KISPIOX TIMBER SUPPLY AREA

TIMBER SUPPLY
REVIEW III

TIMBER SUPPLY
ANALYSIS

ANALYSIS REPORT

Version 5.0

Prepared for:

Kispiox TSA DFAM Group
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March 2007

For Information on the Timber Supply Review Process:

This document was prepared to support an allowable annual cut determination by British Columbia's chief forester. To learn more about this process please visit the following website:

http://www.for.gov.bc.ca/hts/

Or contact:

Forest Analysis and Inventory Branch
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Comments or Questions on the Analysis Report:

The opportunity for the public and first nations to provide input and comment is an important component of the Provincial timber supply review process. If you have questions or wish to provide comments on this Analysis Report please contact Jay Greenfield, RPF. The formal public and first nation review and comment period ends on May 28th, 2007.

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Additional information on this analysis, including copies of this report and maps, can be found at the Kispiox TSA TSR III Website: www.timberline.ca/kispiox/

This document has been prepared according to the *Interim Standards for Data Package Preparation and Timber Supply Analysis - Defined Forest Area Management Initiative- March 2004* by Jay Greenfield,. RPF

March 23rd, 2007

Jay Greenfield, RPF
Timberline Forest Inventory Consultants Ltd

Date

Timberline
Forest Inventory Consultants

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Kispiox Forest Products Ltd.

Kitwanga Lumber Company Ltd.

Executive Summary

As part of the provincial timber supply review, this report examines the availability of timber in the Kispiox timber supply area (TSA). The analysis assesses how current forest management practices affect the supply of timber available for harvesting over the short (next 20 years), mid (21 to 100 years from the present) and long (beyond 100 years from the present) terms. It also examines the potential changes in timber supply resulting from uncertainties about forest growth and management actions. It is important to note that the various harvest forecasts included in this report indicate the timber supply implications as modelled in the base and various sensitivity analyses. These forecasts are intended to support the chief forester in making a determination on the appropriate allowable annual cut (AAC) for the TSA and are not allowable annual cut recommendations.

This analysis has been undertaken under proposed defined forest area management (DFAM) legislation, whereby licencees operating within the TSA have accepted the responsibility to conduct timber supply analysis for the TSA. The DFAM legislation requires the formation of a DFAM group that includes the holders of replaceable forest licences, BC Timber Sales, and other holders of agreements that meet the prescribed requirements.

Timberline Forest Inventory Consultants Ltd., on behalf of the Kispiox TSA DFAM group is preparing timber supply information for the Provincial timber supply review (TSR). These reviews are conducted every five years and assist the BC Forest Service's chief forester in re-determining AAC. For the Kispiox TSA, the chief forester will make a determination regarding the AAC by January 2008.

The Kispiox TSA covers approximately 1.22 million hectares in the northwest interior of British Columbia. This TSA is bordered to the north by the Nass and Prince George TSA, to the west by the Kalum and Cranberry TSA, and to the south and east by the Bulkley TSA. The Kispiox TSA is administered by the Skeena Stikine Forest District office in Smithers.

The forests of the Kispiox TSA are diverse and many tree species are commercially harvested and processed into a variety of wood products. Within the land base currently considered available for timber harvesting, forests are dominated by hemlock and subalpine fir. Spruce (Engelmann, white and hybrid), lodgepole pine, western redcedar, amabilis fir and cottonwood are also commonly found.

About 57% (697,736 ha) of the TSA land base is considered productive forest land managed by the B.C. Forest Service. Currently about 44% of this forested land base is considered available for harvesting (27% of the total TSA land base).

The current AAC in the Kispiox TSA is 977,000 m^3/yr. This level was set by the chief forester in January 2003 and represented a decrease from the previous AAC of 1,092,611 m^3/yr set in December 1996.

Significant changes in data, knowledge, legislation and forest management have occurred since the last timber supply review was completed. These changes include:

- The introduction of the *Forest and Range Practices Act*, the *West Babine Sustainable Resource Management Plan*, and the *Kispiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife*;
- The refinement of various netdown assumptions for the TSA based on the Harvest Methods Mapping project;
- A revision of non-recoverable loss estimates;
- A revision of regeneration delay assumptions;
- A revision of visual quality objectives classifications and modelling assumptions; and
- A review of the impacts of *dothistroma* needle blight on pine plantations;

The results of this timber supply analysis suggest that the current AAC of 977,000 m^3/yr can be maintained for the next 50 years before stepping down at a rate of 10% per decade to the long-term harvest level (LTHL) of 729,000 m^3/yr in 75 years. In the short-term, timber supply is supported by a significant quantity (over 80 times the current AAC) of operable growing stock on the THLB, nearly all of which is above minimum harvestable ages. This quantity of existing harvestable growing stock provides for significant flexibility in the short-term harvest forecast creating a relatively smooth transition to the LTHL, minimizing the affects of a gap in the age class distribution between 40 and 80 years old.

The results of the sensitivity analysis further demonstrate the flexibility in the short-term harvest forecast in the base case. With the exception of removing pulp and marginal sawlog stands from the THLB, all scenarios are able to achieve the current AAC and maintain it for at least 30 years. Reducing natural stand volumes by 13% has the most significant impact on short-term timber supply where the current AAC can only be maintained for 30 years before stepping down to the long-term level. Many of the sensitivity analyses have little to no impact on timber supply. In the long-term the most significant impact to timber supply come from removing pulp and marginal sawlog stands from the THLB, reducing natural stand volumes by 13%, and decreasing the land base by 10%.

The analysis suggests that the current AAC of 977,000 m^3/yr can be maintained for the next 50 years and is stable relative to the uncertainties explored. Key TSA issues around the economic viability of non-sawlog stands and existing unmanaged stand volume estimates present the most significant risks to the base case timber supply.

Document History

Version Number	Description	Date	Submitted By:
1.0	Draft of results up to scenario #8	March 31st, 2006	Jay Greenfield
2.0	Draft of base case results with revised base case assumptions	May 30th, 2006	Jay Greenfield
2.2	Incomplete draft for MoFR input	August 23rd, 2006	Jay Greenfield
3.0	1st draft submitted to the DFAM group for review and comment	December 4th, 2006	Jay Greenfield
4.0	2nd draft submitted to the DFAM group for review and comment	January 5th, 2007	Jay Greenfield
4.1	Internal Draft	N/A	N/A
4.2	3rd Draft including additional harvest deferral scenarios submitted to DFAM group for review and comment	March 8th, 2007	Jay Greenfield
4.3	Minor editorial modifications submitted to MoFR Regional Analyst for approval.	March 22nd, 2007	Jay Greenfield
5.0	Approved by MoFR Regional Analyst on March 23rd, 2007 and submitted for Public and First Nations review and comment.	March 28th, 2007	Jay Greenfield

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1.0 Introduction

Timber supply is the quantity of timber available for harvest over time. Timber supply is dynamic, not only because trees naturally grow and die, but also because conditions that affect tree growth, and the social and economic factors that affect the availability of trees for harvest, change through time.

Assessing the timber supply involves considering physical, biological, social and economic factors for all forest resource values, not just for timber. Physical factors include the land features of the area under study as well as the physical characteristics of living organisms, especially trees. Biological factors include the growth and development of living organisms. Economic factors include the financial profitability of conducting forest operations, and the broader community and social aspects of managing the forest resource.

All of these factors are linked: the financial profitability of harvest operations depends upon the terrain, as well as the physical characteristics of the trees to be harvested. Determining the physical characteristics of trees in the future requires knowledge of their growth pattern. Decisions about whether a stand is available for harvest often depends on how its harvest could affect other forest values, such as wildlife or recreation.

These factors are also subject to both uncertainty and different points of view. Financial profitability may change as world timber markets change. Unforeseen losses due to fire or pest infestations will alter the amount and value of timber. The appropriate balance of timber and non-timber values in a forest is an ongoing subject of debate, and is complicated by changes in social objectives over time.

Thus, before an estimate of timber supply is interpreted, the set of physical, biological and socio-economic conditions on which it is based, and which define current forest management — as well as the uncertainties affecting these conditions — must first be understood.

Timber supply analysis is the process of assessing and predicting the current and future timber supply for a management unit (a geographic area). For a timber supply area (TSA), the timber supply analysis forms part of the information used by the chief forester of British Columbia in determining an allowable annual cut (AAC) — the permissible harvest level for the area.

Timber supply projections made for TSA look far into the future — 250 years or more. However, because of the uncertainty surrounding the information and because forest management objectives change through time, these projections should not be viewed as static prescriptions that remain in place for that length of time. They remain relevant only as long as the information upon which they are based remains relevant. Thus, it is important that re-analysis occurs regularly, using new information and knowledge to update the timber supply picture. This allows close monitoring of the timber supply and of the implications for the AAC stemming from changes in management practices and objectives.

This report describes the results of the timber supply analysis for the Kispiox TSA. The following sections provide a brief description of the Kispiox TSA as well as a general description of the data, assumptions and methodology used in conducting this analysis. Readers should refer to the Data Package (Appendix II) for a more detailed explanation of the data, assumptions and methodology used in conducting this analysis.

This analysis has been undertaken under proposed defined forest area management (DFAM) legislation, whereby licencees operating within the TSA have accepted the responsibility to conduct timber supply analysis for the TSA. The DFAM legislation requires the formation of a DFAM group that includes the holders of replaceable forest licences, BC Timber Sales (BCTS), and other holders of agreements that meet the prescribed requirements.

Timberline Forest Inventory Consultants Ltd., on behalf of the Kispiox TSA DFAM group is preparing timber supply information for the Provincial timber supply review (TSR). These reviews are conducted every five years and assist the BC Forest Service's chief forester in re-determining AAC. For the Kispiox TSA, the chief forester will make a determination regarding the AAC by January 2008.

In the Kispiox TSA the DFAM group is represented by the three forest companies operating in the TSA as well as BC Timber Sales (BCTS). Forest companies currently operating in the TSA are: Kitwanga Lumber Company Ltd., Kispiox Forest Products Ltd., and Bell Pole Canada Inc.

Under the DFAM framework, the DFAM group is responsible for the completion of the steps leading up to, and including the delivery of, timber supply analyses as follows:

- Collecting data and preparing a Data Package which summarizes the data assumptions - land base, growth and yield, forest management practices, statement of management strategies, and analysis methods that will be used, and the critical issues that will be examined in the timber supply analysis;
- Providing for an initial public and first nations review of the Data Package;
- Completing the timber supply analysis and report;
- Completing a socio-economic analysis; and
- Providing for public and first nations review of the timber supply and socio-economic analyses.

After the completion of these steps, the Analysis Report is submitted to the chief forester. The AAC is then set by the chief forester using the Analysis Report as one of the many factors required as part of the determination process.

This Analysis Report documents the results of the timber supply analysis performed in support of TSR III.

1.1 The Timber Supply Review Process

Preparation for the Kispiox TSA TSR analysis began in May 2005. The first step under the DFAM process is the preparation of the Data Package. The Data Package is a technical document that acts as the foundation for the timber supply analysis. It provides a clear description of information sources, assumptions, issues, and any relevant data processing or adjustments related to the land base, growth and yield, and management objectives and practices used in the analysis.

The first draft of the Data Package was completed on September 27th, 2005. It was submitted at this time to the BC Ministry of Forest and Range (MoFR) and was also made available for a 60 day public and first nations review period. The methodology used to carry out the public and first nations review was documented and is provided in Appendix III. A summary of comments from the review process are also provided in this Appendix.

The public and first nation review of the Data Package was completed on November 30th, 2005. The Data Package was revised to address issues with the operability linework and was re-submitted on March 1st, 2006. The MoFR accepted it for use on March 14th, 2006. The most recent version of the Data Package is provided as Appendix II to this Analysis Report.

Under the DFAM process, the Analysis Report, and the Socio-economic Analysis (Appendix I), must go through a second 60 day public and first nations review period. The review period will begin on March 28th, 2007 continuing through to May 28th , 2007. After the review period, the feedback will be documented and incorporated with the feedback from the first review period.

To facilitate the review processes, an internet web site dedicated to this project was established at www.timberline.ca/kispiox. This Analysis Report, appendices, background documents and maps, as well as an interactive web-mapping tool are all hosted on this site. They will remain freely available for download by individuals throughout the remainder of the determination process.

2.0 Description of the Kispiox Timber Supply Area

The Kispiox TSA covers approximately 1.22 million hectares in the northwest interior of British Columbia. This TSA is bordered to the north by the Nass and Prince George TSA, to the west by the Kalum and Cranberry TSA, and to the south and east by the Bulkley TSA. The Kispiox TSA is administered by the Skeena Stikine Forest District office in Smithers.

According to the 2001 census, the population of the Kispiox TSA is 6,071, a 4% decrease from the population figures reported in the 1996 census. Since 2001, estimates suggest that the population has increased slightly. In 2001, 3,028 people were identified as living on reserves in the TSA; a number relatively unchanged from 1996. The District of New Hazelton, with a 2001 population of 750 is the principal commercial, administrative and retail centre for the area. Other smaller communities include Hazelton, South Hazelton, Kitwanga, Cedarvale, Kispiox, Gitsegukla, Gitwangak and Gitanyow.

The topography of the Kispiox TSA is mountainous with wide river valleys between the mountain ranges. The TSA is situated around the confluence of the Skeena and Bulkley rivers, with the Babine and Kispiox rivers also being major features. The TSA is bounded by the Rocher Deboule and Seven Sisters ranges to the south and by the Sicintine watershed and Kispiox river headwaters to the north. To the west are the Hazelton mountains and to the east is the North Babine mountain range. The overall climate in the TSA is transitional between coast and interior, with cool summers and cool winters.

The forests of the Kispiox TSA are diverse and many tree species are commercially harvested and processed into a variety of wood products. Within the land base currently considered available for timber harvesting, forests are dominated by hemlock and subalpine fir. Spruce (Engelmann, white and hybrid), lodgepole pine, western redcedar, amabilis fir and cottonwood are also commonly found.

The current AAC in the Kispiox TSA is 977,000 m^3/yr. This level was set by the chief forester in January 2003, and represented a decrease from the previous AAC of 1,092,611 m^3/yr set in December 1996.

About 57% (697,736 ha) of the TSA land base is considered productive forest land managed by the B.C. Forest Service. Currently about 47% of this forested land base is considered available for harvesting (27% of the total TSA land base).

Significant changes in data, knowledge, legislation and forest management have occurred since the last timber supply review was completed. These changes include:

- The introduction of the *Forest and Range Practices Act* (FRPA), the *West Babine Sustainable Resource Management Plan (WBSRMP)*, and the *Kispiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife*;

- The refinement of various netdown assumptions for the TSA based on the Harvest Methods Mapping (HMM) project;
- A revision of non-recoverable loss (NRL) estimates;
- A revision of regeneration delay assumptions;
- A revision of visual quality objectives (VQO) classifications and modelling assumptions; and
- A review of the impacts of *dothistroma* needle blight on pine plantations.

The forests of the Kispiox TSA provide a broad range of forest land resources, including forest products (timber and non-timber, such as pine mushrooms), outdoor recreation and tourism amenities, minerals and a variety of fish and wildlife habitats. The scenic mountain landscapes and numerous rivers and lakes provide a variety of opportunities for outdoor recreation, including climbing and mountaineering, hiking, mountain biking, wildlife viewing, rafting, canoeing, cross-country skiing, snowmobiling, dog-sledding and trapping. Hunting and fishing have been popular for many years in this area and these activities have important cultural significance for first nations.

Figure 1: Map of the Kispiox TSA (Source: Ministry of Forests and Range Website)

2.1 The Environment

The six biogeoclimatic zones that occur in the Kispiox TSA reflect the diversity of climate and vegetation in the area and its transitional location between coastal and interior ecosystems. The varied ecological features and unique nature of the area contribute to the high biodiversity values found in this TSA.

The Interior Cedar-Hemlock (ICH) zone occurs in the low to mid elevations in valley bottoms throughout most of the TSA. This zone has an interior, continental climate with cool wet winters and warm moist summers, and has the highest diversity of tree species of any zone in the province. Mature forests are dominated by western hemlock, subalpine fir, western redcedar, amabilis fir and a spruce hybrid known as Roche spruce. Other species found include lodgepole pine, Engelmann spruce, white spruce, trembling aspen, black cottonwood and birch.

The Sub-Boreal Spruce (SBS) zone is found in the valley bottom of the Babine river in the eastern part of the TSA. This zone is characterized by seasonal extremes of temperature, with severe, snowy winters and relatively warm, moist and short summers. Frequent, large-scale fires occur in the SBS zone (the average fire return interval is 100 years). Hybrid spruce, subalpine fir, lodgepole pine and trembling aspen are the most common tree species.

The Engelmann Spruce-Subalpine Fir (ESSF) zone is the uppermost forested zone in most of the Kispiox TSA, occurring above the ICH and SBS zones. The ESSF zone has a continental climate, with cool, moist and short growing seasons, and long, cold winters. The ESSF zone is comprised of continuous forest at its lower elevations and parkland at its higher elevations. Subalpine fir is the dominant tree species throughout the zone; hybrid spruce and lodgepole pine are common in drier parts of the zone that have been influenced by fire.

The Coastal Western Hemlock (CWH) zone has a limited occurrence at low to mid elevations in the western part of the TSA. The climate is predominantly coastal, but is significantly influenced by continental weather patterns. As a result, the CWH zone is not as subject to winter cold spells and summer droughts as are the more interior zones. The dominant tree species are western hemlock, amabilis fir, mountain hemlock, lodgepole pine, trembling aspen and subalpine fir.

The Mountain Hemlock (MH) zone occurs above the CWH zone in the western portion of the TSA. The MH zone's subalpine climate is characterized by short, cool summers and long, cool and wet winters. The deep winter snowpack is slow to disappear and a short growing season results. Mountain hemlock and amabilis fir are the dominant tree species.

The Alpine Tundra (AT) zone occurs at high elevations above the ESSF and MH zones. The climate is cold, windy and snowy with a short, cool growing season. Frost can occur at any time during the year. By definition this zone is treeless, although trees in stunted form are common at lower elevations. Vegetation is dominated by shrubs, herbs, mosses and lichens. Much of the alpine landscape lacks vegetation and is the domain of rock, ice and snow.

The area and proportion of crown forested land base (CFLB) and THLB by biogeoclimatic ecosystem classification (BEC) variant is listed in Table 1. This table also shows the percentage of each variant that is within the THLB, and this is further illustrated in Figure 2 below.

Table 1: Area of CFLB and THLB by Biogeoclimatic Ecosystem Classification Variant

BEC Variant	CFLB (ha)	THLB (ha)	THLB (%)	Percent BEC Variant in THLB (%)
AT	1,005	-	-	-
CWHws2	56,613	25,127	7.7	44.4
ESSFmc	37,129	25,204	7.7	67.9
ESSFWVP	226,518	73,399	22.4	32.4
ESSFwvp	10,898	1,738	0.5	16.0
ICHmc1	165,138	96,792	29.5	58.6
ICHmc2	157,055	86,161	26.3	54.9
MHmm2	14,499	3,125	1.0	21.6
MHmmp2	2,602	138	0.0	5.3
SBSmc2	38,450	16,152	4.9	42.0
Total	**709,908**	**327,837**	**100.0**	

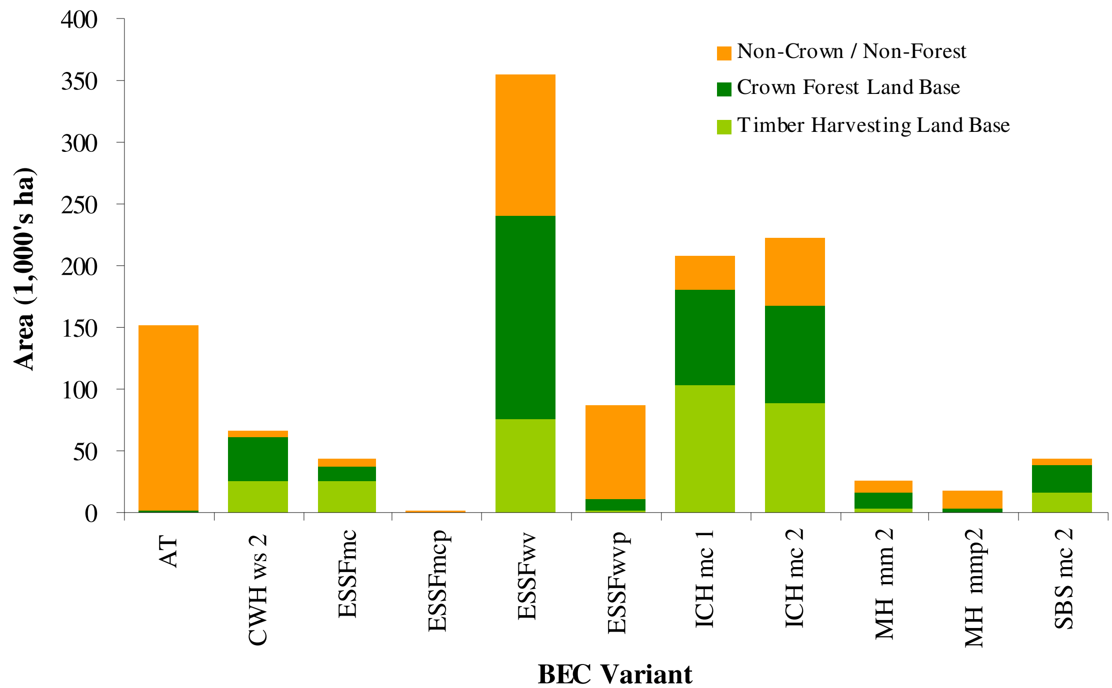


Figure 2: BEC Variant Distribution

The forests of the Kispiox TSA are home to an abundance of wildlife species including grizzly bear, moose, mule deer and mountain goat, as well as songbirds, raptors, owls, and many other smaller mammal species. Black bears are common and widespread, and a population of the Kermode colour variant of black bears extends into the western half of the TSA. Many wildlife species are dependent on the mature and old forest ecosystems within the TSA. The Skeena river (and its tributaries) is a highly productive system for many fish species, providing important spawning habitat and migration routes for chinook, coho, sockeye and pink salmon. Other rivers and lakes in the TSA provide habitat for steelhead, bull trout, Dolly Varden and lake trout.

The BC Ministry of Environment (MoE) Conservation Data Centre (CDC) lists a number of species and ecosystems which are red listed (expatriated, endangered or threatened) or blue listed (of special concern) within the Kispiox TSA. Several of the species are Identified Wildlife under the *Forest and Range Practices Act*. Species and ecosystems at risk are listed in Table 2 and Table 3.

Table 2: Species at Risk

Scientific Name	English Name	BC Status	Identified Wildlife
Arabis holboellii var. pinetorum	Holboell's rockcress	Blue Listed	
Botaurus lentiginosus	American Bittern	Blue Listed	
Botrychium crenulatum	dainty moonwort	Blue Listed	
Carex backii	Back's sedge	Blue Listed	
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	Red Listed	
Grus canadensis	Sandhill Crane	Blue Listed	Yes (Jun 2006)
Gulo gulo luscus	Wolverine, *luscus* subspecies	Blue Listed	Yes (May 2004)
Hirundo rustica	Barn Swallow	Blue Listed	
Lloydia serotina var. *flava*	alp lily	Blue Listed	
Martes pennanti	Fisher	Blue Listed	Yes (Jun 2006)
Melica spectabilis	purple oniongrass	Blue Listed	
Phalacrocorax auritus	Double-crested Cormorant	Blue Listed	
Polemonium occidentale ssp. *occidentale*	western Jacob's-ladder	Blue Listed	
Potentilla diversifolia var. *perdissecta*	diverse-leaved cinquefoil	Blue Listed	
Rangifer tarandus pop. 15	Caribou (northern mountain population)	Blue Listed	Yes (May 2004)
Ribes oxyacanthoides ssp. *cognatum*	northern gooseberry	Red Listed	
Salvelinus confluentus	Bull Trout	Blue Listed	Yes (Jun 2006)
Salvelinus malma	Dolly Varden	Blue Listed	
Tympanuchus phasianellus columbianus	Sharp-tailed Grouse, *columbianus* subspecies	Blue Listed	Yes (Jun 2006)
Ursus arctos	Grizzly Bear	Blue Listed	Yes (May 2004)

Table 3: Ecosystems at Risk

Scientific Name	English Name	BC Status	BGC
Amelanchier alnifolia / Elymus trachycaulus	saskatoon / slender wheatgrass	Red Listed	SBSdk/81
Calamagrostis purpurascens Herbaceous Vegetation	purple reedgrass Herbaceous Vegetation	Red Listed	AT MHmmp/00
Pinus contorta / Arctostaphylos uva-ursi	lodgepole pine / kinnikinnick	Red Listed	CWHws1/02 CWHws2/02
Poa secunda ssp. *secunda - Elymus trachycaulus*	Sandberg's bluegrass - slender wheatgrass	Red Listed	SBSdk/82
Populus balsamifera ssp. *trichocarpa / Cornus stolonifera - Rosa acicularis*	black cottonwood / red-osier dogwood - prickly rose	Red Listed	SBSdk/08
Abies amabilis - Thuja plicata / Gymnocarpium dryopteris	amabilis fir - western redcedar / oak fern	Blue Listed	CWHms1/04 CWHms2/04 CWHws1/04 CWHws2/04

Scientific Name	English Name	BC Status	BGC
Carex lasiocarpa / Drepanocladus aduncus	slender sedge / common hook-moss	Blue Listed	BWBSdk1/Wf05 ICHdk/Wf05 ICHmc1/Wf05 ICHmc2/Wf05 ICHmw1/Wf05 ICHmw3/Wf05 ICHvk1/Wf05 ICHwk1/Wf05 ICHwk2/Wf05 IDFdk1/Wf05 IDFdk3/Wf05 IDFdk4/Wf05 IDFdm2/Wf05 MSdk/Wf05 MSdm1/Wf05 MSdm2/Wf05 SBPSdc/Wf05 SBPSmk/Wf05 SBPSxc/Wf05 SBSdk/Wf05 SBSmc2/Wf05 SBSmk1/Wf05 SBSwk1/Wf05 SWB/Wf05
Picea engelmannii x glauca / Spiraea douglasii - Rosa acicularis	hybrid white spruce / hardhack - prickly rose	Blue Listed	SBSdw3/06
Picea sitchensis / Rubus spectabilis Wet Submaritime 2	Sitka spruce / salmonberry Wet Submaritime 2	Blue Listed	CWHws2/07
Picea spp. - *Abies lasiocarpa / Lysichiton americanus*	spruces - subalpine fir / skunk cabbage	Blue Listed	SBSvk/10 SBSwk1/Ws11 SBSwk2/Ws11 SBSwk3/Ws11
Pinus contorta / Juniperus communis / Oryzopsis asperifolia	lodgepole pine / common juniper / rough-leaved ricegrass	Blue Listed	SBSdk/02
Pinus contorta - Picea mariana / Pleurozium schreberi	lodgepole pine - black spruce / red-stemmed feathermoss	Blue Listed	SBPSdc/04 SBSdw2/07 SBSdw3/05
Pinus contorta / Vaccinium membranaceum / Cladina spp.	lodgepole pine / black huckleberry / reindeer lichens	Blue Listed	SBSvk/09 SBSwk1/02 SBSwk2/02 SBSwk3/02

Scientific Name	English Name	BC Status	BGC
Populus balsamifera ssp. *trichocarpa / Cornus stolonifera*	black cottonwood / red-osier dogwood	Blue Listed	CWHdm/09 CWHds1/09 CWHds2/09 CWHmm1/09 CWHms1/08 CWHms2/08 CWHvm1/10 CWHwm/06 CWHws1/08 CWHws2/08 CWHxm1/09 CWHxm2/09
Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus	Douglas-fir - hybrid white spruce / thimbleberry	Blue Listed	SBSdh1/06 SBSdw1/06 SBSmh/01 SBSmh/05 SBSmh/06 SBSvk/03 SBSwk3/03 SBSwk3a/01 SBSwk3a/03
Pseudotsuga menziesii - Pinus contorta / Cladonia spp.	Douglas-fir - lodgepole pine / clad lichens	Blue Listed	SBSdw1/02 SBSdw2/02 SBSdw3/02 SBSmh/02 SBSmh/03
Pseudotsuga menziesii / Pleurozium schreberi - Hylocomium splendens	Douglas-fir / red-stemmed feathermoss - step moss	Blue Listed	IDFdk3/05 IDFdk4/07 IDFxm/05 IDFxm/06 SBSdk/04
Salix sitchensis / Carex sitchensis	Sitka willow / Sitka sedge	Blue Listed	ICH/Ws06 SBSwk1/Ws06 SBSwk2/Ws06 SBSwk3/Ws06
Schoenoplectus acutus Deep Marsh	hard-stemmed bulrush Deep Marsh	Blue Listed	IDFdk3/W14 SBPSdc/W15 SBPSmc/W15 SBPSxc/W15

2.2 First Nations

The Gitxsan, Wet'suwet'en, Gitanyow, Nisga'a, Nat'oo'ten and Tsimshian first nations have traditional lands within the Kispiox TSA. The Gitxsan Nation has five villages (Gitanmaax, Glen Vowell, Kispiox, Gitsegukla and Gitwangak) and the Wet'suwet'en and the Gitanyow have one village each (Hagwilget and Gitanyow, respectively).

The Nisga'a Treaty, finalized in April 2000, includes the Nass Wildlife Area which covers part of the Kispiox TSA. The Gitxsan, Gitanyow and Tsimshian first nations are currently engaged in treaty negotiations toward an agreement-in-principle with the province and Canada. The Wet'suwet'en have reached the agreement-in-principle stage of the treaty process. The Gitxsan, Gitanyow and the Wet’suwet’en have signed and, together with the province, are currently implementing pre-treaty agreements primarily focused on forestry economic development.

First nations groups have expressed concerns about timber harvesting in areas with high cultural and historic values. Several steps have been taken to address these concerns.

The province has engaged or is actively engaging the Gitanyow, the Gitxsan and the Nisga'a in land use planning processes, to identify and inventory commonly held forest values and to co-develop forest management strategies for those values.

A Cultural Heritage and Archeological Resource Inventory (CHARI) was completed for Gitxsan territory, which identifies areas and trails of known and potential cultural and archaeological significance. An inventory of known archeological and traditional use sites has also been accumulated for Gitanyow and Wet'suwet'en territory. These inventories are used by licencees and MOFR in developing and evaluating forest development plan and forest stewardship plan (FSP) submissions.

Inventories of current and historical botanical forest product areas are ongoing.

Where inventories and planning processes are completed, they have been considered in this timber supply review.

3.0 Information Preparation for the Timber Supply Analysis

There are three basic components to a timber supply analysis: the current state of the land base as represented by the inventory, growth and yield - future volume predictions for the forest, and management practices - current and future harvesting, reforestation and other management decisions.

3.1 Land Base Inventory

Land base inventory information used in this analysis were provided as a series of geographic information systems (GIS) data files from the MoFR, the BC Ministry of Sustainable Resource Management (MSRM) (now the Integrated Land Management Bureau) and licencees. Vegetation, biogeoclimatic and visual inventory data, management zone definitions, wetland, riparian, operability, access and habitat data was provided. A complete list of the data sources used in this analysis is presented in Table 2 of the Data Package (Appendix II).

A Forest Cover inventory was produced in 1992, updated in 1997, and rolled over into INCOSADA[1] in 2002. This inventory has not had a vegetation resources inventory (VRI) phase II ground sampling volume adjustment, or a net volume adjustment factor (NVAF) applied to it. The inventory has been projected to January 1st, 2005. As part of the data preparation process, the inventory has been updated to include disturbances up to June 2005.

New woodlot licenes have been allocated in the TSA that are not reflected in the current inventory. The land status for these areas was updated to reflect the change in land status for these areas.

[1] The Integrated Corporate Spatial and Attribute Database (INCOSADA) is a standardized set of corporate spatial and attribute data (i.e., map and text data) with common database structures for all Forest Act, Range Act, and Vegetation Resources Inventory data.

The THLB describes the area of crown forested land where timber harvesting is considered acceptable, economically feasible and is expected to occur within the 250-year planning horizon of the timber supply analysis. Area that is not forested, not managed by the MoFR or is not expected to be harvested is excluded from the THLB. Figure 3 shows the distribution of the total TSA and crown productive portion of the TSA. Approximately 31% of the 1.22 million hectares of the TSA is covered by non-forested or non-productive forest types and 12% of the TSA is not managed by the MoFR. The remaining 57% of the TSA is considered to be crown productive forest. Forty-seven percent of the crown productive forest (27% of the total TSA area) is considered part of the THLB.

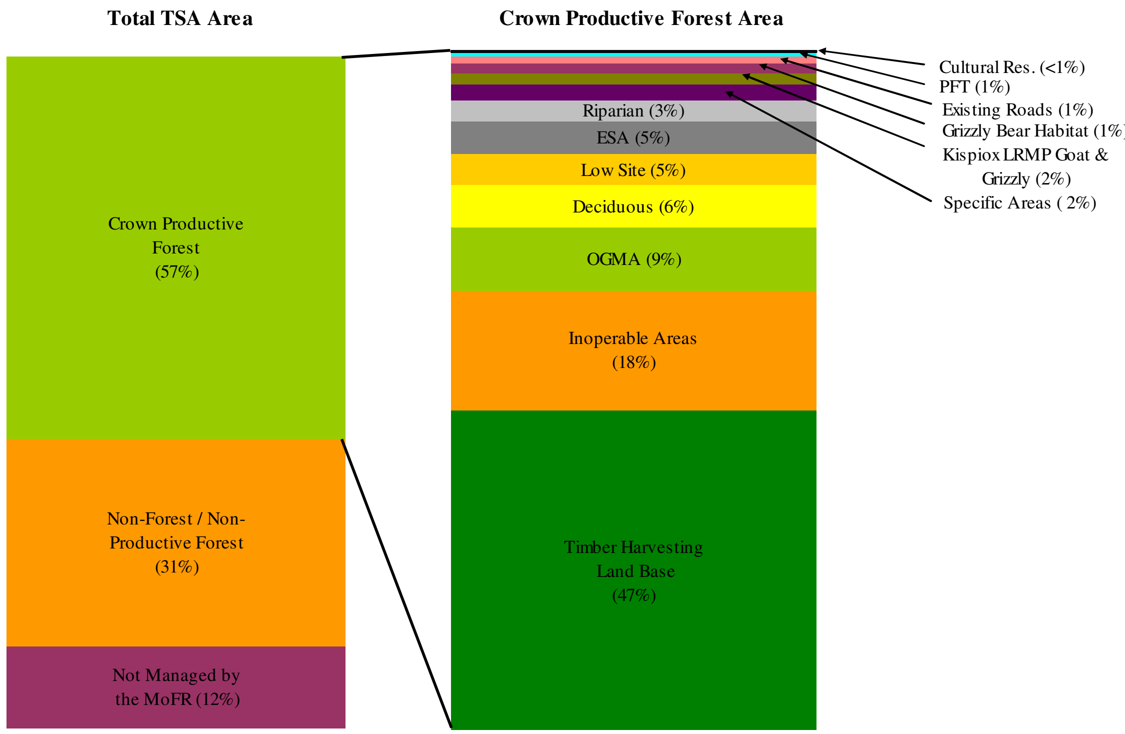


Figure 3: Total TSA and Crown Productive Forest Area - Kispiox TSA

Table 4 provides a more detailed breakdown of the areas removed from the THLB for this analysis. There have been changes in what constitutes current management in the TSA as well as changes in the input data since the Data Package was originally published and distributed for public and first nations review and comment in September 2005. An updated version of the Data Package that addresses these revisions is included in Appendix II of this Analysis Report. Section 5.1 below discusses the changes in data and management assumptions since the September 2005 publication of the Data Package.

Table 4: Timber Harvesting Land Base Definition

Land Base Classification	Productive Forest Area (ha)	Area (ha)	% of Total Area	% of Productive Forest
Total Land Base (Gross Area)		1,224,856	100	
Non-BC Forest Service Managed Lands		149,988	12	
Non-forest / Non-productive Forest		376,309	31	
Non-commercial Cover		823	-	
Total Productive Forest		**697,736**		
Reductions to Productive Forest:				
Old Growth Management Areas	65,677	65,677	5	9
Grizzly Bear Habitat	9,362	9,362	1	1
Cultural Heritage Resource	1,150	898	-	-
Environmentally Sensitive Areas (ESA)	45,247	32,756	3	5
Inoperable Areas	188,779	123,527	10	18
Low Timber Growing Potential	56,711	32,764	3	5
Problem Forest Types	4,727	4,213	-	1
Deciduous Leading Stands	46,872	42,731	3	6
Riparian Management Areas	91,022	21,342	2	3
Specific Geographically Defined Areas	33,594	15,912	1	2
Existing Roads, Trails and Landings	27,560	8,463	1	1
Kispiox LRMP Goat and Grizzly Objectives	42,736	12,253	1	2
Total Reductions to Productive Forest		*369,899*	*30*	*53*
Current Timber Harvesting Land Base		**327,837**	**27**	**47**
Future Road Reductions		11,958		
Long-Term Timber Harvesting Land Base		**315,879**		

Figure 4 presents the current composition of the THLB by tree species group. Hemlock and balsam leading stands make up 76% of the THLB, the majority of which are above minimum harvest age. Spruce and pine leading stands account for most of the balance of the THLB, the majority of which are below minimum harvest age. There is a small amount of cedar and cottonwood leading stands in the THLB. Overall, 77% of the THLB is currently above the minimum harvest age.

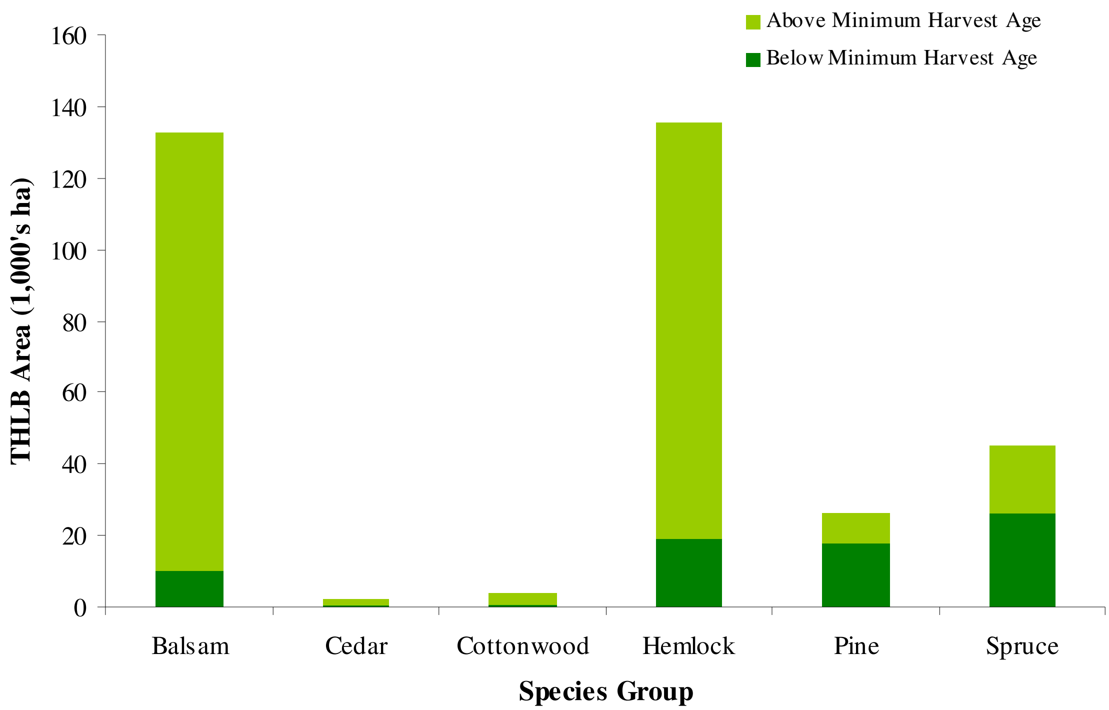


Figure 4: THLB Area Above and Below Minimum Harvestable Age by Species Group

The distribution of area within the THLB by inventory site index and leading species is illustrated in Figure 5. It should be noted that site index by biogeoclimatic classification (SIBEC) (Section 6.7) site index values are 12.8% higher than inventory site index on average in the Kispiox TSA. The majority of hemlock and balsam leading stands have a lower site index than the majority of pine and spruce leading stands. Overall, 47% of the THLB is between site index 9 and 12.

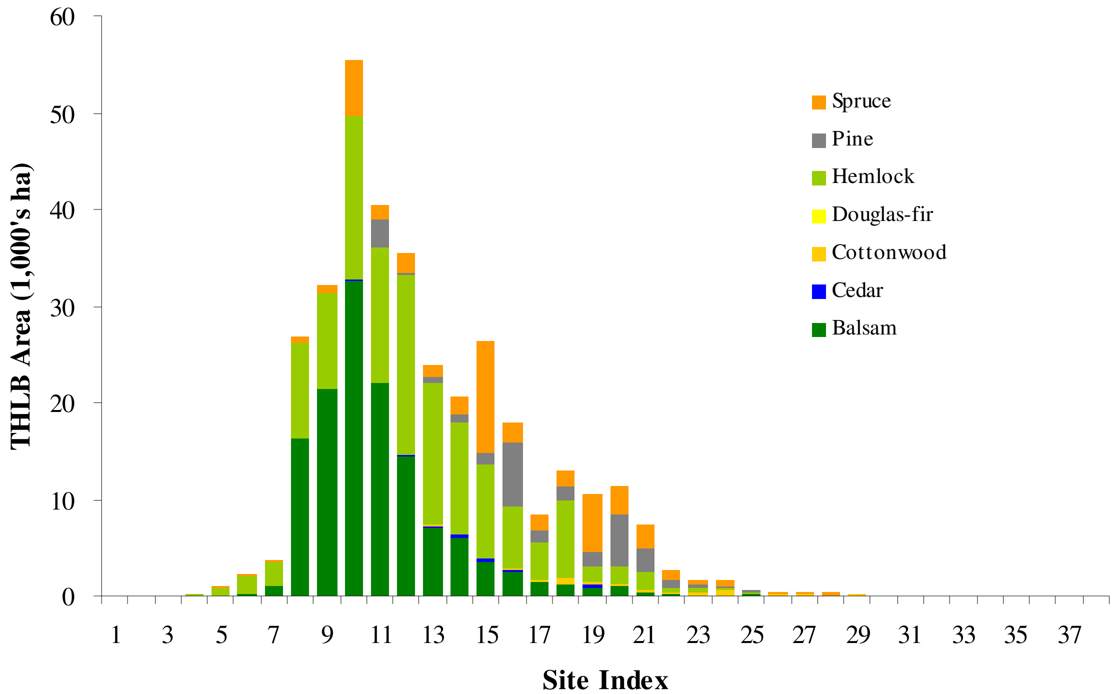


Figure 5: Inventory Site Index by Leading Species (THLB)

Figure 6 shows the THLB by leading species and age group. Consistent with Figure 4 above, 77% of the THLB is above 140 years of age with the majority of this area in hemlock and balsam. The majority of the pine and spruce-leading stands are less than 40 years of age.

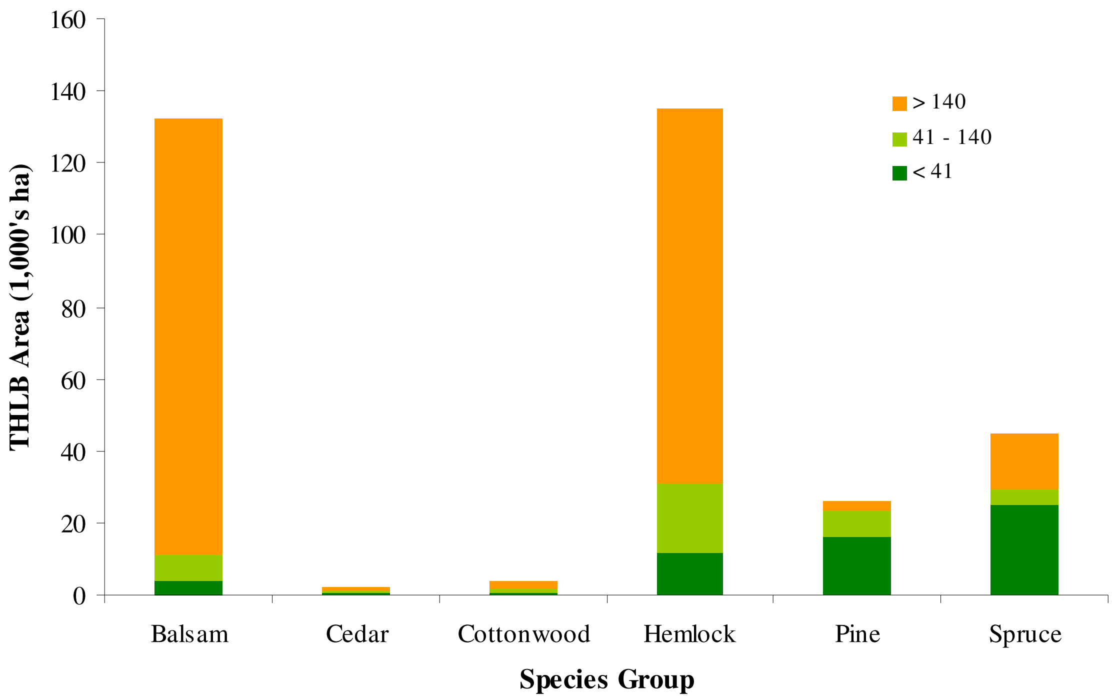


Figure 6: Age Group by Leading Species (THLB)

Consistent with the previous figures, Figure 7 shows that the age class distribution of the CFLB is heavily weighted towards the older age classes. Over 73% of the CFLB is in age class 8 (141 - 250 years) and 9 (250+ years). The majority of the non-THLB area is in age class 8 and 9 as well.

Figure 7: Current Age Class Distribution

3.2 Timber Growth and Yield

Growth and yield refers to the prediction of how various stand attributes change as stands age. Net merchantable volume and average stand height are two primary stand attributes that apply directly to the timber supply capability of a particular land base. The prediction of net merchantable volume determines how much volume can be produced by a particular stand at a specific point in time, while changes in average stand height determine the rate at which different stands achieve "green-up" and hydrologic recovery.

In British Columbia, the majority of growth and yield prediction for timber supply analysis is carried out using two BC Government produced models. The Variable Density Yield Prediction (VDYP) program predicts stand growth of unmanaged stands and the Table Interpretation Program for Stand Yield (TIPSY) predicts stand growth over time for managed stands.

Stands that have not been previously harvested and replanted are considered to be natural stands. Consistent with TSR II, all stands established before 1979 are considered to be natural, unmanaged stands. Yields for natural stands are generated using batch VDYP version 6.6d4, based on the following inventory attributes:

- Species composition (Species 1 to 6);
- Forest Inventory Zone (FIZ);
- Public Sustained Yield Unit (PSYU);
- Inventory site index;
- Projected stocking class;
- Crown closure; and
- Utilization level.

Stands that have been harvested and planted since 1979 (26 years of age or younger) are considered to be managed stands. Managed stand yields are used for stands that have already been harvested and planted as well as those stands that will be harvested and planted in the future. Managed stand yields are generated using batch TIPSY version 3.2b, based on the following attributes.

- Planted species composition;
- Initial planting density;
- Forest Inventory Zone (FIZ);
- Site productivity estimate (inventory site index / SIBEC);
- Regeneration delay;
- Operational adjustment factor (OAF) 1 and 2;
- Utilization level; and
- Planted or natural stem distribution.

Please refer to Section 8 of Appendix II for a detailed description of the growth and yield component of this analysis.

Uncertainty in volume estimation and prediction may result from uncertainty in the inventories as well as from uncertainty in the growth and yield models themselves. Sensitivity analyses described in Section 6.0 examine the potential impacts of this uncertainty.

3.3 Management Practices

Timber supply depends directly on how the forest is managed for both timber and non-timber resources. Forest management activities are governed primarily by FRPA and the *Forest Practices Code* (FPC) as well as the plans and prescriptions required under these acts.

Currently there are two officially designated higher level plans under FRPA that apply to the Kispiox TSA:

1. The *West Babine Sustainable Resource Management Plan* applies to the West Babine landscape unit; and

2. The *Kispiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife (Version 1.6)* applies to all of the landscape units in the Kispiox TSA except the West Babine landscape unit.

The plans set out objectives for biodiversity, wildlife habitat and visual quality. These objectives have been incorporated, where possible, into the timber supply analysis. In addition, the DFAM group has provided descriptions, and where possible, supporting information to describe the following management practices:

- **Silviculture Practices:** The majority of stands are harvested using a clear-cut silviculture system and reforestation activities are required to establish free-growing stands of acceptable tree species. All areas are restocked by planting.

- **Forest Health and Unsalvaged Losses:** Timber losses to fire, windthrow, insects and diseases are expected to be 12,840 m^3/yr. Dothistroma needle blight is expected to affect the pine component of some plantations of the TSA changing the volume, height and species composition of these stands (see Section 6.10 of Appendix II).

- **Utilization Levels:** Minimum sizes of trees, and logs to be removed during harvesting.

- **Minimum Harvestable Ages:** The time it takes for stands to grow to a merchantable condition. Minimum harvestable ages are defined as the age at which a stand achieves a minimum volume of 200 m^3/ha. The impacts of increasing the merchantable volume threshold to 250 m^3/ha are examined through sensitivity analysis.

- **Cutblock Adjacency and Green-Up:** In the Kispiox TSA, approval of harvesting activities is contingent on previously harvested stands reaching a desired condition, or green-up (three metres in height) before adjacent stands may be harvested. The purpose of the cutblock adjacency guidelines is to prevent timber harvesting from becoming overly concentrated in an area at any time. To approximate the effect of cutblock adjacency, a maximum of 33% of the integrated resource management (IRM) portion of the CFLB is allowed to be below green-up condition at any time within each landscape unit.

- **Maintenance of Scenic Values:** Maintaining important scenic values requires that maximum visible disturbance levels must be adhered to within visually sensitive portions of the TSA as defined by the District Manager.

- **Community Watersheds:** To protect water quality, each community watershed is required to have no more than 30% of the crown forested land base below a height of six metres.

- **Landscape-Level Biodiversity:** As specified in the WBSRMP and the *Kipsiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife*, each landscape unit and biogeoclimatic ecosystem classification (BEC) variant is required to maintain minimum levels of mature and old forest and ensure that maximum levels of early seral stage forest are adhered to. Old growth management areas (OGMA) have been spatially identified and have been removed from the THLB. In addition, patch size objectives for each natural disturbance type (NDT) are examined through sensitivity analysis.

- **Tourism:** Areas identified as having high tourism value have been removed from the THLB.
- **Pine Mushroom Habitat:** Areas identified as having a high likelihood of being pine mushroom habitat will maintain at least 60% of the forested area in ages greater than 80 years.
- **Grizzly Bear Habitat:** Grizzly habitat is maintained through a combination of no harvest areas and seral stage constraints.
- **Mountain Goat Winter Range:** These areas are removed from the THLB.
- **Mule Deer Winter Range:** These areas are managed to ensure that at least 40% of the area is older than 150 years at any point in time.

A more detailed description of these management practices and the assumptions used to assess their impacts on timber supply are discussed in Appendix II.

As mentioned above, management for some non-timber resources involves complete exclusion of harvesting while others involve the application of forest cover constraints ensuring that certain stand conditions exist within an area. Where harvesting is excluded that area is removed from the THLB. Figure 8 illustrates the portions of the THLB where forest cover constraints are applied. These management emphasis zones range from most constraining (i.e. ungulate winter range) to least constraining (i.e. integrated resource management). Areas subject to more than one constraint were accounted for under the most limiting constraint. The IRM constraint addresses those lands not subject to any other constraints.

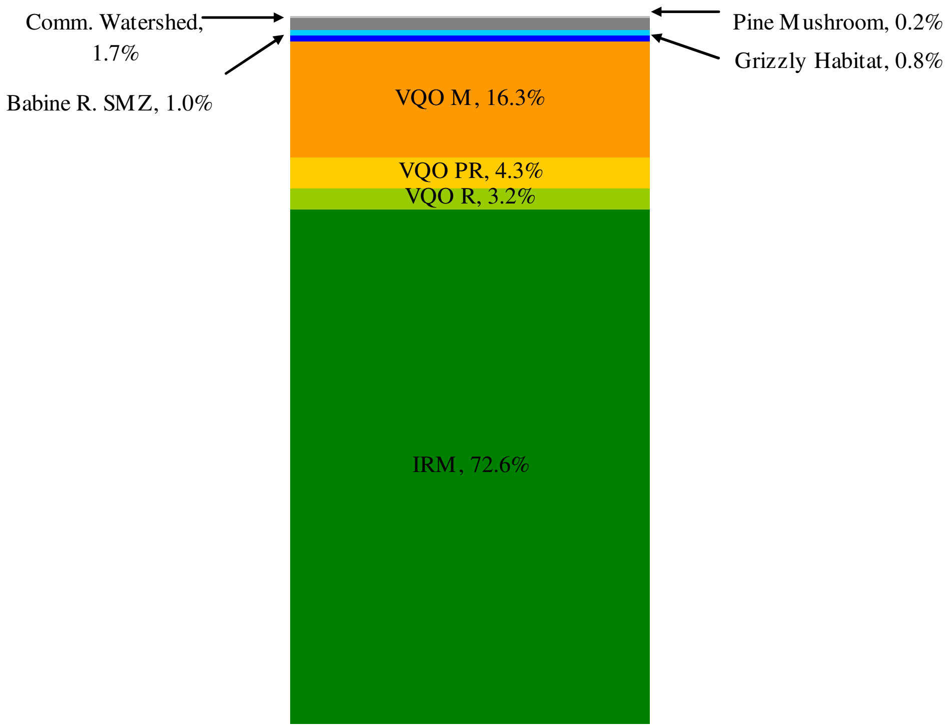


Figure 8: THLB Area by Management Emphasis

3.4 Changes since the Last Timber Supply Analysis

The last TSR for the Kispiox TSA occurred in 2002. Since that time there have been a number of changes in the both management practices in the TSA as well as available information. These include the introduction of FRPA, the WBSRMP, and the *Kispiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife.*

3.4.1 Land Base Changes

The most significant difference between TSR II and III is the size of the THLB.

In TSR II the THLB was 263,046 ha, 64,791 ha (20%) less that the current THLB of 327,837 ha. The most significant difference between TSR II and this analysis is the definition of the physical and economically operable land base. In TSR II, 305,231 ha was removed from the THLB as inoperable area whereas 123,527 ha has been removed in this analysis.

This 181,704 ha decrease in inoperable area from TSR II is a result of the Harvest Methods Mapping (HMM) project completed in 2004 (Corstanje) that redefined the operable land base by creating and applying classifications for harvest method and stand quality. Stand quality codes from the HMM project are incorporated into analysis unit definitions, and their inclusion creates a more refined definition of the THLB than that used in TSR II. Section 5.8 of the Data Package in Appendix II fully describes the HMM project and how it was incorporated into the netdown procedures.

Harvest Methods Mapping classifications define net downs for low potential sites, deciduous leading stands, problem forest types and operability. As recommended in the HMM report, the MoFR district staff have redefined the upper operability line. This analysis also accounts for additional Woodlot licences and new parks and protected areas.

Table 5 shows a comparison between the current and long-term THLB between TSR II and TSR III. The word <u>Current</u> refers to the THLB at the beginning of the planning horizon; the words <u>Long Term</u> refers to the THLB at the end of the 250 year planning horizon once future roads trail and landings have been accounted for.

Table 5: Comparison of TSR II THLB and TSR III THLB

THLB	TSR II (ha)	TSR III (ha)	Change (ha)	Change (%)
Current	263,046	327,837	+64,791	+19.8%
Long Term	253,634	315,879	+62,245	+19.7%

3.4.2 Timber Growth and Yield Changes

There have been minimal changes since TSR II with respect to growth and yield.

Consistent with TSR II, all stands established stands older than 26 years of age (before 1979 in this analysis) or those have not been previously harvested and replanted are considered to be natural, unmanaged stands. Stands 26 years of age or younger that have been harvested and planted (since 1979) are considered to be managed stands.

Also consistent with TSR II, natural stand yield tables were generated using the batch version of the Variable Density Yield Prediction (*BatchVDYP*) model, while managed stand yield tables were developed using the batch version of the Table Interpolation Program for Stand Yields (*BatchTIPSY*) model.

Basic analysis unit definitions are largely the same as TSR II. However, stand quality codes from the HMM project are incorporated into analysis unit definitions in order to identify the proportion of the harvest coming from sawlog, marginal sawlog and pulpwood stands.

3.4.3 Forest Management Changes

There are several differences in forest management assumptions between TSR II and the current analysis:

- **Non Recoverable Losses:** After the increase in THLB, changes in NRL are the most significant change from TSR II. Non-recoverable loss estimates have been reduced by 190,525 m^3/yr for the first decade and 65,850 m^3/yr for all subsequent decades effectively increasing available timber supply by this amount.

- **Regeneration Delay:** The regeneration delay was either zero or five years in TSR II (depending on the analysis unit) while it is two years for all analysis units in this analysis. Further, TSR II assumed that 30% of the area in all analysis units would be thinned from the initial density of 3,000 stems/ha down to 1,600 stems/ha; an assumption not continued in this analysis.

- **Partial Harvesting:** TSR II assumed that partial harvesting regimes would apply to 22% of the area covered with coniferous stands within the THLB, whereas all stands are assumed to be clear cut in this analysis.

- **Water Quality:** Forest cover requirements to protect water quality in community watersheds were applied in the TSR II base case, but are only explored through sensitivity analysis in TSR III.

- **Number of Landscape Units:** In TSR II there were 33 landscape units in the Kispiox TSA. Approval of both the *West Babine Sustainable Resource Management Plan* and the *Kispiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife* reduced the total number of landscape units to nine. Objectives for biodiversity and visual quality are modelled at the landscape unit level and applying these constraints to fewer, larger landscape units likely decreases their impact on timber supply.

- **Visual Quality Objectives:** Approximately 19% of the THLB was subject to visual quality management in TSR II versus 24% in this analysis. In TSR II some scenic areas with a partial retention visual quality class (VQC) were re-labeled as a modification VQC as part of a visual impact mitigation strategy; a practice not continued in this analysis. The TSR III VQO's are recommended VQO's for newly mapped scenic areas plus all the existing VQO's from the current VLI. Further, the minimum green-up heights for TSR II were 6 m, versus 5 m for this analysis. The area distribution by VQC is compared in Table 6 below.

Table 6: Area Distribution of VQO Classification Comparison: TSR II versus TSR III

Visual Quality Objective Classification	TSR II (2002) (%)	TSR III (2006) (%)
Modification	10.8	16.3
Partial Retention	3.8	4.3
Retention	4.4	3.2
Total	**19.0**	**23.8**

4.0 Timber Supply Analysis Methods

Timber supply analysis is generally conducted using a combination of stand-level models to predict how individual stands or groups of similar stands grow over time, and forest-level models that forecast the cumulative effects of stand growth and management activity across a large area and over a period of time. The use of stand-level models to predict stand growth and yield has already been discussed in Section 3.2. The following section describes the use of forest-level (or forest estate) models in conducting timber supply analysis.

Timber supply modeling for this analysis was conducted using two different timber supply models: Woodstock and Patchworks.

4.1 Woodstock

Similar to the MoFR Forest Service Simulation Model (FSSIM), Woodstock is a pseudo-spatial timber supply model that projects harvesting activities across a land base over a specific period of time. These models are referred to as pseudo-spatial because the data used to create the model has spatial components to it however, the harvest schedules produced by these models are not spatially explicit. It is possible to bring spatial context into this type of model by applying constraints to spatial attributes of the land base such as landscape units or watersheds, however harvest schedules produced using these types of models report the timing of the harvest of different types of stands as opposed to specific polygons harvested in each period. For these reasons it is not possible to explicitly model spatial management objectives such as cut block size, adjacency and green-up requirements, or patch size targets using this type of model. A spatially explicit model is required for this type of analysis which is described below.

The aspatial (or pseudo-spatial) component of this timber supply analysis was conducted using Remosft's spatial planning system Woodstock (www.remsoft.com). Woodstock uses optimization to establish a harvest schedule that incorporates objectives such as visual quality, biodiversity, wildlife habitat with the objective of timber harvest. In Woodstock, harvest volume is maximized subject to the maintenance of other values on the land base (as defined in the Data Package in Appendix II). Additionally, the model must produce a harvest schedule that is sustainable beyond the planning horizon of 250 years.

All of the results reported in Section 5.0 and 6.0 are based on modelling from Woodstock and do not include spatially explicit objectives for cut block size or patch size distribution. All scenarios reported use five-year planning periods and project harvest volume for a period of 250 years. All scenarios, unless otherwise stated maintain the current AAC of 977,000 m^3/yr for as long as possible before stepping down at a maximum rate of 10% per decade to a sustainable long-term harvest level (LTHL).

4.2 Patchworks

The 2006 signing of the *Order to Establish the Kispiox Landscape Unit and Objectives* set out legal requirements to manage for objectives for patch size, among other things. In order to understand how these objectives might affect timber supply or other management objectives we must be able to determine how future harvest patterns might affect the patch size distribution of the forest and must be able to modify harvest patterns in consideration of patch size and other objectives. This type of analysis requires a very specialized type of forest-estate model that is spatially explicit (assign harvest to specific polygons on the land base) and can calculate patch size "on the fly" and adjust the harvest schedule based on not only patch size, but a number of other management objectives on the land base.

Patchworks is a fully spatial optimization model that is capable of explicitly modelling patch size objectives as well as the other management objectives that are included in the Woodstock model. Data and model preparation for Woodstock and Patchworks are largely the same. The same resultant database and yield projections are used to create both models and there are no significant differences in the assumptions used in each of the models other than the fact that the Patchworks model refers directly to the spatial data whereas the Woodstock model uses a summary of that data. Besides patch size modelling, there are two primary differences between the models:

1. **Spatially Explicit:** Patchworks is spatially explicit and assigns harvest to individual polygons, producing a spatial harvest schedule. While Woodstock develops a harvest schedule based on harvesting different stand types (or strata) at specific times.

2. **Modelling Objective:** Woodstock is formulated to maximize harvest volume subject to a number of constraints. Non-timber management objectives are all set up has hard limits that cannot be violated. All objectives in Patchworks, including patch size and harvest volume are set up with targets levels and penalty weights (costs) for violating these targets. The objective of the model is to determine a harvest schedule that minimized the cost (sum of all the penalties). In Patchworks users can modify the penalty weights for individual objectives in an attempt to modify the harvest schedule to produce a more favourable outcome.

Spatial timber supply modelling involves exploring a large number of potential solutions in establishing a suitable or preferable harvest schedule. This is further complicated when objectives for patch size are included as the patch size distribution resulting from each harvest schedule decision must be evaluated. It should be noted that a spatial harvest scheduling represents one possible approach to achieving a particular harvest level spatially, of which there may be several alternatives. The spatial harvest schedule is a demonstration that a particular harvest level can be achieved on the land base in consideration of specific spatial objectives.

On a land base the size of the Kispiox TSA, spatial analysis requires a considerable amount of computing time to generate a suitable harvest schedule. Spatial analysis scenarios, using Patchworks have been run for the base case, the water quality management scenario (Section 6.4), and the remote area harvest deferral scenario (Section 6.9). These scenarios address all of the objectives included in the Woodstock scenarios in addition to patch size objectives. Explicit objectives for cut block size have not been included in the analysis. All objectives have been given equivalent penalty weights for violating constraints, with the exception of the Remote Area Harvest Deferral 2 scenario (Section 6.10) in which higher penalty weights are assigned to violating non-timber objectives.

The results of each spatial scenario are discussed in Section 7.0.

5.0 Base Case

The base case harvest forecast reflects assumption about current performance with respect to the status of forest land, forest management practices and knowledge of timber growth and yield, and serves as a baseline for assessing the impacts of uncertainty in the assumptions.

At the initiation of this analysis in May 2005, four planning processes were either recently completed or currently underway in the Kispiox TSA:

1. West Babine Sustainable Resource Management Plan (WBSRMP);
2. Kispiox LRMP Higher Level Plan (the Kispiox FRPA Project);
3. Gitsegukla Watershed pilot Planning Project; and
4. Gitanyow Planning Process.

Landscape unit objectives from the WBSRMP were legally established on March 23, 2004, and came into effect on August 1st, 2004, and these objectives contribute to define *current management* in this analysis. In 2006, two significant orders were approved by government significantly changing the definition of *current management*. These orders are:

> *Order To Establish the Kispiox Landscape Unit and Objectives - effective June 1st, 2006*
>
> *Order To Establish Scenic Areas in the Kispiox Timber Supply Area - effective February 1st, 2006*

At the initiation of this project, because these orders had not yet been signed, the assumptions associated with these orders were to be addressed through sensitivity analysis. The September 2005 Data Package does not consider these as part of the base case. However, with the 2006 signing of these two orders these management assumptions have become part of the base case and the Data Package in Appendix II has been updated to reflect this.

The Gitsegukla Watershed Pilot Planning Project was a 2005 planning process involving Chiefs from the Gitxsan's Gitsegukla watershed, Skeena Stikine District stewardship staff, and Gitxsan Treaty Society staff. District staff worked directly with Chiefs to identify and spatially represent Gitxsan forest values (e.g. water, biodiversity, wildlife, fish, timber, etc.) and to co-develop forest management strategies to help maintain those values. The planning process was discontinued in 2006. Planning products were not finalized thus will not be considered in this timber supply review.

The *Landscape Unit Plan for all Gitanyow Traditional Territory within Kispiox and Cranberry Timber Supply Areas* (the "Gitanyow Plan") is a cooperative consultation and planning process involving Gitanyow chiefs and Skeena Stikine District staff. The Gitanyow Plan is a document that represents a statement of Gitanyow cultural and heritage values, their interests and plans for future use of their territories, and their plan for long-term sustainability of ecological resources.

This process concluded in 2006 and objectives from the Gitanyow Plan have not been set by government thus will not be considered in this timber supply review. However, the Plan is being reviewed in the ongoing Nass Sustainable Resource Management Plan (Nass SRMP) process. The planning group is considering extending the Nass SRMP area to include the Gitanyow Plan area, and translating applicable Gitanyow Plan objectives into SRMP objectives that will be set by government and considered in future timber supply reviews. Also, the plan has influenced the content of certain GIS layers used for this timber supply review. For example, the extent of the operable landbase was adjusted to incorporate modifications recommended by the Gitanyow Plan.

5.1 Changes to the Data Package

The original Data Package was published and distributed for public and first nations review and comment in September 2005. Since that time changes in the definition of current management as well as changes to input data have occurred. The following sections describe the changes in base case assumptions from those documented in the September 2005 Data Package. Section 1.1 of the Data Package (Appendix II) contains a detailed description of the following changes:

- The signing of the *Order To Establish the Kispiox Landscape Units and Objectives - effective June 1st, 2006*
- The signing of the *Order To Establish Scenic Areas in the Kispiox Timber Supply Area - effective February 1st, 2006.*
- Changes to the Harvest Methods Mapping (HMM) data used to define the operable land base, and
- Establishment of an even flow sawlog requirement

Table 7 shows the changes to the netdown information for the current base case relative to those published in the September 2005 Data Package. Overall, the current THLB is 39,600 ha lower than was reported in the September 2005 Data Package.

Table 7: Timber Harvesting Land Base Definitions

Land Base Classification	Original Data Package - September 2005 (ha)	Final Area (ha)	Difference (ha)
Total Land Base (Gross Area)	1,224,856	1,224,856	-
Non-BC Forest Service Managed Lands	149,988	149,988	-
Non-Forest / Non-productive Forest	376,309	376,309	-
Non-Commercial Cover	823	823	-
Total Productive Forest	**697,736**	**697,736**	-
Reductions to Productive Forest:			-
Old Growth Management Areas	-	65,677	65,677
WBSRMP Grizzly Bear Habitat	9,362	9,362	-
Cultural Heritage Resource	1,150	898	-252
Environmentally Sensitive Areas (ESA)	44,869	32,756	-12,113
Inoperable Areas	152,866	123,527	-29,339
Low Timber Growing Potential	29,097	32,764	3,667
Problem Forest Types	1,587	4,213	2,626
Deciduous Leading Stands	42,872	42,731	-141
Riparian Management Areas	23,510	21,342	-2,168
Specific Geographically Defined Areas	16,011	15,912	-99
Existing Roads, Trails and Landings	8,894	8,463	-431
Kispiox LRMP Goat and Grizzly Objectives	-	12,253	12,253
Total Reductions to Productive Forest	*330,219*	*369,899*	*39,680*
Current Timber Harvesting Land Base	**367,517**	**327,837**	**-39,680**

5.2 Analysis Results

Illustrated in Figure 9 and Table 8 is the harvest forecast for the current base case in comparison with the TSR II base case, as per the discussion in Section 3.4 above. The initial harvest level (IHL) for the base case is 16.8% higher than that of TSR II. The current harvest is maintained for 50 years before declining; whereas the TSR II harvest declined after the first decade. In the long-term the base case harvest forecast is 41% higher that the TSR II harvest forecast. The change in THLB brought about by the re-definition of the inoperable land base is the single largest contributor to the difference in harvest levels. NRLs, change in VQO green-up heights, removal of water quality objectives and other aforementioned factors all contribute.

It should be noted that the 1996 TSR (TSR I) projected a harvest level of 1,092,611 m^3/yr on a THLB of 317,939 ha, comparable to the base case. This included a 205,606 ha netdown for inoperable lands.

Note: All harvest volumes reported are net of 12,840 m^3/yr of non-recoverable losses.

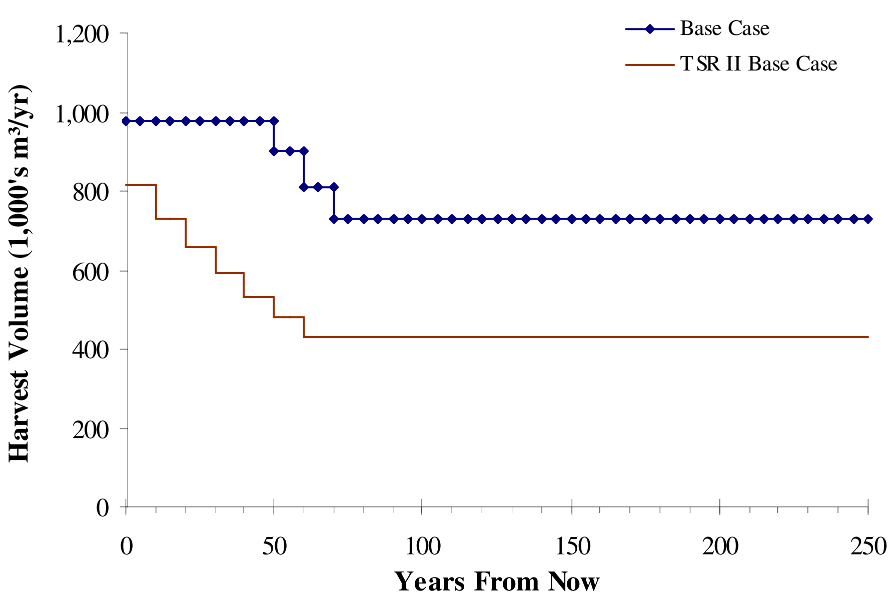


Figure 9: Harvest Volume – Base Case versus TSR II

Table 8: Harvest Volume – Base Case versus TSR II

Years From Now	Harvest Volume (1,000's m³/yr)		
	Base Case	TSR II Base Case	% Difference
5	977	813	-16.8
10	977	813	-16.8
15	977	731	-25.2
20	977	731	-25.2
25	977	658	-32.7
30	977	658	-32.7
35	977	592	-39.4
40	977	592	-39.4
45	977	533	-45.4
50	977	533	-45.4
55	903	480	-46.9
60	903	480	-46.9
65	812	432	-46.8
70	812	432	-46.8
75	729	430	-41.0
80	729	430	-41.0
85	729	430	-41.0
90	729	430	-41.0
95	729	430	-41.0
100	729	430	-41.0
105	729	430	-41.0
110	729	430	-41.0
115	729	430	-41.0
120	729	430	-41.0
125+	729	430	-41.0
TOTAL	**197,276**	**119,790**	**-39.3**

Figure 10 and Table 9 show that the current AAC of 977,000 m^3/yr can be maintained for the next 50 years before stepping down at a rate of 10% per decade to the LTHL of 729,000 m^3/yr. The sawlog portion of the total harvest volume is initially 410,000 m^3/yr before increasing to the LTHL in 125 years.

An additional sensitivity was conducted in which the requirement for an evenflow sawlog volume was removed from the base case. The impact of removing this requirement on timber supply is negligible with no impact in the short-term and a <1% impact in the mid and long-term.

As per Figure 11, nearly all available marginal sawlog, pulpwood and deciduous volume from natural stands within the THLB will be harvested within 120 years. All managed stands will be managed for sawlog production. For simplicity, the sawlog volume was allowed to step up once to a long-term sustainable level.

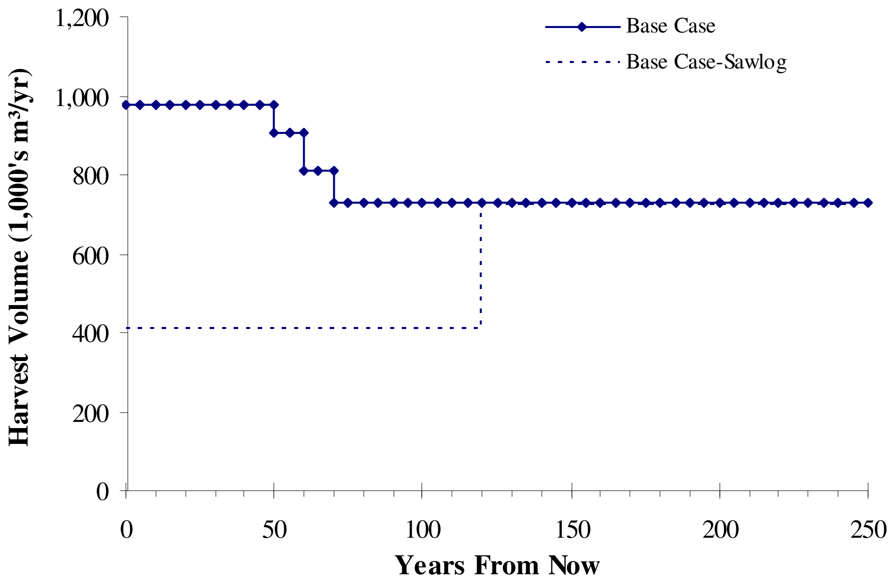


Figure 10: Harvest Volume – Base Case Harvest Volumes

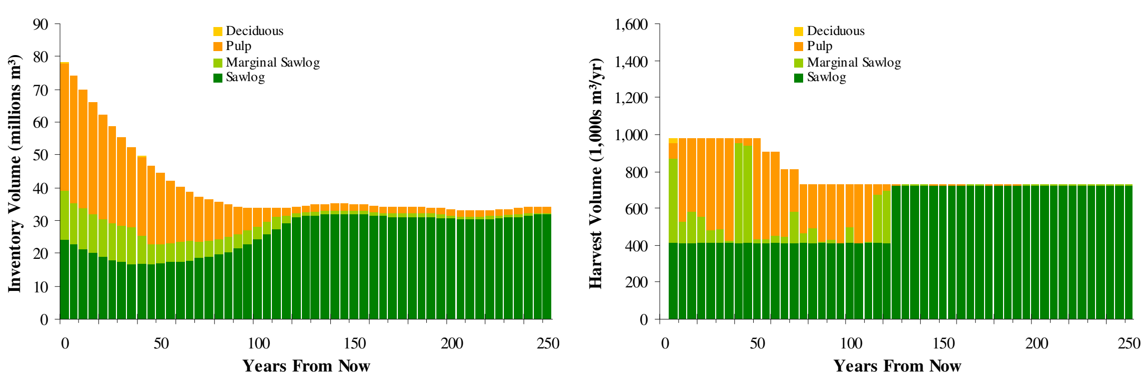


Figure 11: Growing Stock and Harvest Forecast by Stand Quality— Base Case Harvest

Table 9: Harvest Volume – Base Case Harvest Volumes

Years From Now	Harvest Volume (1,000's m³/yr)	Sawlog Harvest Volume (1,000's m³/yr)
5	977	410
10	977	410
15	977	410
20	977	410
25	977	410
30	977	410
35	977	410
40	977	410
45	977	410
50	977	410
55	903	410
60	903	410
65	812	409
70	812	409
75	729	408
80	729	408
85	729	408
90	729	408
95	729	408
100	729	408
105	729	408
110	729	408
115	729	408
120	729	408
125+	729	721
TOTAL	**197,276**	**28,574**

Figure 12 shows the operable growing and available growing stock over the 250-year planning horizon. Operable growing stock is the total standing volume on the THLB while the available growing stock is the portion of this volume that is above minimum harvest age. Figure 11 above shows the proportion of the operable growing stock in sawlog, marginal sawlog, pulpwood, and deciduous stands while Figure 13 shows the portion of the operable growing stock that existing in natural and managed stands.

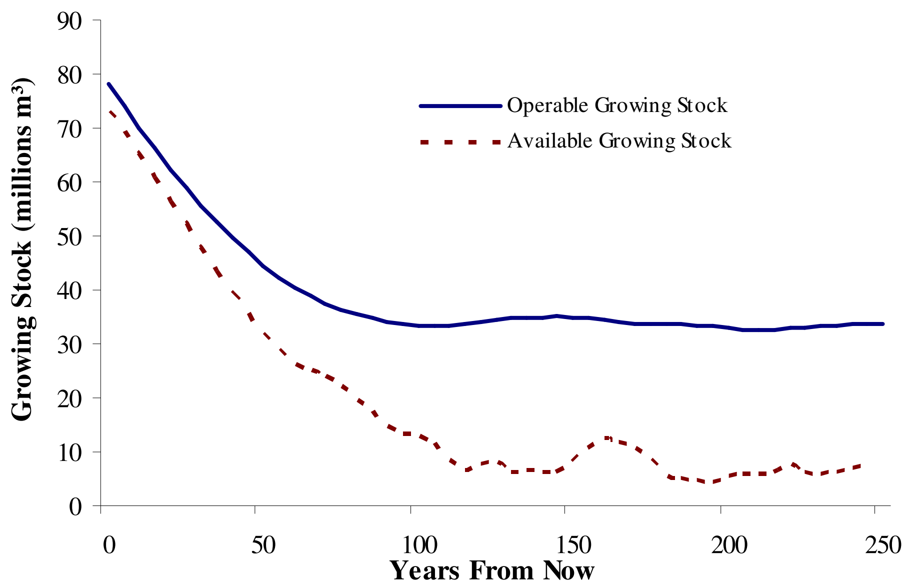


Figure 12: Operable and Available Growing Stock – Base Case

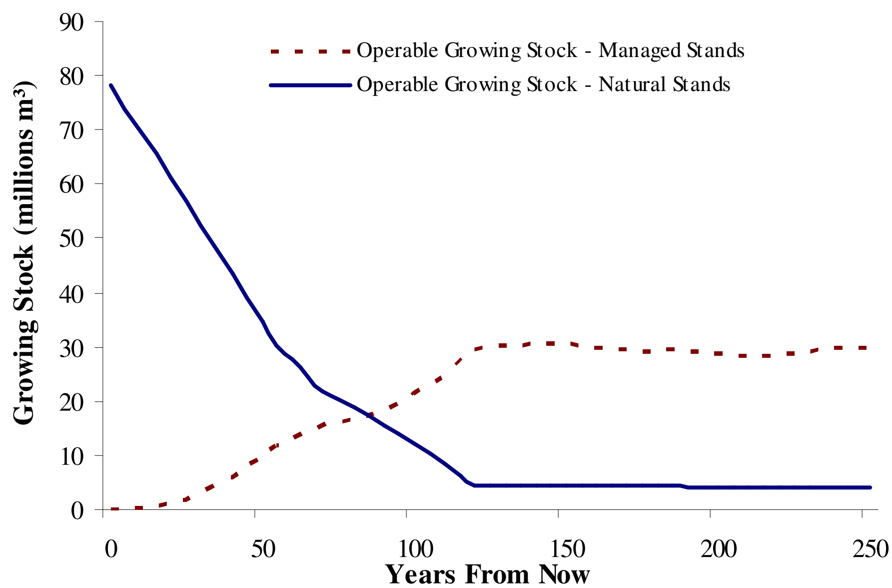


Figure 13: Natural / Managed Stand Operable Growing Stock – Base Case

The average volume per hectare harvested and average harvest age are shown in Figure 14. Figure 15 shows the amount of area harvested in each five-year period from managed and natural stands.

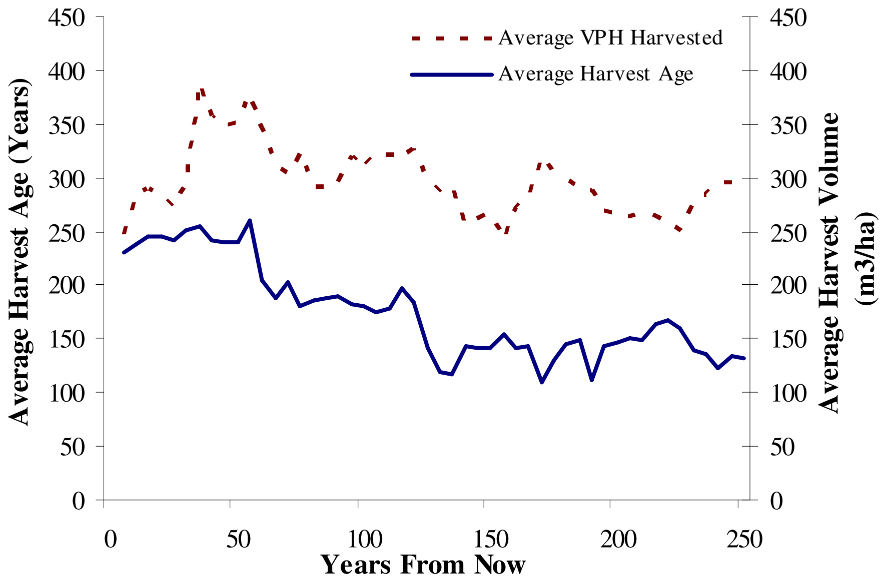


Figure 14: Average Harvest Age and Average m^3/ha Harvested – Base Case

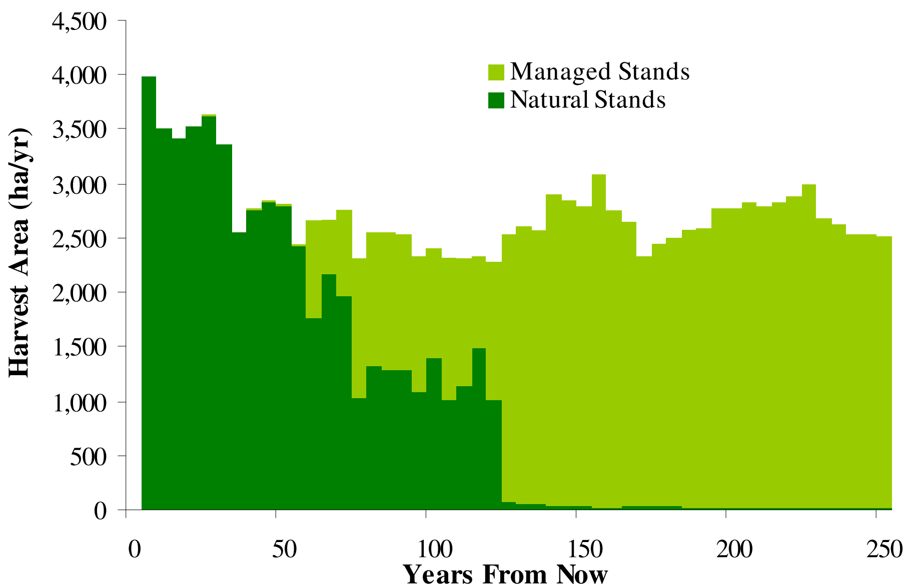


Figure 15: Area Harvest in Natural and Managed Stands – Base Case

Figure 16 shows the age class distribution of the THLB and non-THLB portions of the land base at 50 year intervals throughout the 250 year planning horizon. The base case does not include modelling of natural disturbance in the forested non-THLB portion of the land base. As such, stands outside the THLB continue to age and eventually all become part of the 250+ age category. The current age class distribution of the forest as a whole is heavily weighted to stands greater than 250 year old and suggest that natural disturbances either do not occur on a large scale in the TSA or are not captured in the inventory. Over time, much of the older stands in the THLB are harvested, creating a more even age class distribution.

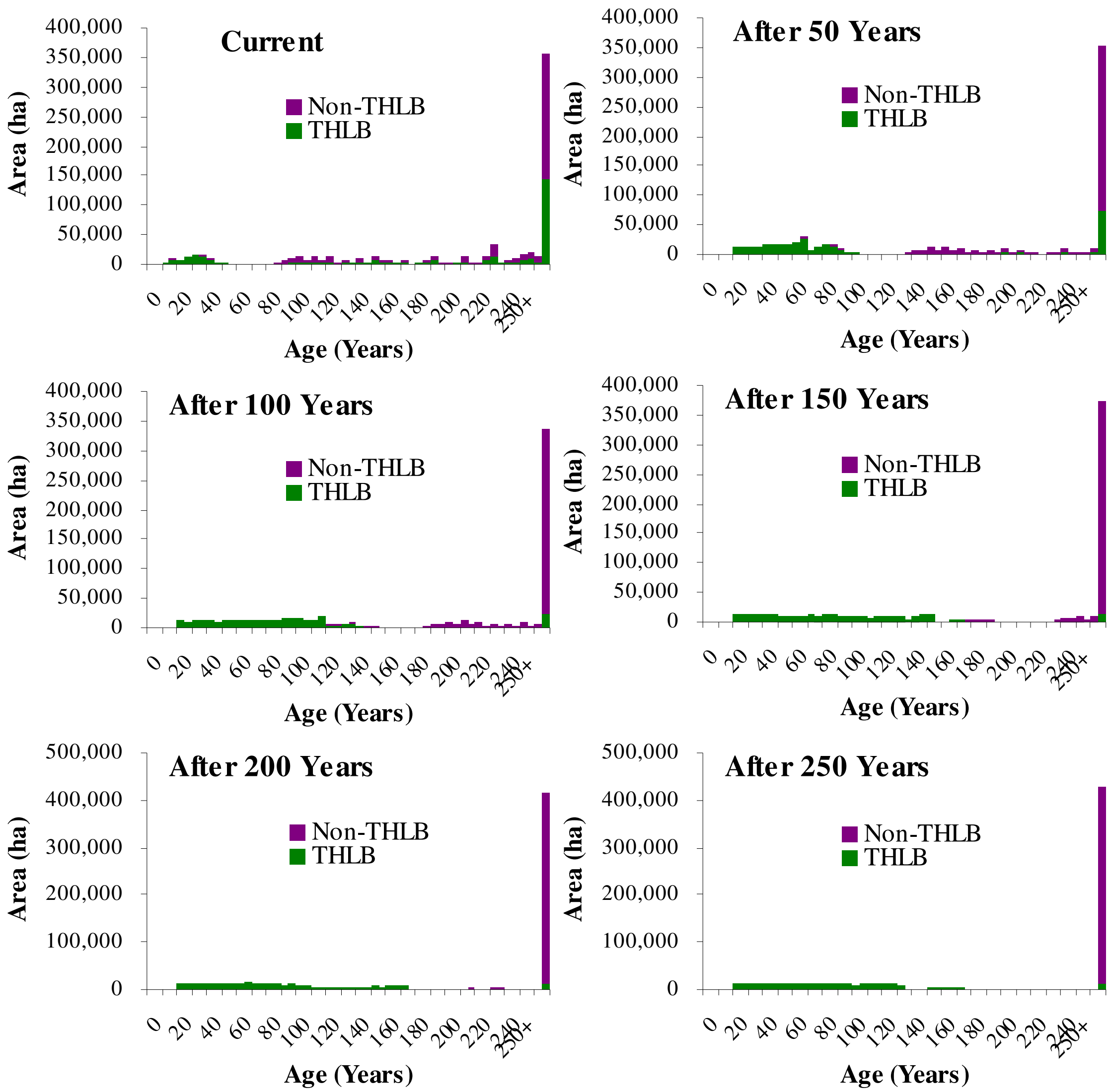


Figure 16: Age Class Distribution through 250 Years – Base Case

5.3 Alternate Harvest - Maximum Even Flow

Examining alternate harvest flow scenarios provide insight into the sensitivity of the base case harvest forecast to changes in the harvest flow policy. Many of these sensitivities also provide an understanding the stability and flexibility of the base harvest forecast. These scenarios look at alternative harvest flows, with different decline rates, starting harvest levels, and potential trade-offs between short-and long-term harvests.

Figure 17 and Figure 18 compare the base case harvest forecast to a maximum even flow (non-declining) harvest. In this scenario the harvest level is maximized, but equal across the planning horizon. The sawlog volume is below that of the base case due to constant reduction of available marginal sawlog, pulp wood and deciduous volumes from natural stands in the short and mid-term as illustrated in Figure 18.

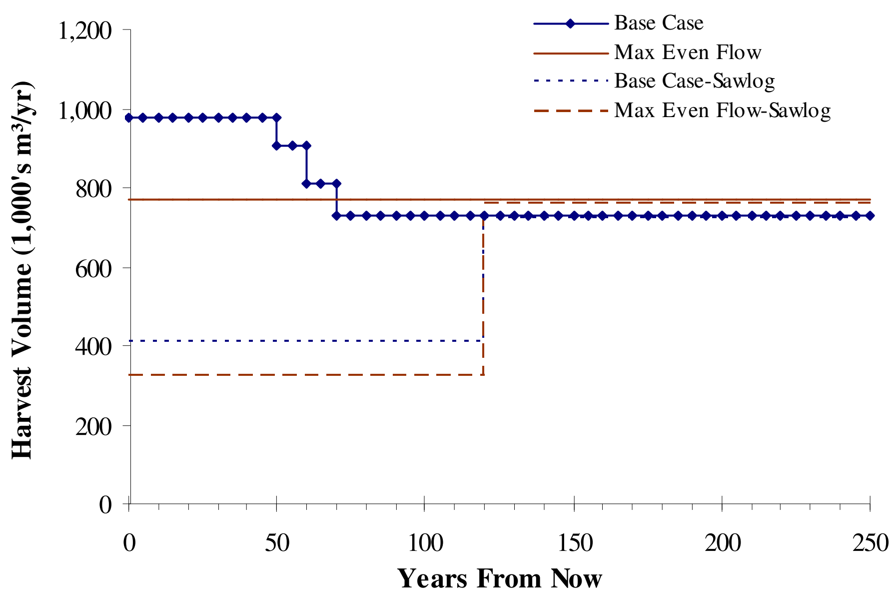
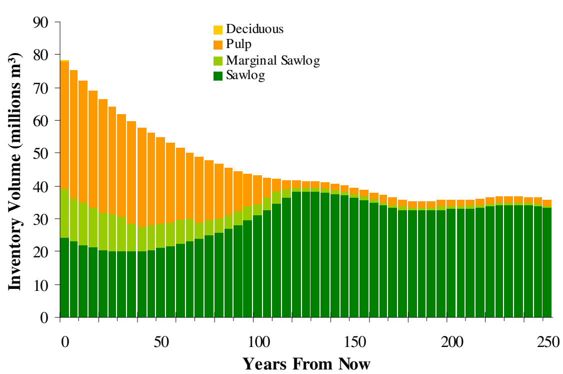


Figure 17: Harvest Forecast – Maximum Even Flow



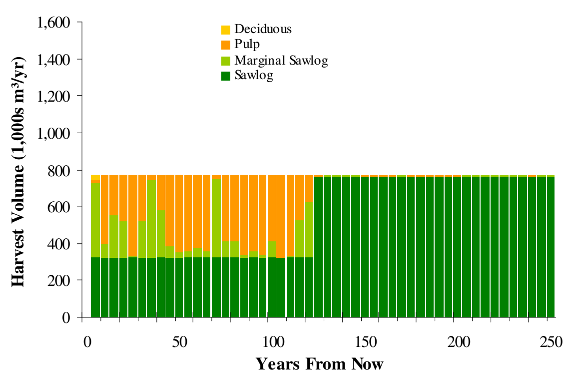


Figure 18: Growing Stock and Harvest Forecast by Stand Quality — Maximum Even Flow

Table 10: Harvest Forecast – Maximum Even Flow Harvest Level

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Max Even Flow	% Difference	Base Case	Max Even Flow	% Difference
5	977	769	-21.3	410	325	-20.8
10	977	769	-21.3	410	325	-20.8
15	977	769	-21.3	410	325	-20.8
20	977	769	-21.3	410	325	-20.8
25	977	769	-21.3	410	325	-20.8
30	977	769	-21.3	410	325	-20.8
35	977	769	-21.3	410	325	-20.8
40	977	769	-21.3	410	325	-20.8
45	977	769	-21.3	410	325	-20.8
50	977	769	-21.3	410	325	-20.8
55	903	769	-14.9	410	325	-20.7
60	903	769	-14.9	410	325	-20.7
65	812	769	-5.3	409	325	-20.6
70	812	769	-5.3	409	325	-20.6
75	729	769	5.4	408	325	-20.4
80	729	769	5.4	408	325	-20.4
85	729	769	5.4	408	325	-20.4
90	729	769	5.4	408	325	-20.4
95	729	769	5.4	408	325	-20.4
100	729	769	5.4	408	325	-20.4
105	729	769	5.4	408	325	-20.4
110	729	769	5.4	408	325	-20.4
115	729	769	5.4	408	325	-20.4
120	729	769	5.4	408	325	-20.4
125+	729	769	5.4	721	761	5.5
TOTAL	**197,276**	**192,197**	**-2.6**	**28,574**	**27,587**	**-3.5**

5.4 Alternative Harvest - Maximum Initial Harvest Level

The harvest flow objective for the base case is to maintain the current AAC for as long as possible before declining to the LTHL. The Maximum Initial Harvest Level (IHL) scenario examines the opportunity to increase the IHL while maintaining a controlled decline at a maximum of 10% per decade to the LTHL. While this scenario may not represent a preferable or economically viable scenario, it does provide valuable insight as to the harvest potential and thereby the flexibility in the early portions harvest schedule.

As shown in Figure 19 and Table 11 it is possible to achieve an IHL that is significantly higher than the current base case while still maintaining a controlled 10% per decade decline to the LTHL. This allows the sawlog volume to exceed the base case level in the short and mid-term, but not all available non-sawlog volume is harvested within that time frame, as illustrated in Figure 20.

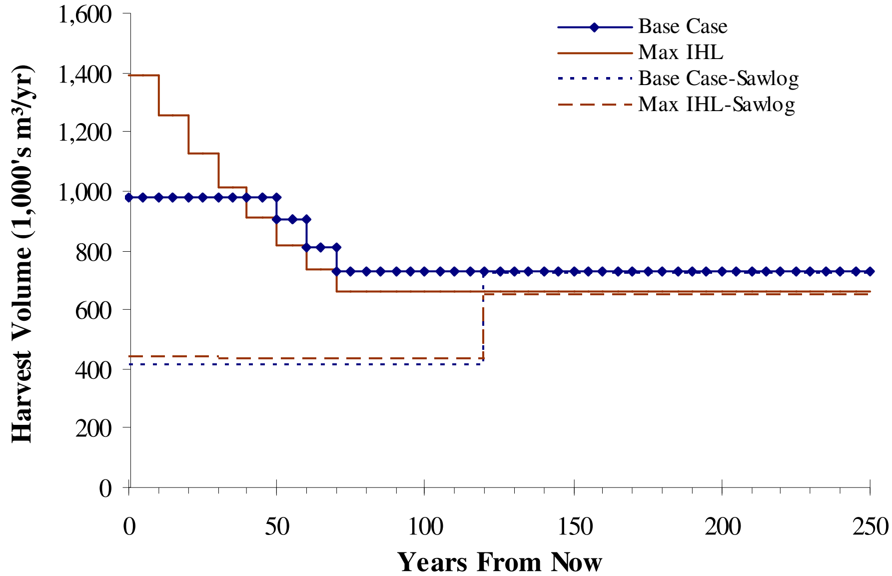


Figure 19: Harvest Forecast – Maximum Initial Harvest Level

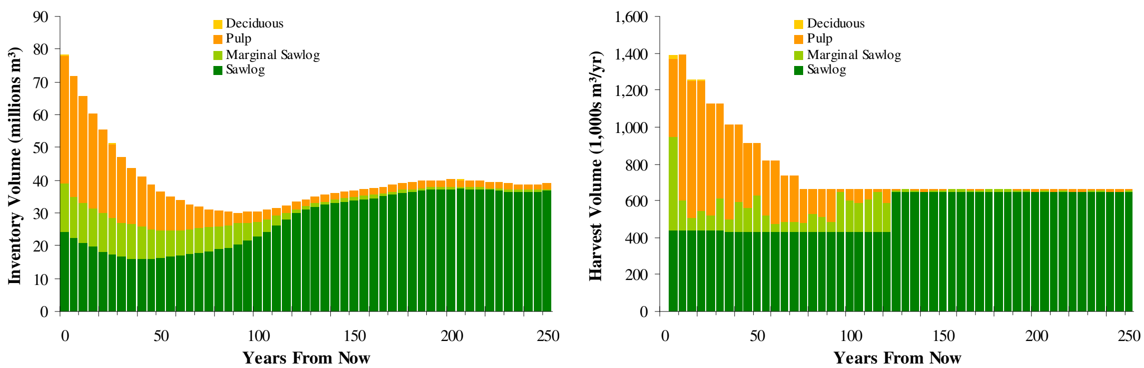


Figure 20: Growing Stock and Harvest Forecast by Stand Quality ─ Maximum Initial Harvest Level

Table 11: Harvest Forecast – Maximum Initial Harvest Level

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Max IHL	% Difference	Base Case	Max IHL	% Difference
5	977	1,392	42.5	410	437	6.6
10	977	1,392	42.5	410	437	6.6
15	977	1,252	28.1	410	436	6.4
20	977	1,252	28.1	410	436	6.4
25	977	1,125	15.2	410	436	6.3
30	977	1,125	15.2	410	436	6.3
35	977	1,011	3.5	410	435	6.2
40	977	1,011	3.5	410	435	6.2
45	977	909	-7.0	410	435	6.0
50	977	909	-7.0	410	435	6.0
55	903	817	-9.6	410	434	6.0
60	903	817	-9.6	410	434	6.0
65	812	734	-9.6	409	433	6.0
70	812	734	-9.6	409	433	6.0
75	729	659	-9.6	408	432	5.9
80	729	659	-9.6	408	432	5.9
85	729	659	-9.6	408	432	5.9
90	729	659	-9.6	408	432	5.9
95	729	659	-9.6	408	432	5.9
100	729	659	-9.6	408	432	5.9
105	729	659	-9.6	408	432	5.9
110	729	659	-9.6	408	432	5.9
115	729	659	-9.6	408	432	5.9
120	729	659	-9.6	408	432	5.9
125+	729	659	-9.6	721	650	-9.9
TOTAL	**197,276**	**191,067**	**-3.1**	**28,574**	**27,316**	**-4.4**

5.5 Alternative Harvest - 15% Step Down Per Decade

The harvest flow objectives in the base case are to maintain the current AAC for as long as possible before stepping down the harvest a maximum of 10% per decade to the LTHL. This scenario examines the impact of changing the rate of harvest decline to 15% per decade. As shown in Figure 21 and Table 12, the current AAC can be maintained for an additional decade when before stepping down a maximum of 15% per decade to the LTHL. Increasing the maximum harvest decline to 15% per decade will result in a slight increase in the sawlog volume in the short and mid-term, with a slight decrease in the long-term. The increase in sawlog volume in the short and mid-term causes slightly less sawlog volume to be available for harvest in the long-term.

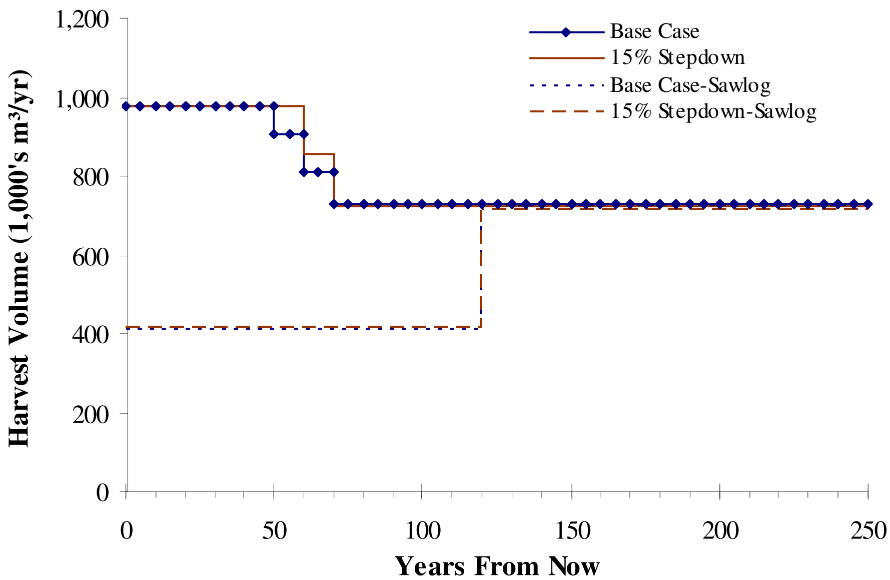


Figure 21: Harvest Forecast – 15% Step Down

Table 12: Harvest Forecast – Harvest Forecast – 15% Step Down

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	15% Stepdown	% Difference	Base Case	15% Stepdown	% Difference
5	977	977	-	410	416	1.5
10	977	977	-	410	416	1.5
15	977	977	-	410	416	1.5
20	977	977	-	410	416	1.5
25	977	977	-	410	416	1.5
30	977	977	-	410	416	1.5
35	977	977	-	410	416	1.5
40	977	977	-	410	416	1.5
45	977	977	-	410	416	1.5
50	977	977	-	410	416	1.5
55	903	977	8.1	410	416	1.6
60	903	977	8.1	410	416	1.6
65	812	852	5.0	409	415	1.6
70	812	852	5.0	409	415	1.6
75	729	723	-0.9	408	414	1.5
80	729	723	-0.9	408	414	1.5
85	729	723	-0.9	408	414	1.5
90	729	723	-0.9	408	414	1.5
95	729	723	-0.9	408	414	1.5
100	729	722	-0.9	408	414	1.5
105	729	723	-0.9	408	414	1.5
110	729	723	-0.9	408	414	1.5
115	729	723	-0.9	408	414	1.5
120	729	723	-0.9	408	414	1.5
125+	729	723	-0.9	721	715	-0.9
TOTAL	**197,276**	**197,194**	**-**	**28,574**	**28,551**	**-**

5.6 Alternative Harvest - 5% Step Down Per Decade

The harvest flow objectives in the base case are to maintain the current AAC for as long as possible before stepping down the harvest a maximum of 10% per decade to the LTHL. This scenario examines the impact of changing the rate of harvest decline to 5% per decade. As shown in Figure 22 and Table 13, the current AAC can be maintained for only 20 years, versus 50 years in the base case, before stepping down a maximum of 5% per decade to the LTHL. Decreasing the maximum harvest decline to 5% per decade results in a decrease in the short and mid-term sawlog volume, but a slight increase in the long-term sawlog volume. The decrease in sawlog volume in the short and mid-term causes slightly more sawlog volume to be available for harvest in the long-term.

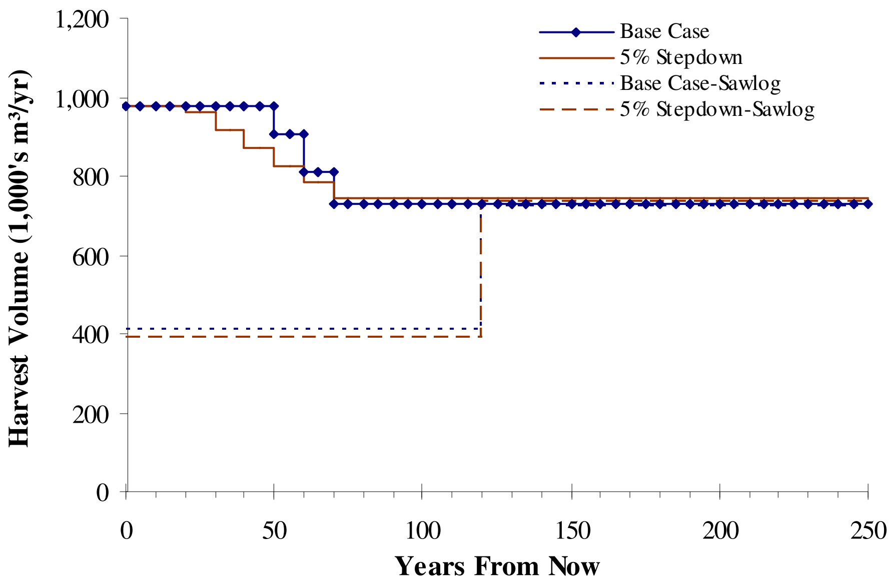


Figure 22: Harvest Forecast – 5% Step Down

Table 13: Harvest Forecast – Harvest Forecast – 5% Step Down

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	5% Stepdown	% Difference	Base Case	5% Stepdown	% Difference
5	977	977	-	410	392	-4.5
10	977	977	-	410	392	-4.5
15	977	977	-	410	392	-4.5
20	977	977	-	410	392	-4.5
25	977	964	-1.3	410	391	-4.5
30	977	964	-1.3	410	391	-4.5
35	977	915	-6.3	410	391	-4.6
40	977	915	-6.3	410	391	-4.6
45	977	869	-11.1	410	391	-4.6
50	977	869	-11.1	410	391	-4.6
55	903	825	-8.7	410	391	-4.6
60	903	825	-8.7	410	391	-4.6
65	812	783	-3.6	409	390	-4.5
70	812	783	-3.6	409	390	-4.5
75	729	743	1.9	408	390	-4.5
80	729	743	1.9	408	390	-4.5
85	729	743	1.9	408	390	-4.5
90	729	743	1.9	408	390	-4.5
95	729	743	1.9	408	390	-4.5
100	729	743	1.9	408	390	-4.5
105	729	743	1.9	408	390	-4.5
110	729	743	1.9	408	390	-4.5
115	729	743	1.9	408	390	-4.5
120	729	743	1.9	408	390	-4.5
125+	729	743	1.9	721	735	1.9
TOTAL	**197,276**	**196,807**	**-0.2**	**28,574**	**28,485**	**-0.3**

6.0 Timber Supply Sensitivity Analysis

The best available information on forest inventories, growth and yield, and management practices is used to assess timber supply. However, timber supply analysis is an approximation of complicated biological, economic and social systems over a long period of time and therefore will never reflect the real world with 100% accuracy. There always some degree of uncertainty inherent with any modeling exercises.

Uncertainty does not necessarily undermine the value and the importance of this type of analysis as long the range of potential impacts of uncertainty is clearly understood. Uncertainty in timber supply analysis is addressed in a number of different ways. By revisiting timber supply analysis every five years we ensure that changes to management practice, data, knowledge and assumptions are assessed and updated regularly.

Another important way of dealing with uncertainty is through sensitivity analysis. Sensitivity analysis is the process whereby data and / or management assumptions are changed and the impacts on other variables (such as timber supply) are assessed. By exploring the range of uncertainty of a particular variable or assumption and its impact on timber supply we gain an understanding of the importance and potential risk to timber supply to a particular source of uncertainty. Through consideration of this potential risk the chief forester is able to make an informed decision on the appropriate AAC for a management unit.

Sensitivity analysis may highlight variables for which relatively small changes result in significant impacts on timber supply. Conversely, this process may also identify variables for which large changes have negligible effects on timber supply. Sensitivity analysis can be used to determine whether impacts are restricted to the short, mid or long-term. Aside from assessing timber supply impacts, sensitivity analysis is a valuable tool for prioritizing data and information needs by identifying the most significant sources of uncertainty from a timber supply perspective.

6.1 No Pulpwood Harvest

As discussed in the base case, the economic viability of the timber supply in the Kispiox TSA is currently dependent on a relatively stable supply of sawlog volume. The base case and all sensitivity analyses require an even flow supply of sawlogs in addition to the harvest of marginal sawlog, pulpwood and certain deciduous leading stands. Once non-sawlog stands are harvested they are assumed to regenerate as sawlog stands which are subsequently harvested in support of the LTHL. This assumes that the non-sawlog volume will continue to be economically viable and will be harvested in the short and mid-term thereby converting these stands into sawlog stands in the long-term.

The following two scenarios examine the potential that marginal sawlog and pulpwood stands are not economically viable and are not, through harvest and regeneration, converted to sawlog stands.

Currently there are 86,913 ha of sawlog, 58,211 ha of marginal sawlog and 121,067 ha of pulpwood stands in the TSA. The following scenario removes all of the pulpwood stands from the THLB, resulting in a 121,067 ha (37%) decrease in the THLB. As a result the IHL drops by 15% (Figure 23 and Table 14) with a slight increase in the sawlog harvest volume. The most significant impact on timber supply is in the long-term where both the total harvest volume and sawlog harvest volume drop by 39%. Figure 24 shows the associated growing stock and harvest forecasts by stand quality.

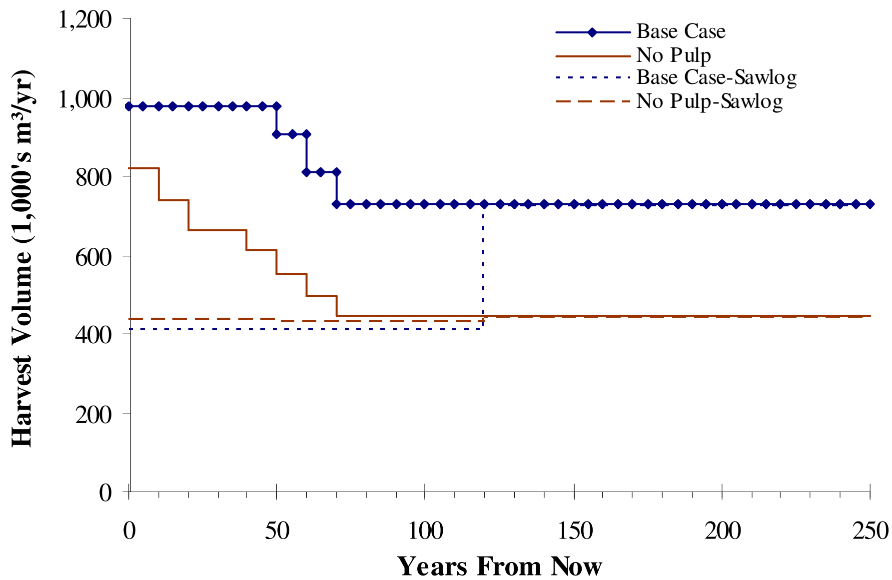


Figure 23: Harvest Forecast – No Pulpwood Harvest

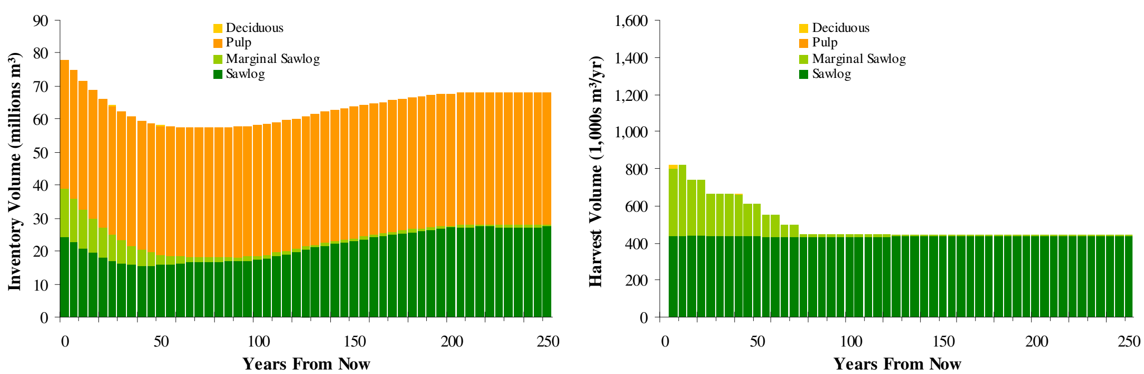


Figure 24: Growing Stock and Harvest Forecast by Stand Quality ─ No Pulpwood Harvest

Table 14: Harvest Forecast – No Pulpwood Harvest

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	No Pulp	% Difference	Base Case	No Pulp	% Difference
5	977	821	-15.9	410	436	6.3
10	977	821	-15.9	410	436	6.4
15	977	738	-24.5	410	435	6.2
20	977	738	-24.5	410	435	6.2
25	977	663	-32.1	410	434	6.0
30	977	663	-32.1	410	434	6.0
35	977	663	-32.1	410	434	6.0
40	977	663	-32.1	410	434	6.0
45	977	613	-37.3	410	434	5.8
50	977	613	-37.3	410	434	5.8
55	903	550	-39.1	410	433	5.7
60	903	550	-39.1	410	433	5.7
65	812	494	-39.1	409	432	5.6
70	812	494	-39.1	409	432	5.6
75	729	443	-39.2	408	430	5.4
80	729	443	-39.2	408	430	5.4
85	729	443	-39.2	408	430	5.4
90	729	443	-39.2	408	430	5.4
95	729	443	-39.2	408	430	5.4
100	729	443	-39.2	408	430	5.4
105	729	443	-39.2	408	430	5.4
110	729	443	-39.2	408	430	5.4
115	729	443	-39.2	408	430	5.4
120	729	443	-39.2	408	430	5.4
125+	729	443	-39.2	721	440	-39.1
TOTAL	**197,276**	**125,240**	**-36.5**	**28,574**	**21,808**	**-23.7**

6.2 No Pulpwood and No Marginal Sawlog Harvest

Stands identified as either pulpwood or marginal sawlog represent 55% of the THLB and 56% of the current growing stock. Removal of these stands from the harvest results in 57% drop in the IHL, and a 44% drop in the LTHL. With the removal of both pulpwood and marginal sawlog volumes from the THLB the sawlog harvest volume is essentially identical to the base case in the short and mid-term, but expectedly the sawlog harvest volume is significantly lower than the base case in the long-term. The harvest forecasts associated with the exclusion of both pulpwood and marginal sawlog volumes are shown in Figure 25 and Table 15. Except for the first period, where a small quantity of deciduous volume is harvested, the total harvest volume and sawlog harvest volume lines are identical. The associated growing stock and harvest forecasts by stand quality are presented in Figure 26.

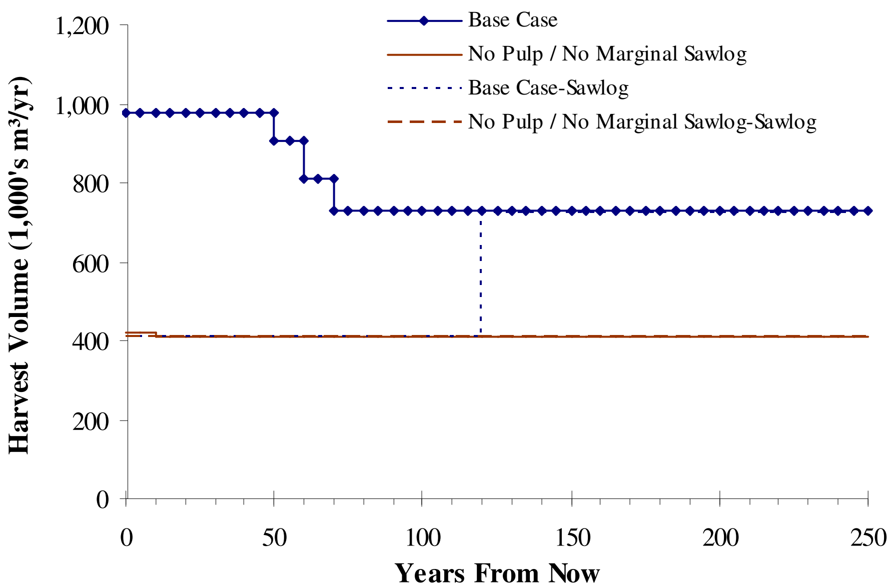


Figure 25: Harvest Forecast – No Pulpwood and No Marginal Sawlog Harvest

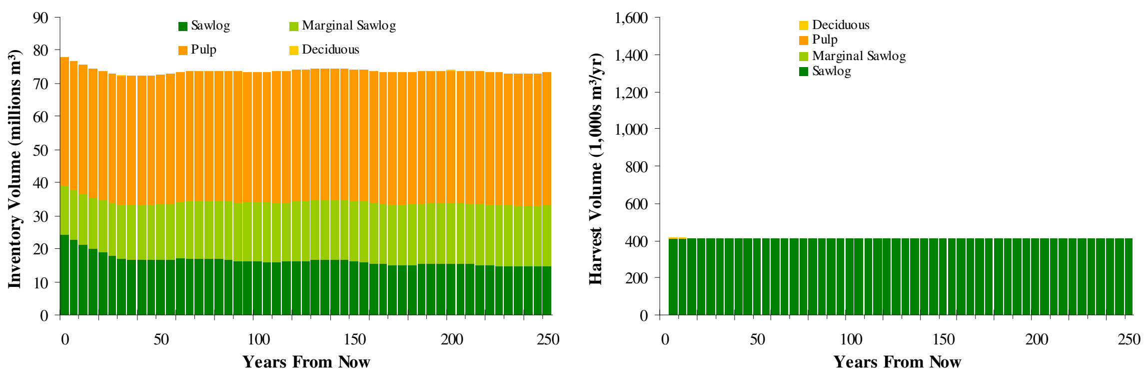


Figure 26: Growing Stock and Harvest Forecast by Stand Quality – No Pulpwood and No Marginal Sawlog Harvest

Table 15: Harvest Forecast – No Pulpwood and No Marginal Sawlog Harvest

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	No Pulp / No Marginal Sawlog	% Difference	Base Case	No Pulp / No Marginal Sawlog	% Difference
5	977	420	-57.1	410	408	-0.4
10	977	420	-57.1	410	408	-0.4
15	977	408	-58.2	410	408	-0.5
20	977	408	-58.2	410	408	-0.5
25	977	408	-58.2	410	408	-0.5
30	977	408	-58.2	410	408	-0.5
35	977	408	-58.2	410	408	-0.5
40	977	408	-58.2	410	408	-0.5
45	977	408	-58.2	410	408	-0.5
50	977	408	-58.2	410	408	-0.5
55	903	408	-54.8	410	408	-0.4
60	903	408	-54.8	410	408	-0.4
65	812	408	-49.7	409	408	-0.2
70	812	408	-49.7	409	408	-0.2
75	729	408	-44.1	408	408	-0.1
80	729	408	-44.1	408	408	-0.1
85	729	408	-44.1	408	408	-0.1
90	729	408	-44.1	408	408	-0.1
95	729	408	-44.1	408	408	-0.1
100	729	408	-44.1	408	408	-0.1
105	729	408	-44.1	408	408	-0.1
110	729	408	-44.1	408	408	-0.1
115	729	408	-44.1	408	408	-0.1
120	729	408	-44.1	408	408	-0.1
125+	729	408	-44.1	721	408	-43.5
TOTAL	**197,276**	**102,111**	**-48.2**	**28,574**	**20,394**	**-28.6**

6.3 Disturbance in Inoperable Lands

The base case does not account for any disturbance in the non-THLB portion of the land base and therefore these stands continue to age throughout the planning horizon. These stands contribute to meeting old retention targets thereby allowing increased utilization of the THLB for harvest. As discussed above, the current age class distribution of the non-THLB portion is heavily weighted to stands greater than 250 years indicating that natural disturbances either do not occur on a large scale in the TSA or are not captured in the inventory. Natural disturbances occur to varying degrees throughout the province and will likely affect the age class distribution of the non-THLB to some degree and removing some stands from contributing to old retention targets. This scenario examines the potential impacts of introducing natural disturbance in the non-THLB portion of the CFLB, including provincial parks. Natural disturbances levels are applied randomly based on the mean disturbance return intervals specified in the Biodiversity Guidebook presented in Table 16.

Table 16: Natural Disturbance Levels by BGC Sub Zone

Natural Disturbance Type	BGC Sub Zone	Mean Disturbance Return Interval (Years)[1]	Percent Disturbed Per 5-Year Period
1	ESSFwv	350	1.43
1	MHmm2	350	1.43
2	CWHws2	200	2.50
2	ESSFmc	200	2.50
2	ICHmc1	200	2.50
2	ICHmc2	200	2.50
3	SBSmc2	125	4.00
5	AT		3.00[2]
5	ESSFwvp		3.00[2]
5	MHmmp2		3.00[2]

[1]From the Biodiversity Guidebook.
[2] The Biodiversity Guidebook does not specify a mean disturbance interval for NDT 5. For the purpose of this analysis a value of 3% per 5 year period was assumed. There is very little THLB in NDT 5 and does not make a significant contribution to TSA timber supply.

As a result of disturbing the inoperable (non-THLB) portion of the land base the current AAC can only be maintained for 40 years, 10 years less than the base case; mid and long-term timber supply are reduced by 13% (Figure 27 and Table 17). Sawlog harvest volumes are reduced by 5% in both the short and mid-term, and 17% long-term.

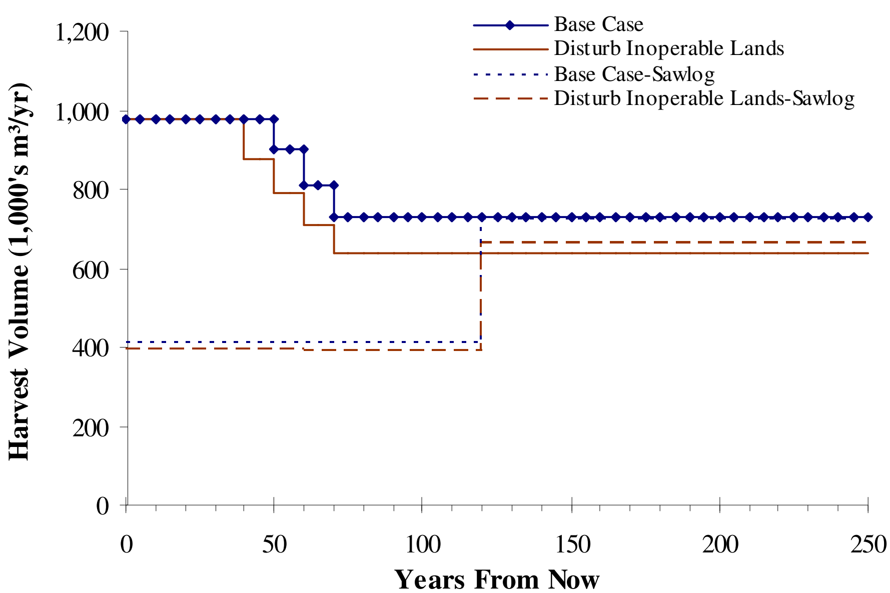


Figure 27: Harvest Forecast – Disturbance in Inoperable Lands

Table 17: Harvest Forecast – Disturbance in Inoperable Lands

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Disturb. Inoperable Lands	% Difference	Base Case	Disturb. Inoperable Lands	% Difference
5	977	977	-	410	390	-4.9
10	977	977	-	410	390	-4.9
15	977	977	-	410	390	-4.9
20	977	977	-	410	390	-4.9
25	977	977	-	410	390	-4.9
30	977	977	-	410	390	-4.9
35	977	977	-	410	390	-4.9
40	977	977	-	410	390	-4.9
45	977	878	-10.1	410	389	-5.1
50	977	878	-10.1	410	389	-5.1
55	903	789	-12.7	410	389	-5.1
60	903	789	-12.7	410	389	-5.1
65	812	709	-12.7	409	388	-5.1
70	812	709	-12.7	409	388	-5.1
75	729	637	-12.7	408	387	-5.2
80	729	637	-12.7	408	387	-5.2
85	729	637	-12.7	408	387	-5.2
90	729	637	-12.7	408	387	-5.2
95	729	637	-12.7	408	387	-5.2
100	729	637	-12.7	408	387	-5.2
105	729	637	-12.7	408	387	-5.2
110	729	637	-12.7	408	387	-5.2
115	729	637	-12.7	408	387	-5.2
120	729	637	-12.7	408	387	-5.2
125+	729	637	-12.7	721	598	-17.1
TOTAL	**197,276**	**177,446**	**-10.1**	**28,574**	**24,878**	**-12.9**

The changing age class distribution of the THLB and Non-THLB at 50 year intervals is shown in Figure 28 below. This figure demonstrates the conversion of old non-THLB to younger stands over time, through the introduction of natural disturbance.

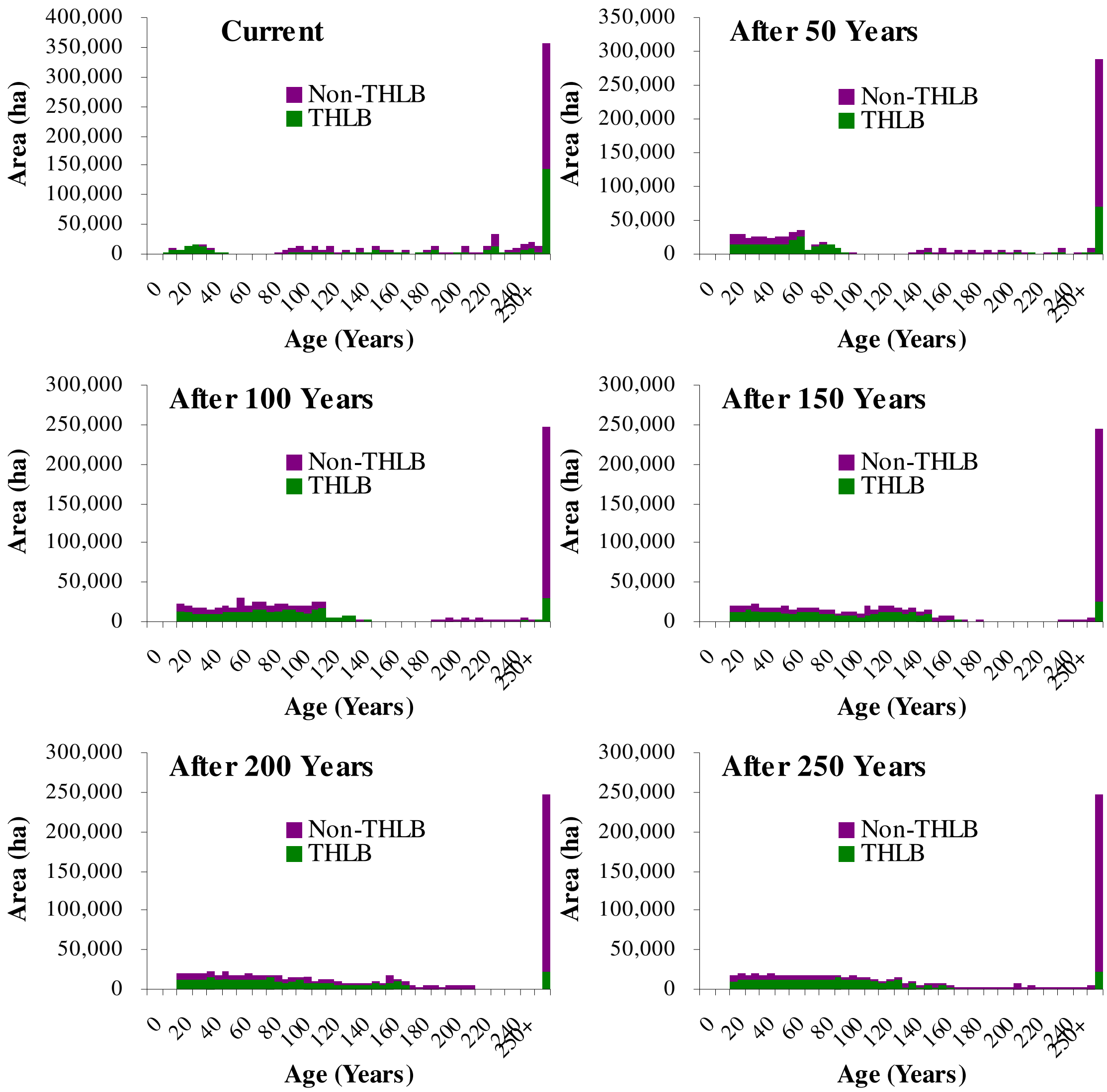


Figure 28: Age Class Distribution through 250 Years

6.4 Water Quality Management

In TSR II, equivalent clear cut area (ECA) water quality constraints were included in the base case. A review of harvesting practices indicates that maintaining maximum ECA levels by watershed is a current operational practice. Beginning about 2001, ECA thresholds for certain watersheds were identified to licencees by MoFR, and licencees have informally managed to those thresholds; that is, they dropped blocks from FDP submissions where ECA thresholds for an affected watershed were exceeded. Equivalent clear cut area thresholds are intended trigger a more detailed watershed level assessment as opposed to prevent all harvesting and the water quality requirements are not included in the 2001, *Amended Kispiox Land and Resource Management Plan* and are therefore not legal requirements for management in the area outside the WBSRMP. As such, ECA water quality constraints are not part of the base case. This scenario examines the impact of enforcing maximum ECA levels by water sheds relative to the base case.

The *Kispiox FRPA Project – Watershed Objectives Draft 1.2* identifies ECA targets for each 4th order watershed, and these are listed in Table 41 of the Data Package in Appendix II. These targets are enforced in the model and harvesting cannot occur in a watershed when these thresholds have been reached.

Based on the flexibility in the short-term harvest and the limited harvesting that has occurred in the last 10 years in the TSA, enforcing ECA targets does not have a significant impact on timber supply (Figure 29 and Table 18).

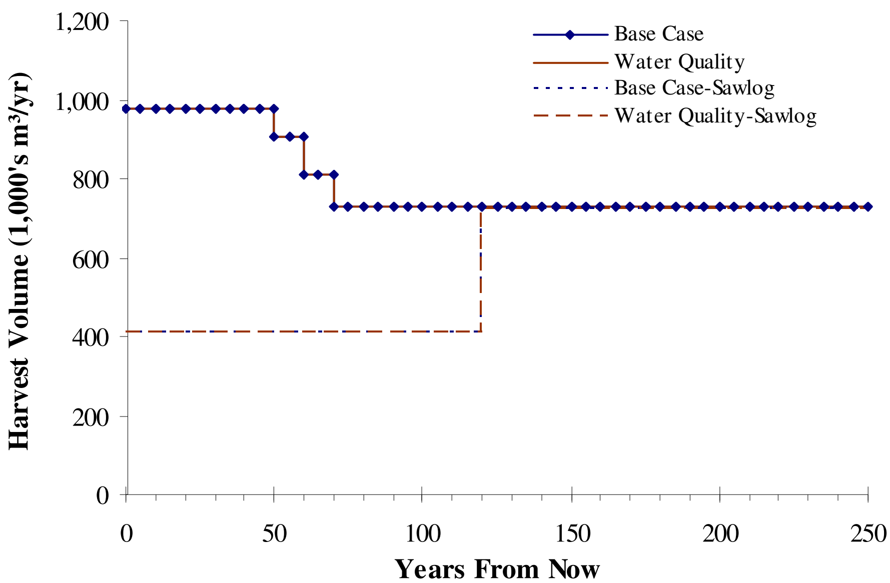


Figure 29: Harvest Forecast ─ Water Quality Management

Table 18: Harvest Forecast – Water Quality Management

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Water Quality	% Difference	Base Case	Water Quality	% Difference
5	977	977	-	410	410	-
10	977	977	-	410	410	-
15	977	977	-	410	410	-
20	977	977	-	410	410	-
25	977	977	-	410	410	-
30	977	977	-	410	410	-
35	977	977	-	410	410	-
40	977	977	-	410	410	-
45	977	977	-	410	410	-
50	977	977	-	410	410	-
55	903	903	-	410	409	-
60	903	903	-	410	409	-
65	812	812	-	409	409	-
70	812	812	-	409	409	-
75	729	729	-	408	408	-
80	729	729	-	408	408	-
85	729	729	-	408	408	-
90	729	729	-	408	408	-
95	729	729	-	408	408	-
100	729	729	-	408	408	-
105	729	729	-	408	408	-
110	729	729	-	408	408	-
115	729	729	-	408	408	-
120	729	729	-	408	408	-
125+	729	729	-	721	721	-
TOTAL	**197,276**	**197,270**	**-**	**28,574**	**28,573**	**-**

6.5 Increase Green-Up Age by Five Years

The green-up period is the time required after harvesting for a stand to achieve a desired condition (generally height) before harvesting is permitted in adjacent stands. Green-up height requirements help ensure the maintenance of water quality, wildlife habitat, soil stability, and visual quality. This scenario examines uncertainty in the time to achieve green-up; testing two issues with respect to green-up: the potential that height growth projections underestimate the time to achieve green-up height, and the potential that a five metre green-up height underestimate the height required to achieve visually effective green-up.

In the base case, green-up is modelled using height growth projections from VDYP (for natural stands) and TIPSY for managed stands whereby height curves are included directly in the model. For this scenario, green-up height is converted to age by averaging the time required for stands to grow to a height of three and five metres across each landscape unit and adding five years to this age.

Figure 30 and Table 19 show that the impact to timber supply of increasing green-up ages by five years is negligible; <1% decrease in total harvest and sawlog harvest volumes in the long-term. With the exception of some of the VQO retention constraints, very few of the VQO or IRM constraints have any impact on timber supply whether the age to green-up is increased by five years or not. Because of the flexibility in the short-term harvest schedule any restrictions on timber supply caused by increasing the time to green-up are nullified.

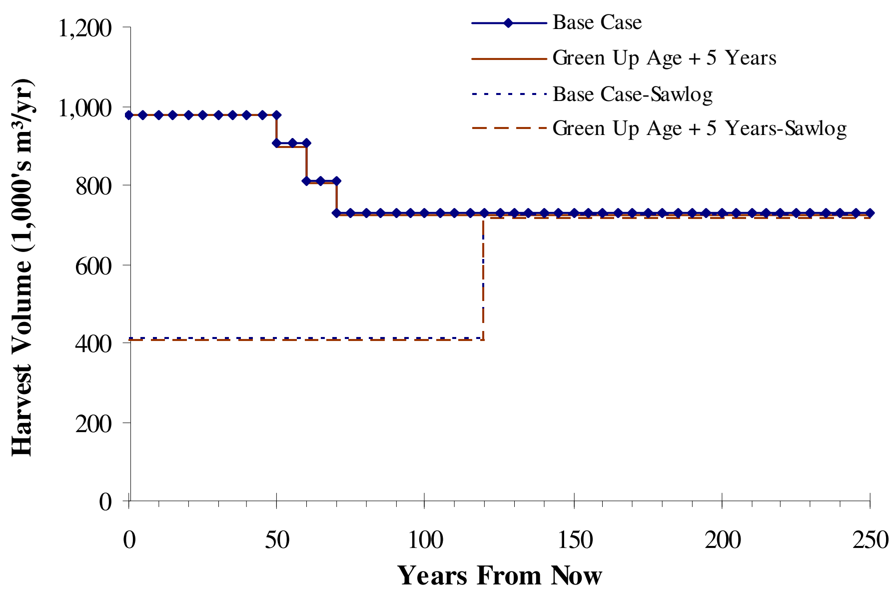


Figure 30: Harvest Forecast ─ Green Up Age + 5 Years

Table 19: Harvest Forecast – Green-Up Age + 5 Years

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Green Up Age + 5 Years	% Difference	Base Case	Green Up Age + 5 Years	% Difference
5	977	977	-	410	409	-0.2
10	977	977	-	410	409	-0.2
15	977	977	-	410	409	-0.2
20	977	977	-	410	409	-0.2
25	977	977	-	410	409	-0.2
30	977	977	-	410	409	-0.2
35	977	977	-	410	409	-0.2
40	977	977	-	410	409	-0.2
45	977	977	-	410	409	-0.2
50	977	977	-	410	409	-0.2
55	903	899	-0.4	410	409	-0.2
60	903	899	-0.4	410	409	-0.2
65	812	808	-0.5	409	408	-0.2
70	812	808	-0.4	409	408	-0.2
75	729	726	-0.5	408	407	-0.2
80	729	726	-0.5	408	407	-0.2
85	729	726	-0.5	408	407	-0.2
90	729	726	-0.5	408	407	-0.2
95	729	726	-0.5	408	407	-0.2
100	729	726	-0.5	408	407	-0.2
105	729	726	-0.5	408	407	-0.2
110	729	726	-0.5	408	407	-0.2
115	729	726	-0.5	408	407	-0.2
120	729	726	-0.5	408	407	-0.2
125+	729	726	-0.5	721	715	-0.8
TOTAL	**197,276**	**196,607**	**-0.3**	**28,574**	**28,401**	**-0.6**

6.6 Increase Minimum Harvest Age

In the base case, the youngest age at which stands have achieved both a merchantable volume of at least 200 m^3/ha and an average stand diameter of 20 cm at breast height is the MHA. This sensitivity analysis examines the timber supply impacts of increasing the minimum volume criteria to 250 m^3/ha.

Currently, 66 million m^3 of operable growing stock (90% of the total operable growing stock) is above 250 m^3/ha threshold; enough to support over 67 years of harvest at the current AAC. As such, Figure 31 and Table 20 demonstrate that there is no timber supply impact in the short and mid-term to increasing MHA. Increasing the minimum harvest ages results in a small (<1%) reduction LTHL.

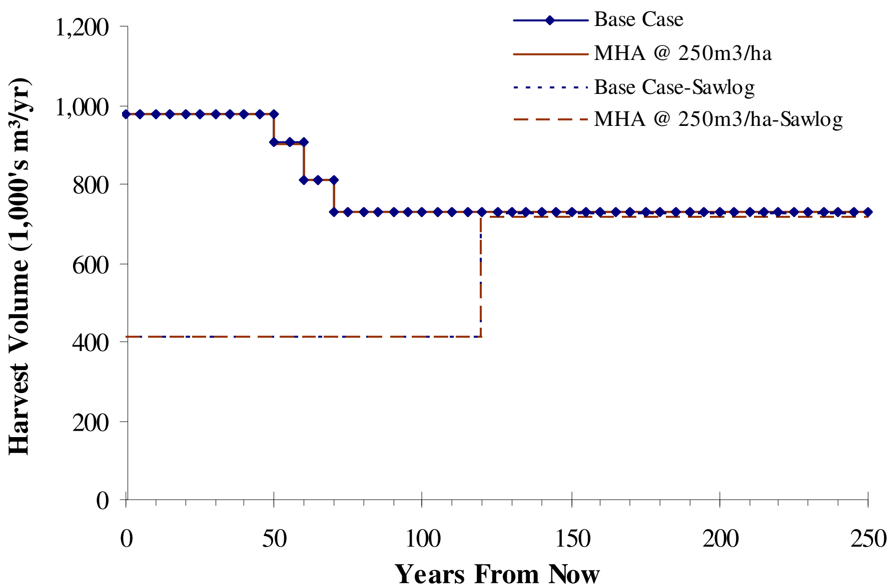


Figure 31: Harvest Forecast ─ Increase Minimum Harvest Age

Table 20: Harvest Forecast – Increase Minimum Harvest Age

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	MHA @ 250 m3/ha	% Difference	Base Case	MHA @ 250 m3/ha	% Difference
5	977	977	-	410	405	-1.1
10	977	977	-	410	405	-1.1
15	977	977	-	410	405	-1.1
20	977	977	-	410	405	-1.1
25	977	977	-	410	405	-1.1
30	977	977	-	410	405	-1.1
35	977	977	-	410	405	-1.1
40	977	977	-	410	405	-1.1
45	977	977	-	410	405	-1.1
50	977	977	-	410	405	-1.1
55	903	894	-1.0	410	405	-1.2
60	903	894	-1.0	410	405	-1.2
65	812	804	-1.0	409	404	-1.2
70	812	804	-1.0	409	404	-1.2
75	729	722	-1.0	408	403	-1.2
80	729	722	-1.0	408	403	-1.2
85	729	722	-1.0	408	403	-1.2
90	729	722	-1.0	408	403	-1.2
95	729	722	-1.0	408	403	-1.2
100	729	722	-1.0	408	403	-1.2
105	729	722	-1.0	408	403	-1.2
110	729	722	-1.0	408	403	-1.2
115	729	722	-1.0	408	403	-1.2
120	729	722	-1.0	408	403	-1.2
125+	729	722	-1.0	721	715	-0.9
TOTAL	**197,276**	**195,783**	**-0.8**	**28,574**	**28,286**	**-1.0**

6.7 SIBEC Site Productivity Estimates – One Step Up

It is generally known that inventory site index values, on average, underestimate site productivity or site potential of stands throughout the province. Site index by biogeoclimatic classification (SIBEC) estimates correlates site productivity to BEC site series classifications, and is one approach to improving site productivity estimates. However, the Kispiox TSA does not currently have an approved ecosystem inventory (Predictive Ecosystem Mapping (PEM) or Terrestrial Ecosystem Mapping (TEM)) upon which SIBEC estimates rely and as such SIBEC estimates are not included in the base case.

However, a Predictive Habitat Mapping (Mahon *et al*. 2004) project has been completed in the TSA which provides the approximate area distribution of site series within each BEC variant in the TSA. By area weighting SIBEC site index values for each BEC variant an average SIBEC site index value was calculated for each BEC variant. An average area-weighted SIBEC site index value was then calculated for each managed stand analysis unit based on the distribution of BEC variants within the analysis unit and the average SIBEC site index calculated for each BEC variant. Table 21 shows the average SIBEC site index value calculated for each managed stand analysis unit in comparison with the average inventory (base case) site index value.

Table 21: Site Index Comparison - Inventory versus SIBEC

Managed Stand Analysis Unit	THLB Area (ha)	Average Inventory Site Index	Average SIBEC Site Index	% Difference
101	4,445	21.3	21.3	-0.3
102	36,782	16.1	16.3	0.8
103	94,987	10.7	15.8	47.6
104	5,700	17.5	21.1	20.5
105	9,365	17.0	19.6	15.6
106	126,000	10.5	16.2	53.3
107	296	28.5	21.2	-25.7
108	17,474	19.5	20.9	7.4
109	26,191	12.9	16.1	24.8
110	920	23.3	20.6	-11.2
111	14,434	18.1	20.0	10.9
112	6,018	12.2	19.6	60.3
113	1,533	15.2	15.4	1.5
114	775	23.8	21.1	-11.2
115	3,132	20.1	21.1	5.2
DOTH1	1,317	18.3	19.3	5.4
DOTH2	3,944	17.2	21.3	23.5
DOTH3	430	15.6	16.0	2.8

Two harvest flow variation using SIBEC site index values are tested: one that allows harvest volume to step up after 125 years and a maximum evenflow harvest. This scenario examines the impact of using SIBEC site index values, maintaining the current AAC for as long as possible before stepping up to a LTHL after 125 years. The resulting harvest forecast, shown in Figure 32 and Table 22, demonstrates a significant increase in mid-term harvest and 42% increase in the LTHL based on these estimates. Flexibility in the short-term harvest schedule, combined with a significant increase in the productivity in managed stands result in a non-declining harvest forecast.

Also of note, sawlog harvest volume increases 28% in the short and mid-term, and 45% in the long-term as result of increased managed stand productivity and the allowable cut effect. The growing stock and harvest forecast by stand quality is illustrated in Figure 33.

This significant increase is not unrealistic when compared with the impacts of improved site productivity estimates on other management units around the province.

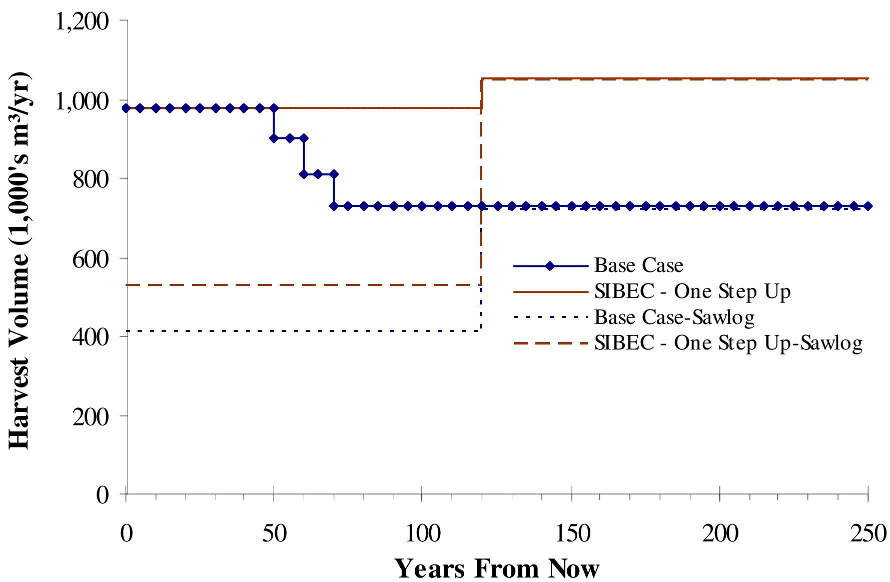


Figure 32: Harvest Forecast ─ SIBEC One Step Up

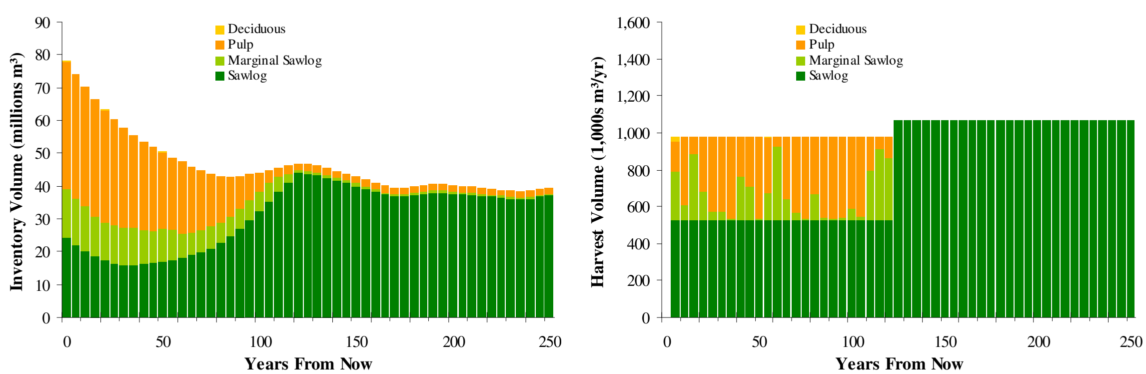


Figure 33: Growing Stock and Harvest Forecast by Stand Quality ─ SIBEC One Step Up

Table 22: Harvest Forecast – SIBEC One Step Up

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	SIBEC - One Step Up	% Difference	Base Case	SIBEC - One Step Up	% Difference
5	977	977	-	410	526	28.2
10	977	977	-	410	526	28.2
15	977	977	-	410	526	28.2
20	977	977	-	410	526	28.2
25	977	977	-	410	526	28.2
30	977	977	-	410	526	28.2
35	977	977	-	410	526	28.2
40	977	977	-	410	526	28.2
45	977	977	-	410	526	28.2
50	977	977	-	410	526	28.2
55	903	977	8.1	410	526	28.3
60	903	977	8.1	410	526	28.3
65	812	977	20.4	409	526	28.5
70	812	977	20.4	409	526	28.5
75	729	977	34.0	408	526	28.8
80	729	977	34.0	408	526	28.8
85	729	977	34.0	408	526	28.8
90	729	977	34.0	408	526	28.8
95	729	977	34.0	408	526	28.8
100	729	977	34.0	408	526	28.8
105	729	977	34.0	408	526	28.8
110	729	977	34.0	408	526	28.8
115	729	977	34.0	408	526	28.8
120	729	977	34.0	408	526	28.8
125+	729	1,056	44.7	721	1,050	45.5
TOTAL	**197,276**	**254,457**	**29.0**	**28,574**	**39,909**	**39.7**

6.8 SIBEC Site Productivity Estimates – Maximum Even Flow

The previous scenario demonstrates that the current AAC may be maintained without decline based on SIBEC site productivity estimates. This scenario examines the possibility of increasing the initial harvest level while maintaining an even flow harvest throughout the planning horizon. The resulting harvest forecast, shown in Figure 34 and Table 23, demonstrates that an evenflow harvest level that is slightly (<1%) higher than the current AAC can be maintained throughout the planning horizon. This harvest level is 35% higher than the base case in the long-term. Sawlog harvest is also increased by 35% in the long-term. The growing stock and harvest forecast by stand quality is illustrated in Figure 35.

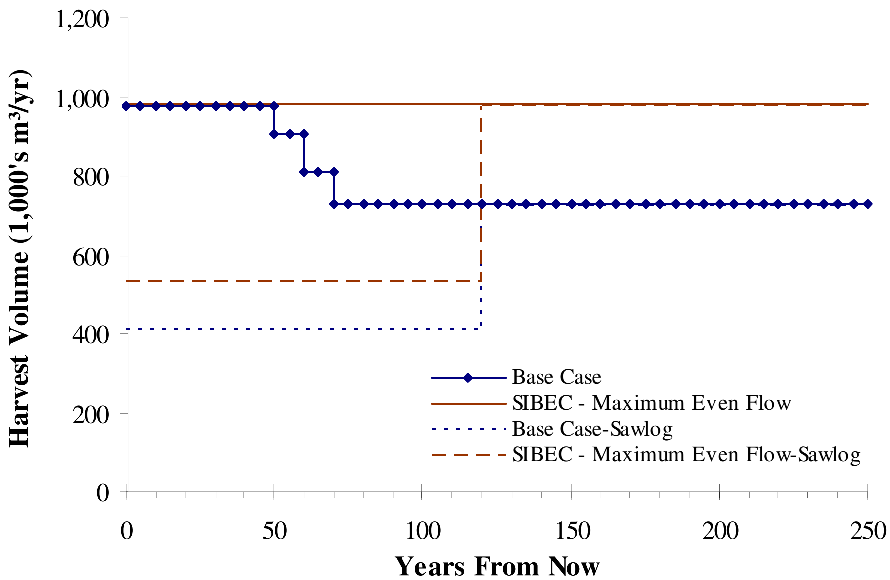


Figure 34: Harvest Forecast ─ SIBEC Maximum Even Flow

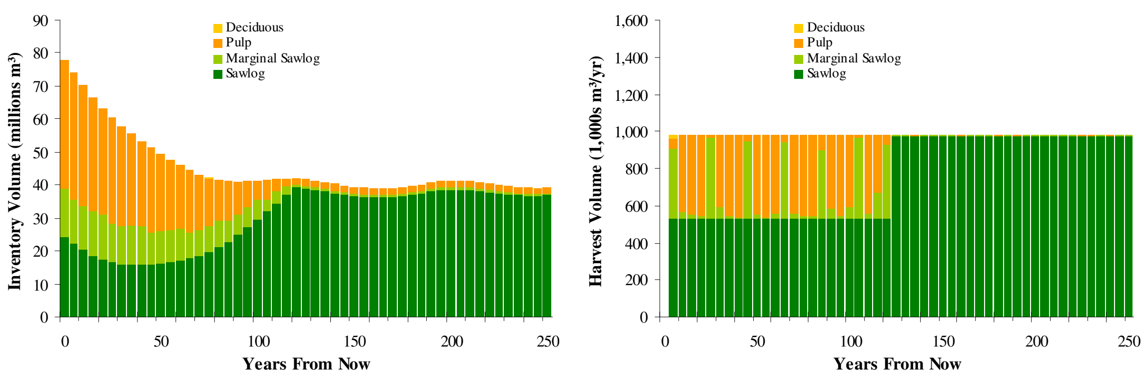


Figure 35: Growing Stock and Harvest Forecast by Stand Quality ─ SIBEC Maximum Even Flow

Table 23: Harvest Forecast – SIBEC Maximum Evenflow

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	SIBEC - Maximum Evenflow	% Difference	Base Case	SIBEC - Maximum Evenflow	% Difference
5	977	983	0.6	410	531	29.4
10	977	983	0.6	410	531	29.4
15	977	983	0.6	410	531	29.4
20	977	983	0.6	410	531	29.4
25	977	983	0.6	410	531	29.4
30	977	983	0.6	410	531	29.4
35	977	983	0.6	410	531	29.4
40	977	983	0.6	410	531	29.4
45	977	983	0.6	410	531	29.4
50	977	983	0.6	410	531	29.4
55	903	983	8.8	410	531	29.6
60	903	983	8.8	410	531	29.6
65	812	983	21.0	409	531	29.8
70	812	983	21.0	409	531	29.8
75	729	983	34.7	408	531	30.0
80	729	983	34.7	408	531	30.0
85	729	983	34.7	408	531	30.0
90	729	983	34.7	408	531	30.0
95	729	983	34.7	408	531	30.0
100	729	983	34.7	408	531	30.0
105	729	983	34.7	408	531	30.0
110	729	983	34.7	408	531	30.0
115	729	983	34.7	408	531	30.0
120	729	983	34.7	408	531	30.0
125+	729	983	34.7	721	977	35.5
TOTAL	**197,276**	**245,632**	**24.5**	**28,574**	**38,142**	**33.5**

6.9 Remote Area Harvest Deferral 1

In the base case, all of the THLB is available for harvest throughout the planning horizon. However, some portions of the TSA are isolated and do not currently have road access. This scenario is designed to assess the impact of deferring harvest for the first 20 years in areas that are greater than 8 km from all existing roads. However, upon further review, it was determined that the remote areas data provided includes lands that are greater than 8 km from both existing and future planned roads thereby underestimating the "remote" area. As a result, additional harvest deferral scenarios were developed and are presented below.

The associated harvest forecast in Figure 36 and Table 24 shows that there is no impact on timber supply as there is sufficient available growing stock in areas within 8 km of existing roads to support the current AAC through the deferral period. A total of 68,288 ha (gross forested area) is deferred; 14,814 ha of which is THLB.

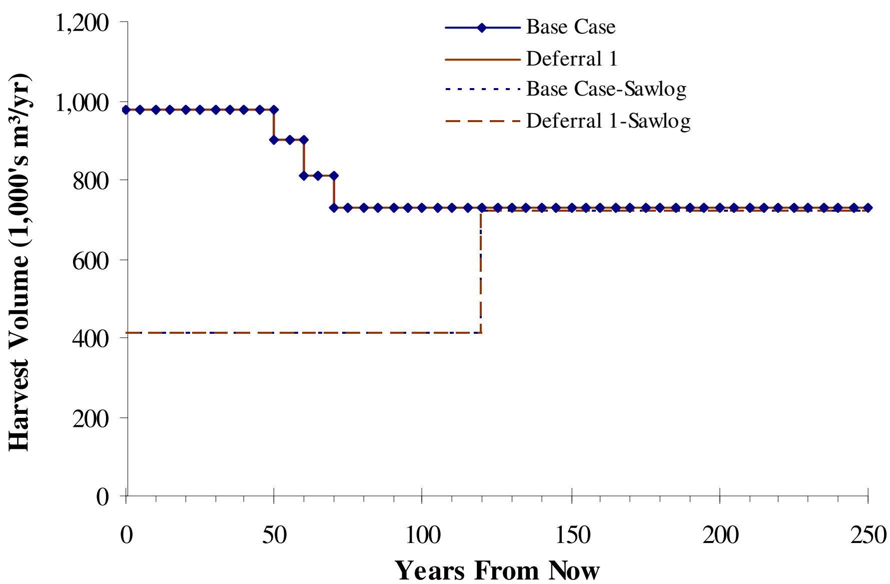


Figure 36: Harvest Forecast — Remote Area Harvest Deferral 1

Table 24: Harvest Forecast – Remote Area Harvest Deferral 1

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Deferral 1	% Difference	Base Case	Deferral 1	% Difference
5	977	977	-	410	410	-
10	977	977	-	410	410	-
15	977	977	-	410	410	-
20	977	977	-	410	410	-
25	977	977	-	410	410	-
30	977	977	-	410	410	-
35	977	977	-	410	410	-
40	977	977	-	410	410	-
45	977	977	-	410	410	-
50	977	977	-	410	410	-
55	903	903	-	410	410	-
60	903	903	-	410	410	-
65	812	812	-	409	409	-
70	812	812	-	409	409	-
75	729	729	-	408	408	-
80	729	729	-	408	408	-
85	729	729	-	408	408	-
90	729	729	-	408	408	-
95	729	729	-	408	408	-
100	729	729	-	408	408	-
105	729	729	-	408	408	-
110	729	729	-	408	408	-
115	729	729	-	408	408	-
120	729	729	-	408	408	-
125+	729	729	-	721	721	-
TOTAL	**197,276**	**197,273**	**-**	**28,574**	**28,573**	**-**

6.10 Remote Area Harvest Deferral 2

Following a review of the *Harvest Deferral 1 Scenario* results, a second harvest deferral scenario was developed; increasing both the amount of area deferred as well as the length of time of the deferral. The following criteria were used in selecting lands for deferral in this scenario:

- The Sicintine drainage north of Tommy Jack pass;
- The THLB north of confluence of Sicintine and Skeena River;
- The primarily pulp concentration areas north of Babine River unless access road and approved Category A cut blocks are nearby;
- Isolated areas of THLB in primarily pulp quality drainages; and
- Portions of the THLB with no current access, and where any new road will have to be developed through Class V terrain.

This results in 479,489 ha (gross) being selected for deferral. Of this area 215,917 ha is crown forested and 57,990 ha is THLB. This compares with 14,814 ha of THLB deferred in the *Harvest Deferral 1 Scenario* (Table 25). This area is deferred from harvest for the first 40 years of the planning horizon compared with 20 years in the *Harvest Deferral 1 Scenario*.

Table 25: Remote Area Harvest Deferrals - Area

Land Base	Deferred Area - Harvest Deferral 1 (20 years) (ha)	Deferred Area - Harvest Deferral 2 (40 years) (ha)
THLB	14,814	57,990
Non-THLB	53,475	157,928
CFLB Area Deferred	**68,288**	**215,917**
Gross Area Deferred	**216,927**	**479,489**

In should be noted that there are differing opinions as to whether this harvest deferral scenario reasonably reflects future demand for fibre in the TSA. Licencees point to the inevitable decrease in timber supply in much of the province as a result of the mountain pine beetle as well as increased activity in the bio-energy sector as two factors likely to increase demand for fibre in the Kispiox TSA in the near future. Licencees suggest that the area selected for deferral as well as the length of the deferral significantly underestimates the area likely to be accessed in the next 40 years.

Figure 37 and Table 26 show that the base case harvest forecast is still attainable given this new harvest deferral with a very small (<1%) reduction in sawlog harvest volume. While the deferral has been applied to 39% of the TSA, this area only represents 18% of the total THLB for the TSA, and therefore the impact on timber supply is negligible. While 18 % of the THLB deferred for 40 years, there is still over 58 million m^3 of available (above MHA) growing stock, or 60 years of harvest at the current AAC, in the non-deferred portion of the TSA as is shown in Table 27.

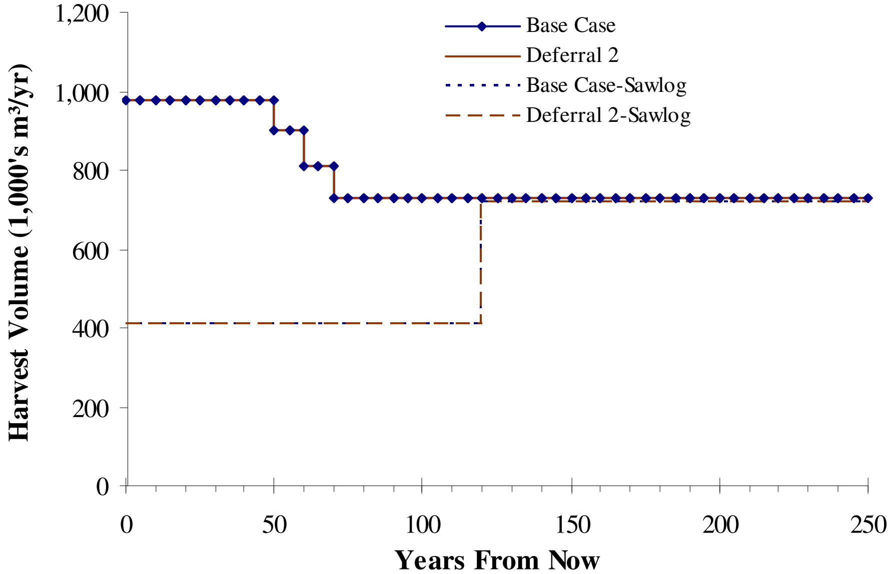


Figure 37: Harvest Forecast ─ Remote Area Harvest Deferral 2

Table 26: Harvest Forecast – Remote Area Harvest Deferral 2

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Deferral 2	% Difference	Base Case	Deferral 2	% Difference
5	977	977	-	410	409	-0.1
10	977	977	-	410	409	-0.1
15	977	977	-	410	409	-0.1
20	977	977	-	410	409	-0.1
25	977	977	-	410	409	-0.1
30	977	977	-	410	409	-0.1
35	977	977	-	410	409	-0.1
40	977	977	-	410	409	-0.1
45	977	977	-	410	409	-0.1
50	977	977	-	410	409	-0.1
55	903	901	-0.2	410	409	-0.1
60	903	901	-0.2	410	409	-0.1
65	812	810	-0.2	409	408	-0.1
70	812	810	-0.2	409	408	-0.1
75	729	728	-0.2	408	408	-0.1
80	729	728	-0.2	408	408	-0.1
85	729	728	-0.2	408	408	-0.1
90	729	728	-0.2	408	408	-0.1
95	729	728	-0.2	408	408	-0.1
100	729	728	-0.2	408	408	-0.1
105	729	728	-0.2	408	408	-0.1
110	729	728	-0.2	408	408	-0.1
115	729	728	-0.2	408	408	-0.1
120	729	728	-0.2	408	408	-0.1
125+	729	728	-0.2	721	720	-0.3
TOTAL	**197,276**	**196,943**	**-0.2**	**28,574**	**28,514**	**-0.2**

Table 27: Remote Area Harvest Deferrals –Growing Stock

Scenario	Deferred Operable Growing Stock Above MHA (million m^3)	Non-deferred Operable Growing Stock Above MHA million m^3 (years of harvest)
Base Case	-	72.9 (74 years of harvest)
Remote Area Harvest Deferral 1 (20 years)	3.5	69.4 (71 years of harvest)
Remote Area Harvest Deferral 2 (40 years)	14.5	58.4 (60 years of harvest)

6.11 Remote Area Harvest Deferral 2 with No Pulpwood Harvest

This scenario is based on the *Harvest Deferral 2 Scenario* above and examines the combined impacts of this harvest deferral and the exclusion of pulpwood stands from the THLB. As shown in Figure 38 and Table 28, the IHL is 22% lower than the base case and this level is maintained for 10 years. After 55 years the harvest declines to a LTHL that is 39% below the base case. Conversely, removal of pulpwood stands and the deferral causes the sawlog harvest volumes to be 5% to 6% higher than the base case for the first 120 years. After year 120 of the planning horizon the sawlog LTHL is 39% below the base case because pulpwood stands are not being harvested and thereby converted to future sawlog stands.

In comparison with the previous *No Pulpwood Scenario* (Section 6.1) in which there were no harvest deferrals, this scenario produces an IHL that is 7 % lower for the first 10 years, a result the increased deferral area. The sawlog IHL is slightly (<1%) lower than the previous scenario for the first 10 years, as well.

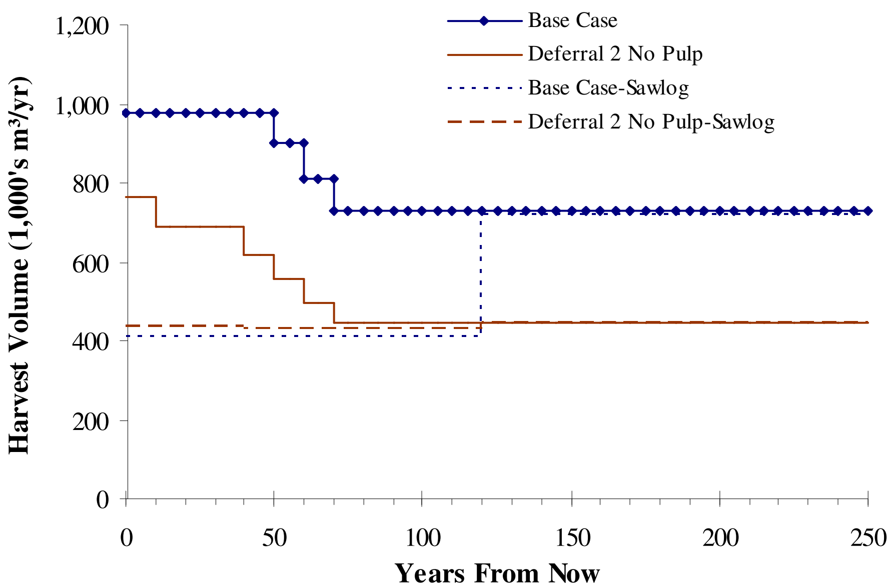


Figure 38: Harvest Forecast ─ Remote Area Harvest Deferral 2 with No Pulpwood Harvest

Table 28: Harvest Forecast – Remote Area Harvest Deferral 2 with No Pulpwood Harvest

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Deferral 2 No Pulp	% Difference	Base Case	Deferral 2 No Pulp	% Difference
5	977	766	-21.6	410	434	5.9
10	977	766	-21.6	410	434	5.9
15	977	688	-29.6	410	433	5.7
20	977	688	-29.6	410	433	5.7
25	977	688	-29.6	410	433	5.7
30	977	688	-29.6	410	433	5.7
35	977	688	-29.6	410	433	5.7
40	977	688	-29.6	410	433	5.7
45	977	618	-36.8	410	432	5.5
50	977	618	-36.8	410	432	5.5
55	903	555	-38.6	410	431	5.4
60	903	555	-38.6	410	431	5.4
65	812	498	-38.7	409	430	5.3
70	812	498	-38.7	409	430	5.3
75	729	447	-38.7	408	429	5.1
80	729	447	-38.7	408	429	5.1
85	729	447	-38.7	408	429	5.1
90	729	447	-38.7	408	429	5.1
95	729	447	-38.7	408	429	5.1
100	729	447	-38.7	408	429	5.1
105	729	447	-38.7	408	429	5.1
110	729	447	-38.7	408	429	5.1
115	729	447	-38.7	408	429	5.1
120	729	447	-38.7	408	429	5.1
125+	729	447	-38.7	721	443	-38.6
TOTAL	**197,276**	**125,422**	**-36.4**	**28,574**	**21,872**	**-23.5**

6.12 Remote Area Harvest Deferral 2 with No Pulpwood or Marginal Sawlog Harvest

This scenario examines the combined impacts of the *Harvest Deferral 2 Scenario* with the removal of all pulpwood and marginal sawlog stands from the THLB. As shown in Figure 39 and Table 29 the IHL is 57% lower than the base case, and then by year 75 maintains a harvest volume 44% below the base case in the long-term. The removal of pulpwood stands combined with the deferral causes the sawlog harvest volumes to be <1% lower than the base case for 120 years before dropping 44% below the base case thereafter. Given the requirement to maximize the IHL up to the current AAC and maintain this level for as long as possible, sawlog harvest volumes are maximized within the constraints to replace missing pulpwood volumes before being declining at a rate of 10% per decade to a LTHL.

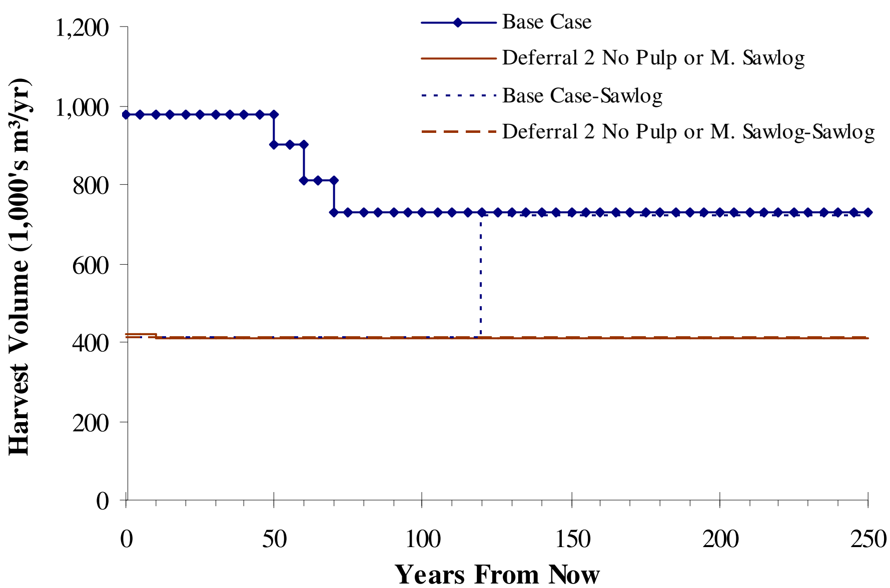


Figure 39: Harvest Forecast — Remote Area Harvest Deferral 2 with No Pulpwood or Marginal Sawlog Harvest

Table 29: Harvest Forecast – Remote Area Harvest Deferral 2 with No Pulpwood or Marginal Sawlog Harvest

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Deferral 2 No Pulp or M. Sawlog	% Difference	Base Case	Deferral 2 No Pulp or M. Sawlog	% Difference
5	977	419	-57.1	410	408	-0.5
10	977	419	-57.1	410	408	-0.5
15	977	408	-58.2	410	408	-0.6
20	977	408	-58.2	410	408	-0.6
25	977	408	-58.2	410	408	-0.6
30	977	408	-58.2	410	408	-0.6
35	977	408	-58.2	410	408	-0.6
40	977	408	-58.2	410	408	-0.6
45	977	408	-58.2	410	408	-0.6
50	977	408	-58.2	410	408	-0.6
55	903	408	-54.8	410	408	-0.5
60	903	408	-54.8	410	408	-0.5
65	812	408	-49.7	409	408	-0.3
70	812	408	-49.7	409	408	-0.3
75	729	408	-44.1	408	408	-0.1
80	729	408	-44.1	408	408	-0.1
85	729	408	-44.1	408	408	-0.1
90	729	408	-44.1	408	408	-0.1
95	729	408	-44.1	408	408	-0.1
100	729	408	-44.1	408	408	-0.1
105	729	408	-44.1	408	408	-0.1
110	729	408	-44.1	408	408	-0.1
115	729	408	-44.1	408	408	-0.1
120	729	408	-44.1	408	408	-0.1
125+	729	408	-44.1	721	408	-43.5
TOTAL	**197,276**	**102,048**	**-48.3**	**28,574**	**20,382**	**-28.7**

In comparison with the previous *No Pulpwood or Marginal Sawlog Scenario* (Section 6.2) in which there were no harvest deferrals, this scenario produces both an IHL and a sawlog IHL that is <1% lower than the aforementioned scenario for the first 10 years. Further, there is no significant difference in harvest volumes and sawlog harvest volumes from the *No Pulpwood or Marginal Sawlog Scenario*. This suggests that as in the deferral scenario in Section 6.10 the size and length of the deferral has little impact.

6.13 Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands

This scenario and the two that follow it explore the cumulative impacts of the harvest deferral, removal of pulp and marginal sawlog stands from harvest and the potential impact of natural disturbances in the non-THLB. As more and more factors are combined it becomes more difficult to determine the impacts of each individual factor. However, the results of these three scenarios are compared to the previous scenarios to provide an indication of the cumulative impact when certain factors are combined, illustrating the sensitivity of the timber supply to combined effects.

This scenario examines the combined impacts of deferring harvest for the first 40 years in portions of the THLB and introducing natural disturbance in the non-THLB portion of the CFLB, including provincial parks. As in the previous *Disturbance in Inoperable Lands Scenario* (Section 6.3), natural disturbances levels are applied randomly based on the mean disturbance return intervals specified in the Biodiversity Guidebook and presented in Table 16.

As illustrated in Figure 40 and Table 30 the IHL equals the current AAC for 10 years and then drops to a LTHL 11% below the base case by year 55 of the planning horizon. The sawlog harvest volume is 7% below the base case in short and mid-term and 15% below base case in long-term. For ease of reporting, the name of the total harvest volume line has been shortened to "Deferral 2 Dist. Inop.", while the "Deferral 2 Dist. Inop.-Sawlog" line represents the portion of the total harvest volume coming from sawlog stands.

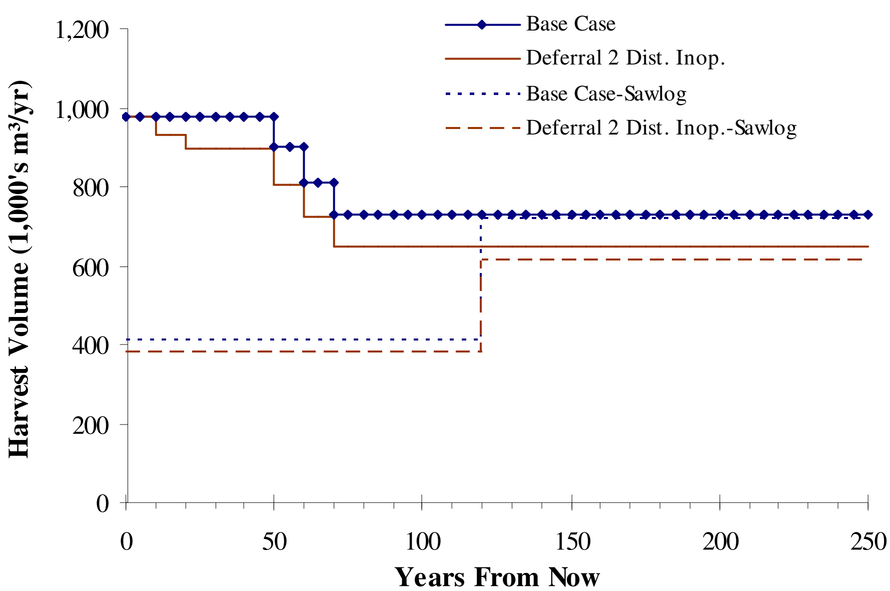


Figure 40: Harvest Forecast ─ Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands

Table 30: Harvest Forecast – Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Deferral 2 Dist. Inop.	% Difference	Base Case	Deferral 2 Dist. Inop.	% Difference
5	977	977	-	410	382	-6.9
10	977	977	-	410	382	-6.9
15	977	929	-4.9	410	381	-7.0
20	977	929	-4.9	410	381	-7.0
25	977	896	-8.3	410	381	-7.0
30	977	896	-8.3	410	381	-7.0
35	977	896	-8.3	410	381	-7.0
40	977	896	-8.3	410	381	-7.0
45	977	896	-8.3	410	381	-7.0
50	977	896	-8.3	410	381	-7.0
55	903	805	-10.9	410	381	-7.1
60	903	805	-10.9	410	381	-7.1
65	812	723	-10.9	409	380	-7.1
70	812	723	-10.9	409	380	-7.1
75	729	650	-10.9	408	379	-7.1
80	729	650	-10.9	408	379	-7.1
85	729	650	-10.9	408	379	-7.1
90	729	650	-10.9	408	379	-7.1
95	729	650	-10.9	408	379	-7.1
100	729	650	-10.9	408	379	-7.1
105	729	650	-10.9	408	379	-7.1
110	729	650	-10.9	408	379	-7.1
115	729	650	-10.9	408	379	-7.1
120	729	650	-10.9	408	379	-7.1
125+	729	650	-10.9	721	611	-15.2
TOTAL	**197,276**	**178,183**	**-9.7**	**28,574**	**25,024**	**-12.4**

The results of this scenario demonstrate how the cumulative impacts of two factors can be greater than the sum of the impacts when each of those factors is examined individually. Both the *Harvest Deferral 2* and the *Disturbance in Inoperable Lands* scenarios had little impact on timber supply individually. However, when combined, the impact is larger because timber volumes once available to overcome the impacts of disturbance in inoperable lands have been reduced, albeit temporarily, reducing the number of years in which the current AAC can be maintained before declining to a LTHL.

Compared with the *Disturbance in Inoperable Lands Scenario* (Section 6.3) and the *Harvest Deferral 1 Scenario* (Section 6.9) where the current AAC can be maintained for 40 and 50 years respectively, the combination of these two factors (increased harvest deferral and disturbance in the inoperable land base) results in the current AAC only being maintained for 10 years. Figure 41 compares the *Deferral 2 Dist. Inop. Scenario* with the *Disturbance in Inoperable Lands Scenario.* The results indicate that the combined impact of these two factors is more severe than just introducing disturbance in inoperable lands. In the first 10 years the sawlog harvest volume in this scenario is 3% lower than the *Disturbance in Inoperable Lands Scenario* and 7% lower than the *Harvest Deferral 2 Scenario*.

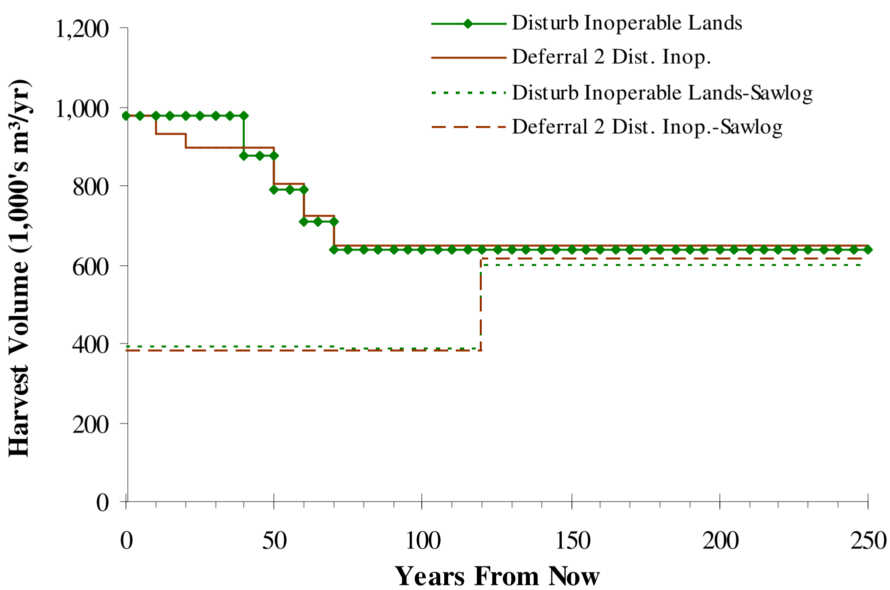


Figure 41: Harvest Forecast ─ Disturbance in Inoperable Lands vs. Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands

6.14 Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood Harvest

This scenario examines the combined impacts of the *Harvest Deferral 2*, *Disturbance in Inoperable Lands* and *No Pulpwood* scenarios. As in the previous disturbance in inoperable lands scenarios, natural disturbances levels are applied randomly based on the mean disturbance return intervals specified in the Biodiversity Guidebook presented in Table 16.

In this scenario the IHL is 33% below the base case and maintained for 10 years before falling to a LTHL by year 75 of the planning horizon that is 41% below the base case as shown in Figure 42 and Table 31. Sawlog harvest volumes drop from 3% to 4% below the base case in the short and mid-term, and then to 43% below the base case in long-term. For ease of reporting the name of this scenario has been shortened to "Defer 2 DI No Pulp."

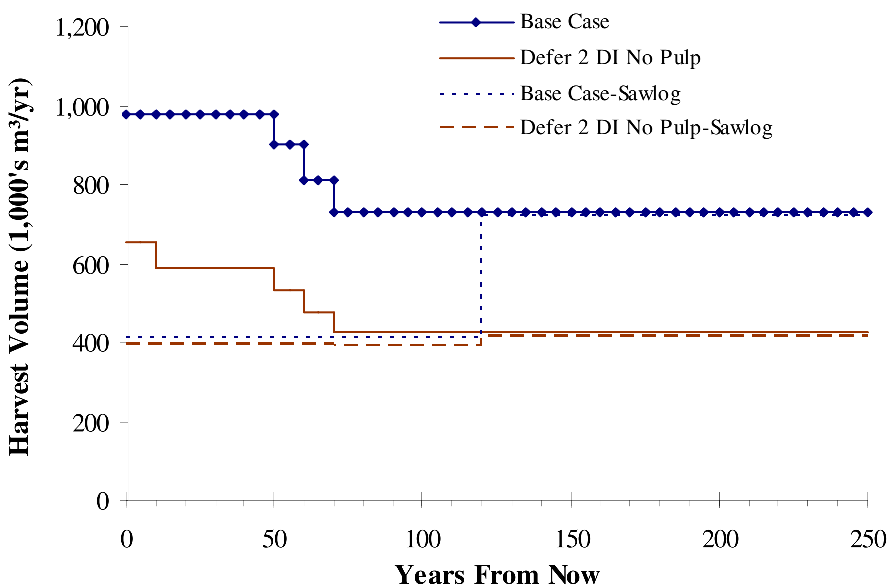


Figure 42: Harvest Forecast ─ Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood Harvest

Table 31: Harvest Forecast – Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood Harvest

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Defer 2 DI No Pulp	% Difference	Base Case	Defer 2 DI No Pulp	% Difference
5	977	655	-33.0	410	396	-3.4
10	977	655	-33.0	410	396	-3.4
15	977	588	-39.8	410	395	-3.6
20	977	588	-39.8	410	395	-3.6
25	977	588	-39.8	410	395	-3.6
30	977	588	-39.8	410	395	-3.6
35	977	588	-39.8	410	395	-3.6
40	977	588	-39.8	410	395	-3.6
45	977	588	-39.8	410	395	-3.6
50	977	588	-39.8	410	395	-3.6
55	903	530	-41.3	410	394	-3.7
60	903	530	-41.3	410	394	-3.7
65	812	476	-41.3	409	393	-3.8
70	812	476	-41.3	409	393	-3.8
75	729	427	-41.4	408	392	-4.0
80	729	427	-41.4	408	392	-4.0
85	729	427	-41.4	408	392	-4.0
90	729	427	-41.4	408	392	-4.0
95	729	427	-41.4	408	392	-4.0
100	729	427	-41.4	408	392	-4.0
105	729	427	-41.4	408	392	-4.0
110	729	427	-41.4	408	392	-4.0
115	729	427	-41.4	408	392	-4.0
120	729	427	-41.4	408	392	-4.0
125+	729	427	-41.4	721	415	-42.5
TOTAL	**197,276**	**117,024**	**-40.7**	**28,574**	**20,226**	**-29.2**

When compared against the *No Pulp Scenario* (Section 6.1), the *Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulp Scenario* harvest volume is 20% lower in the first 20 years with a LTHL that is 4% lower. The sawlog harvest volume is 9% lower than *No Pulp Scenario* in the short and mid-term, and 6% lower in the long-term.

In comparison with the *Harvest Deferral 2 No Pulpwood Scenario* (Section 6.11) that does not have any natural disturbances; the harvest level of the *Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulp Scenario* is 14% lower in the short and mid-term and 4% lower in the long-term. Similarly the sawlog harvest volume is 9% lower in the short-term and mid-term, and 6% lower in the long-term. This shows that the impact of combining the *Harvest Deferral 2*, *Disturbance in Inoperable Lands* and *No Pulpwood* scenarios into one is greater than the sum of the individual impacts as illustrated in Figure 43.

Against the *Harvest Deferral 2 Disturbance in Inoperable Lands Scenario* (Section 6.13) the harvest volume of the *Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulp Scenario* is 33% lower throughout, while the sawlog harvest volume are equal to the other scenario in the short and mid-term, but 33% lower in the long-term.

Given that the *No Pulp Scenario* and the *Harvest Deferral 2 No Pulpwood Scenario* had very similar results, the differences between the *Harvest Deferral 2 No Pulpwood Scenario* suggest that the inclusion of disturbance of inoperable lands with these factors has a negative impact as shown in Figure 43.

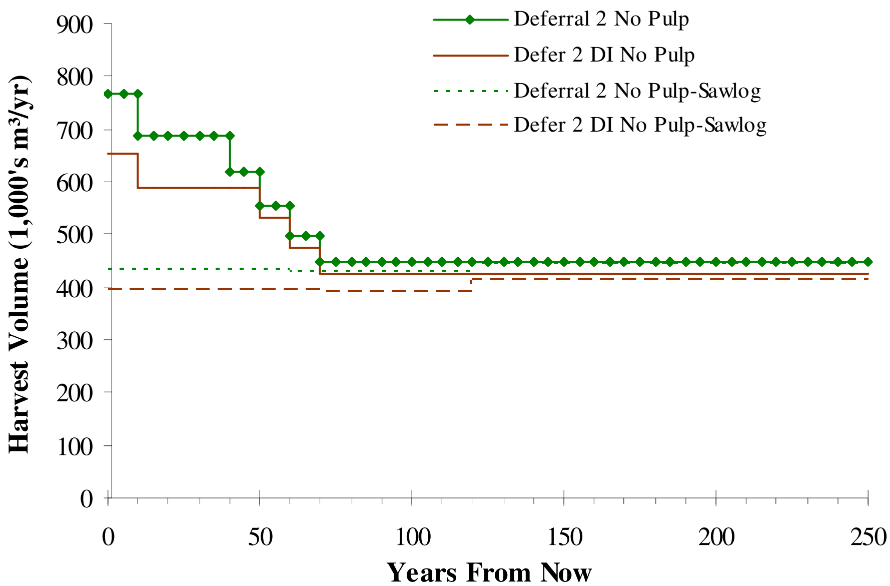


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Figure 43: Harvest Forecast ─ Remote Area Harvest Deferral 2 with No Pulpwood Harvest vs. Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood Harvest

6.15 Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood or Marginal Sawlog Harvest

This scenario examines the combined impacts of the *Harvest Deferral 2*, the *Disturbance in Inoperable Lands*, and the *No Pulpwood or Marginal Sawlog* scenarios and assumes that there will be no harvest of pulp or marginal sawlog volume in the TSA over the next 250 years and no harvest in the harvest deferral area for the next 40 years. Additionally, this scenario assumes natural disturbances in the inoperable portion of the land base at levels specified in the Biodiversity Guidebook and presented in Table 16 of this report.

The IHL is 60% below the base case, while the LTHL is 48% below the base case (Figure 44 and Table 32). The sawlog harvest volumes are 7% below the base case in short and mid-term, but 47% below the base case in the long-term. For ease of reporting the name of this scenario has been shortened to "Defer 2 DI No Pulp or M. Sawlog."

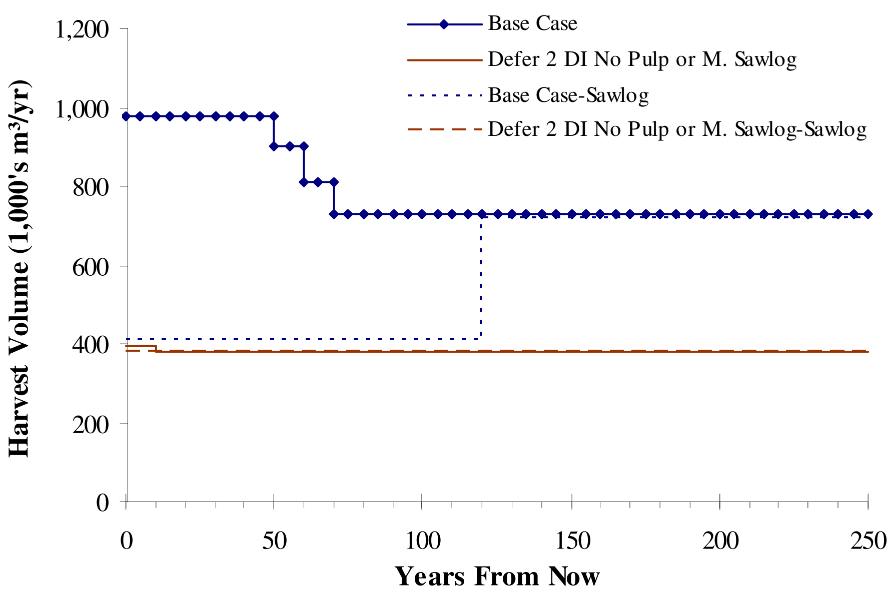

Figure 44: Harvest Forecast ─ Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood or Marginal Sawlog Harvest

Table 32: Harvest Forecast – Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood or Marginal Sawlog Harvest

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Defer 2 DI No Pulp or M. Sawlog	% Difference	Base Case	Defer 2 DI No Pulp or M. Sawlog	% Difference
5	977	392	-59.8	410	382	-6.8
10	977	392	-59.8	410	382	-6.8
15	977	382	-60.9	410	382	-6.9
20	977	382	-60.9	410	382	-6.9
25	977	382	-60.9	410	382	-6.9
30	977	382	-60.9	410	382	-6.9
35	977	382	-60.9	410	382	-6.9
40	977	382	-60.9	410	382	-6.9
45	977	382	-60.9	410	382	-6.9
50	977	382	-60.9	410	382	-6.9
55	903	382	-57.7	410	382	-6.8
60	903	382	-57.7	410	382	-6.8
65	812	382	-53.0	409	382	-6.7
70	812	382	-53.0	409	382	-6.7
75	729	382	-47.6	408	382	-6.5
80	729	382	-47.6	408	382	-6.5
85	729	382	-47.6	408	382	-6.5
90	729	382	-47.6	408	382	-6.5
95	729	382	-47.6	408	382	-6.5
100	729	382	-47.6	408	382	-6.5
105	729	382	-47.6	408	382	-6.5
110	729	382	-47.6	408	382	-6.5
115	729	382	-47.6	408	382	-6.5
120	729	382	-47.6	408	382	-6.5
125+	729	382	-47.6	721	382	-47.1
TOTAL	**197,276**	**95,571**	**-51.6**	**28,574**	**19,089**	**-33.2**

In comparison to the *No Pulpwood or Marginal Sawlog Scenario* (Section 6.2) and the *Harvest Deferral 2 No Pulpwood or Marginal Sawlog Scenario* (Section 6.12) both the harvest volumes and the sawlog volumes are 6% lower throughout the planning horizon.

The IHL and LTHL are 60% and 49% lower, respectfully, than the *Harvest Deferral 2 Disturbance in Inoperable Lands Scenario* (Section 6.13) due to the removal of pulpwood and marginal sawlog volumes. Sawlog harvest volumes are equal to the *Harvest Deferral 2 Disturbance in Inoperable Lands Scenario* in the short and mid-term, but 38% lower in the long-term.

Both the *No Pulpwood or Marginal Sawlog Scenario* (Section 6.2) and the *Harvest Deferral 2 No Pulpwood or Marginal Sawlog Scenario* (Section 6.12) had a total harvest of 102 million m^3. This scenario shows that the addition of disturbance in inoperable lands results the total harvest volume fall to approximately 96 million m^3. This suggests that the differences in total harvest volumes between this scenario and the other two, as well as the similar differences in total sawlog harvest volumes, are attributed to the disturbance of inoperable lands as shown in Figure 45.

The fact that the *No Pulpwood or Marginal Sawlog Scenario* (Section 6.2) and the *Harvest Deferral 2 No Pulpwood or Marginal Sawlog Scenario* (Section 6.12) produced similar results demonstrates that the addition of disturbance in the inoperable lands in combination with these factors has a greater impact that when each of these factors is considered individually (Figure 45).

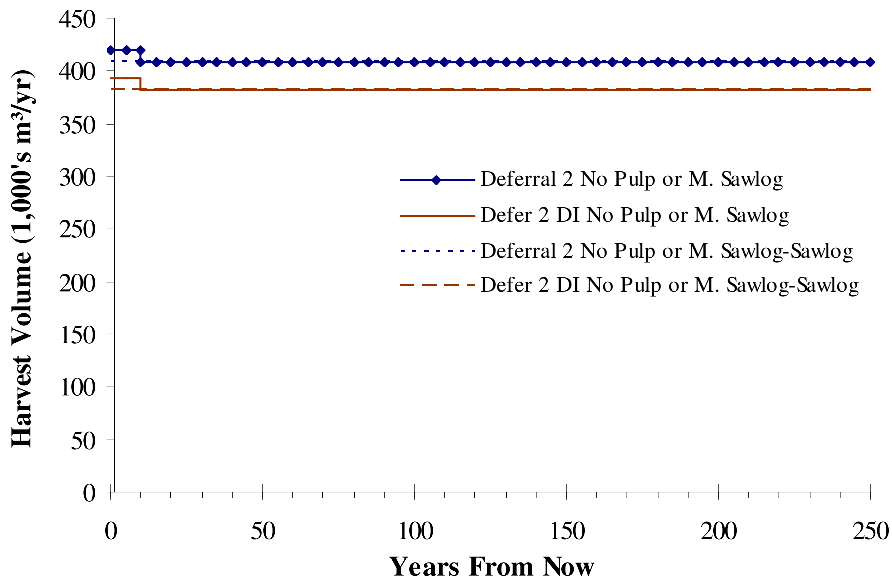

Figure 45: Harvest Forecast – Remote Area Harvest Deferral 2 with No Pulpwood / No Marginal Sawlog Harvest vs. Remote Area Harvest Deferral 2 with Disturbance in Inoperable Lands and No Pulpwood Harvest / No Marginal Sawlog Harvest

6.16 Pine Mushroom Habitat

In TSR II, the chief forester identified that pine mushrooms are an important botanical forest product in the TSA, and must be considered in forest management and planning. Since TSR II, inventories and management strategies have been developed through the WBSRMP and are included in the base case. However, inventories and strategies for the area outside the WBSRMP are still being developed and are therefore not part of the base case.

In support of this issue, Skeena Stikine District staff developed an approximation of the potential pine mushroom habitat in the remainder of the TSA. In this approximation, pine mushroom habitat is defined as all stands in the ICH or CWH BEC sub zone where:

- Lodgepole pine, western hemlock, white birch or white spruce is the leading species;
- The leading species is less than 37.5 metres tall;
- Lodgepole pine or western hemlock is one of the first five species;
- The elevation is no greater than 800 metres; and
- A sub-mesic soil moisture condition is present.

This approximation identified and additional 17,709 ha of potential pine mushroom habitat, of which 6,588 ha is in the THLB. Consistent with the management practices from the WBSRMP, this sensitivity applies a forest cover constraint to ensure that at least 50% of the CFLB area identified as pine mushroom habitat is greater than 80 years at any point in time.

Below, Figure 46 and Table 33 show that the pine mushroom habitat constraint does not impact on timber supply as the area under constraint represents approximately 2% of the total THLB.

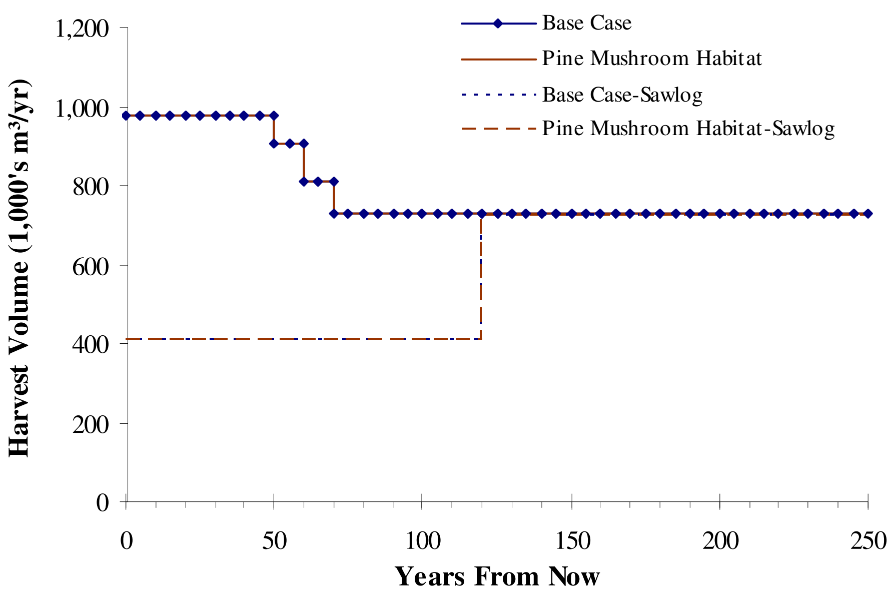

Figure 46: Harvest Forecast ─ Pine Mushroom Habitat

Table 33: Harvest Forecast – Pine Mushroom Habitat

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Pine Mushroom Habitat	% Difference	Base Case	Pine Mushroom Habitat	% Difference
5	977	977	-	410	410	-
10	977	977	-	410	410	-
15	977	977	-	410	410	-
20	977	977	-	410	410	-
25	977	977	-	410	410	-
30	977	977	-	410	410	-
35	977	977	-	410	410	-
40	977	977	-	410	410	-
45	977	977	-	410	410	-
50	977	977	-	410	410	-
55	903	903	-	410	410	-
60	903	903	-	410	410	-
65	812	812	-	409	409	-
70	812	812	-	409	409	-
75	729	729	-	408	408	-
80	729	729	-	408	408	-
85	729	729	-	408	408	-
90	729	729	-	408	408	-
95	729	729	-	408	408	-
100	729	729	-	408	408	-
105	729	729	-	408	408	-
110	729	729	-	408	408	-
115	729	729	-	408	408	-
120	729	729	-	408	408	-
125+	729	729	-	721	721	-
TOTAL	**197,276**	**197,276**	**-**	**28,574**	**28,574**	**-**

6.17 Natural Stand Volumes Reduced by 13%

An inventory audit was conducted in 1996 by the MoF - Resource Inventory Branch which assessed the mature component of the inventory and evaluated the differences between the existing inventories estimate of mean mature volume per hectare for the TSA and a new estimate obtained from the audit samples. The audit suggested that the mature inventory volumes were overestimated by as much as 13%, and so this scenario examines the impact of reducing natural stand volumes by 13%.

As shown in Figure 47 and Table 34, the current AAC can be maintained for 30 years before stepping down to a LTHL 16% lower than base case in the long-term. Reducing natural stand volumes 13% reduces sawlog harvest volumes 5% in the short and mid-term, and 15% in the long-term. Based on the requirement to maintain an even flow long-term harvest level the impact of reducing the natural stand volumes is carried out into the mid and long-term.

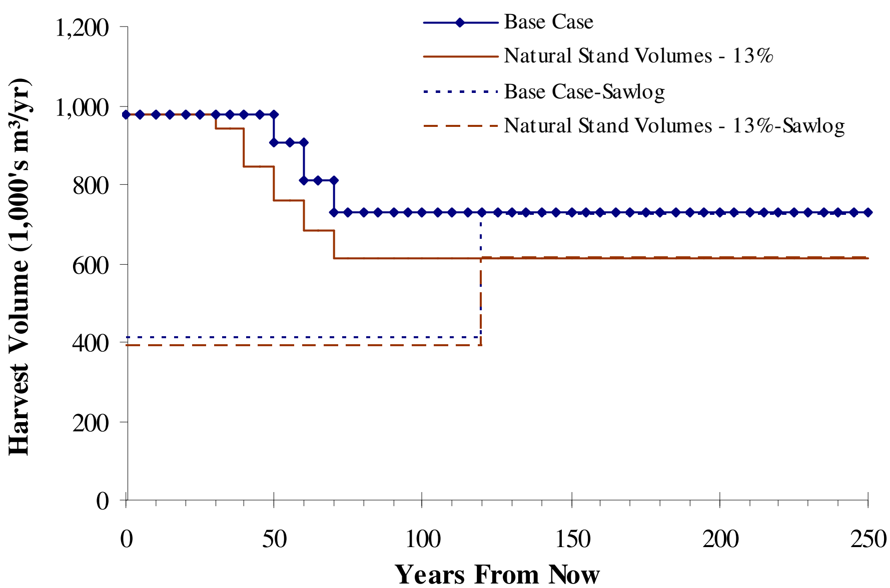

Figure 47: Harvest Forecast ─ Natural Stand Volumes -13%

Table 34: Harvest Forecast – Natural Stand Volumes -13%

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Natural Stand Volumes - 13%	% Difference	Base Case	Natural Stand Volumes - 13%	% Difference
5	977	977	-	410	391	-4.5
10	977	977	-	410	391	-4.5
15	977	977	-	410	391	-4.5
20	977	977	-	410	391	-4.5
25	977	977	-	410	391	-4.5
30	977	977	-	410	391	-4.5
35	977	939	-3.8	410	391	-4.6
40	977	939	-3.8	410	391	-4.6
45	977	844	-13.6	410	391	-4.7
50	977	844	-13.6	410	391	-4.7
55	903	758	-16.0	410	390	-4.8
60	903	758	-16.0	410	390	-4.8
65	812	681	-16.1	409	389	-4.8
70	812	681	-16.1	409	389	-4.8
75	729	612	-16.1	408	388	-4.8
80	729	612	-16.1	408	388	-4.8
85	729	612	-16.1	408	388	-4.8
90	729	612	-16.1	408	388	-4.8
95	729	612	-16.1	408	388	-4.8
100	729	612	-16.1	408	388	-4.8
105	729	612	-16.1	408	388	-4.8
110	729	612	-16.1	408	388	-4.8
115	729	612	-16.1	408	388	-4.8
120	729	612	-16.1	408	388	-4.8
125+	729	612	-16.1	721	610	-15.4
TOTAL	**197,276**	**171,695**	**-13.0**	**28,574**	**25,217**	**-11.7**

6.18 VQO Option 1

As part of the District Manager's responsibility for setting objectives for visual quality, Skeena Stikine District staff are in the process of reviewing the 2005 visual landscape inventory and are examining modification and variations of the established and recommended visual quality classifications that are represented in the base case. Through this process two VQO options have been identified and are examined through sensitivity analysis. Visual quality objectives for the WBSRMP area are unchanged in either of these options.

This scenario examines VQO Option 1 which modifies 2005 VLI classifications as follows:

- Preservation VQO for visual sensitivity class (VSC) = 1;
- Retention for VSC = 2, or for VSC = 3 in a special management zone;
- Partial retention for VSC = 3;
- Modification for VSC = 4; and
- Maximum modification for VSC = 5.

The area distribution by VQO classification for the base case, Option 1 and Option 2 are shown in Table 35 below.

Table 35: Comparison of VQO Classifications

Visual Quality Objective	Base Case (ha)	Option 1 (ha)	Option 2 (ha)
Modified (M)	54,979	5,277	66,774
Partial Retention (PR)	14,799	62,933	13,543
Retention (R)	12,145	13,641	1,535
None	245,914	245,986	245,986
Total	**327,837**	**327,837**	**327,837**

As shown in Figure 48 and Table 36, there is no significant impact on timber supply of using VQO Option 1even though significant area has been moved from a *modification* classification to a more restrictive *partial retention* classification. Because of the flexibility in the short-term harvest schedule and the large proportion of the forested land base that is outside the THLB, visual quality objectives do not have a significant impact on timber supply, even under this more limiting regime.

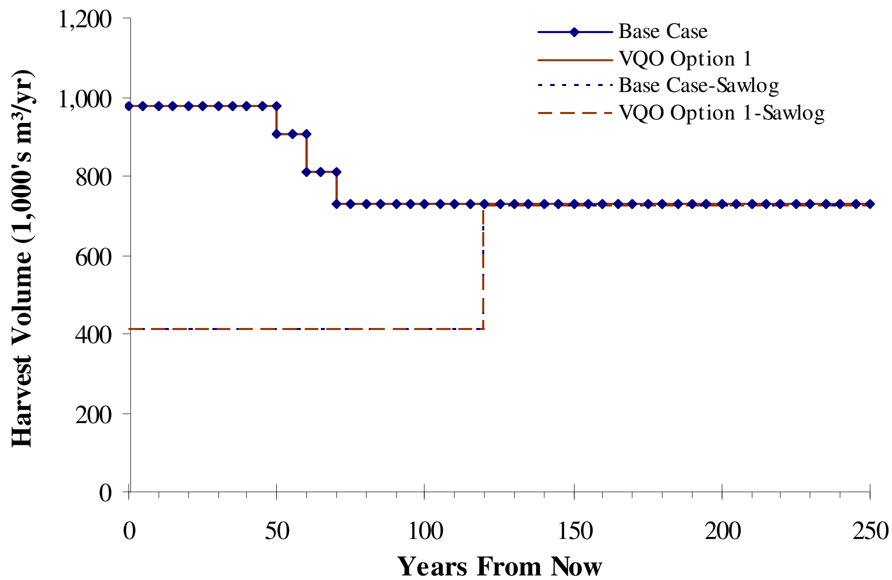

Figure 48: Harvest Forecast — VQO Option 1

Table 36: Harvest Forecast – VQO Option 1

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	VQO Option 1	% Difference	Base Case	VQO Option 1	% Difference
5	977	977	-	410	410	-
10	977	977	-	410	410	-
15	977	977	-	410	410	-
20	977	977	-	410	410	-
25	977	977	-	410	410	-
30	977	977	-	410	410	-
35	977	977	-	410	410	-
40	977	977	-	410	410	-
45	977	977	-	410	410	-
50	977	977	-	410	410	-
55	903	903	-	410	409	-
60	903	903	-	410	409	-
65	812	812	-	409	409	-
70	812	812	-	409	409	-
75	729	729	-	408	408	-
80	729	729	-	408	408	-
85	729	729	-	408	408	-
90	729	729	-	408	408	-
95	729	729	-	408	408	-
100	729	729	-	408	408	-
105	729	729	-	408	408	-
110	729	729	-	408	408	-
115	729	729	-	408	408	-
120	729	729	-	408	408	-
125+	729	729	-	721	722	-
TOTAL	**197,276**	**197,262**	**-**	**28,574**	**28,576**	**-**

6.19 VQO Option 2

The second VQO option provided by the District moves area from the *retention* and *partial retention* classification to the less restrictive *modification* classification as follows:

- Retention for VSC = 1, or for VSC = 2 in a special management zone;
- Partial retention for VSC = 2, or for VSC = 3 in a special management zone;
- Modification for VSC = 3 or 4; and
- Maximum modification for VSC = 5.

As shown in Figure 49 and Table 37, the application of the VQO Option 2 requirements has minimal impact on timber supply with a slight (<1%) increase in the LTHL with this slightly less restrictive VQO option.

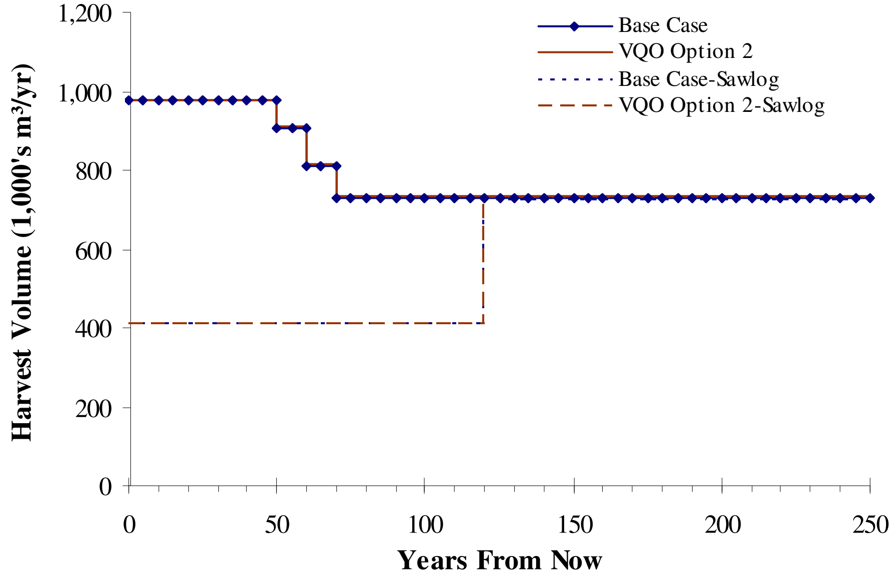

Figure 49: Harvest Forecast ─ VQO Option 2

Table 37: Harvest Forecast – VQO Option 2

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	VQO Option 2	% Difference	Base Case	VQO Option 2	% Difference
5	977	977	-	410	410	-
10	977	977	-	410	410	-
15	977	977	-	410	410	-
20	977	977	-	410	410	-
25	977	977	-	410	410	-
30	977	977	-	410	410	-
35	977	977	-	410	410	-
40	977	977	-	410	410	-
45	977	977	-	410	410	-
50	977	977	-	410	410	-
55	903	909	0.6	410	409	-
60	903	909	0.6	410	409	-
65	812	817	0.6	409	409	-
70	812	817	0.6	409	409	-
75	729	734	0.6	408	408	-
80	729	734	0.6	408	408	-
85	729	734	0.6	408	408	-
90	729	734	0.6	408	408	-
95	729	734	0.6	408	408	-
100	729	734	0.6	408	408	-
105	729	734	0.6	408	408	-
110	729	734	0.6	408	408	-
115	729	734	0.6	408	408	-
120	729	734	0.6	408	408	-
125+	729	734	0.6	721	728	0.9
TOTAL	**197,276**	**198,169**	**0.5**	**28,574**	**28,745**	**0.6**

6.20 Increase the Land Base by 10%

For TSR analysis, a set of standard sensitivities which do not test any management assumptions in particular, but provide a general reference for factors that may have not been considered in the analysis. The results of these sensitivities can infer the potential impacts of sources of uncertainty that have yet to be quantified.

This scenario examines the impact of increasing the THLB by 10%. The associated harvest forecast is shown in Figure 50 and Table 38. The harvest forecast is identical to the base case for the first 50 years because the harvest level is not allowed to exceed the current AAC. The harvest forecast is 13 % higher than the base case in the mid and long-term, while the sawlog harvest forecast is 2% higher in the short and mid-term, and 13% higher in the long-term.

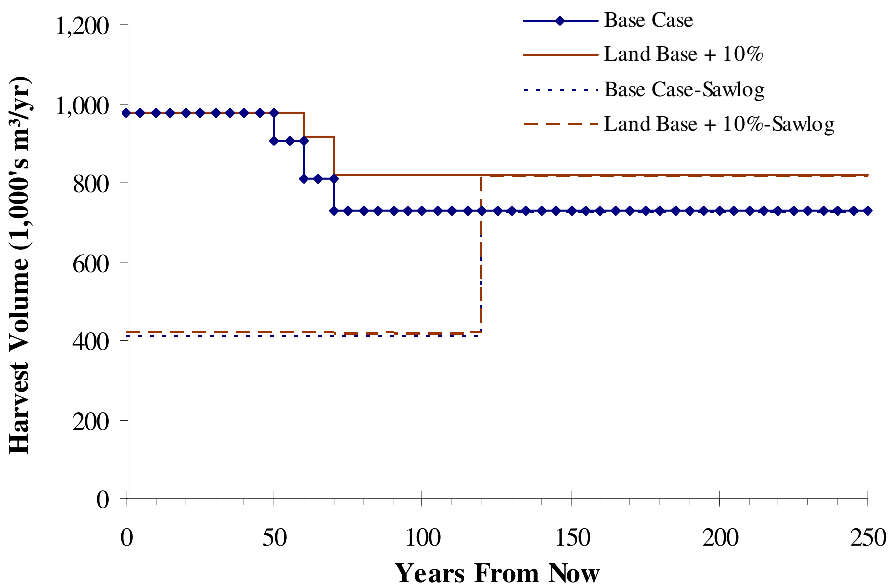

Figure 50: Harvest Forecast – Increase the Land Base by 10%

Table 38: Harvest Forecast – Increase the Land Base by 10%

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Land Base + 10%	% Difference	Base Case	Land Base + 10%	% Difference
5	977	977	-	410	418	2.1
10	977	977	-	410	418	2.1
15	977	977	-	410	418	2.1
20	977	977	-	410	418	2.1
25	977	977	-	410	418	2.1
30	977	977	-	410	418	2.1
35	977	977	-	410	418	2.1
40	977	977	-	410	418	2.1
45	977	977	-	410	418	2.1
50	977	977	-	410	418	2.1
55	903	977	8.1	410	418	2.2
60	903	977	8.1	410	418	2.2
65	812	915	12.7	409	418	2.2
70	812	915	12.7	409	418	2.2
75	729	822	12.7	408	417	2.3
80	729	822	12.7	408	417	2.3
85	729	822	12.7	408	417	2.3
90	729	822	12.7	408	417	2.3
95	729	822	12.7	408	417	2.3
100	729	822	12.7	408	417	2.3
105	729	822	12.7	408	417	2.3
110	729	822	12.7	408	417	2.3
115	729	822	12.7	408	417	2.3
120	729	822	12.7	408	417	2.3
125+	729	822	12.7	721	813	12.7
TOTAL	**197,276**	**215,688**	**9.3**	**28,574**	**31,170**	**9.1**

6.21 Decrease the Land Base by 10%

This scenario examines the impact of decreasing the THLB by 10% where the current AAC can be maintained for 30 years before decreasing to a LTHL 13% lower than the base case (Figure 51 and Table 39). The sawlog harvest forecast is 6% lower than the base case in the short and mid-term, and 14% lower in the long-term.

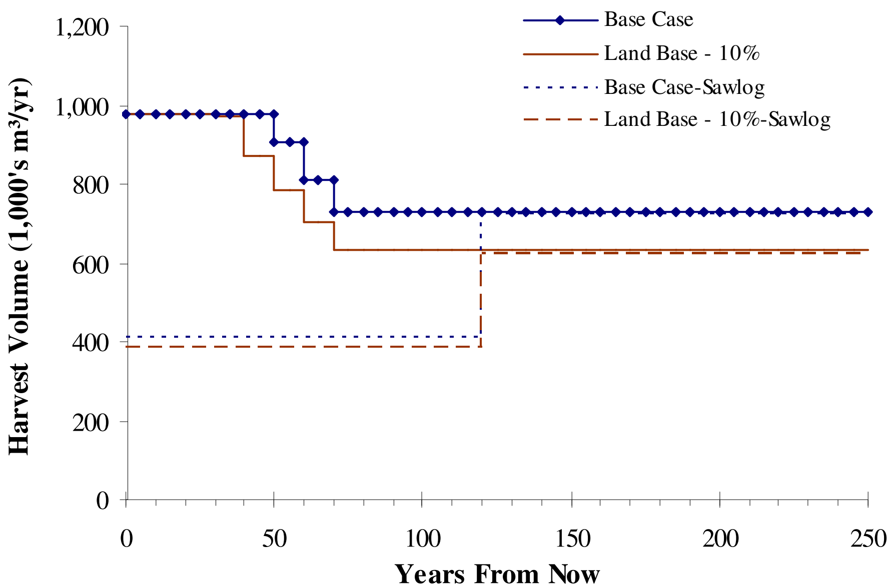

Figure 51: Harvest Forecast ─ Decrease the Land Base by 10%

Table 39: Harvest Forecast – Decrease the Land Base by 10%

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Land Base - 10%	% Difference	Base Case	Land Base - 10%	% Difference
5	977	977	-	410	386	-5.8
10	977	977	-	410	386	-5.8
15	977	977	-	410	386	-5.8
20	977	977	-	410	386	-5.8
25	977	977	-	410	386	-5.8
30	977	977	-	410	386	-5.8
35	977	968	-0.9	410	386	-5.9
40	977	968	-0.9	410	386	-5.9
45	977	870	-11.0	410	385	-6.0
50	977	870	-11.0	410	385	-6.0
55	903	781	-13.5	410	385	-6.0
60	903	781	-13.5	410	385	-6.0
65	812	702	-13.5	409	384	-6.1
70	812	702	-13.5	409	384	-6.1
75	729	631	-13.5	408	383	-6.1
80	729	631	-13.5	408	383	-6.1
85	729	631	-13.5	408	383	-6.1
90	729	631	-13.5	408	383	-6.1
95	729	631	-13.5	408	383	-6.1
100	729	631	-13.5	408	383	-6.1
105	729	631	-13.5	408	383	-6.1
110	729	631	-13.5	408	383	-6.1
115	729	631	-13.5	408	383	-6.1
120	729	631	-13.5	408	383	-6.1
125+	729	631	-13.5	721	622	-13.7
TOTAL	**197,276**	**176,011**	**-10.8**	**28,574**	**25,409**	**-11.1**

6.22 Decrease Managed Stand Volumes by 10%

This scenario examines the impacts of reducing managed stand volumes by 10%. As shown in Figure 52 and Table 40, the current AAC can be maintained for 40 years before dropping 9% below the base case in the long-term. The reduction in managed stand volumes lowers the sawlog harvest volume 11% in the short and mid-term and 9% less than the base case in long-term.

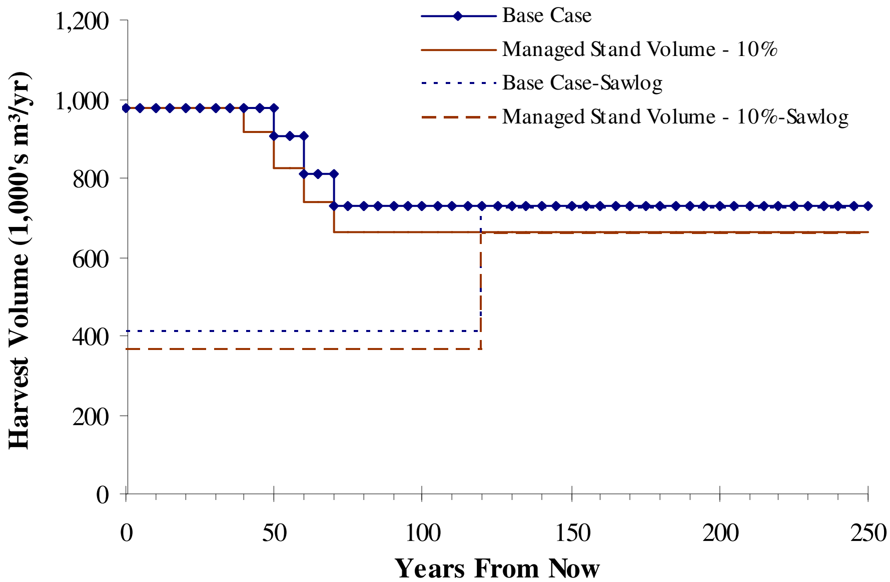

Figure 52: Harvest Forecast — Managed Stand Volumes -10%

Table 40: Harvest Forecast – Managed Stand Volume – 10%

Years From Now	Harvest Volume (1,000's m³/yr)			Sawlog Harvest Volume (1,000's m³/yr)		
	Base Case	Managed Stand Volume - 10%	% Difference	Base Case	Managed Stand Volume - 10%	% Difference
5	977	977	-	410	365	-11.0
10	977	977	-	410	365	-11.0
15	977	977	-	410	365	-11.0
20	977	977	-	410	365	-11.0
25	977	977	-	410	365	-11.0
30	977	977	-	410	365	-11.0
35	977	977	-	410	365	-11.0
40	977	977	-	410	365	-11.0
45	977	916	-6.3	410	365	-11.1
50	977	916	-6.3	410	365	-11.1
55	903	823	-8.9	410	364	-11.1
60	903	823	-8.9	410	364	-11.1
65	812	739	-8.9	409	363	-11.1
70	812	739	-8.9	409	363	-11.1
75	729	664	-8.9	408	363	-11.1
80	729	664	-8.9	408	363	-11.1
85	729	664	-8.9	408	363	-11.1
90	729	664	-8.9	408	363	-11.1
95	729	664	-8.9	408	363	-11.1
100	729	664	-8.9	408	363	-11.1
105	729	664	-8.9	408	363	-11.1
110	729	664	-8.9	408	363	-11.1
115	729	664	-8.9	408	363	-11.1
120	729	664	-8.9	408	363	-11.1
125+	729	664	-8.9	721	657	-8.9
TOTAL	**197,276**	**183,420**	**-7.0**	**28,574**	**25,811**	**-9.7**

7.0 Spatial Analysis Results

The 2006 signing of the *Order to Establish the Kispiox Landscape Unit and Objectives* set out legal requirements to manage for objectives for patch size, among other things. In order to understand how these objectives might affect timber supply or other management objectives we must be able to model how future harvest patterns might affect the patch size distribution of the forest and must be able to model harvest patterns in consideration of patch size and other objectives. Spatial analysis was conducted on three different scenarios to asses how managing towards patch size objectives might affect timber supply as well as the ability to achieve other objectives on the land base.

Spatial analysis was conducted using the Patchworks model which is a fully spatial optimization model that is capable of explicitly modelling patch size objectives as well as the other management objectives. The Patchworks model contains all of the same input data and management assumptions as the Woodstock model. The primary differences between the Woodstock model and the Patchworks model are:

> **Spatially Explicit:** Patchworks is spatially explicit and assigns harvest to individual polygons, producing a spatial harvest schedule; whereas Woodstock develops a harvest schedule based on harvesting different stand types (or strata) at specific times.
>
> **Patch Size Objectives:** Patchworks includes the explicit modelling of patch size objectives and has the ability to develop harvest patterns that strive towards achieving landscape level patch size objectives.
>
> **Modelling Objective:** Woodstock is formulated to maximize harvest volume subject to a number of constraints. Non-timber management objectives are all set up has hard limits that cannot be violated. All objectives in Patchworks, including patch size and harvest volume are set up with targets levels and penalty weights (costs) for violating these targets. The objective of the model is to determine a harvest schedule that minimized the cost (sum of all the penalties). In Patchworks users can modify the penalty weights for individual objectives to modify the harvest schedule to produce a more favourable outcome.

Spatial timber supply modelling involves exploring a large number of potential solutions in establishing a suitable or preferable harvest schedule and the solutions represent one of many possible solutions to achieving a particular harvest level spatially. The spatial harvest schedule is a demonstration that a particular harvest level is spatially feasible given the modelling assumptions. It is important to note that not all operational consideration and limitations are represented in the model, and therefore the harvest schedule and that the accuracy and precision of spatial timber supply analysis is still limited by input data and management assumptions - in particular the accuracy and precision of the forest inventory. Additionally, factors that operationally do not affect the ability to harvest timber, such as the distribution, size and location of polygons in the model - the unit from which the model must construct cut blocks and patches - can potentially limit modelling results. While every reasonable attempt is made to understand the impacts of these factors it is not always possible to fully quantify their impacts. This understanding plays an important role in both developing a modelling methodology and understanding and interpreting results.

For the purpose of this analysis a patch is defined as a contiguous[2] group of stands within the same natural disturbance type that are less than 15 years of age. We assume that if a suitable patch size distribution is maintained in young stands this patch size distribution will be reflected in older patches through time. Additionally, our ability to impact the patch size distribution in older forests is solely based on the creation of young patches through harvesting.

The modelling of patches on a land base the size of the Kispiox TSA is a complicated and computationally expensive task, and until recently the ability to reasonably model patch size targets in a timber supply analysis of this scale has not been possible. The fact that we can consider the potential impacts of these objectives represents a fairly significant step forward in TSR timber supply analysis. Currently, the modelling of patches in Patchworks is limited by its ability to utilize available memory and therefore we cannot explicitly model all aspects of how patch targets have been defined in the higher level plans for the Kispiox TSA.

Patch size targets are applied to each natural disturbance type as specified in Table 41 as opposed to each landscape unit-NDT combination as specified in the *Kispiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife* (or watershed-NDT combination as specified in the WBSRMP). Enforcing patch targets at this smaller scale would cause patches to be split by landscape unit or watershed boundaries effectively cutting up larger patches that cross landscape unit or watershed boundaries; underestimating the proportion of large patches on the land base. Additionally, based on memory limitations in Patchworks, we have modelled landscape level patch size objectives but have not explicitly modelled objectives for cut block size. As such, cut block size targets are not enforced in the model.

Table 41: Patch Size Distribution Targets

Natural Disturbance Type	Target Patch Size Distribution (%)		
	0 to 40 ha	**40 to 80 ha**	**80+ ha**
1	30 to 40 %	30 to 40 %	20 to 40 %
2	30 to 40 %	30 to 40 %	20 to 40 %
	0 to 40 ha	**40 to 250 ha**	**250+ ha**
3	20 to 30 %	10 to 20 %	60 to 80 %

Patchworks is a tool that can be used to balance competing objectives and therefore does not use rigid or absolute constraints that cannot be violated. When it is not possible to achieve a target in a given period Patchworks will attempt to minimize the degree to

[2] For the purpose of this analysis stands that are within 50 metres of one another are considered to be contiguous and can be part of the same patch.

which this constraint is violated while considering other, possibly competing objectives on the land base. This is different from strict linear programming (LP) optimization where the problem is deemed infeasible and optimization is terminated if a target cannot be achieved in a particular period. Patchworks accomplishes this using penalty weights assigned for violating each constraint or target. The model incurs one penalty unit for each unit (area, volume or otherwise) that the solution deviates from the defined targets The optimization process seeks to minimize the overall cost or sum of the penalty weights of a harvest schedule, thereby achieving a balancing among competing objectives. Penalty weights for a particular target or objective may be increased (or decreased) in order to achieve a solution where more (or less) of that target is achieved. By increasing the penalty weight for violating patch size objectives the model will seek out a solution that comes closer to achieving these targets; likely at the expense of other objectives. By changing the relative penalty weights, stakeholders can affect the model outcome causing more or less violation of a particular target. For this analysis all targets have been assigned a penalty weight of one, meaning that the cost of violating each target is roughly equivalent.

Spatial analysis scenarios, using Patchworks have been run for the base case (Section 7.1), the water quality management scenario (Section 7.2), the remote area harvest deferral scenario (Section 7.3), and the remote area harvest deferral 2 / non-timber focus scenario (Section 7.4). The spatial scenarios address all of the objectives included in the Woodstock scenarios in addition to modelling patch size objectives. Periodic cut block size and patch size distribution reports are provided for each spatial scenario. Harvest schedule and patch size distribution maps have been prepared and are hosted on the *Kispiox TSA TSR III Website* (www.timberline.ca/kispiox/) as both portable document format (PDF) maps and within an interactive web mapping interface.

7.1 Base Case Spatial Scenario

The base case spatial scenario examines the degree to which patch size objectives impact the base case timber supply as well as non-timber objectives on the land base. Generally speaking, none of the spatial scenarios tested produced a change in the timber supply forecasts reported in Sections 5.0 and 6.0 above. The introduction of patch size objectives does not affect timber supply. However, it should be noted that patch size objectives were not achieved in all periods and violations of other targets did occur in these scenarios; particularly in constraining visual quality objectives. These violations are discussed in greater detail below.

The patch size distribution for the spatial base case for each natural disturbance type (NDT) is shown in Figure 53 below. As is demonstrated in Figure 53, patch targets are achieved in almost all periods in NDT 1 and NDT 2. In NDT 3 the minimum size definition of large patches increases from 80 ha to 250 ha and a minimum of 60 % of the land base is to be in large patches. From both a modelling and operational standpoint the formation of large patches is more difficult than small and medium patches because it requires that large contiguous areas must be both operable (in the THLB) and harvestable at roughly the same period of time. A history of small cut blocks (< 80 ha) and the fact that less than 50% of the crown forested land base is harvestable make the formation of large patches more difficult. In fact, for two periods of time during the 250 year planning horizon there are no large patches less than 15 years of age on the land base. However, it should be noted that these large young patches have aged into a large older patches as there is no harvesting in stands this age that would prevent these patches from maintaining their large structure. The dashed lines on each figure represent the minimum cumulative percentage for each size category.

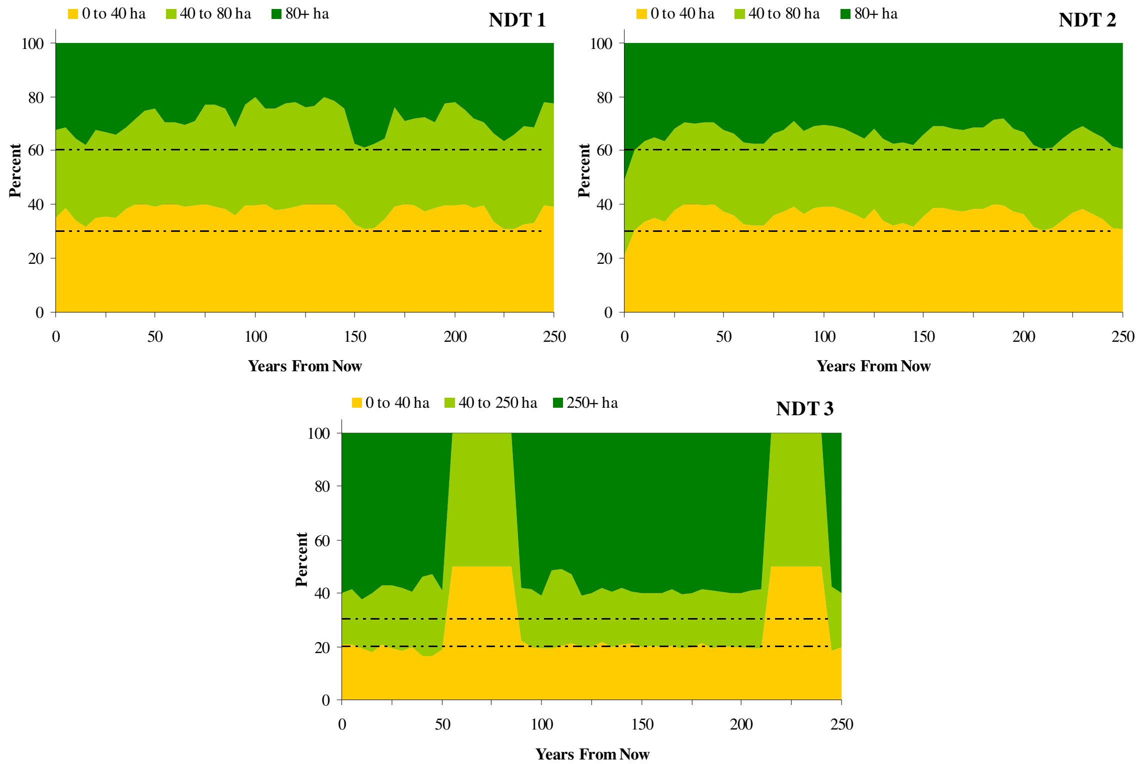

Figure 53: Patch Size Distribution (< 15 Years of Age) ─ Base Case (Spatial)

Figure 54 provides a distribution of cut blocks by size category from the spatial base case scenario. As discussed above there were not cut block size distribution targets enforced in the model; only targets for the resulting patch size distribution. A cut block is represented by a single harvest entry within a 5 year planning period (the area upon which timber was extracted) whereas a patch represents the opening that results from harvest activities in one or more periods resulting in a contiguous[4] stand (or group of stands) that is less than 15 years old. The majority of all cut blocks created are between 10 and 80 hectares in size with some as large as 400 ha.

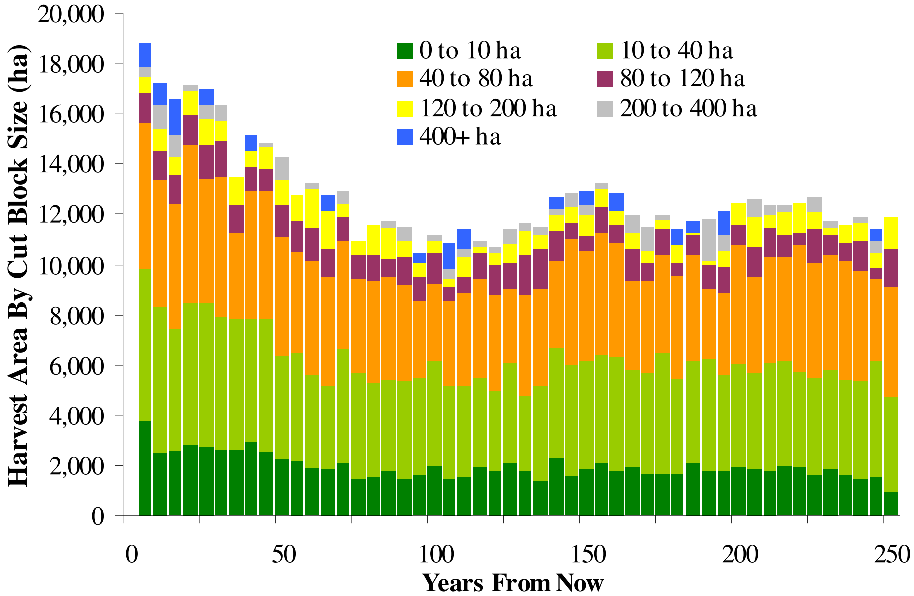

Figure 54: Cut Block Size Distribution ─ Base Case (Spatial)

As discussed above, Patchworks does not enforce rigid constraints but rather provides for the balancing of multiple, sometimes competing objectives to produce a harvest schedule that best addresses a number of values on the land base. Through this approach some target levels may not be achieved in all periods. However, the model seeks out a solution that minimizes the violation of targets. Targets for patch size have been achieved in nearly all periods but this has occurred at the expense of certain other targets; particularly targets such as VQO, community watershed and early seral biodiversity that limit the amount of disturbance that can occur in each period. Targets for maximum disturbance compete directly with the formation of large patches where these objectives overlap. For example it is very difficult to create a 250 ha patch (of which 60% of the land base must be within in NDT 3) while only having 5% of the land base less than 5 metres tall (as is the case with a VQO retention requirement). While VQO and community watershed maximum disturbance targets are applied to only portions of an NDT the following figures (Figure 55, Figure 56, Figure 57, Figure 58, Figure 59, and Figure 60) clearly demonstrate when, where and by how much these constraints are in conflict with other objectives, primarily patch size targets. The following figures provide a comparison between the spatial (Patchworks) and aspatial (Woodstock) scenarios for objectives in which Patchworks violated the target (Limit). All of these target levels were achieved in the Woodstock scenarios except in cases where the target was already in violation at the beginning of the planning horizon. The only major difference between the aspatial (Woodstock) output and the spatial (Patchworks) output is the application of patch size objective targets. The most significant conflict occurs between the patch size objectives and the VQO; in particular the retention VQO. Of note is the fact that the most significant constraint violations occur between near the points in time where the large patches in NDT 3 disappear, likely in an attempt to create additional large patches.

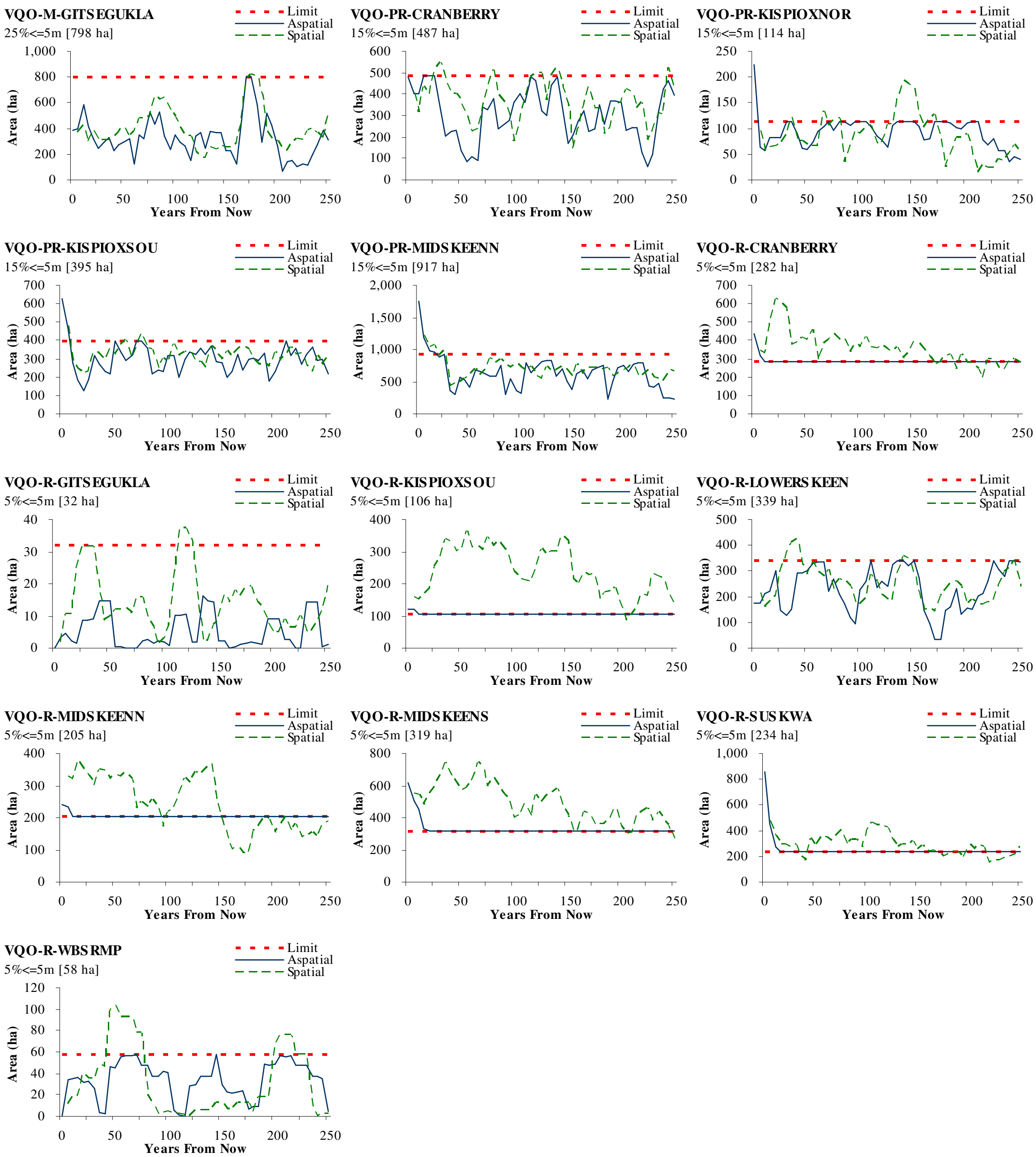

Figure 55: VQO Constraint Violations – Base Case (Spatial)

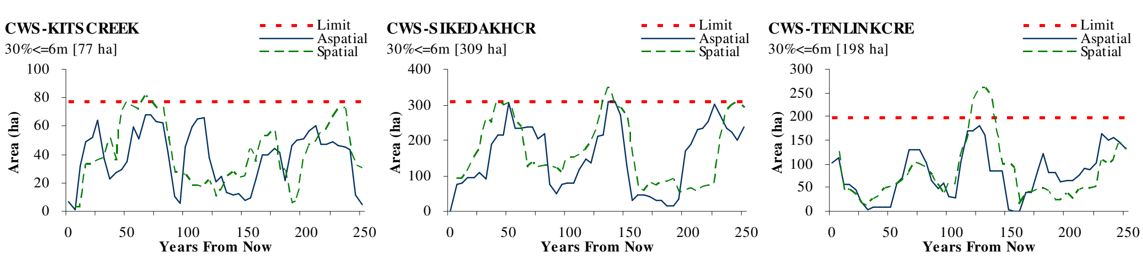

Figure 56: Community Watershed Constraint Violations – Base Case (Spatial)

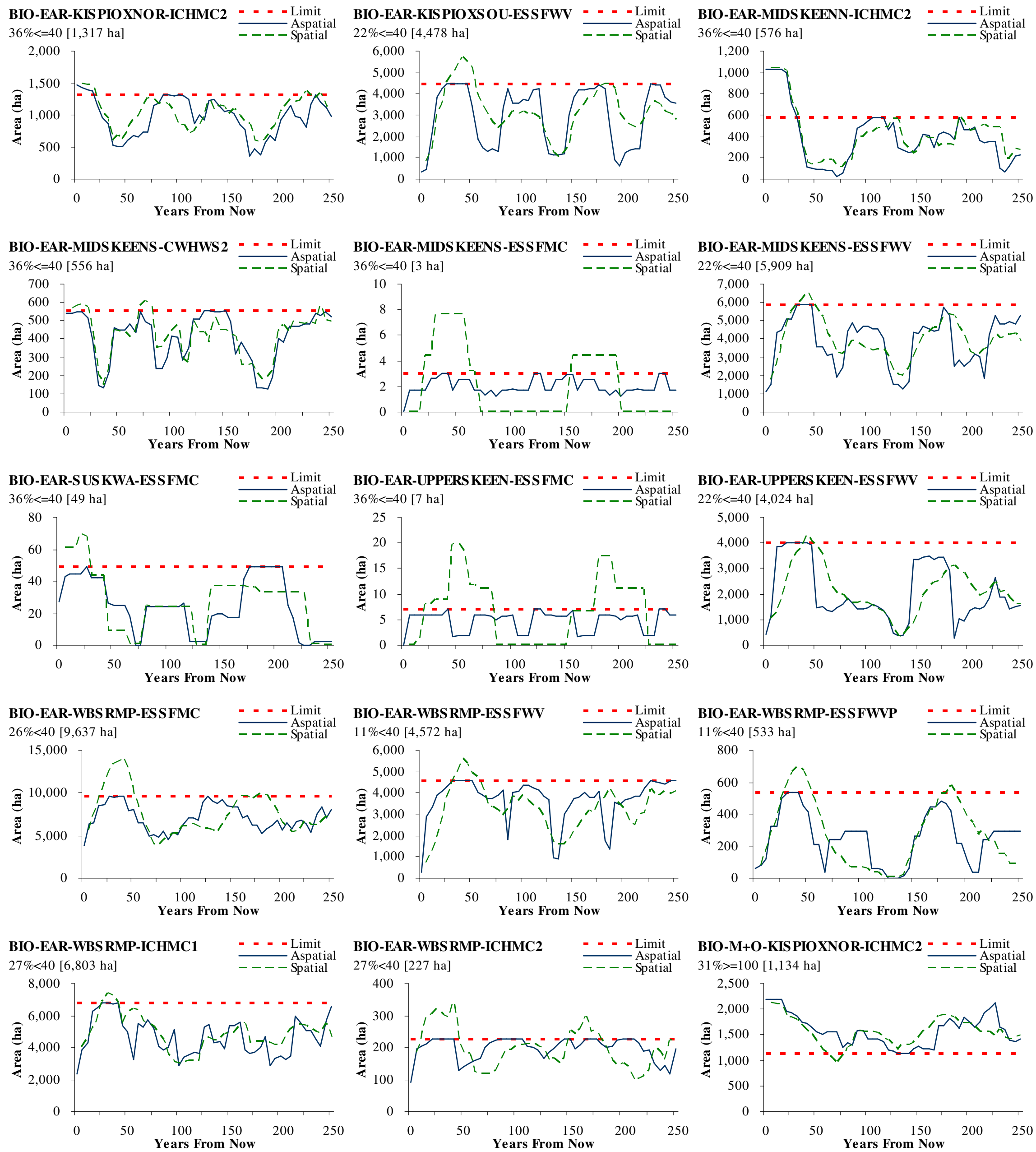

Figure 57: Biodiversity Early Constraint Violations ─ Base Case (Spatial)

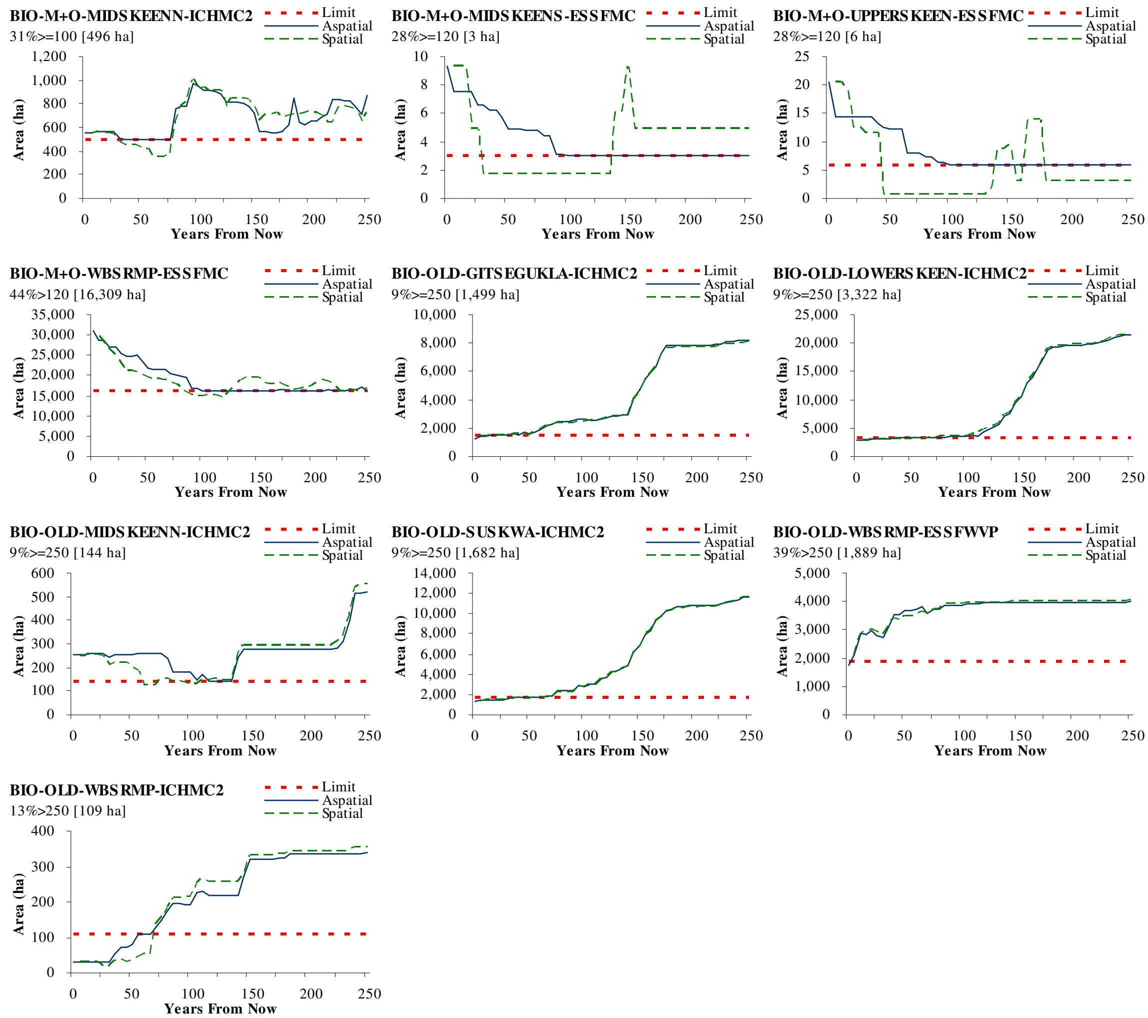

Figure 58: Biodiversity Mature+Old and Old Constraint Violations ─ Base Case (Spatial)

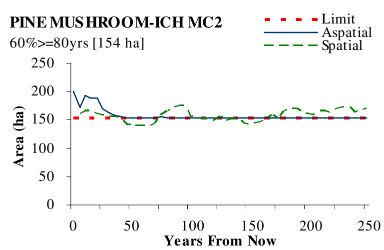

Figure 59: Pine Mushroom Habitat Constraint Violations ─ Base Case (Spatial)

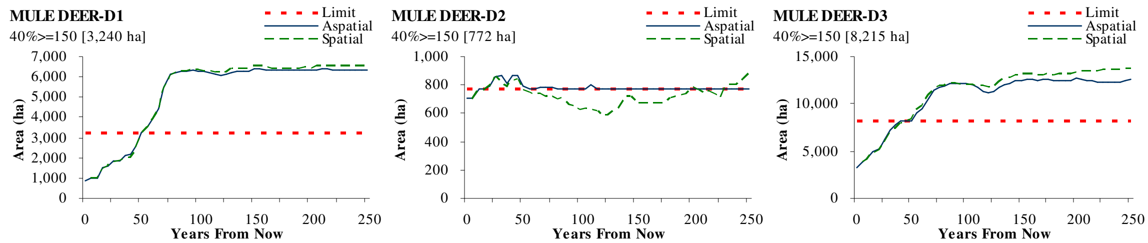

Figure 60: Mule Deer Winter Range Constraint Violations ─ Base Case (Spatial)

7.2 Water Quality Spatial Scenario

The water quality scenario examines the impact of adding watershed level equivalent clearcut area (ECA) targets. As discussed above there is no impact on harvest level and the resulting patch size distribution (Figure 61) and cut block size distribution graphs (Figure 62) are largely the same as the base case spatial scenario. Given the fact that there was very little change in the aspatial harvest forecast between the base case and the water quality scenario (Section 6.4) there is no reason to suspect that the patch size distribution or cut block size would show any significant change.

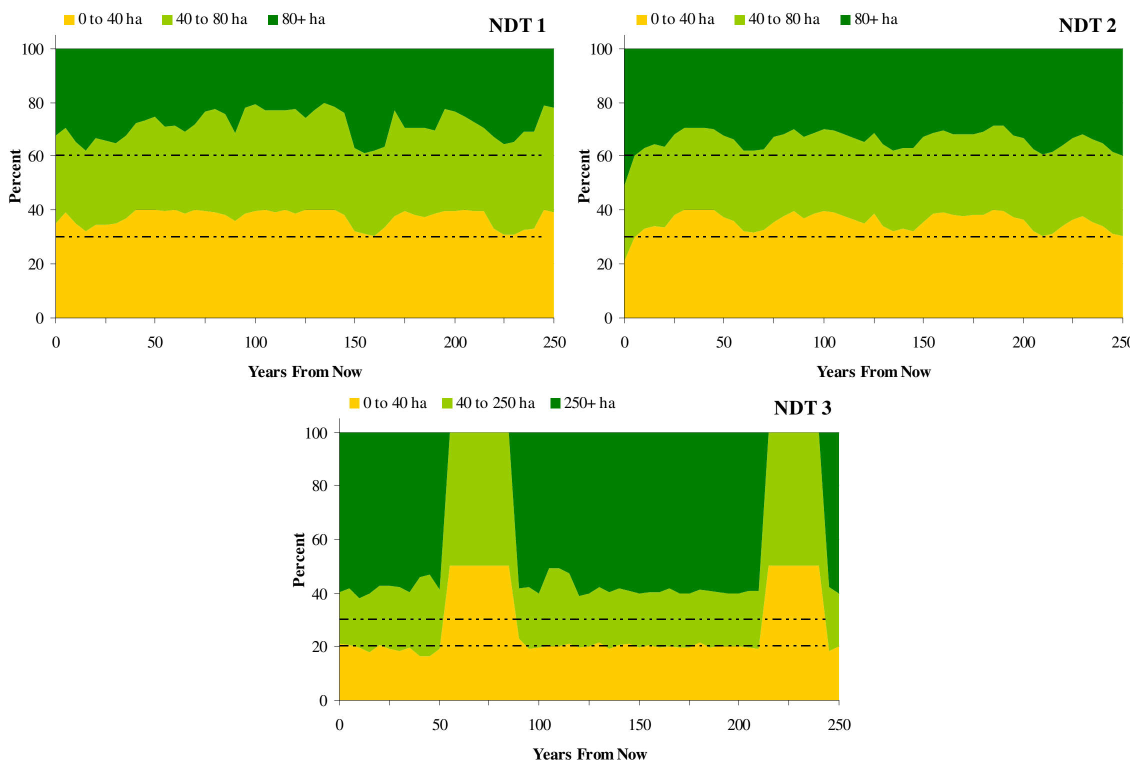

Figure 61: Patch Size Distribution ─ Water Quality Scenario (Spatial)

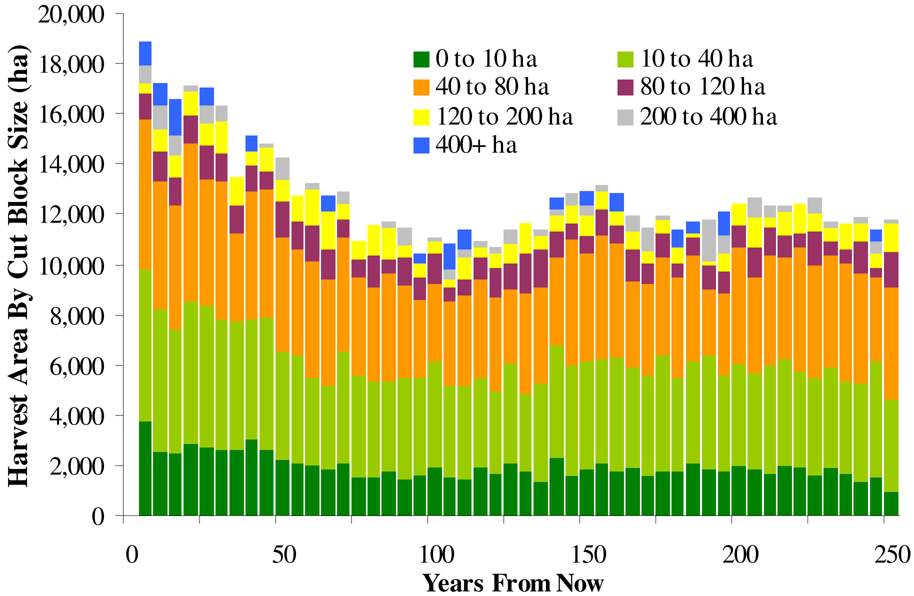

Figure 62: Cut Block Size Distribution ─ Water Quality Scenario (Spatial)

As with the base case spatial scenarios, Figure 63, Figure 64, Figure 65, Figure 66, Figure 67, and Figure 68 show the Patchworks target violations for the water quality scenario. The addition of Figure 69 shows the violations to the equivalent clearcut area targets which also appear to be focussed in the periods of time where there is a shortage of large patches in NDT 3.

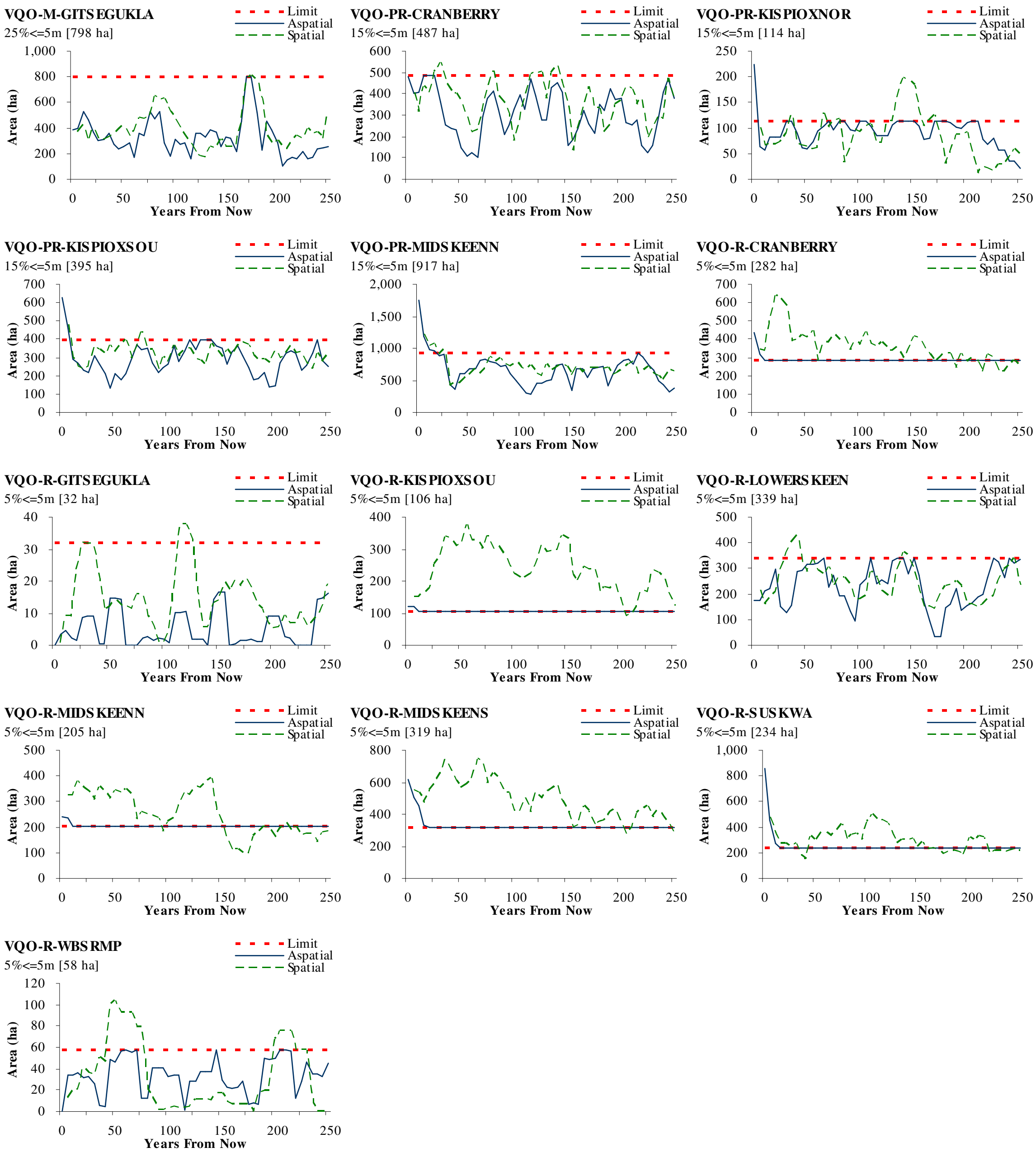

Figure 63: VQO Constraint Violations ─ Water Quality Scenario (Spatial)

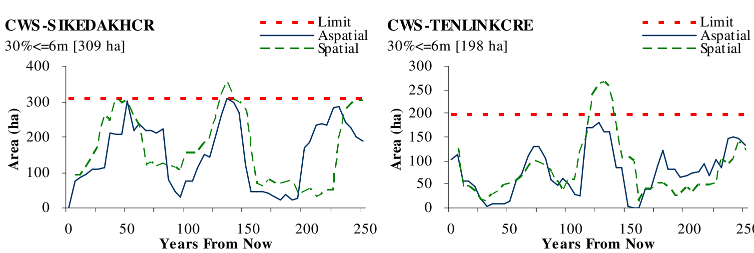

Figure 64: Community Watershed Constraint Violations ─ Water Quality Scenario (Spatial)

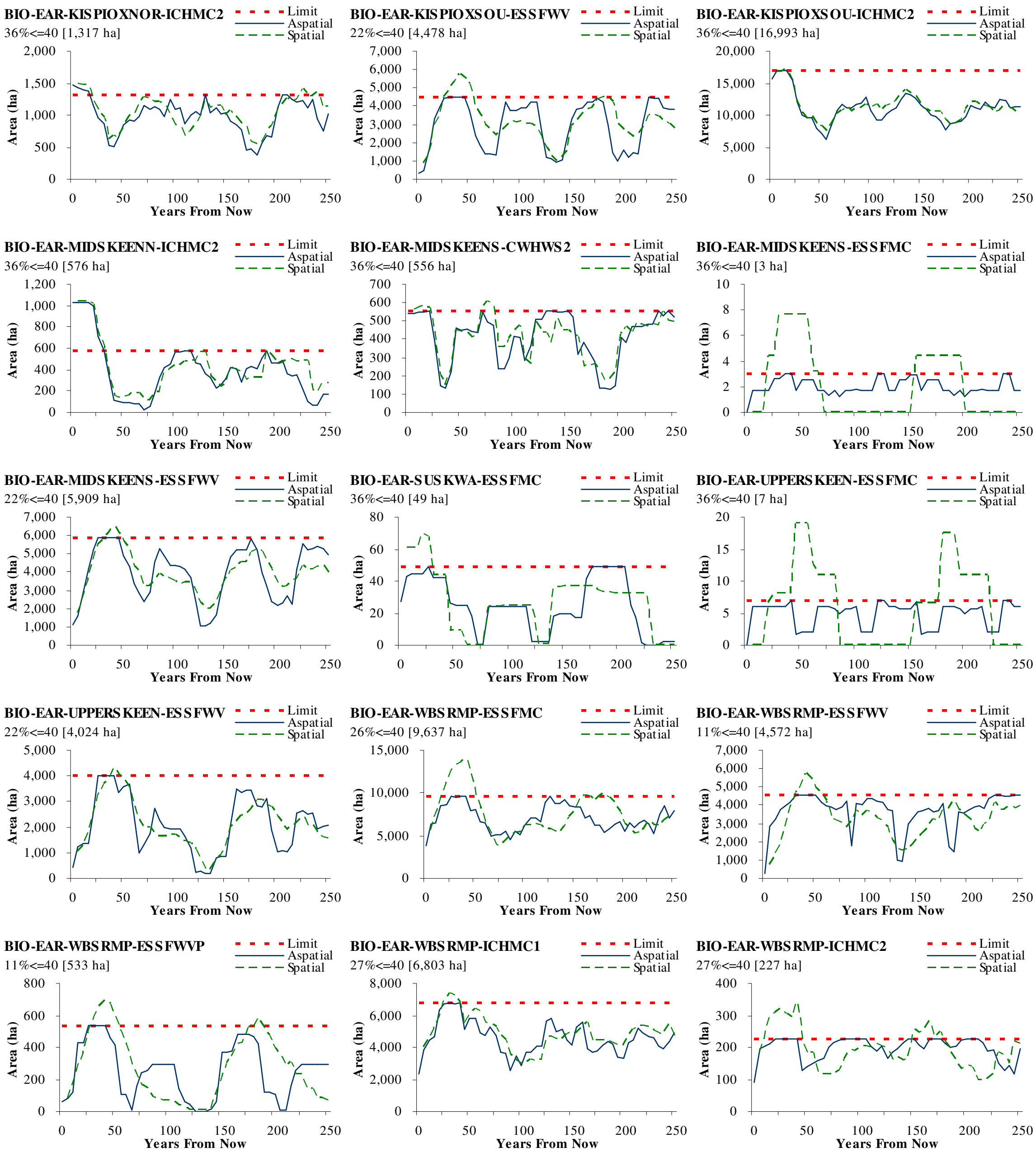

Figure 65: Biodiversity Early Constraint Violations – Water Quality Scenario (Spatial)

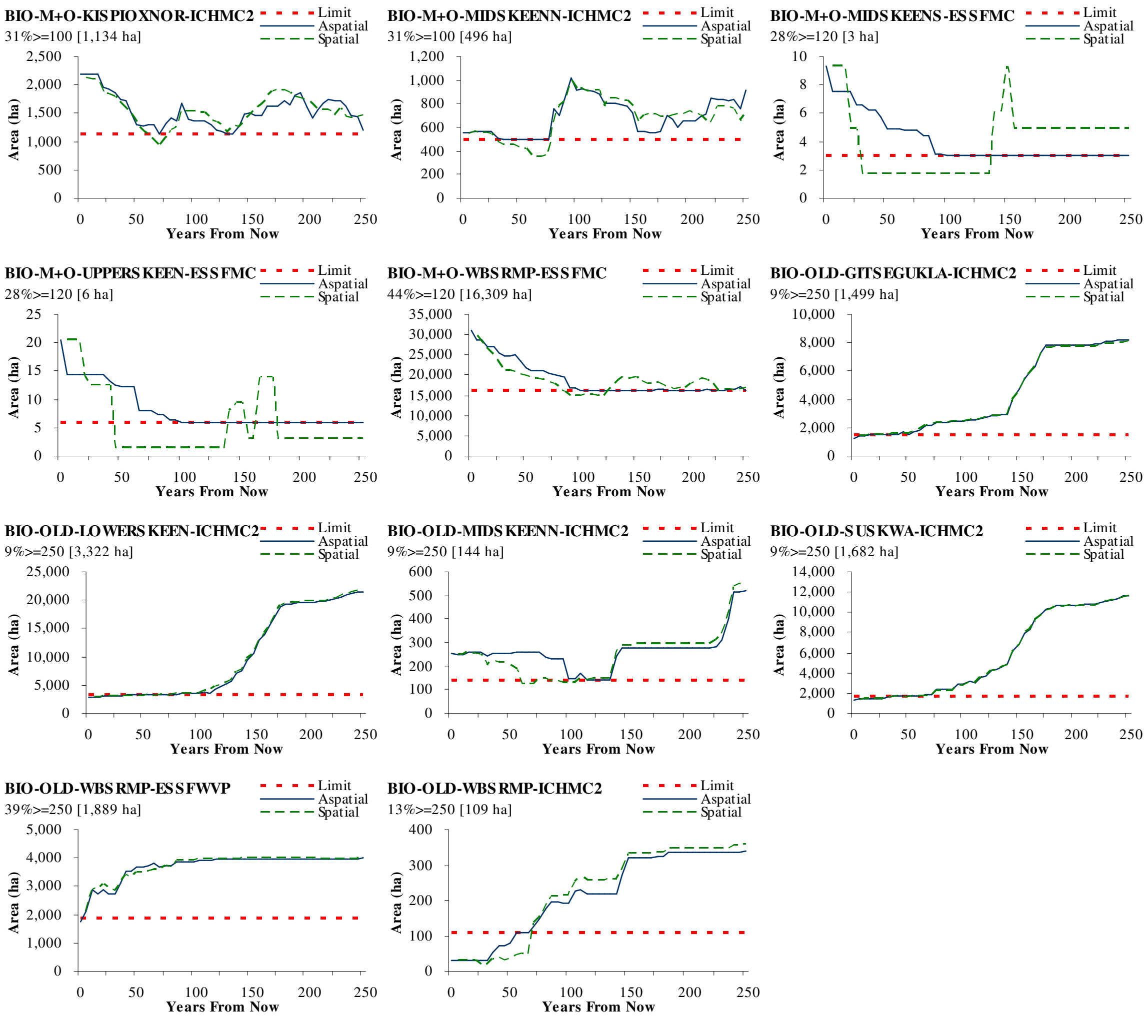

Figure 66: Biodiversity Mature+Old and Old Constraint Violations ─ Water Quality Scenario (Spatial)

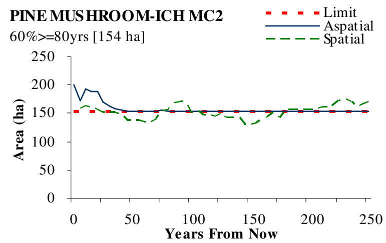

Figure 67: Pine Mushroom Habitat Constraint Violations ─ Water Quality Scenario (Spatial)

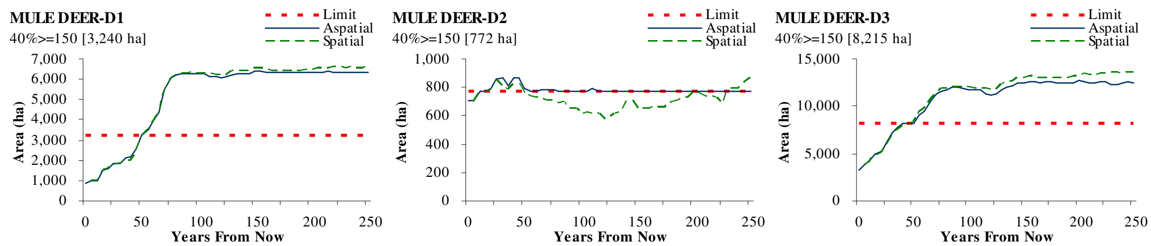

Figure 68: Mule Deer Winter Range Constraint Violations ─ Water Quality Scenario (Spatial)

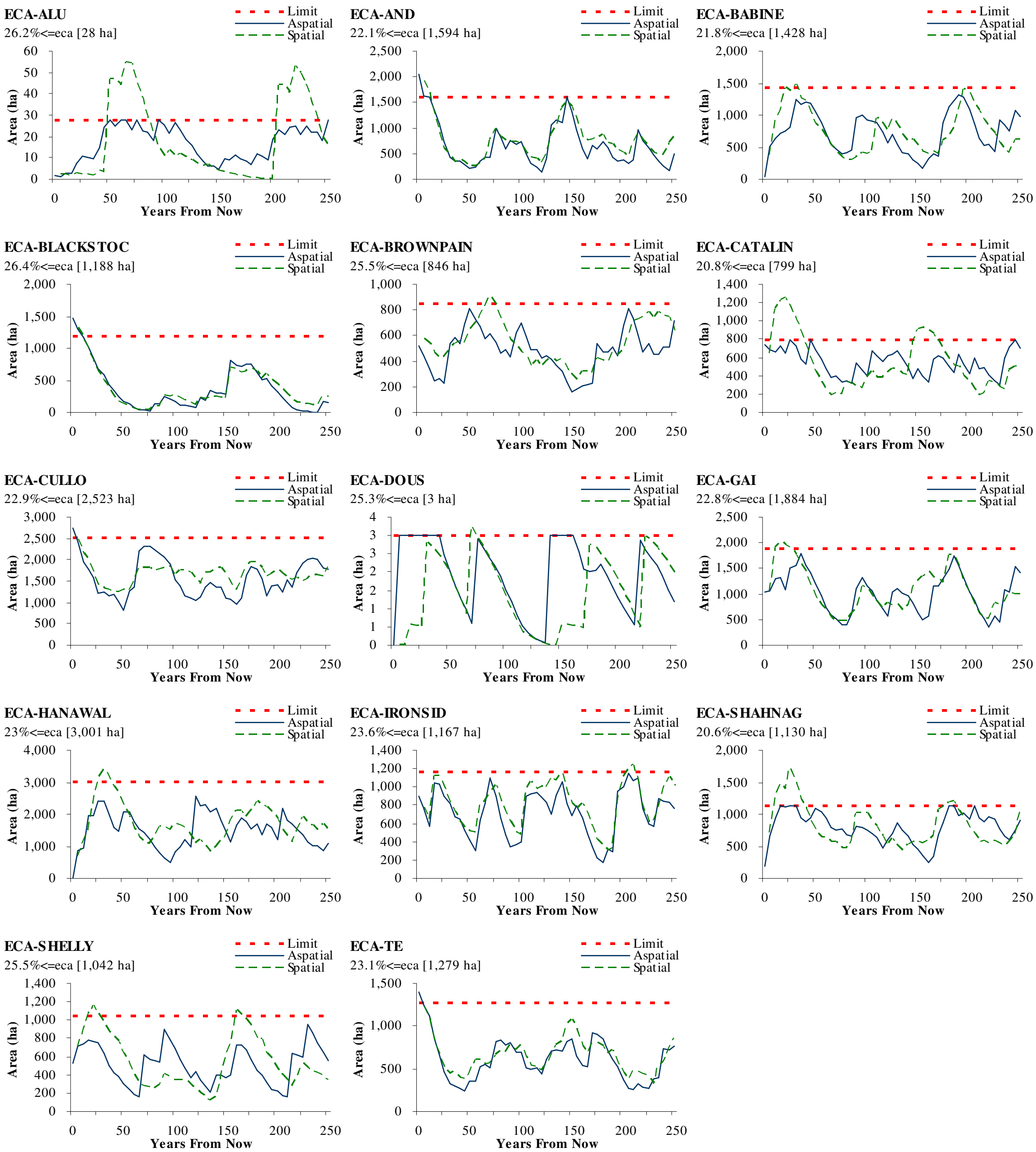

Figure 69: Equivalent Clearcut Area (ECA) Constraint Violations ─ Water Quality Scenario (Spatial)

7.3 Harvest Deferral Spatial Scenario

The harvest deferral scenario examines the impact of delaying harvest in remote areas (greater than 8 kms from an existing road) for the first 20 years. Similarly, the lack of a harvest impact in the aspaital scenario (Section 6.9) supports the fact that the resulting patch size distribution (Figure 70) and cut block size distribution graphs (Figure 71) are largely the same as the base case spatial scenario.

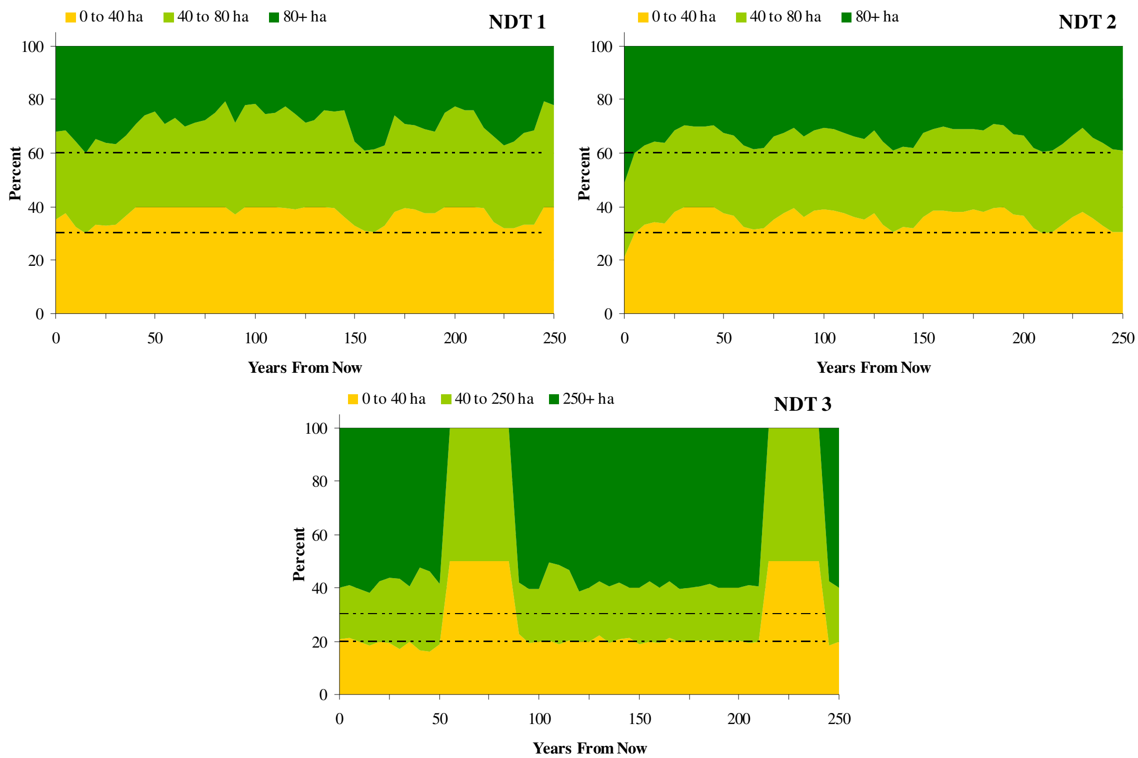

Figure 70: Patch Size Distribution — Harvest Deferral Scenario (Spatial)

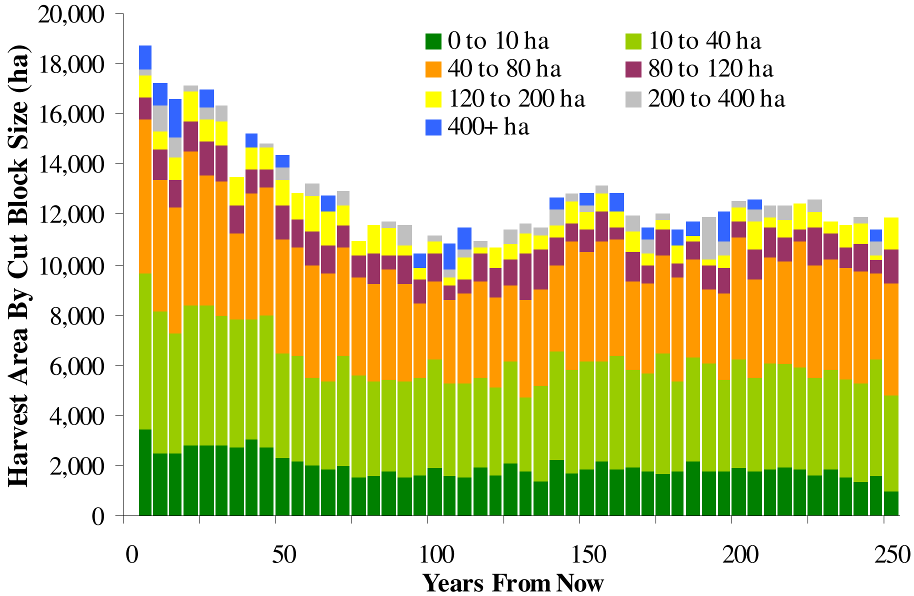

Figure 71: Cut Block Size Distribution ─ Harvest Deferral Scenario (Spatial)

As with previous scenarios, Figure 73, Figure 74, Figure 75, Figure 76 and Figure 77 show the Patchworks target violations for the water quality scenario.

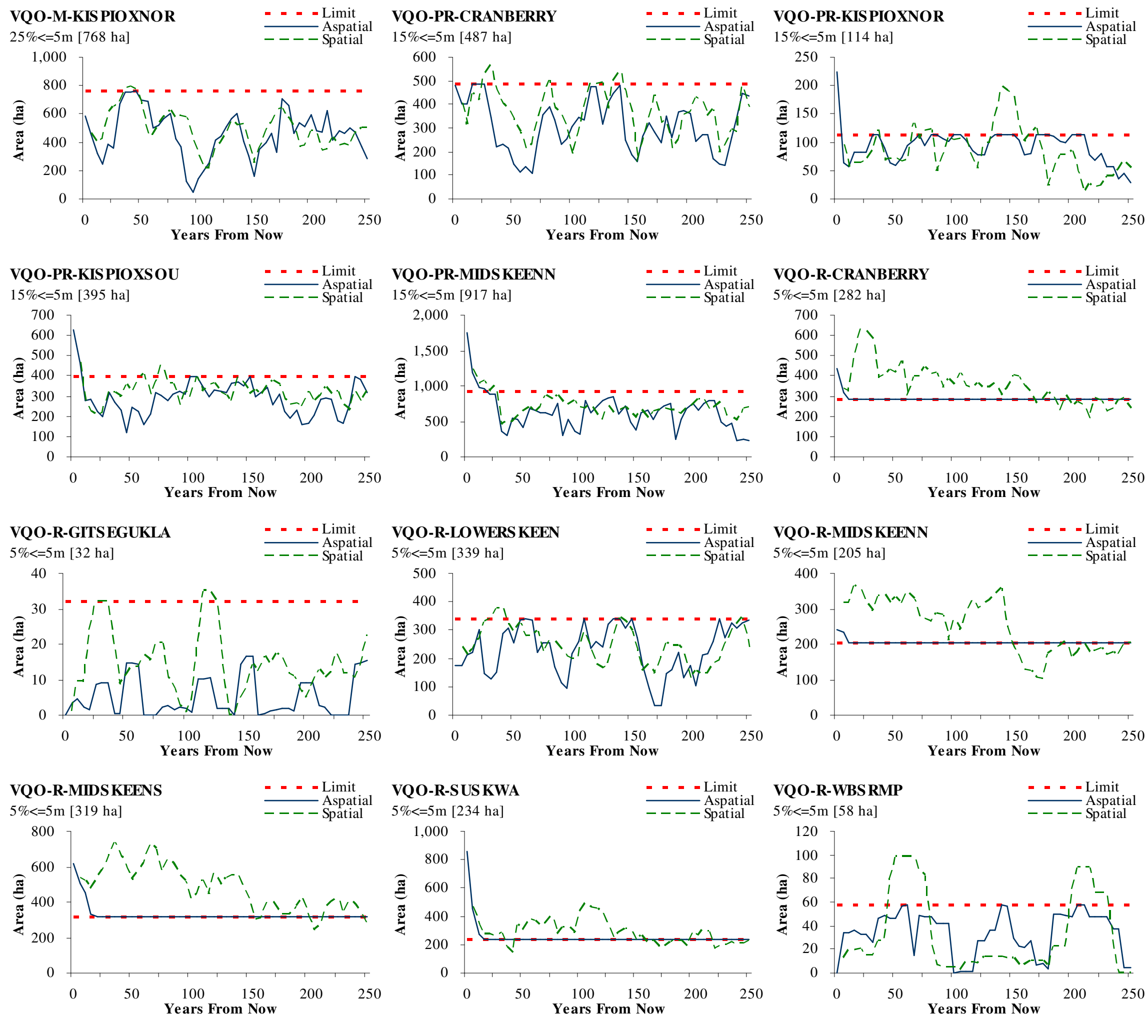

Figure 72: VQO Constraint Violations ─ Harvest Deferral Scenario (Spatial)

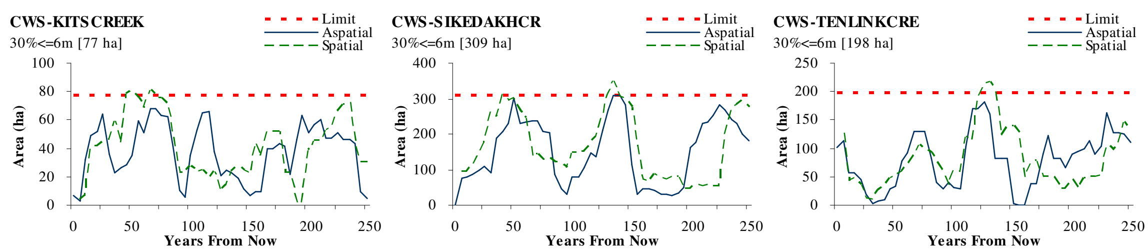

Figure 73: Community Watershed Constraint Violations ─ Harvest Deferral Scenario (Spatial)

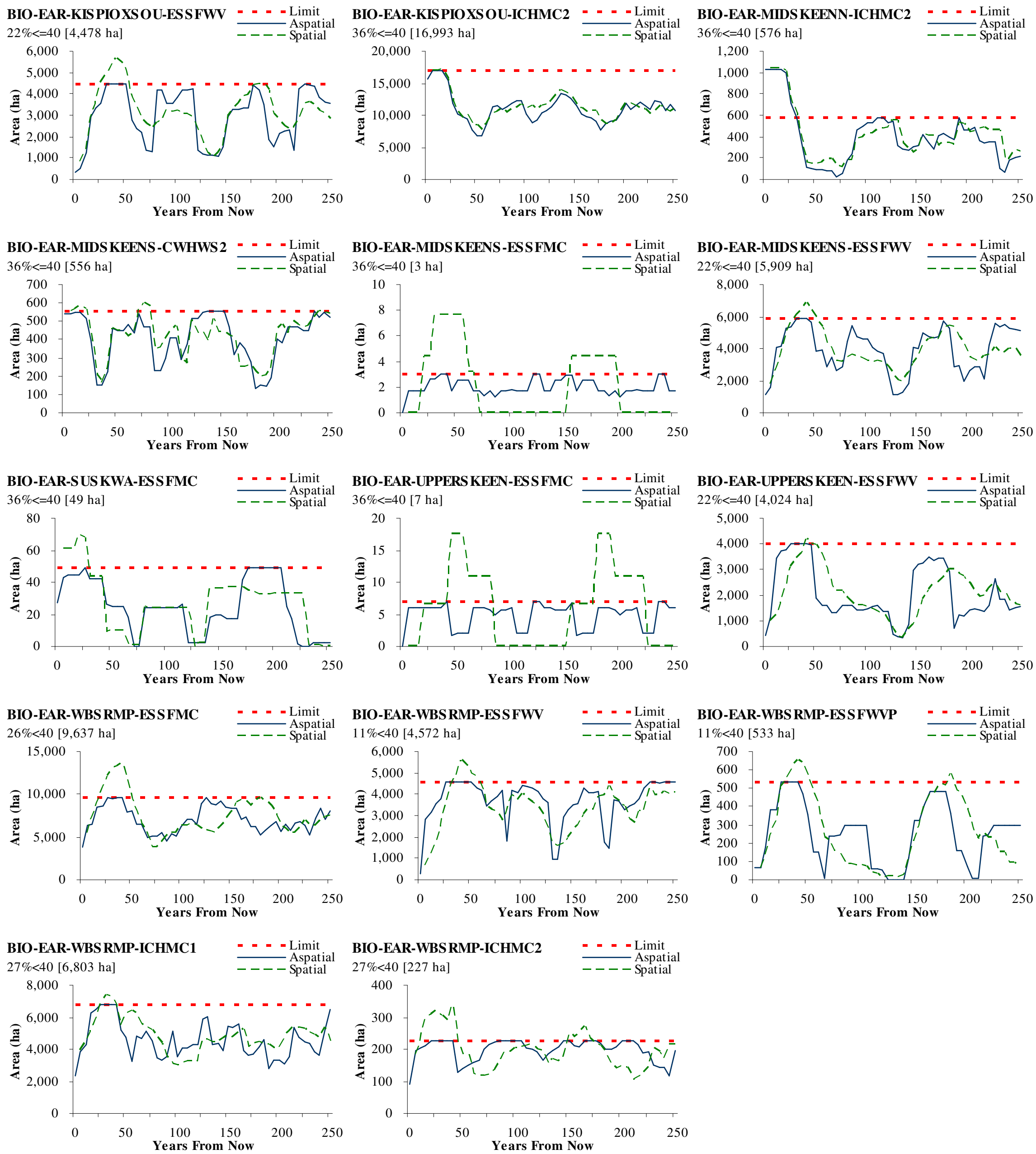

Figure 74: Biodiversity Early Constraint Violations ─ Harvest Deferral Scenario (Spatial)

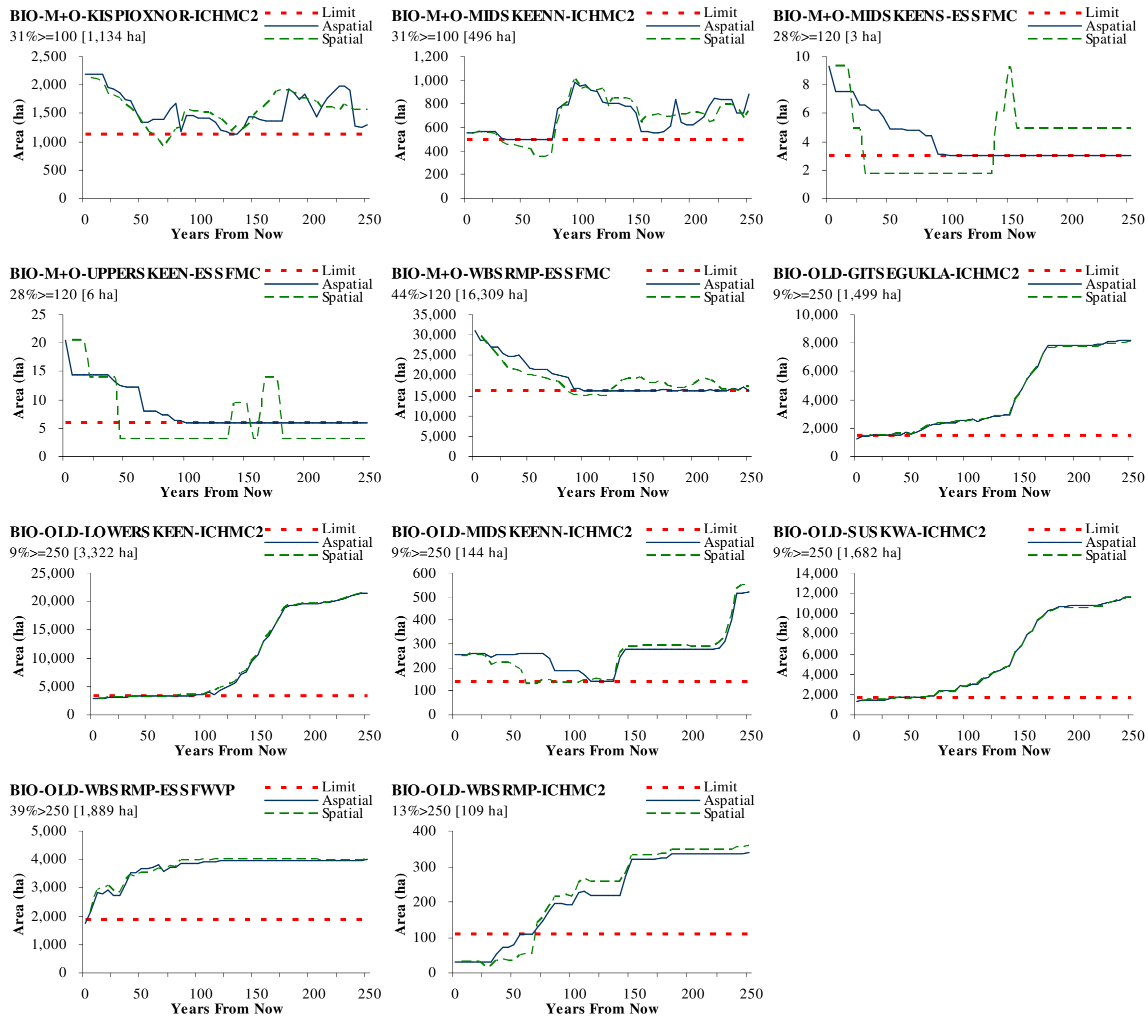

Figure 75: Biodiversity Mature+Old and Old Constraint Violations – Harvest Deferral Scenario (Spatial)

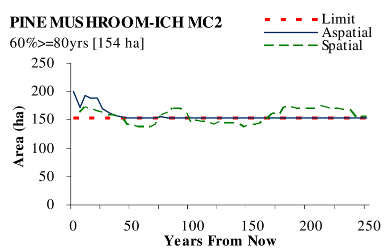

Figure 76: Pine Mushroom Habitat Constraint Violations – Harvest Deferral Scenario (Spatial)

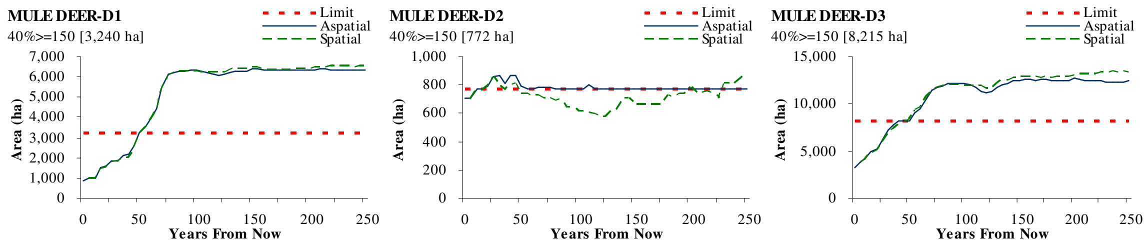

Figure 77: Mule Deer Winter Range Constraint Violations ─ Harvest Deferral Scenario (Spatial)

7.4 Harvest Deferral 2 / Non-Timber Focus Spatial Scenario

This spatial scenario examines the impacts of applying the harvest deferral 2 assumptions (See Section 6.10) as well as placing a higher penalty on violating non-timber objectives relative to harvest volume. The overall objective of this scenario is to minimize, to the extent possible, the violations in non-timber objectives that are demonstrated in the previous spatial scenarios. By increasing the penalty weight for not meeting non-timber objectives relative to penalties for not meeting harvest volume objectives the model reduce harvest volume if it causes non-timber objectives to be achieved.

As with the aspatial *Harvest Deferral 2 Scenario*, the areas selected for deferral are unavailable for harvest for the first 40 years of the planning horizon.

A penalty weight of 1,000 units for each hectare of violation is assigned to each non-timber objective. Harvest volume targets are assigned a penalty weight of one unit per cubic metre of harvest. The model seeks out to find a solution that minimizes the sum of all penalties (area or volume over/under target multiplied by the penalty weight) over the planning horizon. Based on this weighing the model will select a solution that minimizes the violation of non-timber objectives at the expense of harvest volume if necessary.

Similar to the aspatial scenario, the result of this scenario demonstrate that the harvest levels (as reported in Section 6.10) can be maintained spatially while achieving the majority of non-timber objectives, including patch size distribution. Figure 78 shows the patch size distribution for each NDT for this scenario. Patch size objectives have largely been achieved in all NDT except for NDT 3. This is a similar trend as exists in the previous spatial scenarios. Figure 79 shows the distribution of cut block sizes across the planning horizon.

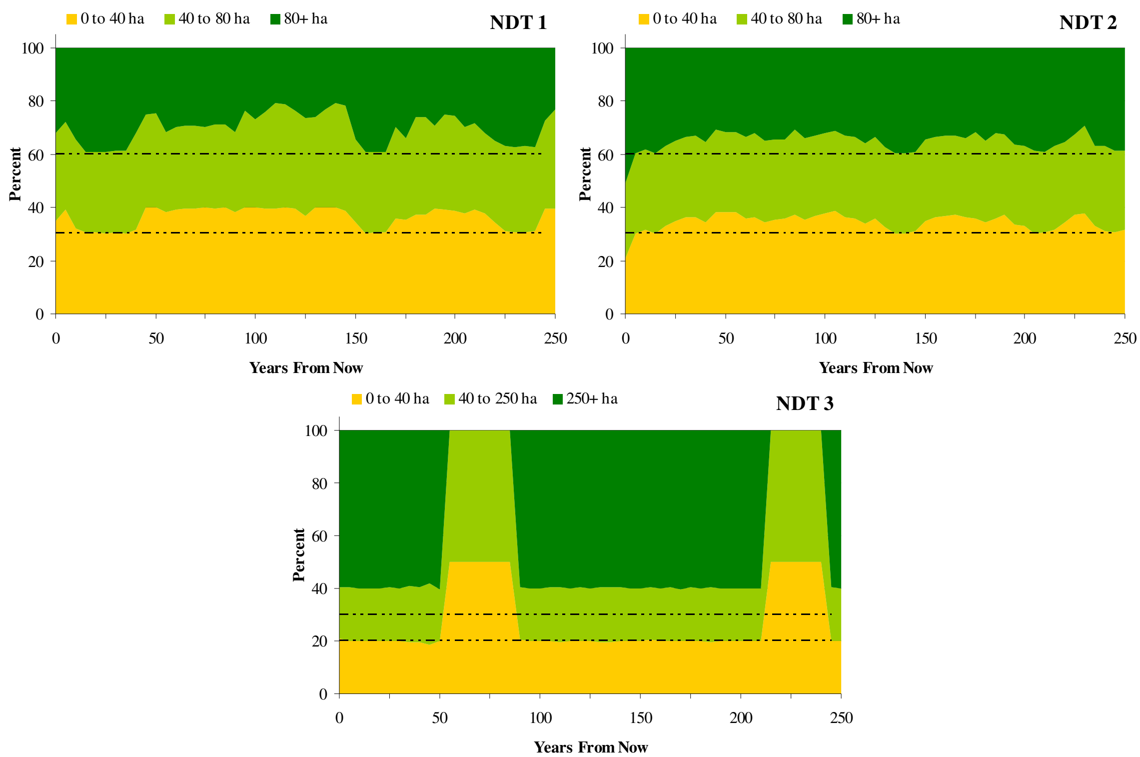

Figure 78: Patch Size Distribution ─ Harvest Deferral 2 Scenario (Spatial)

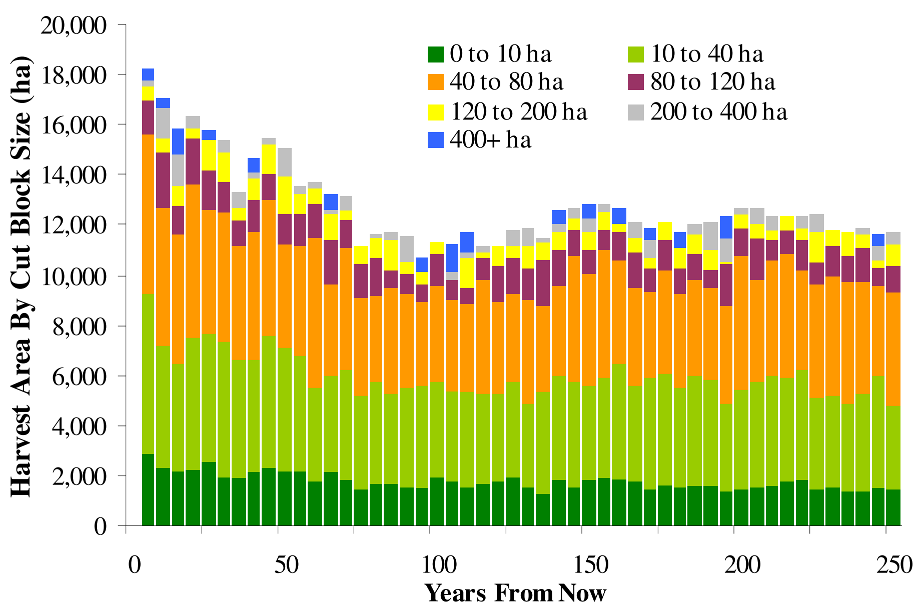

Figure 79: Cut Block Size Distribution ─ Harvest Deferral 2 Scenario (Spatial)

Increasing the penalty weights associated with not achieving non-timber objectives greatly reduces the number and degree to which many non-timber objectives are violated. The following figures (Figure 80, Figure 81, Figure 82, Figure 83 and Figure 84) show the non-timber objectives that have been violated. Many of these violations are so small that they cannot be detected in these figures. Based on how penalty weights have been applied in this scenario, these violations represent a balance between achieving patch size objectives and other disturbance limiting non-timber objectives. Objectives that limit the amount of disturbance are in conflict with objectives for the creation and maintenance of large patches where these objectives overlap. It is unlikely that any reduction in harvest volume will significantly improve the outcome otherwise the model would have chosen to reduce harvest volume to improve performance in non-timber targets.

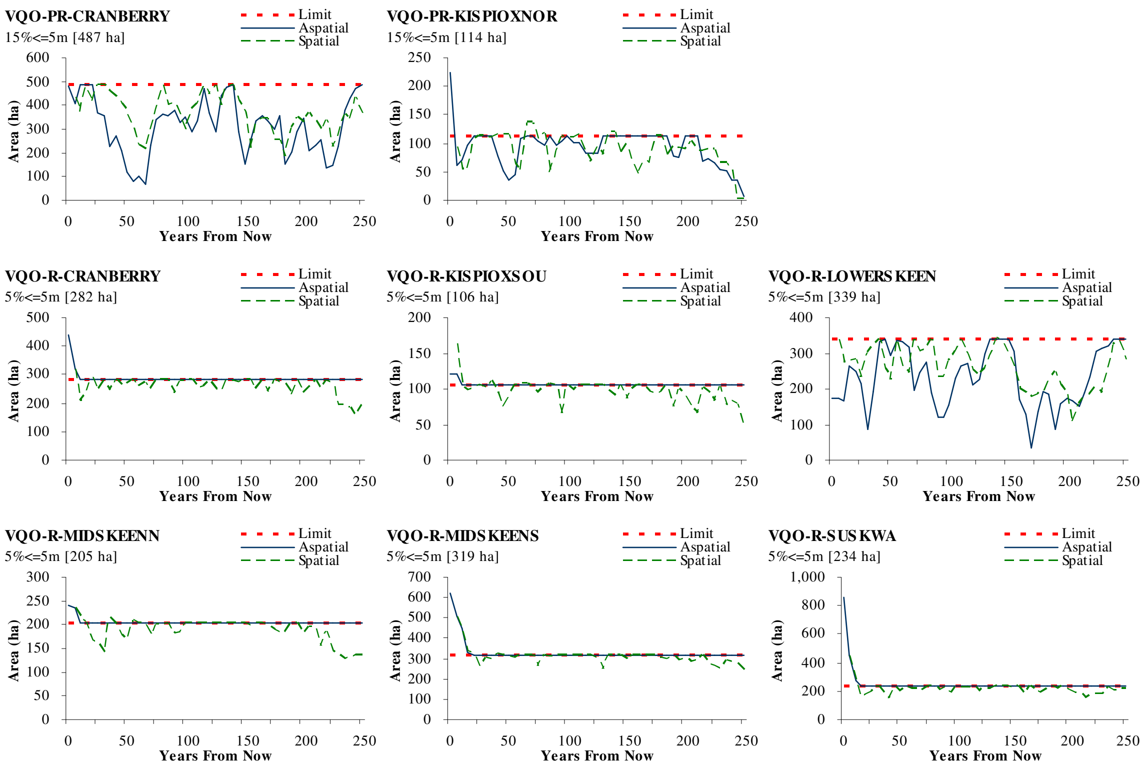

Figure 80: VQO Constraint Violations ─ Harvest Deferral 2 Scenario (Spatial)

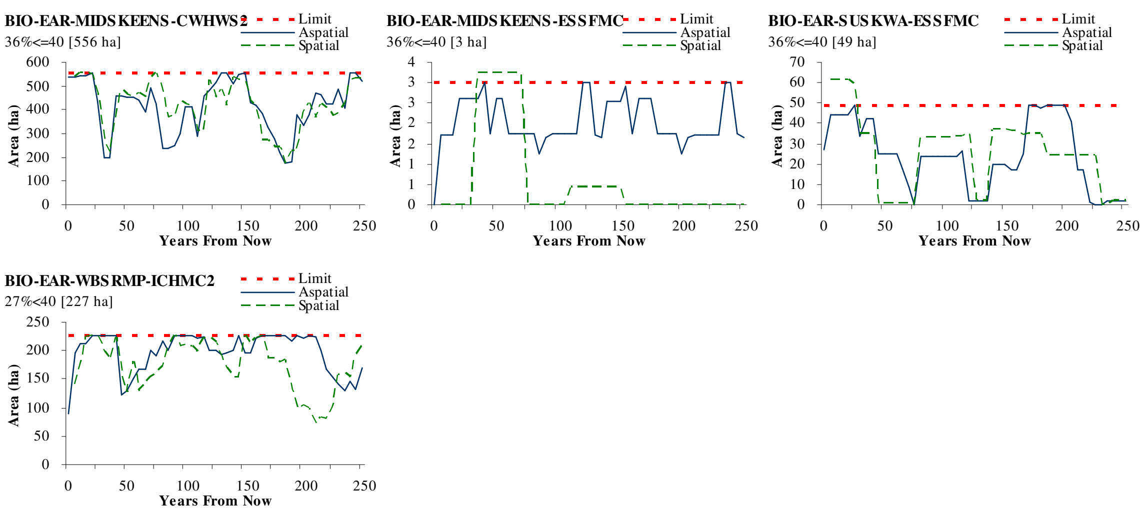

Figure 81: Biodiversity Early Constraint Violations ─ Harvest Deferral 2 Scenario (Spatial)

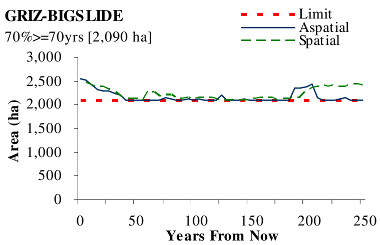

Figure 82: Grizzly Bear Habitat Constraint Violations ─ Harvest Deferral 2 Scenario (Spatial)

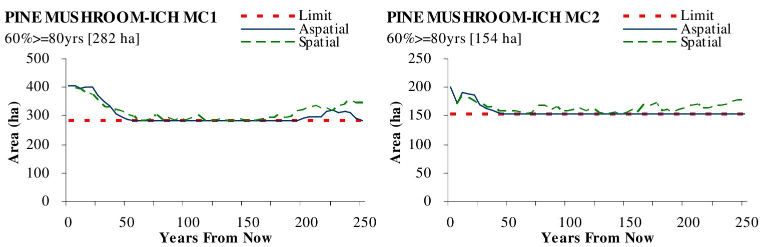

Figure 83: Pine Mushroom Habitat Constraint Violations ─ Harvest Deferral 2 Scenario (Spatial)

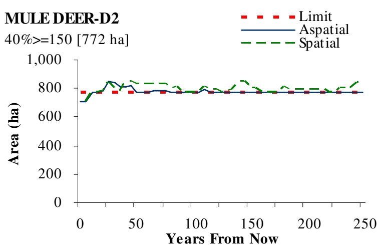

Figure 84: Mule Deer Winter Range Constraint Violations ─ Harvest Deferral 2 Scenario (Spatial)

8.0 Summary and Conclusions of the Timber Supply Analysis

In 1981, the AAC for the Kispiox TSA was 1.1 million m^3/yr. This AAC was in effect until 1996 when it was reduced slightly to 1,092,611 m^3/yr. In the 2003 timber supply review (TSR II), the AAC was reduced to 977,000 m^3/yr based primarily on significant increases in the amount of area classified as economically inoperable, as well as higher estimates for non-recoverable losses.

There have been a number of changes in available information, legislative requirements and management practices since the last timber supply review. However, two factors account for the majority of the differences in timber supply between TSR II and TSR III:

- Most significantly, the harvest methods mapping project, combined with the refinement of the upper operability line have increased the THLB by approximately 20 % over that of TSR II.
- Non-recoverable loss estimates have been reduced by 190,525 m^3/yr in the first decade and 65,850 m^3/yr for all subsequent decades. This represents a 23% increase in timber supply in the first decade and an 8% increase in subsequent decades

There are a number of other factors that contribute to the increase in available timber supply such as the removal of water quality constraints and the change in the green-up heights for visual quality objectives however, these scale of these impacts are low relative to the above two points.

Changes from TSR II that represent a downward pressure on timber supply include: an increase in areas set aside for parks and protected areas, an increase in areas under visual quality objectives, and the implementation of both the *West Babine Sustainable Resource Management Plan* and the *Kispiox LRMP Higher Level Plan Objectives for Biodiversity, Visual Quality and Wildlife.* However, the impacts of these factors are also relatively small in relation to the changes in the THLB and NRLs.

The results of this timber supply analysis suggest that the current AAC of 977,000 m^3/yr can be maintained for the next 50 years before stepping down at a rate of 10% per decade to the LTHL of 730,000 m^3/yr in 75 years. In the short-term, timber supply is supported by a significant quantity (over 80 times the current AAC) of operable growing stock on the THLB, nearly all of which is above minimum harvestable ages. This quantity of existing harvestable growing stock provides for significant flexibility in the short-term harvest forecast creating a relatively smooth transition to the LTHL, minimizing the affects of a gap in the age class distribution between 40 and 80 years old.

Another important aspect of the Kispiox TSA is the fact that over 50% of the crown forested land base is excluded from the THLB. As shown in Figure 28, much of this area is older than 250 years old and contributes to achieving many of the non-timber retention objectives in the TSA. This creates additional flexibility in the harvest schedule as very little THLB area is tied up in constraints. The age class distribution of the non-THLB portion of the land base suggests that either past natural disturbance has not had a significant impact on the age class distribution or the inventory does not accurately reflect the natural disturbance that has occurred. A sensitivity analysis that examines introducing natural disturbance into the inoperable land base shows no timber supply impact in the short-term with a 13% reduction in the long-term harvest level.

Improved managed stand site productivity estimates represent a significant potential positive impact on mid and long-term timber supply as demonstrated by the SIBEC sensitivity analyses. Even though an approved ecosystem inventory has not yet been completed for the TSA, the results of these scenarios are consistent with impacts of improved site productivity estimates on other management units in the province.

Given the uncertainty surrounding the pulp market in the Kispiox TSA, the capability of the land base to support a sustainable timber supply from stands with a significant proportion of sawlog is an important component of the timber supply in the TSA. The base case and all sensitivity analyses include a requirement to produce a steady supply of sawlog volume. The sawlog harvest level for the base case is 410,000 m^3/yr for the first 60 year, dropping slightly before reaching the long-term level of 722,000 m^3/yr in 125 years.

Sensitivity analysis examines the potential risk to timber supply posed by sources of uncertainty in the analysis. Through sensitivity analysis we have examined a number of key issues around uncertainty. These results are summarized in Table 42.

Table 42: Sensitivity Analysis Summary

Years From Now	Base Case	Max Even Flow	Max IHL	15% Stepdown	5% Stepdown	No Pulp	No Pulp / No Marginal Sawlog	Disturb. Inoperable Lands	Water Quality	Green Up Age + 5 Years	MHA @ 250 m^3/ha
5	977	769	1,392	977	977	821	420	977	977	977	977
10	977	769	1,392	977	977	821	420	977	977	977	977
15	977	769	1,252	977	977	738	408	977	977	977	977
20	977	769	1,252	977	977	738	408	977	977	977	977
25	977	769	1,125	977	964	663	408	977	977	977	977
30	977	769	1,125	977	964	663	408	977	977	977	977
35	977	769	1,011	977	915	663	408	977	977	977	977
40	977	769	1,011	977	915	663	408	977	977	977	977
45	977	769	909	977	869	613	408	878	977	977	977
50	977	769	909	977	869	613	408	878	977	977	977
55	903	769	817	977	825	550	408	789	903	899	894
60	903	769	817	977	825	550	408	789	903	899	894
65	812	769	734	852	783	494	408	709	812	808	804
70	812	769	734	852	783	494	408	709	812	808	804
75	729	769	659	723	743	443	408	637	729	726	722
80	729	769	659	723	743	443	408	637	729	726	722
85	729	769	659	723	743	443	408	637	729	726	722
90	729	769	659	723	743	443	408	637	729	726	722
95	729	769	659	723	743	443	408	637	729	726	722
100	729	769	659	722	743	443	408	637	729	726	722
105	729	769	659	723	743	443	408	637	729	726	722
110	729	769	659	723	743	443	408	637	729	726	722
115	729	769	659	723	743	443	408	637	729	726	722
120	729	769	659	723	743	443	408	637	729	726	722
125+	729	769	659	723	743	443	408	637	729	726	722

Table 42: Sensitivity Analysis Summary (continued)

Years From Now	Base Case	SIBEC - One Step Up	SIBEC - Maximum Evenflow	Harvest Deferral 1	Harvest Deferral 2					
					Harvest Deferral 2	No Pulp	No Pulp / M. Sawlog	Disturbance in Inoperable Lands		
								Full THLB	No Pulp	No Pulp / M. Sawlog
5	977	977	983	977	977	766	419	977	655	392
10	977	977	983	977	977	766	419	977	655	392
15	977	977	983	977	977	688	408	929	588	382
20	977	977	983	977	977	688	408	929	588	382
25	977	977	983	977	977	688	408	896	588	382
30	977	977	983	977	977	688	408	896	588	382
35	977	977	983	977	977	688	408	896	588	382
40	977	977	983	977	977	688	408	896	588	382
45	977	977	983	977	977	618	408	896	588	382
50	977	977	983	977	977	618	408	896	588	382
55	903	977	983	903	901	555	408	805	530	382
60	903	977	983	903	901	555	408	805	530	382
65	812	977	983	812	810	498	408	723	476	382
70	812	977	983	812	810	498	408	723	476	382
75	729	977	983	729	728	447	408	650	427	382
80	729	977	983	729	728	447	408	650	427	382
85	729	977	983	729	728	447	408	650	427	382
90	729	977	983	729	728	447	408	650	427	382
95	729	977	983	729	728	447	408	650	427	382
100	729	977	983	729	728	447	408	650	427	382
105	729	977	983	729	728	447	408	650	427	382
110	729	977	983	729	728	447	408	650	427	382
115	729	977	983	729	728	447	408	650	427	382
120	729	977	983	729	728	447	408	650	427	382
125+	729	1,056	983	729	728	447	408	650	427	382

Table 42: Sensitivity Analysis Summary (continued)

Years From Now	Base Case	Pine Mushroom Habitat	Natural Stand Volumes - 13%	Land Base + 10%	Land Base - 10%	Managed Stand Volume - 10%	VQO Option 1	VQO Option 2
5	977	977	977	977	977	977	977	977
10	977	977	977	977	977	977	977	977
15	977	977	977	977	977	977	977	977
20	977	977	977	977	977	977	977	977
25	977	977	977	977	977	977	977	977
30	977	977	977	977	977	977	977	977
35	977	977	939	977	968	977	977	977
40	977	977	939	977	968	977	977	977
45	977	977	844	977	870	916	977	977
50	977	977	844	977	870	916	977	977
55	903	903	758	977	781	823	903	909
60	903	903	758	977	781	823	903	909
65	812	812	681	915	702	739	812	817
70	812	812	681	915	702	739	812	817
75	729	729	612	822	631	664	729	734
80	729	729	612	822	631	664	729	734
85	729	729	612	822	631	664	729	734
90	729	729	612	822	631	664	729	734
95	729	729	612	822	631	664	729	734
100	729	729	612	822	631	664	729	734
105	729	729	612	822	631	664	729	734
110	729	729	612	822	631	664	729	734
115	729	729	612	822	631	664	729	734
120	729	729	612	822	631	664	729	734
125+	729	729	612	822	631	664	729	734

The results of the sensitivity analysis further demonstrate the flexibility in the short-term harvest forecast in the base case. With the exception of removing pulp and marginal sawlog stands from the THLB, and combining the harvest deferral 2 with natural disturbance, all scenarios are able to achieve the current AAC and maintain it for at least 30 years. Aside from these scenarios, reducing natural stand volumes by 13% has the most significant impact on short-term timber supply where the current AAC can only be maintained for 30 years before stepping down to the long-term level. However, it should be noted that because of the amount of available growing stock, much of the impacts from reducing natural stand volumes are realized in the long-term where the LTHL is reduced by 16%. Uncertainty associated with natural stand volumes was identified in TSR II.

Many of the sensitivity analyses have little to no impact on timber supply. In the long-term the most significant impact to timber supply come from (in decreasing order of impact): removing pulp and marginal sawlog stands from the THLB, removing pulp stands from the THLB, reducing natural stand volumes by 15%, decreasing the land base by 10%, reducing managed stand volumes by 10%, maximizing the initial harvest level, disturbing the inoperable land base, increase the maximum harvest step down to 15%, and increasing the minimum merchantable criteria to 250 m^3/ha.

Sensitivity analysis was conducted to evaluate the cumulative impact of a number of factors on timber supply. These analyses suggest that the combination of simulating natural disturbance in the inoperable land base and deferring harvest in remote areas for 40 years result in the current AAC being maintained for only 10 years compared with 50 years in the base case. Similarly, when disturbing the inoperable land base and a 40 year harvest deferral is combined with the removal of pulp and marginal sawlog from harvest, the timber supply impact is greater than the sum of the impact when each of these scenarios is examined individually. However, these results should be tempered by the possibility that the Biodiversity Guidebook mean disturbance return intervals overestimate the amount of natural disturbance that actually occurs in the Kispiox TSA.

Spatial analysis conducted for the base case, the water quality the harvest deferral, and harvest deferral 2 scenarios suggest that patch size distribution targets can be achieved in almost all periods without impacting timber supply. It is unlikely that reducing the harvest level will provide for any improvement in achieving these targets. The spatial analysis also outlines that patch targets, particularly the requirement for large patches on the land base is in conflict with many of the objectives that limit maximum disturbance levels. These objectives include VQO, community watershed, early seral biodiversity, and equivalent clearcut area.

The analysis suggests that the current AAC of 977,000 m^3/yr can be maintained for the next 50 years and is stable relative to the uncertainties explored. Key TSA issues around the economic viability of non-sawlog stands and existing unmanaged stand volume estimates present the most significant risks to the base case timber supply.

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10.0 Glossary and Acronyms

The following Glossary and list of Acronyms is based on the Glossary and Acronyms from the *Kispiox TSA Timber Supply Review Analysis Report* (MoFR, 2002). Definitions have been updated and modified where appropriate

Allowable annual cut (AAC)	The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic metres of wood per year.
Analysis unit	A grouping of types of forest — for example, by species, site productivity, silvicultural treatment, age, and or location — done to simplify analysis and generation of timber yield tables.
Base case harvest forecast	The timber supply forecast which illustrates the effect of current forest management practices on the timber supply using the best available information, and which forms the reference point for sensitivity analysis.
Biodiversity (biological diversity)	The diversity of plants, animals and other living organisms in all their forms and levels of organization, including the diversity of genes, species and ecosystems, as well as the evolutionary and functional processes that link them.
Biogeoclimatic (BEC) variant	A subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer or colder than other areas in the subzone.
Biogeoclimatic (BGC) zones	A large geographic area with broadly homogeneous climate and similar dominant tree species.
Clearcut harvesting	A harvesting method in which all trees are removed from an area of land in a single harvest. The harvested site is then regenerated to acceptable standards by appropriate means including planting and natural seeding. Note that retention of some live trees and snags for purposes of biodiversity now occurs on most clearcuts.
Coniferous	Coniferous trees have needles or scale-like leaves and are usually 'evergreen'.
Cultural heritage resource	An object, a site or the location of a traditional societal practice that is of historical, cultural or archaeological significance to the province, a community or an aboriginal people.
Cutblock	A specific area, with defined boundaries, authorized for harvest.

Cutblock adjacency	The desired spatial relationship among cutblocks. Most adjacency restrictions require that recently harvested areas must achieve a desired condition (green-up) before nearby or adjacent areas can be harvested. Specifications for the maximum allowable proportion of a forested landscape that does not meet green-up requirements are used to approximate the timber supply impacts of adjacency restrictions.
Deciduous	Deciduous trees shed their leaves annually and commonly have broad-leaves.
Employment coefficient	The number of person-years of employment supported by every 1000 cubic metres of timber harvested; for example, a coefficient of 1.0 indicates that every 1000 cubic metres harvested supports one person-year, or 500 000 cubic metres supports 500 person-years.
Employment multiplier	An estimate of the total employment supported by each direct job, for example a multiplier of 2.0 means that one direct job supports one additional indirect and induced job.
Environmentally sensitive areas (ESA)	Areas with significant non-timber values, fragile or unstable soils, impediments to establishing a new tree crop, or high risk of avalanches.
Forest cover objectives	Specify desired distributions of areas by age or size class groupings. These objectives can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover objectives (see Cutblock adjacency and Green–up).
Forest Ecosystem Network (FEN)	An area that serves to maintain or restore the natural connectivity within an area.
Forest inventory	An assessment of British Columbia's timber resources. It includes computerized maps, a database describing the location and nature of forest cover, including size, age, timber volume, and species composition, and a description of other forest values such as recreation and visual quality.
Forest Practices Code (FPC) Act	Legislation, regulations, standards and guidebooks that govern forest practices and planning, with a focus on ensuring management for all forest values.
Forest and Range Practices Act (FRPA)	Legislation and regulations that govern forest practices and planning, with a focus on ensuring management for all forest values; legislation that replaces the Forest Practices Code Act.
Free-growing	An established seedling of an acceptable commercial species that is free from growth-inhibiting brush, weed and excessive tree competition.
Green-up	The time needed after harvesting for a stand of trees to reach a desired condition (usually a specific height) — to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics — before harvesting is permitted in adjacent areas.

Growing stock	The volume estimate for all standing timber at a particular time.
Harvest forecast	The flow of potential timber harvests over time. A harvest forecast is usually a measure of the maximum timber supply that can be realized over time for a specified land base and set of management practices. It is a result of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions.
Integrated Corporate Spatial and Attribute Database (INCOSADA)	A standardized set of corporate spatial and attribute data (i.e., map and text data) with common database structures for all Forest Act, Range Act, and Vegetation Resources Inventory data.
Indirect and induced jobs	Indirect jobs are supported by direct business purchases of goods and services. Induced jobs are supported by employee purchases of goods and services; for example, at retail outlets.
Inoperable areas	Areas defined as unavailable for harvest for terrain- related or economic reasons. Characteristics used in defining inoperability include slope, topography (e.g., the presence of gullies or exposed rock), difficulty of road access, soil stability, elevation and timber quality. Operability can change over time as a function of changing harvesting technology and economics.
Integrated resource management (IRM)	The identification and consideration of all resource values, including social, economic and environmental needs, in resource planning and decision-making.
Land and Resource Management Plan (LRMP)	A strategic, multi-agency, integrated resource plan at the sub-regional level. It is based on the principles of enhanced public involvement, consideration of all resource values, consensus-based decision making, and resource sustainability.
Landscape-level biodiversity	The Landscape Unit Planning Guide provides objectives for maintaining biodiversity at both the landscape level and the stand level. At the landscape level, guidelines are provided for the maintenance of seral stage distribution, patch size distribution and landscape connectivity.
Landscape unit (LU)	A planning area based on topographic or geographic features, that is appropriately sized (up to 100 000 hectares), and designed for application of landscape-level biodiversity objectives
Long-term harvest level (LTHL)	A harvest level that can be maintained indefinitely given a particular forest management regime (which defines the timber harvesting land base, and objectives and guidelines for non-timber values) and estimates of timber growth and yield.

Management assumptions
Approximations of management objectives, priorities, constraints and other conditions needed to represent forest management actions in a forest planning model. These include, for example, the criteria for determining the timber harvesting land base, the specification of minimum harvestable ages, utilization levels, integrated resource guidelines and silviculture and pest management programs.

Mean annual increment (MAI)
Stand volume divided by stand age. The age at which average stand growth, or MAI, reaches its maximum is called the culmination age (CMAI). Harvesting all stands at this age results in a maximum average harvest over the long term.

Model
An abstraction and simplification of reality constructed to help understand an actual system or problem. Forest managers and planners have made extensive use of models, such as maps, classification systems and yield projections, to help direct management activities.

Natural disturbance type (NDT)
An area that is characterized by a natural disturbance regime, such as wildfires, which affects the natural distribution of seral stages. For example areas subject to less frequent stand-initiating disturbances usually have more older forests.

Non recoverable losses
Timber volumes destroyed or damaged by natural causes that are not recovered through salvge operations. Losses result from insects, diseases, wind, fire, livestock, snow and ice.

Not satisfactorily restocked (NSR) areas
An area not covered by a sufficient number of well-spaced trees of desirable species. Stocking standards are set by the B.C. Forest Service. Areas harvested prior to October 1987 and not yet sufficiently stocked according to standards are classified as backlog NSR. Areas harvested or otherwise disturbed since October 1987 are classified as current NSR.

Old seral
Old seral refers to forests with appropriate old forest characteristics. Ages vary depending on forest type and biogeoclimatic variant.

Operability
Classification of an area considered available for timber harvesting. Operability is determined using the terrain characteristics of the area as well as the quality and quantity of timber on the area.

Patchworks
A spatially explicit forest-estate model developed by Spatial Planning Systems (www.spatial.ca) that allows for the modelling of patch size objectives and the analysis of trade-offs between multiple management objectives.

Partial retention VQO
Alterations may be visible but not conspicuous. Up to 15% of the area can be visibly altered by harvesting activity (see Visual quality objective).

Person-year(s)
One person working the equivalent of one full year, defined as at least 180 days of work. Someone working full-time for 90 days accounts for 0.5 person-years.

Protected area	A designation for areas of land and water set aside to protect natural heritage, cultural heritage or recreational values (may include national park, provincial park, or ecological reserve designations).
Pruning	The manual removal of the lower branches of crop trees to a predetermined height to produce clear, knot-free wood.
Regeneration delay	The period of time between harvesting and the date at which an area is occupied by a specified minimum number of acceptable well-spaced trees.
Retention VQO	Alterations are not easy to see. Up to 5% of the visible landscape can be altered by harvesting activity (see Visual quality objective).
Riparian area	Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes.
Riparian habitat	The stream bank and flood plain area adjacent to streams or water bodies.
Scenic area	Any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by a district manager.
Sensitivity analysis	A process used to examine how uncertainties about data and management practices could affect timber supply. Inputs to an analysis are changed, and the results are compared to a baseline or base case.
Seral stages	Sequential stages in the development of plant communities that successively occupy a site and replace each other over time.
Site index	A measure of site productivity. The indices are reported as the average height, in metres, that the tallest trees in a stand are expected to achieve at 50 years (age is measured at 1.3 metres above the ground). Site index curves have been developed for British Columbia's major commercial tree species.
Stand-level biodiversity	A stand is a relatively localized and homogeneous land unit that can be managed using a single set of treatments. In stands, objectives for biodiversity are met by maintaining specified stand structure (wildlife trees or patches), vegetation species composition and coarse woody debris levels.
Stocking	The proportion of an area occupied by trees, measured by the degree to which the crowns of adjacent trees touch, and the number of trees per hectare.
Table Interpolation Program for Stand Yields (TIPSY)	A B.C. Forest Service computer program used to generate yield projections for managed stands based on interpolating from yield tables of a model (TASS) that simulates the growth of individual trees based on internal growth processes, crown competition, environmental factors and silvicultural practices.

Timber harvesting land base (THLB)	Crown forest land within the timber supply area where timber harvesting is considered both acceptable and economically feasible, given objectives for all relevant forest values, existing timber quality, market values and applicable technology.
Timber supply	The amount of timber that is forecast to be available for harvesting over a specified time period, under a particular management regime.
Timber supply area (TSA)	An integrated resource management unit established in accordance with Section 7 of the Forest Act.
Unsalvaged losses	The volume of timber killed or damaged annually by natural causes (e.g., fire, wind, insects and disease) that is not harvested.
Variable Density Yield Prediction model (VDYP)	An empirical yield prediction system supported by the B.C. Forest Service, designed to predict average yields and provide forest inventory updates over large areas (i.e., Timber Supply Areas). It is intended for use in unmanaged natural stands of pure or mixed composition
Vegetation Resources Inventory (VRI)	A photo-based, two-phased vegetation inventory program consisting of photo interpretation, and ground sampling to adjust the photo interpreted data.
Visual Sensitivity Class (VSC)	A component of the Visual Landscape Inventory that rates the sensitivity of the landscape based on biophysical characteristics and viewing and viewer related factors.
Visual quality objective (VQO)	Defines a level of acceptable landscape alteration resulting from timber harvesting and other activities. A number of visual quality classes have been defined on the basis of the maximum amount of alteration permitted.
Volume estimates (yield projections)	Estimates of yields from forest stands over time. Yield projections can be developed for stand volume, stand diameter or specific products, and for empirical (average stocking), normal (optimal stocking) or managed stands.
Watershed	An area drained by a stream or river. A large watershed may contain several smaller watersheds.
Wildlife tree	A standing live or dead tree with special characteristics that provide valuable habitat for conservation or enhancement of wildlife.
Woodlot licence	An agreement entered into under the Forest Act. It allows for small-scale forestry to be practised in a described area (crown and private) on a sustained yield basis.
Woodstock	A pseudo-spatial forest estate model developed by Remsoft (www.remsoft.ca). Woodstock utilizes either simulation or optimization to develop harvest schedules that account for multiple overlapping objectives.

Appendix I - Socio-Economic Analysis

Appendix II - Data Package

Appendix III - Summary of Public and First Nations Comment