:

Table 9. TFL 52 Block A - Harvest Volumes

	2001	2002	2003	2004	2005	Total
AAC	508,273	508,273	534,761	534,761	534,761	2,620,829
Vol Charged to AAC	199,801	469,483	544,966	654,102	613,200	2,481,552
Total Harvested	217,538	511,351	729,332	673,674	1,042,182	3,174,077

Table 10 shows the volumes harvested from Block B. Due to the differences in accounting programs between the previous licence holder and West Fraser, the total volume harvested per year is not available for 2004 and 2005.

Table 10. TFL 5 Block B - Harvest Volumes

	2001	2002	2003	2004	2005	Total
AAC	117,346	117,346	294,546	294,546	294,546	1,118,330
Vol Charged to AAC	155,215	108,487	160,385	113,638	77,717	614,902
Total Harvested	n/a	166,183	186,746	not	available	

In December 2006, TFLs 5 and 52 were consolidated and the harvested volumes are summarized as originating from a single licence rather than two, as displayed in Tables 9 and 10. The total volume removed from TFL 52 was 915,929 m³. Of this volume, 690,687 m³ was charged to the allowable annual cut (AAC). This compares reasonably well with the AAC (without the BCTS portions) of 797,014 m³ considering that 25% of the harvested volume was low-grade non-quota wood.

5.1.3. Consolidated TFL 52 - Pine Component

Table 11 provides a summary of the coniferous volumes of stands having a pine component within each age class on the timber harvesting landbase of the consolidated area of TFL 52. West Fraser's priority is to target harvesting on stands having greater than 50% pine component in age classes 5 to 9.

Table 11. Consolidated TFL 52 - Conifer Volume by Age Class

Conifer Volume by Age Class (Stands with a Pine Component)											
% PI in stand	Age Class										
		1	2	3	4	5	6	7	8	9	Total
1 - 10	1000 m3	0	43	163	481	755	473	447	2,674	36	5,072
11 - 20	1000 m3	0	13	19	226	385	234	239	967	21	2,104
21 - 30	1000 m3	0	5	28	206	368	248	269	1,055	0	2,179
31 - 40	1000 m3	0	18	15	193	178	166	178	566	2	1,316
41 - 50	1000 m3	0	29	8	138	188	178	235	415	0	1,191
51 - 60	1000 m3	0	26	6	99	265	183	269	457	1	1,306
61 - 70	1000 m3	0	15	3	99	233	174	287	378	0	1,189
71 - 80	1000 m3	0	15	4	201	329	267	209	305	3	1,333
81 - 90	1000 m3	0	28	4	111	274	300	427	144	0	1,288
91 - 100	1000 m3	0	15	4	92	474	488	872	86	0	2,031
	1000 m3	0	207	254	1,846	3,449	2,711	3,432	7,047	63	19,009
		Priority 1				1,575	1,412	2,064	1,370	4	6,425
		Priority 2				366	344	413	981	2	2106
		Priority 3			1,846	1,508	955	955	4,696	57	10,017

Conifer Volume by Age Class (stands having NO pine component)											
	Age Class										
		1	2	3	4	5	6	7	8	9	Total
	1000 m3	0	91	149	444	916	868	889	11,117	355	14,829
	1000 m3		Volume	Age 5+		916	868	889	11,117	355	14,145

Priority 3 stands have the lowest pine component or are the youngest of the damaged stands. They are expected to provide harvestable volume of approximately 250 m³/ha in 20-30 years time when a timber supply pinch point is expected to occur. The 10 million m³ volume shown in Table 11 (Priority 3) is the total coniferous volume and the pine component is 30% or less except in the Age Class 4 category. Much of the pine component in Priority 3 stands is expected to be a non-recoverable loss as harvesting would not be done for 10 or more years.

5.1.4. Volume Recovery Model

West Fraser undertook a project with J.S.Thrower & Associates to develop a "stand recovery" model to estimate the time required for a stand to recover to a target volume after attack by MPB. The intent of the model is to determine harvest priorities based on which stands will grow to a minimum desired volume within a defined time frame and which stands will not.

The model incorporates a stand condition matrix representing site index, spruce volume (pre-MPB attack), volume class (pre-attack) and age for mixed pine-spruce stands on the TFL. It then utilizes MPB attack severity classes which equate to the proportion of pine stems by diameter class that are attacked within a stand. These parameters are based on measurements and observations on TFL 52.

A series of Tree and Stand Simulator (TASS) model simulations of the pre-attack stand conditions were developed to model the two MPB attack levels. The resulting stands (minus the attacked trees) were then grown to 250 years of age. The model demonstrates that recovery of mixed pine-spruce stands to a specified target volume after a MPB attack is dependent on the post-attack volume, site index and stand age. The model also demonstrates that there is minimum post-attack volume for each stand combination of site index and stand age (i.e. MPB attack reference age) where the stand recovery time takes too long or does not occur.

The volume recovery information from this model was used to set harvest priorities in the Woodstock model used in the timber supply analysis. For example, stands with shorter volume recovery times were given a low priority for harvest. MPB stand losses used in this analysis were based on the high MPB attack severity class only.

5.1.5. Shelf Life

Shelf life refers to the expected number of years that MPB-damaged pine will be economically useable. There is no definitive answer as to how long a tree or a stand will remain useable but some insights are developing.

Dr. Kathy Lewis, Program Chair of Ecosystem Science and Management at UNBC, has conducted research in the dry cool Sub-Boreal Spruce (SBSdk) biogeoclimatic subzone and in the moist cold (SBSmc3) subzone. Dr. Lewis' work suggests that the greatest changes in wood quality occur in the first two years after attack and the deterioration is due to blue stain and the number and depth of checks (*Wood Decay and Degradation in Standing Lodgepole Pine Killed by Mountain Pine Beetle*; Mountain Pine Beetle Initiative Working Paper 2006-11. Canadian Forest Service). Development of sap rot and eventual falling of trees may occur 10 or more years after mortality.

The biogeoclimatic subzones in which Dr. Lewis conducted her research are not present on TFL 52; however, our observations tend to support her conclusions. The timber supply analysis assigns a "wet" or "moist" moisture class to each analysis unit according to the regimes listed in the report *Provincial-Level Projection of the Current Mountain Pine Beetle Outbreak: An Overview of the Model (BCMPB.v2) and Results of Year 2 of the Project* (Canadian Forest Service, Ministry of Forests and Range, April 2005). According to Dr. Lewis' research, fall-down of dead trees in wet subzones may start within 3-5 years of death; by year eight after death, 25-50% of trees may have fallen. Fall-down is related to diameter with larger trees taking longer to reach a state where they will fall. By inference from Dr. Lewis work, we expect that fall-down in moist subzones will be delayed by 2-3 years as compared to wet subzones. If this proves to be the case, then salvage should be feasible for at least the

next five years given that much of the present dead pine was killed within the past two years.

5.1.6. Wood Quality

Wood quality of lodgepole pine, with respect to lumber and plywood manufacturing, begins to deteriorate soon after attack by MPB with most of the damage being done within two years. Blue stain, checks, and sap rot are the initial factors reducing quality.

Checking, a result of rapid drying below the fibre saturation point (FSP), produces the greatest obstacle to lumber recovery and renders logs virtually useless for plywood. Dead dry pine tends to produce broken or shattered veneer as it is peeled. Observations in the summers of 2006 and 2007 indicate that checking occurs very quickly in hot dry weather, especially in decked logs.



Figure 5. Checks and Blue Stain on Pine Logs.

Moisture content of pine logs measured at the butt is commonly as low as 16%, well below the FSP of about 30%. As logs dry below the FSP, checks develop and as drying continues, the number and size of checks increases (*Quantifying Lumber Value Recovery from Beetle-Killed Trees*. MPBI Working Paper 2006-09). Checks are invariably present in dry logs with many of them running to the core.

Blue stain has not been identified as a significant issue for lumber sales in the North American market although it is not desirable for the offshore market. Using sawmill residue with blue stain is not a problem in manufacturing medium density fibreboard.

Blue-stained chips do not present a problem at Cariboo Pulp which uses a kraft process, but has lead to increased costs at Quesnel River Pulp which uses a chemi-thermo-mechanical process.

5.1.7. Utilization

The utilization standards shown in Table 12 are those that reflect current standards and performance on Blocks A and B. There is a 10 cm difference in stump height between Blocks which has been incorporated in the timber supply analysis. During the term of MP 4, the stump height of 20 cm will be maintained on the Block B portion of the landbase.

Table 12. TFL 52 Utilization Specifications

Leading Species	Minimum DBH (cm)	Stump height (cm)	Minimum top DIB (cm)
Block A:			
Pine	12.5	30.0	10.0
All others	17.5	30.0	10.0
Block B:			
Pine	12.5	20.0	10.0
All others	17.5	20.0	10.0

A study of operational stump heights on TFL 5 prior to consolidation with TFL 52 (which included information from the previous five years) was completed prior to MP 10. The results indicated that average stump heights are approximately 16.0 cm. MoFR Research Branch and Resources Inventory Branch reviewed the stump height information and approved it for use in the MP 10 yield tables.

It has been observed that there is a greater amount of unmerchantable debris left after logging on sites having older attacked pine. This appears to be a function of the deterioration that occurs after MPB attack.

Objective: To salvage the Priority 1 and 2 stands within 10 years.

Strategies:

- Direct available harvesting capacity towards stands having a pine component greater than 50% in age class 5 and older stands as indicated in Table 12.
 - Maintain a cutting permit/planning table of timber volumes in the harvesting queue.
 - Prepare an annual summary showing the volume, area and species harvested.
 - Use and refine the “stand recovery model,” developed by J.S.Thrower & Associates to help make decisions on whether a stand should be harvested as a priority or left to recover.
-

Objective: To identify a point where an uplift to AAC is no longer required to meet salvage objectives.

Strategies:

- Prepare an annual summary of coniferous volume in a format similar to Table 12, incorporating disturbance updates from the VRI.
 - Review stand conditions with respect to quality or salvage potential of pine once Priority 1 volumes have been harvested. This review would incorporate local knowledge of pine quality as well as current research on shelf-life.
 - Undertake a timber supply analysis in five years to provide guidance for developing future harvesting, inventory and mitigation plans.
-

Objective: To direct harvesting operations to stands under attack (by spruce bark beetle and Douglas-fir bark beetle) and to blowdown (which provides breeding habitat for these pests).

Strategies:

- Conduct an annual detection program to locate infested or damaged stands.
 - Utilize trap trees and pheromone baits to concentrate populations and facilitate harvesting.
 - Balance the need to harvest damaged spruce and Douglas-fir stands with the need to salvage dead pine.
 - Prepare an annual summary showing the volume, area, and species harvested.
-

5.1.8. Minimum Harvest Ages

In the timber supply analysis, minimum harvest ages are modeled at the age at which stand volume achieves at least 95% of its culmination of mean annual increment. This varies by species and site index and has a range of 50 to 150 years. Appendix II and III of the Information Package for the timber supply analysis provides a list of minimum harvest ages.

In the context of the present efforts to salvage stands damaged by MPB, harvest age does not have a significant bearing. Harvest entries into managed stands are not expected during the term of this management plan except incidentally during road building for access to older natural stands.

5.1.9. Harvesting Methods

The Woods section at West Fraser is required to provide appropriate logs to three manufacturing plants, each with different needs with respect to species and size. Harvesting systems have evolved to suit site conditions and harvesting priorities and to process and sort logs for the mills. West Fraser utilizes conventional and low ground pressure skidding, log forwarders, roadside and stumpside processing, cable yarding, and occasionally helicopter forwarding. The selection of the harvesting method employed on a specific block depends on terrain, soil conditions, species mix, and piece size.

West Fraser utilizes approximately 16 logging contractors in the Quesnel operations. Ten of these are stump-to-dump contractors who are also responsible for log hauling. The other six are stump-to-roadside contractors; West Fraser has 39 logging trucks under contract to haul logs for the roadside contractors

In 2003 our contract grapple yarder was phased out because it did not fit our need to focus on beetle-damaged pine. With West Fraser's support, the contractor re-fitted with cut-to-length equipment which is being used for both stumpside and roadside processing.

In 2005 a major contractor retired and folded his business under the terms of the Forestry Revitalization Act. The volume of approximately 200,000 m³ harvested by this contractor (renewable and non-renewable contract volume) came close to satisfying the take-back volume applied to TFL 52 and renewable Forest Licences held by West Fraser in the Quesnel Forest District.

Objective: To get the best log to the most cost-effective manufacturing facility.

Strategies:

- Identify site-limiting factors in the planning stages of development.
 - Identify species, volumes, and piece sizes that are optimal for the three mills to which logs are delivered.
 - Assign appropriate harvesting systems to blocks that can most closely produce the desired logs within the constraints of harvesting priorities.
-

5.2. Desired Allowable Annual Cut

The desired Allowable Annual Cut (AAC) for the period January 1, 2007 to December 31, 2011 is 1,371,680 m³ which includes 80,693 m³ allocated to BC Timber Sales in 2006.

The Timber Supply Analysis Report (Appendix I) indicates that even with the mortality to lodgepole pine stands by mountain pine beetle, the timber supply is quite robust. The analysis results indicate that it is possible to salvage a large component of dead pine before the expiration of its anticipated shelf life of approximately ten years.

While the timber supply analysis focused on salvaging dead pine, it also included a harvest of 140,000 m³ per year for five years to allow harvest of spruce and Douglas-fir stands attacked by bark beetles. This is a necessary measure to contain the beetle populations at sub-epidemic levels so that the mid-term timber supply is not compromised.

A number of scenarios were tested in the analysis. Setting the initial harvest at the current AAC of 692,800 m³/year in one scenario of the Base Case recovers only 60% of the pine volume impacted by MPB, leaving over 2.95 million m³ unsalvaged. Increasing the initial annual harvest rate to 1.372 million m³ allows maximum salvage of affected pine improves recovery to over 90% with less than 650,000 m³ left unsalvaged.

West Fraser recognizes that there are many variables that affect the shelf life of dead pine. Although the timber supply analysis indicates that the majority of pine can be salvaged by approximately 2016, it is apparent that another analysis will be necessary in five years to incorporate new information and to provide a “status report” on the effectiveness of salvage strategies.

5.3. Integration with other Users

5.3.1. Integration of the BC Timber Sales Program

The Forest Revitalization Act of 2003 included provisions for the government to reduce the allowable annual cut on Tree Farm Licences and other tenures for the purpose of making timber volume available for First Nations, community forests, woodlots, and the BC Timber Sales program. West Fraser completed negotiations with MoFR in 2006 as to what volumes and areas the Act would apply on Blocks A and B.

5.3.1.1. Block A

The traditional volume allocated to the Small Business Forest Enterprise Program (SBFEP) on Block A was 35,239m³/year which was not from any specific geographic area. The negotiations with MoFR to meet West Fraser's obligations under the Forest Revitalization Act resulted in an allocation to BCTS of an additional 40,000m³/year for a total of 75,239m³/year from specific geographic units within Block A. BCTS specifically targeted spruce-leading areas to satisfy the need for sufficient timber sale volume to determine market-based pricing for spruce in this region.

Objective: Remove the land units allocated to BCTS from TFL 52.

Strategies:

- Complete harvesting on those cut blocks within the BCTS tracts that are still under cutting permits held by West Fraser.
 - Assess the implications of legally removing the BCTS tracts from TFL 52 during the term of MP 4.
-

5.3.1.2. Block B

The volume allocated from Block B for the SBFEP was 5,454m³/year. There was no specific geographic area from where this volume was to come. Location of harvest blocks suitable for inclusion in the SBFEP was determined through the normal Forest Development Plan process and was referred to the District Manager for approval and acceptance.

The agreement reached in the negotiations was that the volume allocated to BCTS was increased to 6,747 m³/year and there was no defined geographic area associated with the BCTS allocation (an exception to the norm on TFLs elsewhere in the province). This agreement has proven to be untenable because it is not supported by the legislation. Preliminary discussions have begun to negotiate a specific BCTS tract within Block B.

Objective: Identify a tract within Block B that will satisfy the volume requirements of BCTS without compromising the operational integrity of the Block from West Fraser's perspective.

Strategies:

- negotiate with BCTS Planning Foresters on suitable areas for a BCTS tract.
-

5.3.2. Recreation

The Quesnel Highlands offers considerable opportunity for outdoor recreation in both summer and winter. The high recreational value is due in part to the geography of the area and the historic features left from the 1860's gold rush.

There are a number of good quality hiking trails that provide moderately difficult hiking access into alpine meadows on Mount Murray, Mount Proserpine, and Bald Mountain. Backcountry skiers use alpine and sub-alpine bowls of Mount Greenberry and Mount Tinsdale. Cross country skiers use the Groundhog Lake and Cornish Mountain areas where trails are set and groomed. Snowmobilers use the Groundhog Lake and Elk Mountain area as well as unused logging roads throughout the TFL.



Figure 6. New Footbridge at Meadows Trails, Wells.

Atan Lake, Chisel Lake, Crescent Lake, Lightning Creek, and Whiskey Flats Recreation Sites have been maintained by West Fraser for the past 15 years. These sites receive relatively light use for camping, fishing or hunting throughout the summer and fall, but are locally valuable facilities. West Fraser proposes to continue the maintenance in the future in cooperation with Ministry of Tourism, Sport and the Arts.

West Fraser has supported outdoor recreation in the Wells-Barkerville area for the past four years by providing funding to the Wells Snowmobile Club for grooming the extensive network of snowmobile trails. Some work has been done with the Wells and Area Trails Society and the Ministry of Tourism, Sport and the Arts to help develop the hiking and ski trail network, as shown in Figure 6.

The FSP for TFL 52 (Block A) provides results or strategies for maintaining backcountry conditions as defined in the CCLUP. Beyond this, West Fraser is committed to supporting recreation groups using areas on the consolidated TFL 52, where and when possible, to enhance recreational opportunities through:

- Maintaining existing forest recreation sites
- Providing funding through the Forest Investment Account, when available, for viable projects supported by the Ministry of Tourism, Sport and the Arts.

5.4. Retention Associated With Large-Scale Salvage

The Chief Forester issued a letter on December 12, 2005 (included as Appendix V) which provides “Guidance on Landscape and Stand Level Structural Retention on Large-Scale Operations Associated with Mountain Pine Beetle Killed Timber.” Included as an appendix to this guidance letter was an interpretation paper, “Forest Stewardship in the Context of Large-Scale Salvage Operations,” prepared for the previous Chief Forester. The intent of this directive was to assist in the planning and implementation of salvage operations while minimizing environmental impacts. In February 2006, the Quesnel Forest District released the *Quesnel Forest District Enhanced Retention Strategy for Large Scale Salvage of Mountain Pine Beetle Impacted Stands* (Quesnel Forest District Enhanced Retention Strategy Committee, 2006) (included as Appendix VI), which built upon the Chief Forester’s guidance letter.

The *Strategy* recommends retaining 20% of the MPB-affected area to support stand level biodiversity requirements. Existing riparian areas, wildlife tree patches (WTPs), unique habitat types, and high risk terrain stability areas may contribute to this 20% target, with WTPs contributing a maximum of 8%. OGMA’s are not eligible to contribute to the 20% target. The areas outside of these classifications that contribute to the 20% retention are referred to as Conservation Legacy Areas. They are temporary reserves that are available for harvest over an extended regeneration and growth period.

It is important to note that the *Strategy* was developed for the Quesnel TSA which is comprised of approximately 75% pine-leading timber types. Conversely, TFL 52 is only

about 25% pine-leading. Other productive exclusions for riparian, unstable terrain, habitat, etc. will contribute to the maintenance of biodiversity with only minor enhancements at the stand level.



Figure 6. Forest Mosaic - Reddish Creek, TFL 52.

Table 13 shows the distribution of pine-leading stands by landscape unit (LU). Only the Umiti and Victoria LUs have a pine-leading component that is greater than 30% of the productive forest area of the LU. We believe it is prudent to follow the Quesnel District retention strategy in these two landscape units and to aim to achieve the 20% retention. This is reflected in the timber supply analysis.

Objective: Achieve the target of 20% stand-level retention in MPB-attacked stands in the Umiti and Victoria landscape units.

Strategy:

- Implement the recommendations and strategies contained in the *Quesnel Forest District Enhanced Retention Strategy for Large Scale Salvage of Mountain Pine Beetle Impacted Stands* (Quesnel Forest District Enhanced Retention Strategy Committee, 2006).
-

Table 13. Distribution of Pine-leading Stands

Block A Landscape Units	PI-Leading THLB (ha)	Reductions (ha)						Additional netdown to meet 20% CLA	Productive area (all spp.)	THLB area (all spp.)	PI-Leading as % of Prod. Area	Productive netdowns (all spp.)	Productive netdowns (% of prod.)	Productive netdowns (% of THLB)
		Caribou	Riparian	Terrain	WTP	Total	%							
Antler	7,503	529	684	787	74	2074	27.6	-573.4	41,844	24,444	17.9%	17,401	41.6	71.2
Big Valley	2,539	8	149	142	5	304	12.0	203.8	18,242	14,089	13.9%	4,153	22.8	29.5
Bowron	982	71	5	4	1	81	8.2	115.4	7,452	5,437	13.2%	2,015	27.0	37.1
Indianpoint	1,962		53	11	24	88	4.5	304.4	11,900	10,631	16.5%	1,269	10.7	11.9
Jack of Clubs	824	20	86	223	2	331	40.2	-166.2	18,952	11,890	4.3%	7,061	37.3	59.4
Lightning	3,874		116	14	56	186	4.8	588.8	14,808	11,758	26.2%	3,050	20.6	25.9
Swift	2,420		167	6	48	221	9.1	263	25,232	17,504	9.6%	7,727	30.6	44.1
Umiti	11,658		577	86	124	787	6.8	1544.6	36,854	28,455	31.6%	8,399	22.8	29.5
Victoria	16,903		1,390	1	451	1842	10.9	1538.6	43,666	32,679	38.7%	10,987	25.2	33.6
Willow	2,108		85	44	5	134	6.4	287.6	18,615	14,773	11.3%	3,842	20.6	26.0
	50,773	628	3,312	1,318	790	6,048		4,106.6	237,565	171,660	21.4%	65,904	27.7	38.4
Block B														
Ahbau	8,523		65	1	182	248	2.9	1456.6	32,649	27,714	26.1%	4,935	15.1	17.8
Total	59,296	628	3,377	1,319	972	6,296	3	5,563.2	270,214	199,374	21.9%	70,839	26.2	35.5

5.5. Fire Management

5.5.1 Fire Prevention and Suppression

The responsibility for prevention, detection, and suppression of wildfires is described in the Wildfire Act (2004) and Wildfire Regulation (2005). The goals of West Fraser's fire management program are to minimize the risk of wildfire originating from any of our operations and to minimize the damage from fire in productive forest lands. Fire prevention is the responsibility of everyone, including contractors working for West Fraser.

Objective: Conduct forest management operations in a manner that meets or exceeds the requirements of the *Wildfire Act* and *Wildfire Regulation*.

Strategies:

- Produce a Fire Preparedness Plan annually.
 - Provide basic fire training annually for all staff and contractors so that a fire response capability is maintained.
 - Maintain a central cache of fire equipment suitable to support a 25-person fire crew.
 - Conduct and document periodic inspections of contractor's fire equipment during fire season.
 - Regulate operating restrictions on "high risk" forestry operations according to the fire danger index derived from the appropriate fire weather station
-

5.5.2. Prescribed Fire

Prescribed fire is a useful tool for preparing sites for reforestation and for reducing hazardous accumulations of fuel. West Fraser has used and will continue to use prescribed fire as one means of meeting its forest management goals.

Objective: Use prescribed fire as a silviculture and fuel management tool when weather, fuel, site, and environmental conditions are suitable to conduct a burn within risk and cost parameters that are acceptable to the Company.

Strategies:

- Prepare a plan that describes fuel conditions, desired burning conditions, values at risk, public relations and information dissemination, and operational factors.
 - Adhere to requirements for smoke management.
 - Monitor fire weather indices from the appropriate weather station.
 - Obtain a spot forecast of weather conditions and smoke ventilation from the MoFR weather technician or Environment Canada prior to igniting a prescribed fire.
-



Figure 8. Prescribed Burn CP 758-2.

5.5.3. Fuel Management

In recent years, harvesting has been focused on stands with high proportions of lodgepole pine which have been damaged or killed by mountain pine beetle. The deterioration of these stands has, in some cases, resulted in an elevated volume of fuel loading that not only creates challenges for reforestation, but poses a significant fire hazard. West Fraser has a vested interest in reducing the risk of wildfire because of the potential of fire damaging or destroying future wood supply.

Objective: Reduce the fire hazard of accumulated fuel remaining after harvesting operations.

Strategies:

- Prepare post-harvest fire hazard and risk assessments of harvested blocks using West Fraser's "Fire Hazard Assessment Procedures."
- Where a fire hazard is identified, implement fuel or risk reduction measures where appropriate such as:
 - Piling and burning roadside debris
 - Broadcast burning
 - Piling and burning on-block debris
 - Utilizing mechanical site preparation to align, flatten, or break up fuel concentrations
 - Deactivating or blocking roads to restricting public access to high risk sites where and when practical.

5.6. Forest Health

Healthy forests are those that are resilient to disturbances, sustainable over the long-term and provide for a variety of resource needs and demands. Forest ecosystems are dynamic and our understanding of how they will respond to management actions is limited. If the health, vitality, and rates of biological production are maintained, forest ecosystem condition and productivity will be conserved. Furthermore, forest health will be conserved if biotic and abiotic stresses and disturbances maintain both ecosystem processes and conditions within a range of natural variability.

A key part of sustainable forest management is an understanding of natural disturbance processes and patterns across the landscape. In recent years, our pool of knowledge about natural processes has risen sharply, but there is still much to learn. In 2005, a *Forest Health Plan for Tree Farm Licence 52* was completed for West Fraser by JCH Forest Pest Management and Art Stock Consulting Ltd. The goal of the plan was to "improve the resiliency, sustainability and growth and yield of

forested ecosystems on TFL 52 by developing and implementing strategies and tactics to minimize landscape level forest health hazards and risk.”

The forest health plan provided an overview of forest health factors that have the potential to affect forest management and practices in the major natural disturbance types (NDT) found on TFL 52. NDTs are classifications of ecosystems having similar stand-initiating disturbances as shown in Table 14.

Table 14. Natural Disturbance Types

	Stand-Initiating Events	Biogeoclimatic Subzones (TFLs 5& 52)	Type of Events
NDT 1	Rare - <350 years	ESSFwk1 ESSFwc3 ICHwk4	Small fires, wind, death of patches of trees
NDT 2	Infrequent – approx. 200 years	ICHmk3 SBSwk1	Moderate – large fires
NDT 3	Frequent – approx. 125 years	SBSmh SBSmw SBSdw1	Small to very large fires, defoliating insects
NDT 4	Stand-maintaining fires – 4-50 years	none	Ground fires
NDT 5	None-to-rare: Alpine tundra, Sub-alpine parkland	AT ESSFwcp3	Cold, wind, small fires

Although the forest health plan was prepared for TFL 52 Block A, it is equally applicable to Block B, represented entirely by NDT 3.

5.6.1. Knowledge Gaps

The Forest Health Plan identified a number of knowledge gaps that may have a bearing on long-term productivity, growth and yield estimates, and timber supply analysis.

5.6.1.1. Two-year cycle spruce budworm (*Choristoneura biennis*)

An overlay analysis completed for two-year cycle spruce budworm has provided some insight into current century history, distribution, and landscape level hazard. However other site-specific factors may be contributing to hazard. A more thorough analysis using other spatial data such as Terrestrial Ecosystem Mapping and Digital Elevation Model should be conducted to gain a better understanding of factors which influence hazard. These also include connectivity of suitable host stands as fragmentation may possibly reduce hazard. This analysis should be combined with ground surveys to capture stand characteristics of infested stands and dendro-ecological analysis to determine historical (pre-1912) patterns and growth impacts.

5.6.1.2. Western Balsam Bark Beetle (*Dryocetes confusus*)

Recorded infestations of western balsam bark beetle date back to 1923. Approximately 4-5 outbreaks have been recorded since, with a peak of over 38,000 ha in 2003. The frequency and magnitude of these outbreaks could affect timber supply expectations for sub-alpine fir. Studies should be conducted to determine if non-recoverable losses in the timber supply review need to reflect those resulting from western balsam bark beetle. Ideally these studies could be combined with those for two-year cycle spruce budworm since there is probably some interaction between the two species.

5.6.1.3. Tomentosus root disease

Studies undertaken in the MacGregor Model Forest have shown that site series has a strong relationship to Tomentosus root disease incidence in the SBSwk1. The opportunity exists to examine this relationship on TFL 52 and develop a hazard rating system using terrestrial ecosystem mapping and landscape level surveys. Surveys should be conducted to validate this relationship in the SBSwk1 of TFL 52 and to determine if this relationship exists in other biogeoclimatic zones.

5.6.1.4. Fire Regimes

In order to apply the principles of natural disturbance to a management philosophy we need to fully understand all disturbance agents. The Forest Health Plan reviews historical biotic disturbances but without the link to abiotic events, particularly fire, it is not possible to ascertain whether these current century biotic events are within the historical range of variability. Therefore fire regimes should be characterized for TFL 52.

5.6.1.5. Pests of Young Stands

Young stands represent the future resource of TFL 52. A variety of forest health factors, including western gall rust and Tomentosus root disease, have the potential to impact growth and yield expectations. There is a need to gain a better understanding of the distribution and impact of pests of young stands for hazard and risk rating and for growth and yield purposes (Operational Adjustment Factors).

5.6.1.6. Western Gall Rust (*Endocronartium harnessii*)

Cursory investigations have revealed a relationship between seedlot and western gall rust incidence on TFL 52. Further surveys and studies are required to statistically validate this relationship, conduct ground surveys to determine the extent of the problem, and develop strategies for reducing the impacts to growth and yield expectations.

Current free-growing criteria do not accept trees with stem galls or branch galls within 5 cm of the main stem. A combination of retrospective studies of older stands and establishment of monitoring plots in young stands is required to fully understand the impacts of these “lethal” stem galls.

5.6.1.7. Climate Change and Invasive Insects and Diseases

Climate change can affect forests by altering fire patterns, drought, wind intensities, and insect and disease outbreaks. Climatic factors influencing hazard and risk models can be expected to change, e.g. mountain pine beetle range limits may rise in elevation and latitude. A 2.2° C increase in mean daily temperature, for example, was predicted to increase the percentage of spruce weevil “high hazard” land base in the Prince George area of the Northern Interior Forest Region from 7% to 71%.

If climatic warming is occurring, the geographic distribution of some forest health factors may change. Foliage diseases, particularly of pines, can have very serious impacts but generally only where pine has planted in ecologically inappropriate site series. A warming climate may influence the occurrence of serious foliage disease events.

Within the context of increased global trade and perhaps also as a function of global warming, invasive insects and diseases represent a real, if low-level, threat to sustainable forest management. White pine blister rust is one example of an invasive pest that has had significant consequences for forest management in North America.

Temperate forests are naturally resilient. “Good” forest management practices will likely provide the best available defence in the face of rapid climate change and possibly invasive insects and diseases. Some land use management practices likely to maintain forest diversity and ecological function during rapid climate change are:

- representing forest types in reserves across environmental gradients
- avoiding monocultures
- rapid response to fires and insect outbreaks, i.e. protecting primary forests from catastrophic disturbance
- ensuring (and perhaps narrowing) seed zone transfer fits
- monitoring with adaptive management for observable changes in forest health (pests, drought, regeneration survival, etc.).

5.6.2. Bark Beetles

There are four bark beetles present on TFL 52, including mountain pine beetle (*Dendroctonus ponderosae*), spruce beetle (*D. rufipennis*), Douglas-fir beetle (*D. pseudotsugae*) and western balsam bark beetle (*Dryocetes confusus*) (see Sec. 5.6.1.2).

5.6.2.1. Mountain Pine Beetle

The mortality of pine resulting from the mountain pine beetle (MPB) epidemic is the primary forest health concern on both TFLs at this time.

Current harvesting operations are focused on removing stands killed by MPB and spruce beetle (refer to Sec. 5.1 for details of harvesting operations directed at MPB).

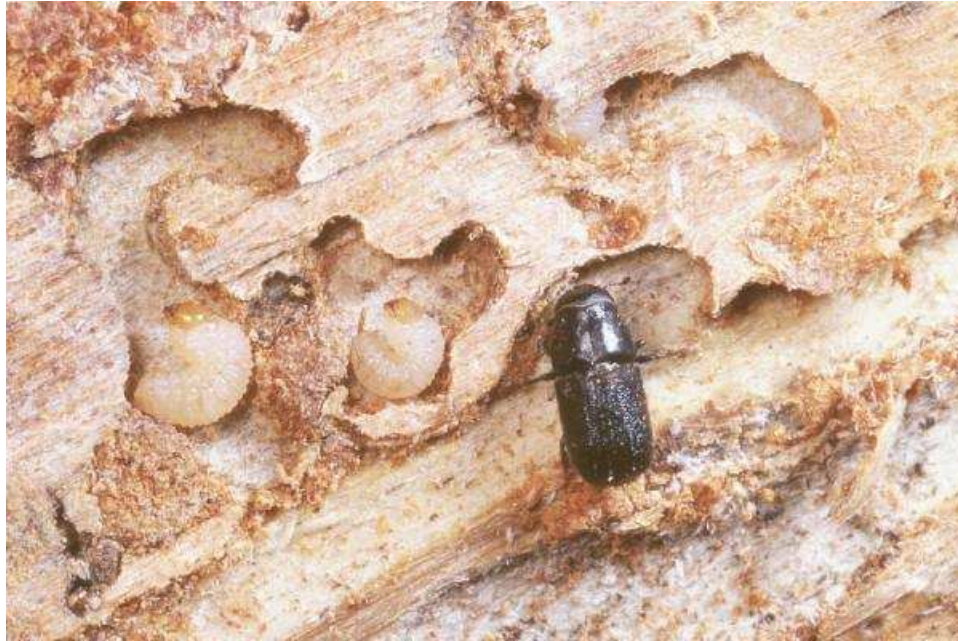


Figure 9. Mountain Pine Beetle Larvae and Adult.

In 2006 the MPB continued to attack young pine in age class 2, but by 2007, surveys have shown that there has been no new attack. Information from MoFR regional staff confirmed our observations that pine greater than 10-12 cm in diameter suffered highly variable mortality rates with some stands having mortality in the range of 80%. While this is a highly significant rate, there are relatively small areas of pine-leading stands of 20-40 years of age. The total area of pine-leading stands in this age class is 8,169 ha.

5.6.2.2. Spruce Beetle

Spruce beetle infestations have been detected in the SBSmw and SBSwk1 subzones in the past two years. In 2006, West Fraser harvested approximately 60,000 m³ of infested spruce stands east of the Quesnel River. About 50% of that was within TFL 52. By the end of 2007, it is expected that about 150-200,000 m³ of attacked spruce stands will have been harvested from the TFL alone. Although the attacked spruce volume is relatively small as compared to the MPB-killed pine, it is a high priority for harvest because of the high proportion of spruce on TFL 52. Trap trees were felled in several locations in the winter of 2006-07 as site specific population control and monitoring projects. A trap tree program will continue as an annual control measure until such time as the population is endemic.

5.6.2.3. Douglas-fir Beetle

Douglas-fir beetle is present in increasing numbers on Block B, particularly along the Fraser River escarpment. This coincides with mule deer winter range where harvesting is restricted by a target of maintaining at least 33% of winter range in age class 4 or older. In the winter of 2006-07, a trap tree program was initiated. A two-pronged project is being undertaken in 2007-08 to evaluate the effectiveness of the mule deer winter range management strategies and the impact of small scale salvage within the winter range.

Objective: Improve the resiliency, sustainability, and growth and yield of forested ecosystems.

Strategies:

- Conduct annual aerial pest detection surveys specifically to identify bark beetle infestations with the intent of also identifying other pests that may appear.
- Harvest pest infestations detected on merchantable stands on a priority basis.
- Harvest the oldest stands as a priority as they are most at risk to endemic and epidemic losses.
- Solicit expert advice where new or unfamiliar pests are detected.
- Identify factors responsible for forest health hazards by describing the role of insects disease and abiotic factors from an historical perspective and comparing them to the present conditions.
- Identify preventative strategies and tactics required to reduce landscape level forest health hazard.
- Identify pest-based suppression strategies and tactics to reduce short-term losses.
- Describe ecologically appropriate management strategies based on natural disturbance regimes.
- Identify and fill knowledge gaps that need to be filled to achieve long-term goals.
- Apply principles of adaptive management to gain a better understanding of insect and disease response to current and experimental silvicultural practices.

5.7. Silviculture

The basis of long-term sustained yield on the TFL is an effective silviculture program that results in a target density of ecologically appropriate species on each site series after harvesting. West Fraser is aggressive in its silviculture practices and will continue to meet or exceed legislative and regulatory requirements.

West Fraser's primary silviculture goal is to increase the long-term sustained yield by taking advantage of the natural productivity of the land base. This includes optimizing wood production and quality in a practical and cost effective manner while co-managing for other forest resources and forest users.

Our basic silviculture obligation is to establish a free growing stand of ecologically appropriate species on all harvested areas. These standards are included as part of the FSPs for both Blocks A and B.

5.7.1. Regeneration Delay

It is current practice on TFL 52 to plant all harvested areas within two years of harvest. Occasionally, planting will be delayed until the third year, but this is generally balanced by those blocks that are planted within one year of harvest.

Site preparation is required on approximately 35% of harvested areas. This is generally done during the first summer post-harvest, which leaves the sites ready for planting the following spring.

Objective: Maintain or reduce the current two year regeneration delay period on harvested areas.

Strategies:

- Conduct site preparation where required at the first opportunity following harvesting.
 - Plant at the first opportunity following harvesting or site preparation.
-

5.7.2. Seed Procurement

An adequate supply of lodgepole pine, spruce, and Douglas-fir seed is available to meet West Fraser's reforestation obligations on both the TFL and Forest Licences in the Quesnel Forest District. At the present time, there is enough seed to produce 5 million Douglas-fir (including 243,500 from "A" seed), 9.25 million spruce (including 5.1 million from "A" seed), and 68.3 million lodgepole pine which is mostly B+ seed. In addition, there is B seed to produce 13.3 million lodgepole pine seedlings. Orchard seed currently satisfies West Fraser's needs for spruce; production of Douglas-fir and pine "A" seed is increasing and is expected to supply a greater proportion of our requirements over the next five years.

West Fraser is a co-owner of the joint-venture Vernon Seed Orchard Company, which is dedicated to the production of the highest quality seed for its owners. All seed produced at VSOC comes from orchards established with natural forest trees from interior BC seed planning zones. The orchards originate from the top 15-25% of parent trees, tested in Ministry of Forests and Range progeny trials spanning almost 30 years. Careful tree breeding practices have resulted in not

only improved growth, but also increased resistance to *Commandra* rust (lodgepole pine orchards 219 and 234) and to leader weevils (spruce orchard 211).

5.7.3. Stocking Standards

The stocking standards for reforestation are included as an appendix to the FSP's for TFL52. They are similar to the MoFR stocking standards for the region with occasional variations to accommodate specific circumstances. In 2006, the average planting densities on Blocks A and B were 1500 and 1790 trees per ha respectively.

In 2006 West Fraser undertook a review of silviculture regimes used on TFL 52 Block A to see if they were still appropriate and whether changes could be incorporated to reduce future risk of MPB attack by reducing the planted pine component and to increase growth and yield of managed stands. Seven major site series, representing 70% of TFL 52, were simulated in the Tree and Stand Simulator (TASS) model. Genetic gain, establishment density, and species composition were tested as variables in the simulations.

The *Analysis of Growth & Yield of Silviculture Regimes on TFL 52 Report* suggests that there is potential to increase the proportion of spruce planted and to reduce planting densities on the highest site index areas. Planting a component of Douglas-fir may be valuable as a risk reduction strategy or for biodiversity and wildlife objectives. However, because of the longer rotation, doing so may have an effect of increasing the minimum harvesting age. The report also suggests that up to 10% aspen in stands may only have a marginal impact on yields and that natural ingress may not have a significant impact on yields.

Discussions are underway with Dr. Chris Hawkins of the University of Northern BC regarding the potential for management of mixed-wood stands (pine-aspen; spruce-aspen) in the certain areas of the SBSmw subzone that have a high component of aspen in natural stands.

Objective: Continue the review and analysis of silviculture regimes and expand the review to those used on Block B.

Strategies:

- review potential changes in silviculture regimes in the context of product objectives and financial analysis
 - compare TASS predictions with CMI plots to see if predicted yields are realized
 - investigate the impacts of aspen and mixed-wood management on growth and yield.
-

5.7.4. Site Preparation

Site preparation is undertaken to create plantable spots, improve the rooting medium of seedlings, and reduce fire hazard. Various types of site preparation have been done on approximately 40% of the harvested area of Block B and on about 34% of the harvested area of Block A.

The following table provides a summary of site preparation done over the past six years on TFLs 5 and 52.

Table 15. Five-Year Site Preparation Summary (2002-2007)

Block A	Pile	Mound	Disc Trench	Burn	Chain Drag	Total Area
Area (ha)	170.8	1449.7	1803.3	260.9	153.9	3838.6
% of Total	4.4%	37.8%	47.0%	6.8%	4.0%	
Block B						
Area (ha)	17.9	64.8	798.5			881.2
% of Total	2.0%	7.4%	90.6%	0.0%	0.0%	

Prescribed burning is still utilized to a small degree. It is an effective treatment, but smoke concerns, biodiversity measures incorporated into blocks, potential liability in the event of escapes, and costs have reduced our ability to use fire.

Site preparation options will be evaluated and implemented after consideration of site factors, reforestation objectives, ecological information, and external interests such as grazing or smoke sensitivity.

5.7.5. Planting

All areas on TFL 52 are planted generally within two years of harvesting. Table 16 shows the numbers of trees planted over the past five years. A general concern has been expressed about the high proportion of pine being planted in the Central Interior in the wake of the MPB epidemic. West Fraser believes that there is diminished risk of a recurrence of an epidemic in managed pine stands because it is expected that reforested sites will be harvested before they reach a mature (100 years) or old age (120+ years) preferred by MPB.

Planting is done in a manner that avoids large strata of a single species except where ecological conditions such as a dry site series limit the option of using other species.

Table 16. Five-Year Planting Summary (2002-2007)

Block A	Pine	Spruce	Douglas-fir	Balsam	Total
Seedlings	10,491,705	8,853,477	437,861	54,185	19,837,228
% of Total	52.9%	44.6%	2.2%	0.3%	
Block B					
Seedlings	1,303,396	822,422	642,149	0	2,767,967
% of Total	47.1%	29.7%	23.2%	0.0%	

Objective: Plant within two years of harvest with ecologically appropriate species according to the stocking standards approved in the FSPs.

Strategies:

- Maintain a detailed forward plan in *TheForestManager* (West Fraser's block history management system) for every cut block and update during the annual accrual review whenever an activity has been completed.
- Complete site preparation, where required, as soon as possible following harvesting.
- Complete sowing requests to correspond with planned harvesting.
- Maintain the *PlantWizard* seedling inventory and allocation planning database.

5.7.6. Stand Tending

Planted seedlings may die or under-perform where herbaceous or woody brush overtops or out-competes them. In such cases it may be necessary to undertake brushing and weeding to free the seedlings from the competition. West Fraser uses a variety of techniques, including manual and herbicide treatments, to tend plantations as shown in Table 17.

Manual treatments include use of power saws and hand tools to cut competing vegetation. Backpack treatments use the herbicides *Vision* or *Vantage* (glyphosate) applied from backpack sprayers on low brush and herbaceous cover. Basal treatments use a small squirt of the herbicide *Release* (triclopyr) to individual small trees such as birch and aspen. Aerial treatments using glyphosate are done by helicopter-mounted boom sprayers on areas that are well-suited to large scale treatments and where it is impractical to do other treatments.

When using *Vision* or *Vantage* with either a backpack or aerial application, the rate used varies from 3.0 to 5.0 litres per hectare depending on the target species. *Release* is applied to individual stems with a variable rate per stem dependent on the stem diameter. The rate ranges from 1.1 ml/cm of stem diameter for small stems to 12.2 ml/stem for stems of 6-12 cm diameter.

Table 17. Five Year Stand Tending Summary (2002-2007)

Block A	Manual	Backpack (glyphosate)	Basal (triclopyr)	Aerial (glyphosate)	Total Area
Area (ha)	626.2	274.5	453.3	1171.3	2525.3
% of Total	24.8%	10.9%	17.9%	46.4%	
Block B					
Area (ha)	342	326	71.8	61.2	801.0
% of Total	42.7%	40.7%	9.0%	7.6%	

Objective: Use appropriate stand tending techniques where required in order to achieve free-growing status on plantations.

Strategies:

- Monitor plantation performance in order to identify stands at risk of being impeded by competing vegetation
 - Maintain for annual use an Integrated Pest Management Plan that will:
 - Define a competition evaluation process
 - Evaluate optional treatments
 - Define a clear decision-making process
 - Reduce the need for and use of herbicides by incorporating silviculture techniques that minimize competition from other vegetation.
-

5.7.7. Intensive Silviculture

Intensive silviculture includes stand treatments that will:

- increase the long-run sustainable yield above that projected using a regime of basic silviculture
- improve the quality of the wood produced
- decrease harvest age.

Intensive silviculture includes such practices as fertilizing, pruning, rehabilitating degraded or unproductive sites, releasing conifers overtopped by deciduous species, juvenile spacing, using genetically superior seed, and increasing planting densities.

A *Type II Forest Level Silviculture Strategy* was completed for TFL 52 Block A late in 2002. The report describes a silviculture investment strategy based on forest-level financial analysis of stand-level silviculture treatments that aim at improving quality and quantity of timber supply.

The results of the analysis indicated that fertilizing, use of Class A orchard seed, and increasing the percentage of planted spruce on certain sites are cost-effective. At the time, analysis of fertilizing pine-leading stands only was done. It became apparent in 2003 in the midst of the MPB epidemic, fertilizing pine stands was not practical or desirable. In 2004-05, the Type II strategy was updated to include an analysis of fertilizing spruce stands.

A similar *Type II Forest Level Silviculture Strategy* report was completed for Block B (TFL 5 at the time) as well in 2002 and the results were summarized in Management Plan 10. Fertilization was identified as a treatment that if properly focused, could be a valuable tool for enhancing timber quality and quantity.

5.7.7.1 Fertilizing

In November 2005 an update to the TFL 52 Type II Silviculture Strategy was completed in order to assess the potential benefit of fertilizing spruce stands. Timberline and J.S. Thrower & Associates Ltd. developed the spruce growth response-yield assumptions and carried out the analysis (see Appendix XIII). The Mean Annual Increment (MAI) increases for managed existing spruce stands are projected at approximately 8.0 -10.5 m³/ha per treatment at rotation. MAI increases for existing natural spruce stands are projected at approximately 7.0- 8.2 m³/ha per treatment at rotation.

West Fraser fertilized 400 ha of spruce in 2005. Approximately 100 ha of this was in a 60 year-old natural stand; the remaining 300 ha was in 25 year-old managed spruce stands. All of the fertilizing was in the SBSwk1 subzone.

In 2006 and 2007, approximately 3100 ha on Block A and 2650 ha on Block B were fertilized. Of the total area, approximately 2300 ha were in Douglas-fir stands ranging in age from 30-60 years; the remaining areas were in spruce stands ranging in age from 25-40 years. It is expected that approximately 2500 ha/year will be fertilized as part of the MoFR “Forests for Tomorrow” program, an initiative intended to help mitigate the negative timber supply effects of the MPB epidemic.

The volume contribution to AAC from fertilizing is expected to be captured over time in the CMI plots (see Sec 4.9) which will ultimately affect change in the managed stand yield curves. Monitoring plots have also been installed at a rate of about 1 for every 500 ha fertilized, using a protocol designed at the University of Northern BC. They will be re-measured every five years to help determine the effectiveness of the treatments.



Figure 10. Aerial Fertilizing.

5.7.7.2 Backlog Silviculture

Extensive surveys were conducted in 2004 to look for opportunities for brushing or otherwise treating old harvested areas. The results indicated that sites were either satisfactorily restocked and free growing, or there was a large component of deciduous species of a size that made it impractical for treatment. Of the several thousand hectares surveyed, only about 25 ha were subsequently treated.

In the previous management plan, approximately 2200 ha of balsam residual stands were identified as being of questionable stocking. It was anticipated that new photography would have been acquired in 2005 which would have been used for improved stratification and surveying. The photography was not completed until summer 2006, so the follow-up work has been delayed. Surveys were included in a proposal for 2008 “Forests for Tomorrow” funding.

Objective: Complete the assessment of the balsam residual stands.

Strategies:

- Stratify the marginally stocked areas using the 2006 photography and previous surveys
 - Undertake surveys in 2007
 - Adjust, if necessary, the yield projections for balsam residual stands.
-

5.8. Roads

5.8.1. Construction

The majority of main and secondary roads have been built on TFL52.

Construction is generally for minor extensions and operational roads, much of which has been driven by salvage of MPB-killed stands. On newly constructed roads, West Fraser may erect temporary barriers to allow roads to settle or otherwise set up prior to use. This would prevent damage to the road surface such as rutting, may avoid environmental damage, and could prevent injury or damage to other users.

All mainline and secondary roads for which West Fraser holds a Road Permit or Road Use Permit are all-season roads. Branch roads constructed under a Road Permit or a Cutting Permit should be accessible during the summer and fall by four-wheel drive depending on weather conditions, temporary blockages, and deactivation status.

Roads constructed under a Cutting Permit may be designed and built to a “winter road” standard for use for a single season only. Maintenance and deactivation will be undertaken to minimize environmental risk.

Objective: Construct all new roads in a manner that provides safe and efficient access for forest management and public use.

Strategies:

- Adhere to legislated road construction standards.
 - Avoid potentially unstable areas whenever practicable and refer any proposed road development that crosses Terrain Class IV or V to a qualified professional to ensure that construction can be done without compromising slope stability.
 - Establish a ground cover on exposed soils in ditches and cut and fill slopes by seeding with an appropriate grass seed mix.
 - Adhere to West Fraser ISO 14001 EMS operational control measures relating to road construction to minimize environmental risk:
 - Implement drainage control measures to minimize sedimentation
 - Undertake formal inspections of activities during construction
 - Ensure adequate slope stabilization on cuts and fills
 - Ensure flow patterns and hydrology are not altered by bridge or culvert installations.
-

5.8.2. Maintenance

All operation roads for which West Fraser holds a Road Permit will be maintained or deactivated according to specifications of the permit. Forest Service Roads or other roads for which West Fraser holds a Road Use Permit will be maintained according to permit specifications. Surface maintenance, such as grading, snow plowing, and spot gravelling will be done in conjunction with West Fraser's harvesting operations. Right-of-way maintenance, such as brushing, snag falling, or ditch cleaning will be done as necessary on those roads where a Road Permit or Road Use Permit is held according to agreements arrived at with MoFR or the Quesnel Road Users Committee.



Figure 10. Bridge at 300 Road 7 km. - Before and After.

Objective: Maintain all roads covered by Road Permits, Road Use Permits, or Cutting Permits according to the terms of the permits.

Strategies:

- Plan and implement road maintenance activities according to West Fraser's ISO 14001 EMS operational control measures related to road maintenance:
 - Assign an environmental risk rating to all roads
 - Implement a road maintenance information management system
 - Complete inspections on all moderate and high risk road segments
 - Implement road maintenance activities according to recommendations stemming from inspections.
-

5.8.3. Deactivation

Deactivating roads presents a management challenge because of the conflicting expectations of various segments of the forest-using community. On the one hand, a segment of the community wants to have all roads available for use all the time for recreation, travel, berry picking, etc.; on the other hand, a segment wants roads closed to reduce pressure on wildlife or environmental values.

West Fraser generally deactivates on-block roads that are not required for access beyond that specific block. Deactivation may occur at the time that harvesting is completed or after site preparation and planting is completed. Deactivation measures include removing temporary bridges, removing culverts, and constructing cross-ditches or waterbars. The measures employed are specific to the environmental risk at the site and the need for future access. In nearly all instances where road are deactivated, a minimum level of ATV access is maintained.

Where a Road Permit or Road Use Permit is no longer required by West Fraser, the responsibility for that road will be either turned over to another user or the road will be deactivated to a standard that is safe for the public and the environment.

Objective: Deactivate roads commensurate with the degree of environmental risk and the level of required or expected use in the future by other resource users.

Strategies:

- Plan and implement deactivation activities according to West Fraser's ISO 14001 EMS operational control measures:
 - Develop an annual deactivation plan considering all the moderate and high risk road segments
 - Complete timely and appropriate deactivation measures
 - Inspect deactivated road segments according to a schedule to ensure deactivation measures are adequate.
-

5.9. Consultation With Other Resource Users

5.9.1. First Nations

Interaction with First Nations is an area of dynamic legal and policy evolution. The relationship between the Crown and Aboriginal people has been described by the Supreme Court of Canada as a fiduciary relationship, where both the Federal and Provincial governments have a trust-like relationship with First Nations.

Aboriginal rights can be activity-based, such as hunting, fishing or gathering, and cultural practices and ceremonies. They may also include rights to the land itself as “Aboriginal title.” The scope and content of Aboriginal rights may vary according to the distinct patterns of historical occupancy and land use. Aboriginal rights are recognized as those practices and traditions which were integral to the distinctive culture of an Aboriginal society at the date of first contact with Europeans, generally accepted as being prior to 1846. Aboriginal rights and title are not absolute and can be infringed upon by the Crown for justifiable reason. The Courts have recognized that economic development in BC is a valid legislative objective. The Supreme Court of Canada has confirmed that that the Province can enact legislation which is intended to balance Aboriginal interests with other interests, including commercial use of natural resources. An example of such legislation is the *Heritage Conservation Act*.

The obligation to consult with First Nations arises out of the fiduciary relationship between the Crown and First Nations and is a key part of the justification test for infringement. The Crown has an obligation to consult with First Nations before making any decisions which affect Aboriginal rights. Most resource extraction clearly has the potential to infringe upon existing Aboriginal rights; therefore, consultation is a key element in the forest management process.

The Nazko Band and Lhatako (Red Bluff) First Nations have asserted that their traditional territory covers the entire area of TFL 52. The Lheidli T’enneh First Nation traditional territory covers the portion of Block B west of the Fraser River the northern portions of Block A in the vicinity of Crescent Lake and Ketcham Creek. The Williams Lake First Nation has traditional territory in the south western portion of Block A near Maud and Nyland Lakes. The Xats’ull (Soda Creek) First Nation traditional territory extends from the Cottonwood area to near the north end of Bowron Lake.

5.9.1.1. Archaeological Assessments

Over the past 11 years, West Fraser and Weldwood of Canada (before being purchased by West Fraser) completed 23 formal archaeological impact assessments (AIA) covering 415 individual sites. Of the sites examined, 21 were found to have evidence of First Nations presence. Lithic scatters were identified on 13 sites and culturally modified trees were found on eight sites.

Sites for preliminary field reconnaissance and AIAs were selected according to assessment of proposed road and harvesting plans as they related to the potential to encounter archaeological evidence. In 1998, a GIS model incorporating topography, water features, and other biophysical factors was used to project classes of archaeological potential in the Quesnel Forest District. When overlaid with proposed development plans and examined in conjunction with air photos, forest cover, surficial geology, local knowledge, and previous assessments, an evaluation of site potential could be made as to whether site inspections were or were not warranted.

An archaeological site is a location containing remains of, or physical evidence of, past human activities. This evidence includes both cultural materials and cultural features. Cultural materials are objects manufactured or modified by humans and include objects like stone and bone artifacts, human remains, animal remains, and fire altered rocks. Cultural features are represented by modifications to the landscape or to objects which cannot be easily moved. In this area, cultural features may typically be burial sites, culturally modified trees, pithouse depressions, storage pits, pictographs, or built structures (*Quesnel Forest District Archaeological Assessments Permit Report, 2001-113*. Arcas Consulting Archaeologists Ltd., 2003).



Figure 12. Culturally Modified Tree.

All field assessments are done by qualified archaeologists, usually with one or two members of the First Nation community having an interest in the area. Operational plans are modified, if necessary, to ensure that archaeological

evidence covered by the *Heritage Conservation Act* is not disturbed. The presence of and location of culturally modified trees are recorded and treated according to an agreement reached with the Nazko Band wherein healthy non-beetle attacked CMTs are left untouched and attacked CMTs are either left as is or cut above the level of the scar. Written notice is provided to the appropriate First Nation before any CMT is cut.

There have been no archaeological sites identified so far that have required a reduction to the timber harvesting land base.

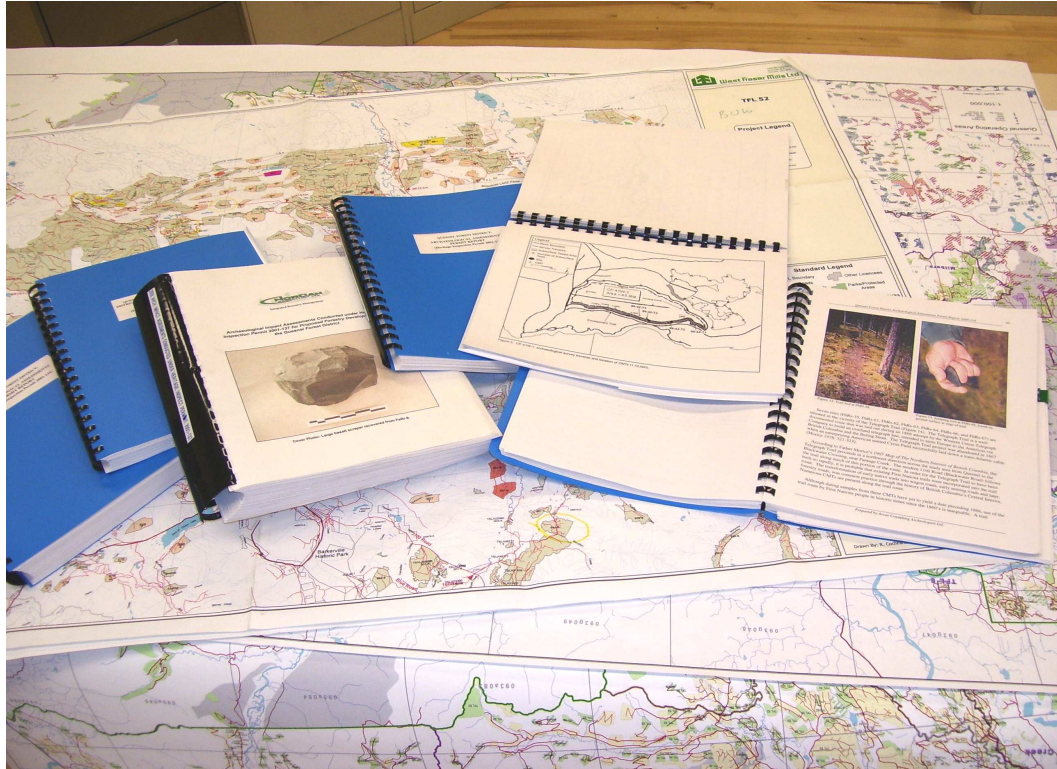


Figure 13. Archaeological Assessment Reports.

5.9.1.2. Referral of Operational Plans

Referral of the various operational plans has proven to be an expensive and time-consuming burden for First Nations. West Fraser has an agreement in principle with the Xat'sull First Nation for a "fee for service" to provide review and comment for operational plans. This has proven to be economically beneficial to the Band and operationally useful to West Fraser.

Nazko First Nation and West Fraser recently started a process where a meeting is held to review and discuss operational plans in batches. This provides an opportunity for meaningful discussion and timely resolution if contentious issues as well as for building working relationships

West Fraser has followed the Provincial guidelines for information sharing with First Nations when preparing the Forest Stewardship Plans for TFL 52 and for projects funded by the Forest Investment Account. The Forest Stewardship Plans and the Land Base Investment Plans for Forest Investment Account projects for both TFL 52 and the Quesnel TSA were provided to the Bands having an expressed traditional territory on the TFL.

Objective: Assist the Crown with its fiduciary duty to consult with First Nations with respect to forest management activities on areas where Aboriginal interests or rights have been expressed.

Strategies:

- Provide information regarding proposed forest management activities to the appropriate First Nations band.
 - Continue development of workable review and comment processes with First Nations for operational plans.
 - Continue to undertake archaeological impact assessments where deemed to have high potential for the presence of artifacts based on the Quesnel Forest District archaeological overview assessment.
 - Provide information with respect to the TFL management planning and timber supply analysis to appropriate First Nations and provide time to explain and discuss the information if requested.
-

5.9.2. Guides and Trappers

West Fraser recognizes the legitimate right of other people using or having an interest on TFL 52 to be informed of forest management activities. A common database of all resource users and interested people is maintained so that the appropriate people or groups can be contacted regarding the various planned or proposed activities that may be of interest.

West Fraser's interaction with guides and trappers is generally undertaken through letters to individuals and newspaper advertisements advising of opportunities to review and discuss operational plans, management plans, forest stewardship plans, pest management plans, or other activities that could have an impact on their resource use.

West Fraser maintains an "open door" policy so that any stakeholder can drop in at the office to discuss issues related to their activities. Discussions with stakeholders are tracked so that we are able to avoid, if possible, any conflicts that could arise from our plans or projects.

We will continue to actively solicit input and comments from guides and trappers.

5.9.3. Range Tenure Holders

Range use is not extensive on TFL 52 with only ten licencees, but to those who have range tenures on the areas, our operations have the potential to have detrimental impacts. The extent of salvage harvesting of dead pine has in some cases resulted in levels of debris that limit or restrict use by cattle, and has removed natural barriers to cattle movement. Site preparation methods have potential to further aggravate a problem where there are high debris loads.

As a result of discussions with two range users, both having range tenures on TFL 52, West Fraser has done some alternative post-harvesting site preparation procedures that may help alleviate problems that have arisen. In one situation, disc trenching was done in winter on a light snow pack so that the depth of trenches and related ground disturbance was reduced. In this case the range user was satisfied with the results.

In another location, a block harvested utilizing a stumpside cut-to-length system was broadcast burned in a location where burning had not been traditionally done. It is as yet undetermined whether this will provide satisfactory results with respect to cattle use.

West Fraser has committed to greater use of excavators for piling cut-to-length harvesting debris where there is range use.

West Fraser's interaction with range tenure holders is generally undertaken through letters to individuals and newspaper advertisements advising of opportunities to review and discuss operational plans, management plans, forest stewardship plans, pest management plans, or other activities that could have an impact on their resource use.

West Fraser maintains an "open door" policy so that any stakeholder can drop in at the office to discuss issues related to their activities. Discussions with stakeholders are tracked so that we are able to avoid, if possible, any conflicts than could arise from our plans or projects. Where conflicts arise, we try to resolve them through one-on-one discussions and field trips if required.

Objective: Conduct our operations in a manner that accommodates the needs of other resource users.

Strategies:

- Foster good communication by:
 - each spring, inviting affected range users individually to discuss harvest systems, timing issues, and other related matters
 - Each year, following West Fraser's review of the past year's harvested sites, meetings with respective range users to discuss post harvest treatments, the location and timing of such treatments, and other related matters
 - Provide comments to range users about any range stewardship plans that are referred to West Fraser.
 - Limit stumpside processing systems to 35% of the area of any range unit with emphasis to avoid core range-use areas if possible
 - Continue to grass seed road rights-of-way and landings with a suitable range forage mixture
 - Enhance debris management (pile and burn) on stumpside processed areas within 20m of the road edge (terrain permitting) to improve range forage potential or, alternatively, pile and burn up to 10% of a stumpside processed area where there is an identified need to do so to maintain grazing levels.
-

5.9.4. Other Licenced Resource Users

There are a large number (100+) of placer mining tenures throughout TFL 52 and ownership changes frequently. Most mining is done at a very small scale and has little impact on forest management. Interaction with miners is generally in the nature of salvaging timber on mining sites or of providing maps or photos. West Fraser will continue to cooperate with the mining community, but will not embark on a consultation process as there has not been an identified need to do so.

There are no licenced water users on TFL 52. However, West Fraser is aware that rural residences and unorganized communities may use unlicenced water sources in their vicinity. West Fraser will avoid conducting operations within 250m of any domestic water source or intake that we are notified of. In 2005, West Fraser provided materials for the Cottonwood Community Association to rebuild a well and protective structure over a spring used locally as a water source for drinking and cooking.

6. Impact of Proposed Management Plan

6.1. Current and Projected Harvest Levels

The AAC for TFL 5 prior to consolidation (including the uplift for MPB salvage) was 300,000 m³. The AAC for the original TFL 52 was 570,000 m³. These figures include the BCTS portion of 81,986 m³/year. In 2006 West Fraser harvested 915,929 m³ from the consolidated TFL 52, of which 690,687 m³ was charged to the AAC.

West Fraser's new Quesnel sawmill is nearing production target with annual log consumption anticipated to be 1.8 million m³ per year. Total consumption for the three mills in Quesnel (including Northstar sawmill and Quesnel Plywood) is 2.7 million m³/year. A potential AAC of 1.37 million m³ from TFL 52 fills about 51% of projected consumption. Other replaceable licences fill about 22% of consumption with the balance expected to come from non-replaceable licences and purchased wood. The actual volumes obtained from these sources are expected to vary from year to year.

The timber supply analysis tested a number of scenarios to address salvage of dead pine, but included provision to also harvest 150,000 m³ per year of beetle-attacked spruce. West Fraser makes no distinction in priorities between Blocks A and B with respect to salvaging dead pine, blowdown, or stands infested with Douglas-fir or spruce bark beetles. Harvesting will be directed to where it is most appropriate.

6.2. Economic Opportunities and Employment

West Fraser provides direct employment for approximately 1755 people in manufacturing plants and administration in Quesnel. We estimate that another 325 full-time-equivalent positions exist in forest consulting, contract harvesting, trucking, and silviculture as a spin-off from our entire forestry operations in the Quesnel Forest District.

The new sawmill has a production capacity approximately 40% greater than the old mill. Employment levels will be about the same with a shift of some of the workforce from the mill to the yard to handle the increased log flow.

The aftermath of the MPB epidemic has introduced an element of uncertainty that has not been experienced before in the BC interior forest industry. West Fraser has a huge capital investment in integrated wood processing facilities in Quesnel which gives the Company a big motivation to long-term forest management and a strong long-term commitment to the community.

6.3. Key Similarities and Differences

6.3.1. Similarities

The major similarity between the Proposed Management Plan 4 and the previous management plans for TFL 5 and TFL 52 is that West Fraser maintains a commitment to a high standard of forest stewardship with a long-term desire to utilize the productive capacity of TFL 52 to supply logs for the mills in Quesnel. There are strong silviculture, inventory, and growth and yield programs that are common across the consolidated TFL 52.

6.3.2. Differences

There are a number of significant differences between Management Plan 4 and the previous management plans:

- MP 4 addresses a consolidation of two TFLs. Fortunately, the ecological conditions, management regimes, land-based inventories, and growth and yield programs are quite similar so there is little dichotomy between the management units.
- MP 4 addresses the aftermath of a major MPB epidemic that has damaged virtually every pine stand across the TFL.
- Since the previous management plans, spatially located Old Growth Management Areas have been incorporated into all planning activities. The OGMA's result in a significant change to the timber harvesting land base.
- Legislative changes have resulted in the introduction of Forest Stewardship Plans. FSPs include some significant forest management articles that are also included in the management plan realm. Examples of this are measures to address visual quality, biological diversity, soils, water, recreation resources, cultural heritage resources, range land, and wildlife and fish habitats. As the FSP is required to address goals related to management of those features, they are not included in the management plan.

7. Summary of Comments from Draft Management Plan 4 Referrals

One letter was received from the Cariboo Ski Touring Club which stated that the Club was satisfied with the level of protection afforded to ski trails and cabins.

No other verbal or written comments were received. This may be a result of "referral fatigue" due to the number referral notices, invitations to meet, and information packages that have been sent out in the past year not only from West Fraser, but other licencees as well.