



Forestry Plan

for the
Arrow Innovative Forestry Practices Agreements

Prepared by the:
Arrow Forest Licensee Group

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Executive Summary

The Arrow Forest Licensee Group (AFLG) was formed in September 1997 to jointly implement the five Innovative Forestry Practices Agreements within the Arrow Timber Supply Area (TSA). The AFLG submitted an uplift request in 2006 based on the activities of the IFPA, and were granted an uplift in January 2008.

The Arrow Innovative Forestry Practices Agreements (IFPA) expires on August 31, 2011. All members of the AFLG have requested the Minister of Forests, Lands and Natural Resource Operations for an extension to their IFPA to December 31, 2015. If the IFPAs are extended, the IFPA holders may update their Forestry Plan and apply to the regional manager for an extension of all or part of their Allowable Annual Cut uplift, to the expiry date of December 31, 2015. This Forestry Plan is intended to support an application for extension of the Arrow uplift.

The Arrow IFPAs operate under a Forestry Plan approved by the Regional Executive Director of the Southern Interior Region. The requirements for the Forestry Plan are identified in the Forest Act Section 59.1, in the IFPA agreements, and in the conditions of the Regional Manager's Allowable Annual Cut Increase Rationale. The Forestry Plan documents the proposed innovative forestry practices and a summary of completed and ongoing projects. Commitments made under the Forestry Plan also include providing meaningful opportunities for First Nations.

The original Arrow IFPA Forestry Plan was approved in 1999. It has been extended several times; the most recent version was written in 2006 and approved in 2007. The Forestry Plan describes the management area, the innovative forestry practices and how they will be carried out, specifies how the practices will improve productivity of the resources, and, if applicable, how the practices support an uplift. As a result of scarce funding for non operational, innovative works, no significant new IFPA projects have been carried out since the last plan, and none are planned for the next five years. This 2011 plan is an amended version of the last approved plan, with updated text to address key parameters/inputs related to the IFPA, as identified by Ministry staff and in the Arrow IFPA increase rationale, including: site productivity; Mountain Pine Beetle; Caribou; fires; OGMAs; site productivity estimates; wildlife tree patches; and the Twenty Year Plan for the Arrow TSA.

Many of the early IFPA projects were not expected to contribute directly to AAC increases but were to address values and improved, sustainable forest management. Some of the Arrow IFPA innovative practices were considered during the Timber Supply Review 3 analysis. Those approved by the Chief Forester for use in TSR3 included new ecological mapping, improved site productivity estimates, genetic gain estimates, and a new VRI Phase I Inventory. Projects completed after TSR3 which were considered during the 2006 uplift request include the VRI Phase 2 plot establishment and inventory adjustment, plus updated OGMA boundary analyses and Twenty Year Spatial Plan. The VRI Phase 2 inventory adjustment showed that mature timber volumes were 16% higher than the current inventory and was the key element in the Regional Manager's decision to grant an uplift. The assumptions used in the 2004 timber supply analysis which supported the uplift request are still current. Both the innovative practices used in TSR3 and in the uplift rationale are still being applied in the Arrow TSA.

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Glossary of Acronyms

AAC	Allowable Annual Cut
ACE	Allowable Cut Effect
AFLG	Arrow Forest License Group
AU	Analysis Unit
AT	Alpine Tundra Biogeoclimatic Zone
BCTS	British Columbia Timber Sales
BEC	Biogeoclimatic Ecosystem Classification
BG	Bunchgrass Biogeoclimatic Zone
BGC	Biogeoclimatic
CASH6	Critical Analysis by Simulation of Harvesting
CCFM	Canadian Council of Forest Ministers
CWD	Coarse Woody Debris
DSH	Diameter at Stump Height
ECA	Equivalent Clearcut Area
ESA	Environmentally Sensitive Area
ESSF	Engelmann Spruce-Subalpine Fir Biogeoclimatic zone
FIA	Forest Investment Account
FFT	Forest for Tomorrow (a program of the MFLNRO)
FPC	Forest Practices Code
FRBC	Forest Renewal British Columbia
FREP	Forest and Range Evaluation Program
FRPA	Forest and Range Practices Act of British Columbia
FSP	Forest Stewardship Plan
FSSIM	Forest Service Simulation Model
ICH	Interior Cedar-Hemlock Biogeoclimatic Zone
IDF	Interior Douglas-fir Biogeoclimatic Zone
IFPA	Innovative Forest Practices Agreement
IMS	Information Management System
IWMS	Identified Wildlife Management Strategy
KBLUP-IS	Kootenay Boundary Land Use Plan Implementation Strategy
KBHLPO	Kootenay Boundary Higher Level Plan Order
LRMP	Land and Resource Management Plan
LU	Landscape Unit
MOE	Ministry of Environment
MOF	Ministry of Forests
MFLNRO	Ministry of Forests, Lands, and Natural Resource Operations
MPB	Mountain Pine Beetle (<i>Dendroctonus ponderosae</i> Hopk.)
MS	Montane Spruce Biogeoclimatic Zone
MSRM	Ministry of Sustainable Resource Management
MSYT	Managed Stand Yield Table
NRFL	Non-renewable Forest License
NSR	Not Satisfactorily Restocked
NSYT	Natural Stand Yield Tables
NVAF	Net Volume Adjustment Factor
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Area
PEM	Predictive Ecosystem Map

PFLB	Productive Forest Landbase
PFT	Problem Forest Type
PHR	Post Harvest Regenerated
PP	Ponderosa Pine Biogeoclimatic Zone
PSI	Potential Site Index
RIC	Resource Inventory Committee
SDM	Statutory Decision Maker
SI	Site Index
SIA	Site Index Adjustment
SIBEC	Site Index Biogeoclimatic Ecosystem Classification
SFMP	Sustainable Forest Management Plan
SIBEC	Site Index Biogeoclimatic Ecosystem Classification
TEM	Terrestrial Ecosystem Map
TFL	Tree Farm License
THLB	Timber Harvesting Landbase
TIPSY	Table Interpolation Program for Stand Yield Information
TSA	Timber Supply Area
TSR	Timber Supply Review
VDYP	Variable Density Yield Prediction
VRI	Vegetation Resource Inventory
WHA	Wildlife Habitat Area
WTP	Wildlife Tree Patch

Glossary of Terms

Allowable Annual Cut (AAC)	The rate of timber harvest permitted each year from specified area of land, usually expressed as cubic metres of wood per year.
Analysis Unit (AU)	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.
Biodiversity	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.
Cutblock Adjacency	The desired spatial relationship among cutblocks as specified in integrated resource management guidelines. This can be approximated by specifying the maximum allowable proportion of a forested landscape that does not meet green-up requirements.
Employment Coefficient	The number of person-years of employment supported by every 1,000 cubic metres of timber harvested; for example, a coefficient of 1.0 indicates that every 1,000 cubic metres harvested supports one person-year, or 500,000 cubic metres supports 500 person-years.
Environmentally Sensitive Area	Areas with significant non-timber values or fragile or unstable soils, or where there are impediments to establishing a new tree crop, or areas where timber harvesting may cause avalanches.
Green-up	The time needed after harvesting for a stand of trees to reach a desired condition (usually specified by height) – to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics – before harvesting is permitted in adjacent areas.
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.
IFPA	An Innovative Forest Practices Agreement is a Provincial government initiative designed to test and pilot alternative and new approaches to forest resource management.

Indirect 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.
Landscape Unit (LU)	A planning area based on topographic or geographic features, that is appropriately sized (up to 100,000 ha), and designed for application of landscape-level biodiversity objectives.
Long-term Harvest Level	A harvest level that can be maintained indefinitely given a particular forest management regime (which defines the timber harvesting land base and includes objectives and guidelines for non-timber values) and estimates of timber growth & yield.
Not Satisfactorily Restocked (NSR)	An area not covered by a sufficient number of tree stems of desirable species. Stocking standards are set by the B.C. Forest Service. If the expected regeneration delay (the period of time between harvesting and the date by which an area is occupied by a specified minimum number of acceptable well-spaced trees) has not elapsed, the land is defined as current NSR. If the expected delay has elapsed, the land is classified as backlog NSR.
Old Growth Management Area	Areas which contain, or are managed to replace, specific structural old-growth attributes which are mapped out and treated as special management areas.
Operational Adjustment Factor	A factor that is applied to timber yields generated from computer models to account for losses of timber volumes as a result of pests, disease, brush, competition and other factors.
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.
Predictive Ecosystem Map (PEM)	PEM is a method of predicting ecosystem occurrence on the landscape using inventory information, field sampling, and expert knowledge.
Productive Forest Landbase (PFLB)	Forest land that is capable of producing a merchantable stand within a defined period of time.
Regeneration Delay	The period of time between harvesting and the date by which an area is occupied by a specified minimum number of acceptable well-spaced trees.

Selection Management	A silvicultural system used to maintain or create areas containing a wide range of trees ages or sizes. The time interval between harvests in such areas is fairly short (usually less than 30 years), and during these harvests either single scattered trees or small groups of trees are removed from across the entire area.
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.
Site Index (SI)	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 measured at 1.3m above the ground).
Terrestrial Ecosystem Mapping	Terrestrial Ecosystem Mapping is the stratification of a landscape into map units, according to a combination of ecological features, primarily climate, physiography, surficial material, bedrock geology, soil, and vegetation.
Timber Harvesting Landbase (THLB)	Crown forest land within the timber supply area that is currently considered feasible and economical for timber harvesting.
Timber Supply Area (TSA)	An integrated resource management unit established in accordance with Section 7 of the Forest Act. The TSA is administered by the Arrow Boundary District Office.
Timber Supply Review (TSR)	This is the process by which the Chief Forester, after considering all ecological, social, and economic factors, determines the AAC within a TSA.
Vegetation Resource Inventory (VRI)	Vegetation Resource Inventory is a process for assessing the quantity and quality of timber and other vegetation resources on a given landbase.

1.0 Introduction

Innovative Forestry Practices Agreements (IFPAs) provide an opportunity for industry to practice innovative forest management in return for corresponding gains in Allowable Annual Cut (AAC). On September 1st, 1998, IFPAs were awarded by the Minister of Forests to five forest licensees in the Arrow Timber Supply Area (TSA).

This Forestry Plan represents the combined strategy of the five licensees who hold IFPAs in the Arrow TSA. In this document the five individual IFPA agreements are referred to collectively as “the IFPA”. The licensees are known as the Arrow Forest Licence Group (AFLG) and consist of:

- Atco Wood Products Ltd.
– Fruitvale
- Salmon Arm Stella-Jones Canada Inc. –
- Kalesnikoff Lumber Ltd.
– Thrums
- Springer Creek Forest Products
– Slocan
- Ltd. Tolko Industries Ltd.
– Lumby

This document is a joint plan submitted by all of the above noted licensees. The content, format and underlying work to support the Forestry Plan are described in the Forest Act, the IFPA Regulation and the IFP agreements. Appendix 1 contains section 59.1 of the Forest Act, which states the required content of the Forestry Plan.

This introduction is Section 1.0 of the Forestry Plan. Section 2.0 describes the Arrow TSA, where the IFPA practices apply. Section 3.0 presents the IFPA’s strategic objectives and strategies to address them. Section 3.0 is not required content under section 59.1, but it is included in the plan as a framework and guidance for the operations of the IFPA. Section 4.0 contains particulars of the IFPA projects, states how they will be carried out, and provides a project schedule. This section specifies how the practices contribute to the management goals of the IFPA, and as required by section 59.1, how they will justify an increase in the allowable annual cut uplift. It also includes a limited discussion of past projects of the IFPA. Section 5.0 covers the IFPA organization and internal management. Section 6.0 is a new section for this version of the Forestry Plan; it details the IFPA analysis and uplift request following the Arrow TSR determination of June 2005 and discusses developments and issues around the key parameters for timber supply since 2006.

1.1 Objective of This Report

Section 59.1 (7) of the Forest Act states that,
“...after approving a person’s forestry plan, the regional manager may increase the allowable annual cut authorized in the person’s license or agreement referred to in subsection (2) (a) by an amount that is justified according to timber supply analysis methodology approved by the chief forester or the chief forester’s designate”.

The objective of this 2011 Forestry Plan is to support the application for extension of the Arrow IFPA agreements and uplift. Specifically, the objectives are to:

- Support the request for extension of the five Arrow IFP agreements, to December 31 2015.
- Support the request for extension of the AAC increase granted to the Arrow IFPA holders in January 2008, under Section 59.1 (7) of the Forest Act, to December 31 2015

This report is being submitted to the Regional Executive Director as an amendment to the current, approved Arrow IFPA Forestry Plan (submitted in 2006). The amendment is to update the approved plan to ensure currency and to respond to requests from Ministry staff for additional information on current issues in the TSA.

The 2006 supporting documents and analysis for the Arrow AAC Uplift Request was prepared by Timberline Forest Inventory Consultants Ltd.

Funding for the bulk of IFPA program activities has been from provincial funding programs including: Forest Investment Account, Forest Resource Development Agreement, Forest Renewal BC, and the Land Base Investment Program. Licensees have also funded a portion of the activities.

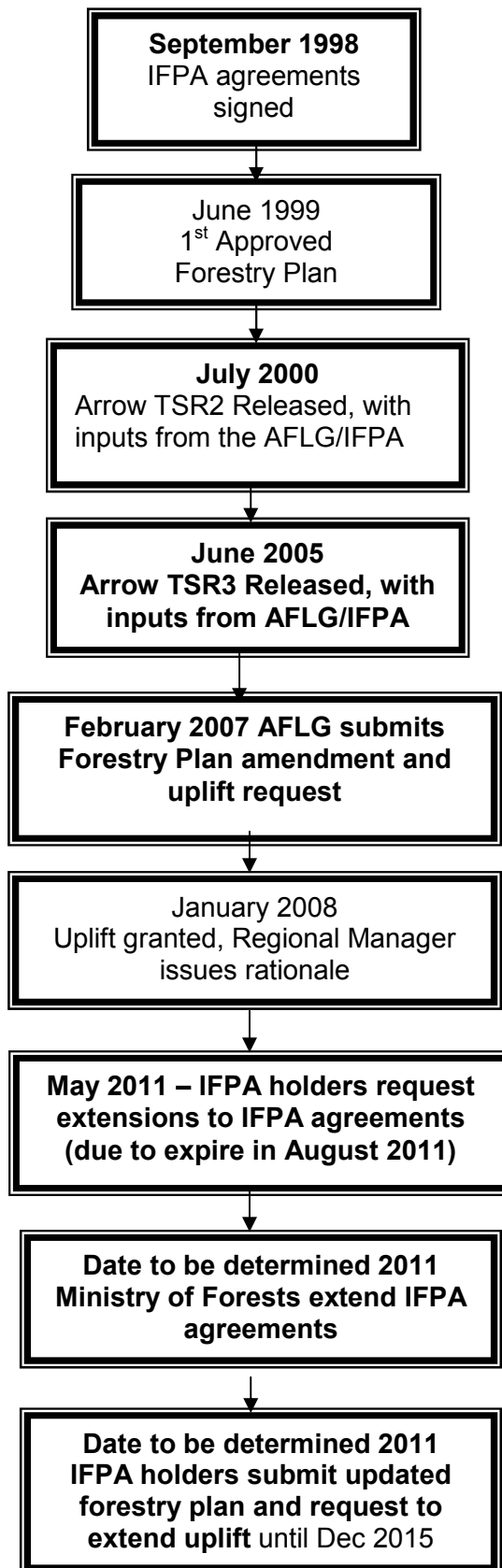
In 1998, the Regional Manager at the time indicated that AAC increment requests would be considered after two years of successful performance, provided the standards of such an application meet the Chief Forester's standards at the time of application, and demonstrate the spatial feasibility of locating the wood supply on the ground consistent with the timber supply review and Chief Forester's methodology.

In developing the Forestry Plan, the AFLG solicited input from stakeholders, communities, the general public, resource consultants, government agencies and licensee staff.

The IFPA in no way fetters the District Manager in his position as a statutory decision maker. Through innovative planning, activities and new information, the IFPA may demonstrate that local changes are appropriate to existing management options. Current legislation will be followed as the AFLG undertakes planning and field activities.

Figure 1.1 illustrates progress milestones for the Arrow IFPA to date.

Figure 1.1: IFPA Performance
Milestones 1998-2011



1.2 Description of the IFPA Area

The AFLG IFPA is located in the Arrow TSA. This TSA forms part of the Arrow-Boundary Forest District, situated in the southeast portion of the Southern Interior Forest Region. The Forestry Plan covers all of the major licensees and BC Timber Sales operating areas in the Arrow TSA, excluding TFLs. The agreements do not include provincial forest covered by Woodlot Licences or Tree Farm Licences (TFL). However, TFL holders International Forest Products Ltd (Interfor) and Springer Creek Forest Products Ltd. have representatives who are consulted with respect to the overall management of the IFPA.

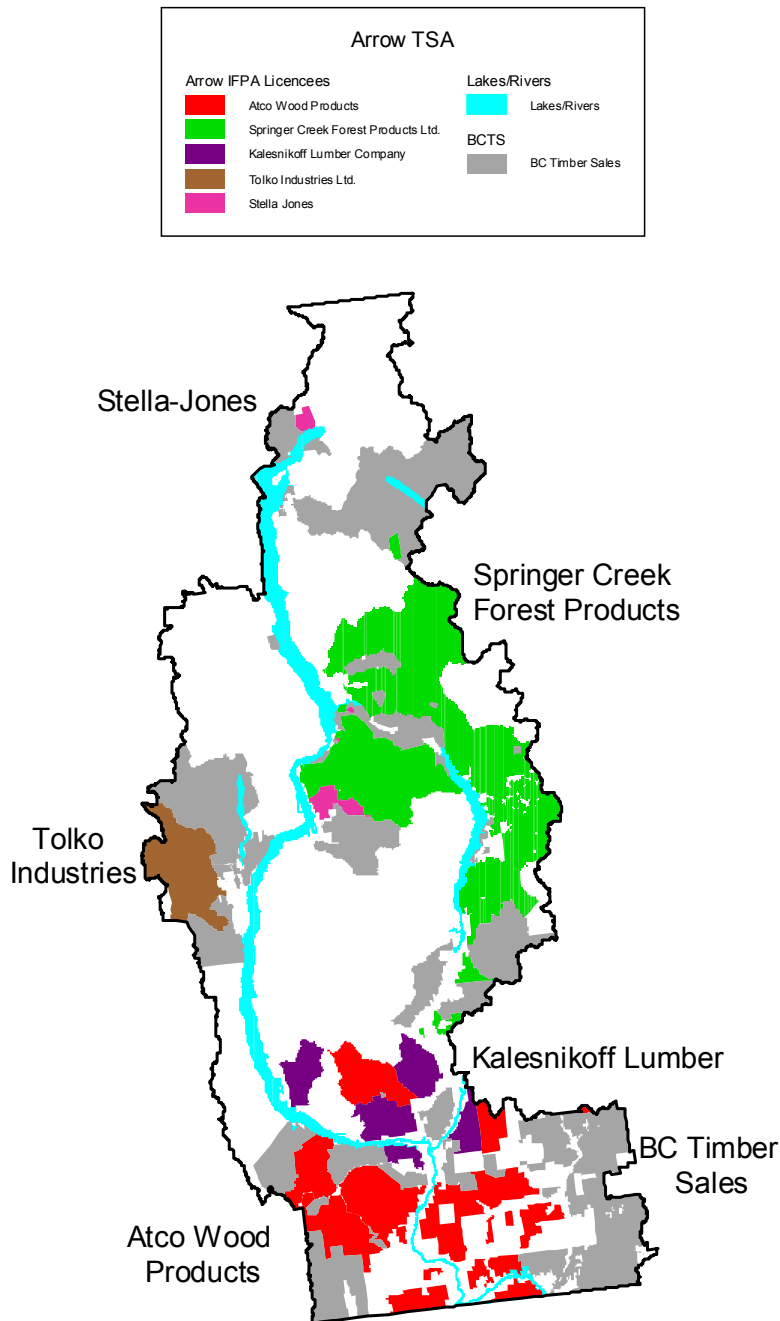
The total area administered by the MFLNRO in the Arrow TSA is 605,640 ha¹. The TSA contains a total productive area of approximately 493,267 ha. The land base available for timber harvesting is limited by areas of inoperability, environmental sensitivity, non-merchantable forest types, steep slopes and unstable soils, non-commercial forest, and other non-timber production uses. Reasonable assumptions and, if necessary, projections, must be made on these factors and appropriate areas must be deducted from the productive forest area to determine the timber harvesting land base. The timber harvesting land base, used for the purposes of the 2005 timber supply review (TSR 3) analysis, was 210,275 ha (35% of the total area). The IFPA will address the sustainable timber volume harvest based on the TSR3 as a base case.

¹ TSR3 determination Arrow TSA, Jim Snetzinger Chief forester , Ministry of Forests June 2005

2.0 The Arrow TSA

The Arrow TSA has a diverse range of interrelated environmental, social and economic values. These values, and the issues and opportunities they present, are outlined in Section 2.1, Current TSA Values. The nature and status of inventories relating to these values are discussed in Section 2.2, Inventories.

The following map outlines the operating areas for the licensees:



2.1 Current TSA Values

Although they are inter-related in a number of ways, the three key forestry related values in the TSA and their related issues are discussed separately in the following sections. Sections 3 and 4 will detail how the AFLG will address these values under the IFPA. The term “value” implies an emotional attachment to a given issue (e.g. employment) or object (e.g. goshawks). For the most part, the strategic objectives of the IFPA attempt to deal with such specific issues and objects.

2.1.1 Environmental Values

The Arrow TSA has a number of environmental value priorities within its boundaries. In addition to maintaining or enhancing forest productivity and the AAC, IFPA holders have demonstrated that environmental values can be maintained and, where appropriate, enhanced. Within the context of current ecosystem management principles, not all values can necessarily be maximized at once in a specific landscape unit, however, the IFPA provides opportunities to increase the information base and to actively manage for many of these values concurrently. For the purposes of this document, the following are considered environmental values in the Arrow TSA:

- Community and domestic watersheds
- Major rivers and lakes
- Fisheries
- Wildlife
- Soils
- Biodiversity
- Climate change

The following sections briefly discuss some of the environmental values in the TSA. Where more information is available, it has been appended to this document.

Community and Domestic Watersheds

Water quality is one of the dominant priorities of licensees, agencies and the public in the Arrow TSA. This area of the province is unique in that large residential areas and forestry operations co-exist in the same watersheds. Unlike most other parts of the province, Crown forest land is located upstream from and in between private residential land. Residents are concerned that industrial activity might reduce the quality of their domestic water supply.

The Arrow TSA contains numerous community and domestic watersheds. Water quality and quantity for consumptive users, fish and other wildlife are critical issues in the Arrow TSA. The AFLG recognizes that concerns over water quality and quantity generate much of the conflict around resource development in many parts of the TSA. A critical challenge and objective of the IFPA is to demonstrate to the public that water quality can be safeguarded now and into the future while maintaining a sustainable timber supply.

During 1999-2010, through their FRBC multi-year agreements and Forest Investment Account funding, the AFLG conducted water quality studies. Data collected was used to establish baselines and to assess the impact of industrial activities on water quality. Results of this work will be considered in developing future harvest locations, systems and techniques.

A significant amount of resource assessment work and research related to the water resource in the Arrow TSA has already been completed. The IFPA technical committee has inventoried over 150 hydrology/watershed related reports for the TSA. The reports have been completed by the Ministries of Forests, Lands and Natural Resource Operations and Environment, the AFLG members, Forest Renewal BC, Forest Investment Account, the Columbia Basin Trust Compensation Program and other independent sources.

Major Rivers and Lakes

The Arrow TSA has a number of small and mid size creeks and lakes distributed within its boundaries. Many of the creeks are within community or domestic watersheds and have fish populations. There are a number of major rivers and lakes within the TSA. The major water bodies in the Arrow TSA include:

- West arm of the Columbia River System
- Upper and Lower Arrow Lakes
- Slocan Lake/River System
- Western section of the Kootenay River
- Pend D'Oreille River and its tributary the Salmo River System

Aquatic and Riparian Values

A variety of fish and other aquatic species are located in numerous streams and lakes throughout the TSA. Licensees and the government have conducted fish inventories on many of the streams in this area.

Effective management of riparian areas is particularly crucial in the Arrow TSA in order to maintain water quality and to protect habitat for fish and other wildlife. Riparian areas often have a number of other resource management implications including old growth, potential for connectivity for movement of species and high value trees. In order to effectively manage for riparian areas, buffer or reserve zones are located along larger and fish bearing watercourses, when proposing harvesting activities. The Forest Service has concluded that approximately 1.7 percent of the Arrow TSA timber harvesting landbase is occupied by managed riparian zones.

There are numerous sport and other fish species found within the Arrow TSA. A number of major creeks and streams of the TSA have been specifically identified as having important fishery values.

Fish inventory work and fish passage projects have continued throughout the TSA as part of the FRBC and Forest Investment Account programs and as part of the Licensee's operational requirements.

Wildlife

The Arrow TSA provides high quality habitat for a number of species, including grizzly bear, wolverine, caribou, white tailed deer, mule deer, elk, bighorn sheep, mountain goat, goshawk, western screech owl, and moose. The TSA contains one designated Wildlife Management Area (WMS). Hamling Lakes WMA was established in 1998 and provides important habitat for caribou and other ungulates as well as habitat for other species such as grizzly bears.

Since the last Forestry Plan (2006) was approved, orders have been made under the Government Actions Regulations (GAR) that legally establish and clearly define management activities for caribou and other ungulate winter range areas within the Arrow TSA. In December 2006, ungulate winter range areas were established for mule deer, white-tailed deer, elk and moose and the order defined the general wildlife measures for forest practices within these areas. In 2009, orders were made to define caribou habitat areas. The orders state that the general wildlife measures (GWM) described within its Schedule 1 are necessary to protect and conserve the habitat of mountain caribou. In addition, the August 2010 Grizzly Bear GAR laid out measures for the management and protection of grizzlies. All of these orders emphasize the importance of managing portions of the landbase for quality wildlife habitat. The licensees recognize the ecological, recreational and economic importance of wildlife species in the TSA.

There are a number of overlapping classification systems for describing significant wildlife species. These include:

- Kootenay Boundary Higher Level Plan Order (KBHLPO)
- Identified Wildlife Management Strategy
- Regionally Significant Species List
- Ministry of Environment Red and Blue Listed Species
- BC Conservation Data Centre List
- Species at Risk Act

Those species designated as being threatened, endangered, sensitive or vulnerable by the Conservation Data Centre or are red- or blue-listed by the Ministry of Environment are reflected in the Identified Wildlife Management Strategy (IWMS). The AFLG will comply with the terms of the IWMS and endeavour to develop strategies to conserve and enhance identified wildlife species at the landscape and site levels.

The AFLG recognizes that in addition to those listed in the IWMS, other species in the Arrow could be at risk. This includes the list of regionally important wildlife determined by the Deputy Minister of Environment. Those species at risk that are not designated as "Identified Wildlife" will be given appropriate consideration in the pursuit of innovative forest practices. Other species are important due to their economic and recreational values rather than their risk status.

The management of environmental values by the IFPA has followed the strategies as set out in the Identified Wildlife Management Strategy and KBHLPO and, subject to peer review, have validated requirements as necessary for the Arrow TSA. As well, detailed wildlife information is contained in wildlife related assessments and reports that have been completed in the TSA.

The Forestry Plan (1999) identified over 110 wildlife studies and reports.

Soils

The Arrow TSA covers several physiographic regions, with a wide variety of bedrock and associated soils. Some of the critical soil characteristics are fine soil textures, shallow soil, steep slopes, and high moisture contents. Given the mountainous terrain and proliferation of water concerns in the TSA, soil conservation is a critical issue in development planning. It is also recognized that innovative approaches must be developed for ensuring that the risk of erosion and mass wastage are adequately mitigated.

Avoiding surface erosion and mass movement of materials are key issues for protecting water quality, forest productivity and fisheries values. This risk exists due to both human intervention (e.g. road construction and land clearing for habitation) and natural causes such as extreme rain or snow fall.

Licensees and government complete terrain stability assessments as a means of addressing results-based requirements of the Forest Planning and Practices Regulation and Forest Stewardship Plans. Licensees and resource agencies have completed many broad level terrain stability assessments and subsequent site specific assessments in areas of identified risk. This information is actively incorporated into forest development strategies and is reflected in the location and design of roads, the extent of forest cover removal on cut blocks and road rehabilitation.

Biodiversity

According to the Forest Planning and Practices Regulation, biodiversity means the biological diversity of plants, animals and other living organisms in all their forms and levels of organization, including the biological diversity of genes, species and ecosystems.

The KBHLPO and the Forest Planning and Practices Regulation provide several biodiversity goals. Emphasis levels for biodiversity (Low; Intermediate; High) have been legally established throughout the TSA. This direction provides an approach to managing biodiversity. It is unknown what consequences this approach will have on genetics, species, ecosystems and the processes that link them. Local research is still needed to determine the requirements in terms of temporal and spatial structure and functionality for better assessment of biodiversity in the Arrow TSA. The AFLG recognizes that biodiversity management must be adaptive and flexible. Biodiversity elements currently managed include:

- Seral stage distribution
- Patch size distribution
- Landscape connectivity
- Stand structure

Old growth forest represents a key component of the mosaic in the Arrow TSA. Chronological age is often used to define old growth, but broader definitions of old growth specify other attributes in addition to age, such as variation in stand structure, crown closure, and coarse woody debris elements. Chronological age is an indicator that a forest is likely to contain certain types of structure. However, younger forests

can exhibit old growth characteristics or can be managed for these characteristics.

The Forest District is currently using the identification of candidate old growth management areas as a strategy to deal with current old growth requirements.

Climate

Climate change represents a global risk, even in a relatively unpolluted environment such as in the Arrow TSA. The Federal government has emphasized the need for Canada to pursue commitments made to mitigating impacts of climate change. Under the terms of the Kyoto Conference, the developed nations of the world agreed to share most of the burden and cost of controlling emissions and taking steps to reverse global warming.

The AFLG recognizes that each area of the country, even a relatively small section such as the Arrow TSA, will have to contribute in some way to mitigate those factors within the TSA that contribute to climatic change.

Maintenance and enhancement of young, healthy and robust coniferous forests represents one of the key contributions which the forest sector in the Arrow TSA can contribute to reducing carbon levels in the atmosphere. As well, licensees and agencies are aware of the need to ensure that their operations do not contribute excessive amounts of chemicals into the atmosphere, ground water or soils.

The AFLG has been approached by outside stakeholders to consider undertaking projects to study the impacts of climate change on forests and forest productivity in the Arrow TSA as well as the effects of various harvest levels and subsequent reforestation strategies as they relate to carbon balance. To date, no work has been done on these projects but if future funding is available the AFLG would give serious consideration to such studies.

Since the previous Forestry Plan (2006) amendment, Atco and Springer Creek have committed to participate in workshops of the Kootenay Climate Resilience Project. This is a two year integrated vulnerability assessment underway in the West Kootenay region of BC. The main goals of the assessment are to increase knowledge about climate changed and ecological resilience, and enhance the capacity of forest managers to adapt to the challenges of climate change.

Atco, Stella-Jones and Tolko have become collaborators in the Assisted Migration Adaptation Trial, a provincial government initiative which seeks to better understand the climate tolerances of various tree species. This long-term forest research installation includes sites ranging from California to the Yukon in an effort to plan the establishment of young forests which will remain healthy and productive in the face of a changing climate.

Atco and Kalesnikoff are active participants with the guiding committee for the Selkirk Decision Support Collaborative to develop carbon modelling tools to assist the local forest sector. Selkirk has received a grant focussing on the development of prototype applications that could allow local small and medium forest enterprises to access, evaluate, and analyze data related to potential opportunities in forest carbon markets.

The overall project goal is the development and deployment of several potentially transferable and commercial utilizable decision support tools for carbon management.

2.1.2 Social Values

In many cases, social values in the TSA are connected to economic and environmental values. Visual quality objectives and forestry employment are both social in nature but relate to these other two key values. For the purposes of this document, the following are considered social values in the Arrow TSA:

- Other forest resource industries
- Recreation
- Scenic landscapes
- Input into forestry related activities

Although considered a social value as well, forest sector employment will be discussed in detail under the economic value section.

Other Forest Resource Industries

There are a number of forest resource industries in the Arrow TSA. These include:

- Botanical forest products (e.g. mushrooms)
- Ecotourism
- Guiding and outfitting
- Commercial recreation

Although these industries do not contribute the same degree to the local economy and tax base as the forest sector, they have grown in size over the last few years. Growth of these industries is expected to be moderate and to continue over the next few years.

Other businesses in local communities rely on outdoor recreation for a portion of their business throughout the TSA.

Recreation

The West Kootenays is seen as a quality outdoor and back country recreation area. There are eight provincial parks in or adjacent to the TSA. The Protected Area Strategy withdrew over 15,000 ha from the TSA. Often, outdoor tourism and recreation are complimented by forestry activities (i.e. through access). In other cases, forestry activities are seen as having a negative impact on outdoor tourism (i.e. viewscapes). In addition to an extensive network of Forest Service recreation sites and trails, and Provincial parks, there are a number of developed tourism facilities in the Arrow TSA. Recreational activities in the TSA include:

- Mountain biking
- Downhill skiing and snowboarding
- Cat and Heli-skiing
- Hiking and camping

- Boating and fishing
- Cross country and backcountry skiing
- Hunting
- Snowmobiling
- Hot spring visiting

Tourism and recreation are acknowledged values in the Arrow TSA. The Arrow TSA provides a range of wilderness recreation opportunities that are easily accessible, including well developed recreation areas directly off the main highways, remote non-roaded opportunities for dispersed non-motorized recreation. Kokanee Glacier and Valhalla Provincial Parks are accessed through the Arrow TSA. The MFLNRO has broadly inventoried recreational opportunities using a recreation opportunities spectrum (ROS) approach. Licensees recognize the ROS designation in their forest planning processes.

Scenic Landscapes

High visual values are associated with the major highways in the TSA (3, 3A, 6, 22, 22A, 23, 31, 31A). Also, many of the lakes in the Arrow district have recreational use and thus have associated visual values. The Arrow TSA has identified visual objectives for areas with high value and forest licensees conduct visual impact assessments prior to forestry development. Visual values are perceived as particularly important in the Arrow TSA because of their significance to tourism and recreation.

Input into forestry related activities

A key social issue in parts of the TSA is public and stakeholder input into forestry related activities. There are currently legislated requirements that licensees and the government operate under to allow the public to review operational plans. The IFPA has developed its own methods for involving communities, the public and stakeholders. These are discussed in section 3.2.

First Nations

Currently there are no First Nations reserves or communities in the TSA however; prior history of First Nations people living in the area has been documented. As an integral part of this Forest Plan Amendment, the following First Nations have been invited to provide input to the Arrow IFPA Forestry plan amendment and AAC uplift request. :

1. Ktunaxa Nation Council
2. Okanagan Nation Alliance
3. Osoyoos Indian Band
4. Penticton Indian Band
5. Lower Similkameen Indian Band
6. Westbank First Nation
7. Shuswap Nations Tribal Council
8. Splatshin First Nation
9. Okanagan Indian Band

2.1.3 Economic Values

According to the 2004 Socio-Economic Analysis (SEA) completed for TSR 3, forestry accounted for 20% of the TSA's employment in 2001. This is second only to the public

sector, and followed closely, at 18%, by Other Primary Industries. Between 1996 and 2001, employment in forestry and other primary industries stayed approximately the same, with a sharp decrease in employment in the tourism and construction sectors. The public sector had a solid increase in employment during this time period.

Table 2.1 details the 2001 and 1996 labour force by industry. While the AFLG recognizes the importance of a diverse economy for overall community stability, this Forestry Plan focuses only on forestry related issues.

Table 2.1: 2004 SEA comparison of basic sector labour force for Arrow TSA

Basic Sector	2001	1996
Logging/Milling	2471	2429
Other primary industries	2302	2289
Tourism	1874	2112
Public Sector	5175	4727
Construction	1377	1481
Other basic	821	827
Totals	14,020	13,865

Table 2.2 shows the variation of average income earned in the basic sectors. The forest sector and mining and petroleum have higher incomes than the other basic sectors.

Table 2.2: 2004 SEA's basic sector incomes in 2001

Basic Sector	Average Income
Logging	\$30,757
Pulp & Paper	\$51,055
Sawmills	\$34,112
Minerals	\$50,231
Agriculture	\$12,382
Tourism	\$11,678
Public Sector	\$29,318

The key areas of the forest district are:

- Castlegar area – forest sector dependent and region's main service centre;
- Rossland/Trail area – predominated by mining;
- Slocan Valley – forest sector dependent, and a growing "non-traditional" economic sector; and,
- Nakusp/Edgewood – forest sector dependent.

The major communities in the Arrow TSA are Trail, Castlegar and Rossland. There are numerous smaller communities (e.g. Slocan, New Denver, Nakusp, and Salmo) and unincorporated areas. According to the 2004 SEA, between 1996 and 2001, the TSA has seen a 4.5 % decrease in population. This trend was common to several of rural resource based regions across the province and may be attributable to a general out-migration in search of improved economic opportunities.

Forestry

Forestry is practiced throughout the TSA. It includes a number of non licensee related activities. Even before implementation of the Forest Practices Code of BC Act in 1995, forestry practices in the Arrow TSA were complex relative to many other TSA's in the province. Forestry activities in the TSA include the following:

- Ministry of Forests, Lands & Natural Resource Operations activities
- Ministry of Environment activities
- Woodlands activities of replaceable and non-replaceable forest licensees, timber sale holders, woodlot licensees, community forest licensees
- Associated consulting and contracting activities
- Logging and transportation
- Silviculture and reforestation activities
- Primary processing of timber
- Value added activities
- Other non government activities on forest land (e.g. BC Hydro; Columbia Basin Trust, BC Gas)

In the 2001 Timber Supply Review for Arrow TSA (TSR 2), the AAC was reduced from 619 000 m³ to the current 550 000 m³, due primarily to the implementation of the Kootenay Boundary Land Use Plan. There have been fluctuations in harvest levels over the years as a result of the complex planning requirements in areas of the TSA and public concerns over harvesting in certain areas. In 2005, following a new Timber Supply Review (TSR3), the AAC of 550 000 was maintained. It does not include harvest volumes from timber licensees, tree farm licences or private lands. This AAC was apportioned by the Minister of Forests as detailed in Table 2.3.

Table 2.3: Current Allowable Annual Cut by Licensee (m³/yr)

Atco	Springer	Tolko	Kalesnikoff	Stella Jones	BC Timber Sales	Woodlots	TSL Majors	Total*
151 627	100 000	47 589	37 703	12 963	99 208	13 957	3 538	466 585

* The 550,000 m³/yr AAC includes a 3,524 m³ Forest Service Reserve and Unallocated 79,891 m³

In 2008, based on the request from the AFLG and the amendment to the Arrow IFPA Forestry Plan, the Regional Manager granted an AAC increase for the Arrow IFPA holders totalling 34,000 m³. Table 2.4 shows the allocation of the additional AAC.

Table 2.4: Allocation of AAC uplift by Licensee (m³/yr)

Atco	Springer	Tolko	Kalesnikoff	Stella Jones	Total*
14 862	9 802	4 664	3 401	1 271	34 000

Atco, Springer and Kalesnikoff have processing facilities located within the TSA while Tolko and Stella-Jones have processing facilities located outside the TSA. A significant amount of the timber harvested by BCTS finds its way to the processing facilities of these five licensees. The current TSA AAC does not provide all of the timber processed at the licensees' mills. Private land, timber licences, TFLs 3 and 23 (technically within TSA boundaries.), and sources outside the timber supply area supplement the volume

requirements of the processing facilities owned by the major licensees, the Celgar pulp mill and other smaller mills in the TSA.

Interfor has a primary processing facility in the TSA and their TFL 23 is adjacent to the Arrow TSA. It is anticipated that there will be many opportunities to share information and work together to develop strategies for both the IFPA and Interfor. Information for Springer Creek Forest Products' TFL 3 will also be incorporated into the IFPA where appropriate.

There are a number of small, non quota holding mills (including value added mills) in the TSA. They are dependent on and compete for BCTS and private timber sales. These mills are important to the economy of the area. The smaller mills add to the TSA's diverse requirements in timber profile (species, size and age). There is the opportunity to expand the mutually beneficial relationship between small and large mills through trading specific species and sizes. Ensuring a long and short term timber supply for all will contribute to a strong and diverse economic base in the TSA.

Mining

In the past, mining was one of the prime economic drivers for this area and the catalyst for settlement in the mid 1800's. Trail's Teck (Cominco) facility is the largest mining operation in the area. Most other mining activity in the TSA is small scale mining and exploration. The SEA showed that the employment in Other Primary Industries (which includes mining) to be a slight increase between 1996 and 2001.

2.2 Inventories

In the 1999 Forestry Plan, the technical committee of the IFPA created an inventory of information for the Arrow TSA. This listing included 2000 reports/projects. The inventory was built by combining inventory and report lists, for documents from the following sources:

- Ministry of Forests, Lands & Natural Resource Operations – Castlegar office
- Ministry of Forests, Lands & Natural Resource Operations Regional office
- Ministry of Environment
- Atco Wood Products
- Stella-Jones Canada Inc.
- Kalesnikoff Lumber Ltd.
- Tolko Industries Ltd.
- Springer Creek Forest Products
- Columbia Basin Fish and Wildlife Compensation Program
- Price Waterhouse Coopers

The categories of inventories recorded for the IFPA include:

- Wildlife
- Fisheries
- Watershed/Hydrology
- Terrain stability
- Geotechnical
- Biodiversity related attributes

- Cultural/archaeological
- Research and trial activities
- Ecological attributes
- Forest health
- Visual
- Mapping
- Miscellaneous

The AFLG has attempted to be as complete as possible in collecting over 20 attributes for each document. The attributes were:

Landscape Unit Name	Licensee	Drainage
Subdrainage	Type of Inventory	Title
Author	Date	TSIL
Digital copy (yes or no)	Maps	Digital maps
Data Dictionary	File type	Size of data
Resolution	NAD	Georeference
Transfer type	Comments	

Very few entries contain all of the attributes listed above. Some reports did not have an accompanying map and some maps did not have an accompanying digital file. In some cases, maps did not have any accompanying written reports. The inventory of inventories should be considered a starting point for the collection of information in the Arrow TSA. The inventory is known to be incomplete, and will be updated and improved over time. The inventory was added to in the 2006 Forestry Plan amendment and Appendix 4 of this update further adds to the list.

As part of the strategic analysis for the IFPA, the AFLG has begun identifying the critical inventory gaps in the TSA. The Chief Forester identified a number of information gaps in his rationale statement for the TSR 3 report. As much as possible, the IFPA will be used to address these gaps.

This section has identified the priority issues and values in the TSA. The following section will put them into context for the IFPA and will begin analysing and recommending management objectives for key environmental, social and economic values.

3.0 Strategic Objectives of the Arrow IFPA

The Arrow IFPA's objectives, strategies and projects flow from two main guiding principles. Firstly, the Arrow IFPA will be guided by the concept of ecosystem management, as defined below.

Ecosystem Management is:

- a process of decision making, that uses an understanding of local and regional information on ecological and social processes, functions, structure and composition, and the interconnections between them,
- to collaboratively develop and implement short and long term management strategies that seek to influence human behaviour and ecosystem dynamics,
- to maintain and restore ecological systems while fostering human development patterns that are sustainable ecologically, economically, organizationally, and politically over the long term.

The second principle of the IFPA is the legislation in the Forest Act Section 59.1, which states that the primary objective of an IFPA is to increase forest productivity in concert with the maintenance of non-timber values. To address the legislated objective, the Arrow IFPA developed the following:

Key IFPA Objectives

1. Integrate the forestry related environmental, social and economic needs of the Arrow TSA.
2. Develop options for maintaining or enhancing biodiversity, ecological function, the AAC, and employment over the short and long term.

Future IFPA activities will have the same objectives, but the level of IFPA activity will depend on funding levels. Funding for the IFPA from the provincial government through programs such as the Land Based Investment Program is uncertain, particularly in current economic conditions.

3.1 Strategic Objectives – Ecological Functioning

The IFPA's overall goal for managing environmental functions is to conserve their integrity while providing for wood supply. The AFLG has adopted the following objectives for managing Ecological function.

Objectives:

1. Assess ecological systems to provide guidance for management.
2. Evaluate ecological response to forest management strategies.

The majority of the specific biodiversity framework will be based on coarse filter principles, since complete scientific data does not exist for all species, the cost is prohibitive and the interrelationships between species at risk and other species are complex and can be contradictory. Fine filter principles and approaches (such as the *Identified Wildlife Management Strategy* and the *Federal Species at Risk Act*) will be used for species at risk and other species where necessary. Individual components, such as species at risk and regionally important species can be looked at in more detail as required.

An adaptive management test of the coarse filter approach will be considered and an appropriate monitoring system through time and space will be investigated.

Initially, the base case and sensitivity analyses were used to determine interactions between ecological and wood supply issues. Further assessment of ecological responses to forest management practices will involve current legislation, regulations, policies, and guidelines. Increased knowledge of ecological relationships and thresholds is required in order to simulate alternatives. Use of a range of timber supply, spatial, ecological, and hydrological models will provide a range of responses and compromises.

The IFPA holders are committed to meeting the obligations of legislation and the intent of KBHLPO. The AFLG also recognizes that the *Identified Wildlife Management Strategy (IWMS)* and the *Federal Species at Risk Act (SARA)* provides direction for managing species listed on the Conservation Data Centre's regionally significant, at risk and endangered species list. Activities to improve knowledge about and habitat for key species will be central to the IFPA strategy. The sustainable forest management plan will develop criteria and indicators for managing environmental values. The IWMS management strategies for individual species and wildlife habitat areas will be modelled and implemented, as appropriate, under the ecosystem management framework.

Objective:

Where possible, assess natural disturbance baseline features for stand structure and spatial patterns within the TSA.

The strategy to address this objective is to test a variety of local forest practices in relation to natural baseline events/processes.

3.2 Management Objectives – Social Values

Objective:

Ensure the incorporation of social values into forest resource management activities.

The IFPA holders recognize that an increase in AAC is sustainable in the TSA in the short term, and particularly, to focus on the harvest of pine stands highly susceptible to attack by Mountain Pine Beetle.

It is also recognized that long-term employment commitments are subject to many unpredictable factors including market conditions, technological improvements, and social values.

The IFPA strategy will be to focus their efforts on the following social value related actions:

- Providing a conduit for public input into IFPA activities and objectives
- Maintaining forest sector employment levels
- Determining key public and stakeholder forest resource issues
- Determining the impact and needs of other forest resource industries and recreational values across the TSA
- Maintaining current AAC levels

Stakeholder input is necessary in managing social values. The Forestry Plan incorporates input received and comments made by the public, government employees not directly involved in the IFPA and other reviewers in and outside of the TSA. The AFLG made a strong effort to present information about the IFPA to all communities in the TSA and to provide the public, stakeholders, government and forest industry employees with an opportunity for input into the IFPA.

The AFLG is committed to providing a variety of conduits for input into IFPA activities and objectives. These are described in section 5.5 under Communication.

Objective:
Maintain forest sector employment in the communities that are served by the Arrow IFPA.

This objective includes maintaining employment in woodlands, primary manufacturing and value added facilities by working with resource agencies to ensure that the AAC volume as determined by the Chief Forester is harvested and historical levels of this harvest are processed at mills in the Arrow TSA over the long term. The strategy to achieve this objective is tied directly to the economic objective of maintaining AAC, addressed in section 3.3 below.

3.3 Management Objectives – Economic Values

Objective:
Maintain current AAC and associated employment levels in the short and long term while maintaining resource values.

The AFLG has developed a strategy and set of categories for the IFPA that will focus both on the short-term and long-term maintenance of AAC levels. Improving the information base for the timber supply review, on which the AAC is based, is the main area of interest for the IFPA.

**Objective:
Improve site productivity index and yield on the Arrow TSA landbase**

The IFPA's first major initiative around AAC was to verify the accuracy of Vegetation Resource Inventory and to validate provincial volume/age and site index curves in the Arrow TSA, to re-adjust the overall timber supply estimates.

Other projects to address this objective will fall into the following categories:

1. Improving site productivity index/yield;
2. Validating factors affecting the land base; and
3. Increasing the productive land base.

3.4 Communication and Extension

Objective – provide clear and timely communication and extension of knowledge gained under the IFPA to all interested parties.

The communication objective is included because it is considered an integral part of the IFPA's monitoring and feedback process. Communication provides agencies, licensees, interest groups and the public with information about the IFPA and gives them an opportunity to submit their comments and input back to the IFPA.

The AFLG sees the need to communicate with the following groups regarding the Arrow IFPA:

- Among licensees
- Local Forest Service and BC Environment representatives (region and district)
- Other IFPA holders
- Community representatives in the Arrow TSA
- Stakeholders
- General public
- Local media
- Academia
- Interested resource professionals across the province

The IFPA will develop a communications plan for the term of the IFPA. The communications plan will outline the avenues of communication for IFPA related information. The following activities will be considered:

- Download sessions
- Open house public meetings/field tours
- Website
- Newsletters

- Public advisory groups
- Posting reports

Communications are discussed in more detail under IFPA administration, in section 5.5.

3.5 Monitoring

Objective – establish a feasible, cost-effective strategic and operational level monitoring system for the IFPA.

Monitoring is performed on key elements within a program which are thought representative of the system, and can indicate a positive or negative treatment response. A good candidate for monitoring has the following characteristics:

- Represents an important component of the system
- Can indicate a positive or negative treatment response
- Is logistically feasible
- Is easily repeated at regular intervals

Monitoring for expected results is completed for two important reasons:

1. to evaluate program success or failure
2. to enable and justify mid-course corrections of an adaptive management program.

The IFPA will require strategic level monitoring to determine success in meeting objectives (i.e. maintaining environmental functions) and operational level monitoring to determine the effectiveness of individual projects. Performance measures, target & acceptable ranges and data sources will be defined for each project. Due to limited funds and the complex nature of some objectives, key strategic components will be looked at to determine impacts on objectives. In general, strategic monitoring will occur over the life of the IFPA whereas most projects will be monitored for the year or two they are ongoing.

In terms of environmental functions, key components of the Arrow IFPA appropriate for monitoring are: post-treatment structure; maintenance of biodiversity; watershed health.

In terms of socio-economic values, key components of the Arrow IFPA will be looked at using a socio economic impact analysis, including the monitoring of jobs.

Activities under this category will include the following:

- Overall project management
- Development of an information management system
- Implementation of a monitoring and adaptive management plan

Adaptive management principles will be used at the strategic and operational levels as appropriate. The IFPA adaptive management will follow the Forest Service guidelines for adaptive management. Monitoring, as described above will be incorporated as part of the adaptive management process at the strategic and operational levels.

4.0 IFPA Projects

Section 3.0 of this document spells out the rationale for the AFLG's strategic direction for managing environmental, social and economic forest values. This section describes projects and activities to pursue those strategies. The activities include planning, inventory, research, silviculture and field practices.

Most projects proposed address more than one of the three values. For this reason, projects may not be assigned to any particular category. Project rationales will identify the extent to which each of the three values will be pursued.

Since 2006 IFPA funding has been decreasing, so although the strategic objectives of the IFPA remain the same, very few new projects are being implemented.

4.1 Process for Approval of Projects

Project work will commence when the following steps are completed:

- Approval of the Forestry Plan by the Regional Executive Director;
- Approval by the Technical Committee of the detailed project descriptions;
- Determination by the Technical Committee of which projects will be selectively tendered. The Technical Committee shall follow defined principles for determining when a project shall be selectively tendered;
- Completion of peer review of some projects (where determined by the Technical Committee); and,
- Identification and selection of successful and qualified contractors by the Technical Committee.

4.1.1 Process for Consideration of Additional Projects

In the event that additional funding becomes available, the Technical Committee will propose additional projects. Outside parties, who have approved funding, can approach the Technical Committee to ask that their unsolicited project be included within the context of the IFPA.

For unsolicited projects, the proponent will be asked to submit a detailed project description in the format for existing project descriptions. The Technical Committee will be asked to review the project description.

Based on this review, the Technical Committee will determine whether the project should be considered further. Unsolicited projects approved by the Committee, as well as projects proposed by the Committee, will be put forward for peer review. As well, the Technical Committee, in consultation with the resource agencies, will determine if the size or technical complexity of the project merits adding a proof of concept phase to the project.

Once the project passes the peer review phase, the project will be considered for funding by the IFPA holders. Upon obtaining funding approval for any additional projects, the Licensees Champion will develop an amendment to the Annual Work Plan which will be forwarded to the Regional Executive Director of the Kootenay Boundary Region. The Technical Committee will rank projects in terms of priorities. It is the intention of the AFLG to submit no more than one amendment each year.

4.1.2 Scheduling Plan

In the event that funding for IFPA activities becomes available, the technical committee will develop a detailed scheduling plan for projects and append it to the Forestry Plan.

At time of writing there are a very limited number of new activities planned for the IFPA. Those which are shown in the planning table 4.1 may not go forward if funds are not secured, but they are still priorities for the AFLG, so are included for planning purposes.

4.2 Description of Projects proposed for 2011-2015

At present there is limited funding available for new IFPA projects. A few projects are planned for 2011-2012 but beyond this year it is not certain whether funds will be available to start new projects. Should funds become available the technical committee will follow the steps outlined in this document, using the objectives in this document, to guide project development.

The IFPA five-year plan is presented in table 4.1. Depending on funding and resources the IFPA holders plan to carry out or support the following projects. Some of the projects identified will be focused on specific geographical or operating areas.

Monitoring/Communication Objective:

- Continue with the Okanagan SFM Public Advisory Group
- Investigate and reinstate web based information for the Arrow IFPA

Biodiversity Objective:

- Continue to identify bridge replacement projects focusing on recreational and fisheries priorities. Arrow watersheds are ranked relatively high in the MoE listing of priority watersheds, so it is hopeful that funding for such activities will be available.

Landbase Objective:

- Continue to support the regional Forests for Tomorrow program. In the 2010/11 fiscal, survey and recommendation work was completed on a number of areas and it is hoped, pending funding, that in the 2011/12 fiscal treatments will occur.
- Continue to support the initiation of Assisted Migration Adaptation Trial: Responding to climate change: assisting seedlot migration to maximize adaptation of future forest plantations. (This estimated \$15,000 - \$20,000 project will be fully funded by Atco corporate dollars).

Additionally, the IFPA technical committee members plan, depending on resources, to be involved in the following longer term FLNRO projects:

Landbase Objective:

- Yellow-cedar Provenance Research – Arrow District Trials, managed by FLNRO – Mesachie Lake & Arrow Boundary Forest District; 15-year (2007) measurement completed, next measurement planned for 2012.
- Western Larch Realized Gain Genetic Gain Trials Nelson / Thompson Okanagan Seed Planning Zones, managed by FLNRO – Kalamalka Forestry Centre; 3-year

(2006) & 6-year (2009) measurements completed, next measurement planned is 10-year in 2013.

- Broadleaf Management in the Arrow TSA – Champion Lakes PROBE site, in partnership with FLNRO – SIFR; 4th & final measurement planned for 2011. This project will be funded by Atco corporate dollars.

4.3 Past IFPA projects

In the early years of the IFPA funding for the program allowed a wide range of projects to be completed, in each of the three value areas.

In the first eight years of the IFPA's implementation, 1999- 2006, projects:

- Developed a research and gap analysis program leading to integrated management options based on ecological processes and wood supply needs in the Arrow TSA
- Completed strategic analyses of potential management alternatives
- Used adaptive management principles, including modelling and monitoring as guiding principles for IFPA projects
- Completed individual projects to improve short term wood supply
- Completed field activities to improve forest productivity
- Utilized new information to develop and implement innovative planning (including ecosystem management) and harvesting techniques in areas with complex (and potentially conflicting) resource values
- Focused on projects that dealt with longer term timber supply issues, environmental objectives and social values

In the next five years 2006 – 2011 although Forest Investment Account funding and IFPA activities were significantly reduced, the AFLG:

- Continued to focus research and analysis on key uncertainties that have been identified in previous years
- Utilized new information to develop and implement innovative planning (including ecosystem management) and harvesting techniques in areas with complex (and potentially conflicting) resource values
- Continued with projects that dealt with issues that affect environmental and social values.

The results of past projects were considered in the TSR2 and TSR3. These timber supply analyses indicate that over the long term, the site productivity in Arrow TSA is

such that the long term harvest level can increase significantly. Detailed timber supply analysis was included in the 2006 IFPA uplift request.

The last timber supply analysis (in 2005) considered the impacts of the Kootenay-Boundary Land Use Plan Order (KBHLPO) and some of the innovative practices completed by the AFLG up to May 2005. The determination by the MFLNRO Chief Forester maintained the short term harvest flow at the same level of TSR 2 in 2001 at 550,000 m³/yr.

To determine if there has been an effect on the availability of timber as a result of an innovative practice, the IFPA established a baseline (known as the base case) for timber that is currently available for harvest. As well, the IFPA conducted sensitivity tests to see what affect proposed activities or management policies may have on timber supply.

It is clear that, under current management policies, some sections of the TSA will have difficulty finding sufficient operable area available for harvest. Unless mitigating factors are considered, AAC levels could decline. The IFPA agreement holders and government agencies have anticipated this situation since the Code and KBHLPO were implemented. The base case sensitivity runs and related analysis confirmed these concerns.

For the January 2008 IFPA uplift the Regional Manager used the timber supply analysis provided by the AFLG in December 2006 and the 2004 timber supply analysis provided (also by the AFLG) for the Chief Forester's 2005 AAC determination in the Arrow TSA.

Also, a number of analyses were undertaken to test the sensitivity of the base case to changes in input assumptions. The sensitivity issues were assessed based on the degree to which they influence timber flow positively or negatively. In addition, as these issues are being evaluated to determine opportunities to enhance timber availability through alternative management scenarios, total availability (using the base case harvest level) was also assessed.

Based on the sensitivity analyses performed, the key factors affecting timber supply availability are:

- Landbase
- Growth and yield expectations
- Biodiversity

The sensitivity analyses serve two purposes. First, they provide insight into the degree of stability in the base case. In this instance, the base case is very sensitive to any increased downward pressure. Moreover, it is heavily constrained, with almost no surplus of available timber.

The second purpose of sensitivity tests is to point to potential opportunities to improve timber supply. The complex set of land use requirements which limits the timber supply at different points in time is not amenable to a single solution. To address this, a composite scenario was developed to characterize an operationally feasible program which, based on the results of the sensitivity analyses, offers the potential to relieve those requirements with the most severe effects on timber supply, thereby providing opportunities to increase timber availability and flow. Several factors were incorporated to assess their combined effects. These included:

- VRI Phase 2 Adjustment
- OGMA analysis
- Twenty year planning spatial analysis
- Mountain Pine Beetle harvest analysis
- Assessment of Caribou habitat and range and analysis

Completion of the Arrow Vegetation Resource Inventory found a 16% difference between Forest Service estimates and volume on the ground across the TSA. Since 2006, further information has been collected in the field to validate and calibrate the Vegetation Resource Inventory volumes.

The IFPA also worked to further the development of a Predictive Ecosystem Mapping for the TSA, which had been started by AFLG members prior to the IFPA start-up. The PEM was completed and approved by the Forest Service Inventory Branch, and led to a Site Index Biogeo Climatic Classification system adjustment. These projects are discussed further in section 6.2.1.

(Some of these factors were noted by the Chief Forester as areas of uncertainty and as such are discussed further in section 6.0).

Table 4.1 IFPA Project Plan for 2011-2015

Activities are subject to Land Base Investment Program funding and approval, unless a different funding source is noted. The shortage of funding for IFPA projects requires use of creative, innovative approaches to leverage existing resources, inventories, ongoing research, and databases.

Project Title	Particulars of Project Activities	IFPA objective	Funding Source	Productivity gain expected?	How gains/improvements will occur	Schedule
Public Advisory Group	IFPA will fund in part, the Okanagan SFM Public Advisory Group	Monitoring/Communication	Unknown - corporate	No	Gains in management efficiencies are expected through improving public involvement in planning.	Periodic over the year
IFPA website	IFPA consultants will investigate and reinitiate web based information for the Arrow IFPA	Monitoring/Communication	Unknown - corporate	No	Forest management improvements are expected as a result of increased information exchanges with other forest management organizations	Start up 2011 – Ongoing through 2015
Fish passage	IFPA consultants will conduct fish passage assessments, site designs, and culvert replacements	Biodiversity	LBIP	No	Enhanced environmental values will result from improved fisheries habitat, and social value improvement through increased recreational access	Spring 2012
Forests for Tomorrow	IFPA members will carry out surveys prescriptions, and treatments on backlog and impeded stands, and for forest health	Landbase	LBIP/FFT	Yes	Improved site productivity is expected from increased individual tree growth	Field seasons 2011-2015
Climate change – seedlot trial	IFPA will support the initiation of Assisted Migration Adaptation Trial: Responding to climate change	Landbase	Unknown - LBIP	Yes, but over a long term	Increased understanding of climate change and species adaptations will improve long term productivity	Filed season 2011-2015
Yellow Cedar trial	The IFPA will support the remeasurement of the Yellow-cedar Provenance Research in Arrow District, a provincial ministry led project (Mesachie Lake and Selkirk Forest District)	Landbase	FLNRO	Yes but over a long term	Increased understanding of species behaviour will improve long term management and forest productivity	15-year (2007) measurement completed, next measurement planned for 2012.
Larch seed trials	The IFPA will support the Western Larch Realized Gain Genetic Gain Trials Nelson / Thompson Okanagan Seed Planning Zones through in house support wherever possible, and use of consultants as needed. The project is government led, out of the Kalamalka Forestry Centre.	Landbase	FLNRO	Yes	Improved tree growth and understanding of long term site suitability will lead to increased stand productivity.	3-year (2006) & 6-year (2009) measurements completed, next is 10-year in 2013
Broadleaf Management	Remeasurements and analysis for the Broadleaf Management in the Arrow TSA – Champion Lakes PROBE site, in partnership with FLNRO – SIFR, via funds and in house assistance. Ministry will lead this project.	Landbase	Atco corporate dollars	No	Improved knowledge of stand dynamics will result in management efficiencies.	4 th measurement planned for 2011-12.

See Appendix 7 for descriptions of how the projects will be carried out.

5.0 Management and Communications

The management and communications strategy outlined in the original IFPA proposal will be followed.

5.1 Management Structure

The management structure for the IFPA ensures that senior management of each licensee is involved in the IFPA and that specific projects are overseen by technical experts from each licensee. The organizational structure for the management of the IFPA is reflected in Figure 5.1.

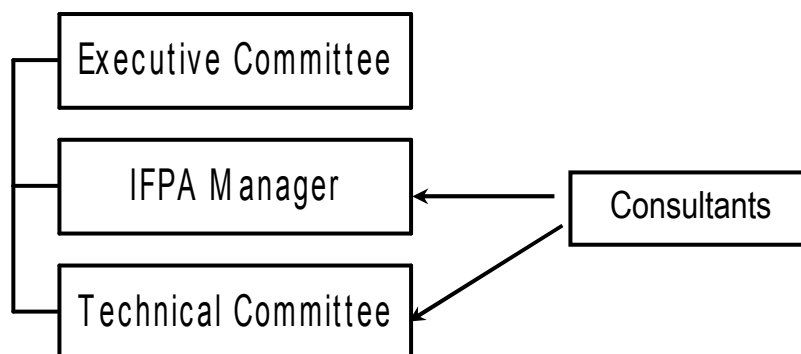


Figure 5.1: IFPA Management Organizational Chart

The Executive Committee is responsible for providing strategic direction for the IFPA and maintaining community liaisons.

The Executive Committee is made up of a voting member from each licensee:

- Atco Wood Products Ltd.
- Stella-Jones Canada Inc.
- Kalesnikoff Lumber Ltd.
- Springer Creek Forest Products Ltd.
- Tolko Industries Ltd.

The Committee will work to the greatest extent possible on a consensus basis. Where consensus cannot be reached, the Chair will put matters to a vote. Votes will be cast by voting members who are present at the meeting or on the conference call (provided that a quorum of three voting members is present). A simple majority shall carry all votes.

Minutes will continue to be prepared for each meeting or conference call of the Executive Committee and shall be approved by the Committee at the subsequent meeting. A meeting agenda and background material will be distributed to all committee members at least three calendar days prior to the meeting or conference call.

Members are permitted to delegate their representation to another member or to any individual they select. However, members will be held accountable for the actions of their delegate at any meeting including, in the case of voting members, voting actions taken.

Key responsibilities of the Executive Committee include:

- Approving budget, expenditures and the strategic direction of the Forestry Plan;
- Providing a source of public input and dialogue

5.1.1 Technical Committee

The Technical Committee will be responsible for ensuring that projects and related work carried out by the IFPA is consistent with the Forestry Plan, Forest Act and related regulations and Forest Renewal funding criteria. This Committee will play an active role in reviewing and approving the selection of project methodology and the approval of contractors to carry out projects contained in the Forestry Plan.

The Technical Committee is made up of representatives from each licensee, the environmental community, Forest Service District and Region, MOE District and Region. This includes the following people:

Voting members:

- Atco Wood Products Ltd. – Fruitvale
- Stella-Jones Canada Inc. – Salmon Arm
- Kalesnikoff Lumber Ltd. – Thrums
- Springer Creek Forest Products Ltd. –
Slocan
- Tolko Industries Ltd. – Lumby

Non-voting members:

- MFLNRO – Kootenay Boundary Forest Region
- MFLNRO - Selkirk Forest District
- MOE - Kootenay Region

The Technical Committee is chaired by an IFPA holder representative, at present, Ron Ozanne of Atco.

The Committee will work to the greatest extent possible on a consensus basis. Where consensus cannot be reached, the Chair will put matters to a vote. Votes will be cast by the voting members who are present at the meeting or on the conference call (provided that a quorum of three voting members is present). A simple majority shall carry all votes. If a simple majority decision cannot be reached by the Technical Committee, the decision will be referred to the Executive Committee.

Minutes will continue to be prepared for each meeting or conference call of the Technical Committee and shall be approved by the Committee at the subsequent meeting. A meeting agenda and background material will be distributed to all committee members at least three calendar days prior to the meeting or conference call.

Members are permitted to delegate their representation to another member or to any individual they select. However, members will be held accountable for the actions of their delegate at any meeting including, in the case of voting members, voting actions taken.

The technical committee sets direction for the IFPA and uses consultants to assist with the management and development of Forestry Plans. The individual IFPA holders use consultants to implement specific projects. Key responsibilities for the technical committee include:

- Addressing technical issues;
- Establishing technical standards; and,
- Providing support and assistance to the IFPA manager.

5.1.2 IFPA Manager

At time of writing, August 2011, the IFPA Manager is Ron Ozanne, R.P.F.

5.2 Project Management

Every project and activity must be approved by the Technical Committee before it can access funding from or operate under the auspices of the IFPA. The Technical Committee will play an active role in approving projects, monitoring project achievements and expenditures, evaluating the effectiveness of projects and determining any subsequent follow up or related projects flowing from current projects.

Each project will be assessed by the Technical Committee and prioritized as High (1), Medium (2), and Low (3) indicating the priority of the project within the Arrow TSA.

5.2.1 Process for Approval of Projects

All projects must be recommended by the Technical Committee and approved by the Executive Council. Each project will be approved in consideration of its financial return on investment and the requirement to complete the project within timelines.

5.2.2 Project Accountability

Each project considered and approved to proceed by the AFLG, will be championed by an IFPA holding Licensee member of the AFLG. The Licensee will be held accountable to the other members of the AFLG

5.3 Monitoring Plan

The monitoring program will be comprised of the annual report and update to the IFPA holders. Monitoring, specific to the Arrow IFPA will focus on monitoring the currency of the Vegetation Resource Inventory every 5 years in conjunction with the Data Package for TSR4 or the IFPA AAC uplift #2 concurrent with TSR 4.

5.4 Financial Management

The Executive Committee is responsible for overall financial management of the IFPA. The technical committee will be responsible for specific project expenses and the IFPA manager will be charged with tracking the finances and reporting to the executive and technical committees.

The IFPA is generally funded from:

1. Corporate funds;
2. Forest Investment Account, where the program activities are eligible for FIA funding;
3. Forests For Tomorrow, where the program activity is eligible for FFT funding;
4. Other funding sources which can be secured that meet both the strategic objective of the funding source the goals of the AFLG.

At the end of the fiscal year, a third party audit will be undertaken to ensure that the books and records accurately reflect expenditures and that funds have been invested in activities which are consistent with the project descriptions contained in the Forestry Plan and the funding source. Results of the audit shall be communicated directly to the Technical Committee, Executive Committee and funding source managers.

5.5 Communications

The Forestry Plan 2011 will be available to the public for review. The MFLNRO is taking responsibility for making the document available to the public.

5.5.1 Technical Committee

The Technical committee meets on an adhoc basis to address business issues of importance at the time.

5.5.2 Executive Committee

The Executive committee meets on an adhoc basis to address business issues of importance at the time.

5.5.3 IFPA Web Site

The IFPA website served the AFLG well during the period of 1999-2004. The IFPA website has been shutdown pending the decision by the Minister of Forests, Lands and Natural Resource Operations as the Ministry considers the longevity of the future program in the province. The website is a relatively low cost item and will be re-opened if the IFPA becomes more active in future.

5.5.4 Annual Download Session

In years when there is sufficient IFPA activity to merit a download session, the IFPA will hold an open house to review accomplishments with all interested parties. Input from the annual download session will be used in setting the IFPA's Business Plan for the next fiscal year. This session will also form part of the IFPA's monitoring and feedback process.

5.5.5. Project report postings

The majority of IFPA projects are funded through the Forest Investment Account/Land Base Investment Program and managed through the LBI program information management website. The purpose of this website is to provide administration of the LBI program as it pertains to the administration of specific LBI activities by PricewaterhouseCoopers LLP (PWC). PWC does not issue completion funds for projects until the deliverables from the project are delivered to specified government information repositories, including the Ministry of Forests, Lands and Natural Resource Operations Library, the Ministry of Environment Library, Regional and District Forest Service offices and databases. All these deliverables are open for public review. Extension of project results is also facilitated by government funded agencies such as FORREX (the forest research and extension partnership). Through this process, most of the IFPA project results are accessible to the public and potential users

In addition, each year the technical committee produces a brief report summarizing the activities completed by the IFPA and the plans for the upcoming year. The annual report and work plan are submitted to the regional manager and are available for public review.

6.0 Arrow IFPA AAC uplift extension

In 2008, the AFLG were successful in their request for an Allowable Annual Cut uplift for the Arrow IFPA. The request was based on the assessment of upward and downward pressures on the Arrow TSA harvest flow (short, medium and longterm) of eligible innovative forest practices in relation to the original TSR 3 base case analysis. The key project was the VRI Phase 2 ground and net volume adjustment factor sampling work which led to a sizeable increase in all mature forest cover volumes. With the exception of the VRI Phase 2 information, the basic data package for both the TSR 3 and the IFPA Uplift Analysis were the same. Timberline Forest Inventory Consultants were commissioned to do both the TSR 3 and Uplift projects.

The TSR 3 AAC determination that occurred in June 2005, is set to be in place until 2015. For a further discussion of issues relating to Arrow TSA since the 2006 uplift request, please see Appendix 10.

A summary of projects that have been undertaken by the IFPA that specifically relate to sustainable forest management is included in Appendix 5. These projects range across the spectrum from research based to operationally focused; from management opportunities to public involvement. Over the past twelve years the Arrow IFPA has done a number of projects, some that have helped with managing the forest environment better and others that have been forethinking in management philosophies.

Also appended to this plan (Appendix 6) is a table from 2001 which lists early IFPA projects and how they contribute to the TSR 2 Arrow timber supply analysis .

Although many of the IFPA reports have not directly affected AAC determination they have provided rigorous innovative assessments of sustainable forest management strategy and verified many parameters used within Timber Supply Analyses.

6.1 Key Innovative Projects from the Arrow IFPA

Many of the IFPA's early innovative projects brought new management concepts to the former Nelson Forest Region. For example, the criteria and indicator project(s) incorporated learnings from Canfor's ² Sustainable Forest Management plans and public advisory groups around the province; and principles of sustainability from the Montreal Process³ and the Canadian Council of Forest ministers. Current (2011) certification programs include many of the elements examined by the IFPA's sustainability initiatives.

The following paragraphs describe some of the IFPA's early innovative projects.

As stated above, these projects were not expected to contribute directly to AAC increases but were to address a range of values, and to improve sustainable forest management.

Sustainability Network

The Arrow IFPA Sustainable Forest Management Framework project developed an alternative conceptual framework for forest management in the Arrow Forest District. The project was a

² Canfor was the predecessor of Springer Creek Forest Products in the AFLG

³ The Montreal Process was an initiative launched in 1992 among non-European temperate and boreal countries to develop and implement internationally agreed criteria and indicators for sustainable forest management.

pilot for the district, and was one of the first applications of sustainability planning in British Columbia.

Built around the concept of sustainability, the Framework uses criteria and indicators as a means of developing forest management strategies with clear goals and objectives. It incorporates hierarchical planning to address these goals and objectives at a variety of spatial and temporal scales, and it is supported by a suite of decision support tools and procedures that include scenario planning, trade-off analysis and public Multi-Criteria Analysis (MCA). The Sustainable Forest Management Plan for Arrow TSA was developed under the Framework.

Information Management System

This project, initiated in 1999, was to develop an Information Management System (IMS) to capture, archive, and extend all information related to IFPA activities. In 1999, information related to the Arrow TSA forest resource was warehoused in different locations and formats, and managed with a number of government and non-government custodians. The Arrow Forest District and the local BC Environment office operate in an ArcInfo GIS environment and thus had the starting point for a seamless GIS database already in place. A critical point was to work with government, to ensure the long term viability of the system. A Fit analysis was undertaken to determine the most appropriate information management system for the IFPA and the AFLG and government agencies. The IFPA, working with the Ministry of Sustainable Resource Management and Selkirk College's GIS centre expanded this project into the Kootenay Spatial Data Partnership.

Overlapping Values Modelling

The Arrow TSA is a very diverse management unit and the overlap of values varies among landscape units. Overlapping values within the Arrow TSA include biodiversity; timber supply, VQO requirements; watershed requirements and wildlife habitat requirements. From the outset, the IFPA technical committee recognized that the overlap of values constrains timber availability, and developed a project to investigate innovative options for addressing this issue.

This project had useful results for planners in Arrow TSA. The researchers found that the approach of geographically locating constraints throughout the model can be helpful in developing operational strategies to address them. It is most applicable in a heavily constrained management unit like the Arrow TSA where the model has relatively few choices about which stands to harvest. The project report identifies several priorities for Arrow planners. For example, reducing the constraining effect of visuals should be a top priority since it affects large areas over the entire time horizon. There are also some relatively large watersheds that have had a significant harvest history that appear to be constraining in decade 3. In these cases while the front part may overlap with VQOs, much of the area is constrained only by water. In these cases watershed assessments and strategically directed restoration and harvesting locations should help. The findings of the overlapping values led to the IFPA's Visual Landscape Review project.

6.2 Recommendation on issues from the 2008 Rationale for Increase in AAC for the Arrow IFPA

In the 2008 Arrow IFPA AAC Increase Rationale, the Regional Manager identified four specific issues which could reduce the uncertainty and risk with future determinations. They are site productivity estimates, wildlife tree patches, twenty-year plan and mountain pine beetle.

6.2.1 Site Productivity estimates

Site productivity largely defines how quickly trees grow in a particular area. In the TSR 3 & IFPA AAC Uplift analyses, site productivity estimates for managed stands were based on Predictive Ecosystem Mapping (PEM). While the Arrow TSA PEM was accepted for use in the analyses, some qualifications were noted. Given the sensitivity of Arrow's timber supply to uncertainty in site index, it would be useful to increase confidence in the productivity estimates by monitoring growth of young stands using established protocols, and to improve the PEM classification.

In 2009, the Forest District received a review of the options to update or replace the Arrow Predictive Ecosystem Mapping (PEM). Three options were provided with costs ranging from \$150,000 to \$500,000. At this time, neither the district nor the AFLG have funding available to address upgrades to the Predictive Ecosystem Mapping product. In addition, the MFLNRO Regional Ecologist is in the midst of revising the current biogeoclimatic mapping for the Arrow TSA, and any revisiting of the Arrow PEM should be postponed until that work is completed.

For the younger stands, the silviculture history records (e.g. Phoenix &/or Genus) does provide the monitoring verification regarding height growth and age data.

6.2.2 Wildlife Tree Patches

Wildlife tree patches (WTP) are now inputted into the RESULTS system. This will provide an improved data source for use in future timber supply analyses. The governments Forest and Range Evaluation Program (FREP) has conducted surveys to verify WTP requirements as set out under forest legislation. The goal of FREP is to be a world leader in resource stewardship monitoring and effectiveness evaluations; communicating science-based information to enhance the knowledge of resource professionals and inform balanced decision making and continuous improvement of British Columbia's forest and range practices, policies and legislation.

6.2.3 Twenty year Plan

A 20 year plan was included with the 2006 Arrow IFPA uplift application submission. The 20-year plan was a map of the first 20 years of harvest spatially allocated by CASH6 in the IFPA Uplift Analysis Scenario (harvest level of 640,000 m³/year). There were some concerns raised that the harvest blocks were in areas unlikely to be harvested, the blocks were often small and there was not enough overlap with proposed layout. In the fall of 2007, the AFLG revised the 20 year plan by:

1. Updating the Arrow resultant file to include the most recent planned harvest blocks from each licensee;
2. Creating a blocking algorithm that makes larger blocks, but still maintains the required attributes for the analysis;
3. Create a new set of CASH6 analysis files replicating the Arrow Uplift analysis scenario using the new blocking layer;
4. Adjusting the analysis to:
 - a. Not harvest in proposed OGMAs;
 - b. Target the newest licensee proposed harvest blocks (in addition to the previous planned blocks which were already prioritized);
 - c. Only harvest what was proposed for harvest in the Slokan Valley.

This revised plan was submitted and satisfied the concern on the issues. Recently, Springer has raised a concern about finding available volume within their operating area, specifically

within the Slocan Valley. They are currently working through alternative processes and options with District staff.

6.2.4 Mountain Pine Beetle

Demonstrating the impact on the TSA of Mountain Pine Beetle (MPB) is a very difficult item to analyze or model accurately. As MPB has had differing impacts throughout the TSA and the AFLG operating areas, it was decided that each licensee would provide individual statements regarding the MPB impact in their areas and how they are addressing it. Appendix 8 contains these statements.

List of Appendices

- APPENDIX 1 Section 59.1 of the Forest Act
- APPENDIX 2 Information Document – IFPA Process 2011
- APPENDIX 3 ARROW TSA Background – Arrow IFPA Share Agreement
- APPENDIX 4 Inventory of Inventories 2008 – 2011
- APPENDIX 5 IFPA Sustainable Forest Management Projects – 1999 - 2011
- APPENDIX 6 Arrow IFPA Timber Supply Project Review – April 2001
- APPENDIX 7 IFPA Planned Projects Descriptions (2011 – 2015)
- APPENDIX 8 AFLG statements regarding Mountain Pine Beetle
- APPENDIX 9 Timber Supply Analysis Report, Arrow IFPA, Support & Analysis for Uplift Application, October 2006
- APPENDIX 10 Key Issues or Changes since the 2006 submission of the AAC Uplift Request

APPENDIX - 1 Section 59.1 of the Forest Act

Innovative forestry practices

59.1 (1) For the purpose of improving the productivity of the forestry resource, the minister, at his or her discretion, may enter into an agreement with a person referred to in subsection (2) to allow that person to carry out, subject to subsection (5) and the *Forest and Range Practices Act*, one or more of the innovative forestry practices and other activities that are set out in a regulation made under subsection (4).

(2) For the purposes of subsection (1), the minister may enter into an agreement with a person who

- (a) is the holder of a forest licence or other agreement that is entered into under section 12 and specified in a regulation made under subsection (4) of this section, and
- (b) presents a written proposal for an agreement to the minister.

(3) An agreement under subsection (1)

- (a) must be for a term not exceeding the term prescribed in a regulation made under subsection (4) (c), and
- (b) may include terms and conditions that

- (i) the minister considers are necessary to effectively carry out the purpose of the agreement and further the social and economic objectives of the government, and
- (ii) are consistent with this Act and the regulations and the *Forest and Range Practices Act*, and the regulations and standards made under that Act.

(4) The Lieutenant Governor in Council may make regulations as follows:

- (a) specifying the innovative forestry practices and other activities that may be the subject of an agreement referred to in subsection (1);
- (b) specifying the agreements entered into under section 12, the holders of which may enter into an agreement with the minister under subsection (1) of this section;
- (c) prescribing the maximum term of an agreement under subsection (1).

(5) A person may only carry out an innovative forestry practice or other activity referred to in subsection (1) if the person

- (a) has prepared and obtained the minister's approval of a forestry plan that meets the requirements of subsection (6), and
- (b) is carrying out the practice or activity in accordance with the plan.

(6) A forestry plan

- (a) must contain a description of the management area where the innovative forestry practices or other activities will be carried out,
-

- (b) must specify the particulars of the innovative forestry practices or other activities,
- (c) must contain a description of how the innovative forestry practices or other activities will be carried out,
- (d) must contain a schedule of when the innovative forestry practices or other activities will be carried out,
- (e) must specify how the innovative forestry practices or other activities will contribute to improved productivity of the forestry resource,
- (f) must specify how the innovative forestry practices or other activities will justify an increase in the allowable annual cut of the participant's licence or agreement referred to in subsection (2) (a), and
- (g) may include other terms and conditions that
 - (i) the minister believes are necessary to effectively carry out the agreement referred to in subsection (1), and
 - (ii) are consistent with this Act and the regulations and the *Forest and Range Practices Act*, and the regulations and standards made under that Act.

(7) After approving a person's forestry plan, the minister may increase the allowable annual cut authorized in the person's licence or agreement referred to in subsection (2) (a) by an amount that is justified according to timber supply analysis methodology approved by the chief forester or the chief forester's designate.

(8) When the minister increases an allowable annual cut under subsection (7), the minister may limit the increase to a period of time, area of land and type of timber, and may make the increase subject to conditions.

(9) If an assessment of

- (a) the innovative forestry practices or other activities being carried out under the forestry plan, or
 - (b) information that was not available at the time the minister increased the allowable annual cut under subsection (7)
- indicates that all or part of the allowable annual cut increase was not justified, the minister may reduce the allowable annual cut of the licence or agreement referred to in subsection (2) (a) by an amount not exceeding the increase granted under subsection (7).

(10) If, with respect to an innovative forestry practice or other activity, a person is not complying with

- (a) the agreement referred to in subsection (1),
 - (b) the forestry plan approved under subsection (5),
-

(c) any limitation or conditions imposed under subsection (8), or
(d) this Act and the regulations made under this Act, or the *Forest and Range Practices Act* and the regulations or standards made under that Act,

the minister may do one or both of the following:

(e) suspend or cancel the agreement referred to in subsection (1) and sections 76 and 77 apply with respect to that suspension or cancellation;

(f) reduce the allowable annual cut of the person's licence or agreement referred to in subsection (2) (a) by an amount the minister determines is attributable to the default.

(11) A reduction under subsection (9) or (10) may be apportioned over a period of up to 5 years.

(12) If the forest licence, or other agreement referred to in subsection (2) (a), is suspended, the agreement under subsection (1) is suspended.

(13) If the forest licence, or other agreement referred to in subsection (2) (a), is cancelled or surrendered, the agreement under subsection (1) is cancelled.

(14) If the agreement referred to in subsection (1) is suspended or cancelled, the forestry plan is suspended or cancelled, as the case may be.

APPENDIX - 2 *Information Document – IFPA Process 2011*
Southern Area, Ministry of Forests, Lands and NRO

March, 2011

Information Document – IFPA Process 2011

Southern Area, Ministry of Forests, Lands and NRO

General Information

- February 9, 2011 Minister Bell determined that he was willing to extend the IFPA agreements to December 31, 2015, from the current expiry date of August 31, 2011.
- The IFPA holders can initiate this extension of their IFPA Agreement by confirming their wish for this extension by either letter or email to their Regional Timber Tenures Forester.
 - Arrow & Okanagan TSAs - Glen Sparrow
 - Interfor – Kamloops TSA - Dave Baird
 - Merritt TSA - Tracy Hendry
 - Tolko – 100 Mile House and Williams Lake TSAs - Gerald Reichenback

Confirmation before April 15th, 2011 would be appreciated.

- Current IFPA AAC uplifts expire August 31, 2011. If the IFPA is extended, the IFPA holder may update their forestry plan and apply to the regional manager for an extension of all or part of their AAC uplift to the expiry date of December 31, 2015.
 - Forestry plan submissions and any request for extending AAC uplifts must be made prior to August 31, 2011.
 - Legal requirements for forestry plans are identified in Forest Act Section 59.1, in each licensee innovative forestry practices agreement, and conditions of the allowable annual cut increase rationales.
 - The application needs for forestry plans and AAC increases will vary among IFPA areas. Variations depend upon currency of forestry plan and AAC increase application analysis, conditions of AAC increases, and land base and forest management changes since previous determinations.
 - IFPA holders should note that in some cases information presented for a decision may still be relevant if minimal changes have occurred. However, it must be recognized the decision maker will be different and may see the information in a different light given current conditions. As such, decisions may not be identical to past decisions given these changes.
-

- First Nation consultation will be required for Forestry Plan and AAC increase applications. The licensee should be information sharing with First Nations to facilitate the ministry's consultation process.
- With the submission of the Forestry Plan and AAC increase application a summary of previously obtained input from public, First Nations, government agencies (MOE, MFR), and others who may be affected should be provided at the time of the submission.
- The IFPA holder should make available and solicit input on the Forestry Plan and AAC increase application from First Nations, the public, Ministry of Environment, Ministry of Natural Resource Operations, and others who may be affected (e.g., trap line holders). A summary of whose input was solicited, how it was solicited, comments received, and actions taken to address any comments should be provided to the regional manager within 65 days following the submission.
- **For queries on the Forestry Plan and the AAC uplift process please contact Jeff Stone.**

Arrow

- The forestry plan was last approved in December 2007. Even if status quo is being followed the forestry plan needs updates of information prior to submission to the regional manager.
 - The IFPA holder should submit a formal request for an AAC increase that identifies the AAC increase requested, how the specific innovative forestry practices justified and continue to justify an AAC increase, and how the timber supply analysis provided demonstrates this justification.
 - To support the current AAC increase the IFPA holders had provided analysis that was up-to-date in 2004. While this analysis is dated it is probably still sufficient information with respect to a status quo AAC increase application. However, the IFPA holder s will need to justify the use of such analysis as per chief forester methodology (i.e., document assumptions used are still current). Changes in the application (e.g., different innovative forestry practices or increases in requested level) may require updates to the analysis.
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APPENDIX - 3 *ARROW TSA IFPA holders Background – Agreement*

Arrow Forest Licensee Group

Memorandum of Understanding Regarding the Arrow IFPA

September 16, 2002

Background

The Arrow Innovative Forest Practices Agreement (IFPA) has been a collective venture of the Arrow Forest Licensee Group (AFLG) for the past few years. Previously, projects were largely funded through FRBC and a special IFPA allocation. That funding source is now gone, replaced with a new Forest Investment Account (FIA) funding delivery mechanism characterized by individual licensee allocations and significantly reduced dollars. As foreseen at the outset of the IFPA, adjustments to the structure of the IFPA are now required.

Goal

To have a common understanding among the AFLG of how decisions regarding IFPA monetary or non monetary issues are reached, implemented and reviewed.

Members

Atco Lumber Ltd. (Atco)
Bell Pole Company (Bell Pole)
Kalesnikoff Lumber Co. Ltd. (Kalesnikoff)
Riverside Forest Products Ltd. (Riverside)
Slocan Forest Products Ltd. (Slocan)

Representatives/Alternates

Hans Louwe/Ron Ozanne
Gord Sluggett/Colin Pike
Ken Kalesnikoff/Reiner Augustin
Mark Tamas/Peter Love
Tim Yanni/Kathy Howard

IFP A Executive Chair and Meeting

Annually the members will elect a Chair, as necessary, to coordinate the activities of the Arrow IFP A and speak (or designate alternate speakers) on behalf of the IFPA. The Chair will call at least two face-to-face full Executive meetings per year and at least two additional Executive tele-conferences. Participation by the representative or his alternate, or the provision of a Proxy is fully expected. Additional licensee-only meetings may be scheduled at the call of the Chair to resolve issues that may threaten the AFLG's unity as seen by the public, or other primary concerns of the AFLG.

Quorum

For any meeting, quorum of the members will be a majority of the members plus Proxies (i.e. 3).

Agreement

Agreement to proceed on various projects, etc. will generally be by consensus of all the members. On every important decision, members will make a strong effort to come to agreement. Where best efforts for consensus cannot be reached, the Chair will determine a method to resolve the issue. When speaking on behalf of the IFP A, the Chair or his representative shall confine his or her remarks to matters upon which agreement has been explicitly reached.

IFPA Technical Chair and Meeting

Annually, the members will elect a Chair to guide IFPA direction on a day-to-day basis and to liaise with the Executive.

Memorandum of Understanding Term

This Memorandum of Understanding has a term of one year from July 1st, 2002 to June 30th, 2003.

IFPA Strategic Direction

The AFLG is committed to a two-pronged approach to the IFPA consistent with the approved Forestry Plan and its amendments, namely the pursuit of Sustainable Forest Management (SFM) along with an increase in allowable annual cut (AAC). Each project contributing to these two goals will be expressly approved by the Executive following a review of the detailed project description and timelines by the Technical Committee.

Project Funding

The members will approve a list of projects that will be carried out for the furtherance of collective IFPA objectives. For the 2002-03 fiscal year, it is expected that funding for these projects will come from FIA dollars in proportion to each member's FIA allocation within the Arrow TSA. Funds will be transferred between various FIA Investment Schedules as required to achieve overall proportionate funding of IFPA projects, along with FIA administrative allowances associated with those funds, as set out below.

Licensee	FIA Allocation	Proportion of Total FIA Allocation	Licensee Share of IFP A Budget	Blended Administrative Allowance	Total Administrative Allowance
Atco	\$270,865	36.3%	\$191,664	8.22%	\$17,166
Bell Pole	\$30,354	4.1%	\$21,648	12.00%	\$2,952
Kalesnikoff	\$62,423	8.4%	\$44,352	12.00%	\$6,048
Riverside	\$83,686	11.2%	\$59,136	12.00%	\$8,064
Springer Creek	\$298,458	40.0%	\$211,200	8.01%	\$18,390
Total	\$745,786	100.0%	\$528,000		

Where projects are not eligible for FIA funding the members may contribute corporate dollars if they so wish.

Project Administration

Approved projects will be administered by individual licensees and peer reviewed by the Technical committee representative of at least one other licensee. Project sectors, their budgets and the individual licensees responsible for each sector are set out below.

Project Sector	Responsible Licensee	Sector Budget
SFM Framework	Slocan	\$242,000
Vegetative Resource Inventory	Atco	\$168,000
PEM Accuracy	Bell Pole	\$15,000
SFM Plan	Kalesnikoff	\$25,000
AAC Uplift	Atco & Riverside	\$78,000
Total Project Budget (Excluding FIA Administrative Allowances)		\$528,000

The responsible licensee will ensure that for each project a final report consisting of both a hard copy and a compact disc (CD) is sent to the Ministry of Forests Regional Office, the Ministry of Forests District Office, and, where appropriate, the Ministry of Sustainable Resource Management Regional Office. In addition, the responsible licensee will send a CD copy of the deliverables for each project to the Technical Committee representative of each of the other members.

Reports to the IFPA Executive

Each AFLG member will track and regularly report to the IFPA Executive the current contracted costs, claimable in-house costs (for example, a mapping deliverable done by a member's Own staff), and the associated administrative allowance due to the licensee for each project under its administration. These reports will adhere to the following format and schedule:

Project Name	FIA Project #	YTD Contract Expenditures	YTD In-House Expenditures	YTD FIA Administrative Allowance	Total YTD Project Expenditures	Comments
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In addition, the administering licensee will provide a one-page description of each project's progress with respect to its approved timeline, its budget and its accomplishments. The intent of these reports is to monitor each project to ensure that it is on track, and it is understood that they will entail estimates only.

Written reports will be provided to the IFPA Executive at each of the following dates:

October 31st, 2002
 December 31st, 2002
 January 31st, 2003
 February 28th, 2003
 March 31st, 2003
 May 31st, 2003

AAC Changes Resulting From the IFPA

Any AAC uplift (or reduction) that accrues to the members as a result of a request made on behalf of the IFPA, will be shared in proportion to the January 1,2002 TSA AAC allocation set out below.


Licensee	AAC as of January 1,2002
Atco Lumber Ltd.	151,627
Bell Pole Company	11,970
Kalesnikoff Lumber Co. Ltd.	34,703
Riverside Forest Products Ltd.	47,589
Springer Creek Forest Products Ltd.	197,841
Total	443,730

Notwithstanding the foregoing, there is an option for a different sharing of the uplift if all parties agree to the process.


Withdrawal From the Memorandum of Understanding

In the event that a member chooses to withdraw from this agreement, it is incumbent upon that member to immediately advise the other four parties of their decision and their intended future direction at the earliest possible opportunity. If, after further consideration, the member decides they have no alternative, the member will provide a notice of their withdrawal to the Ministry of Forests.

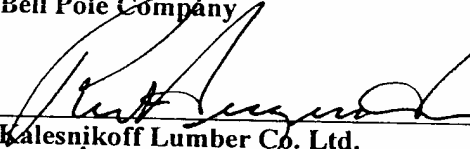
Agreed to by the Members this _____ day of September, 2002.



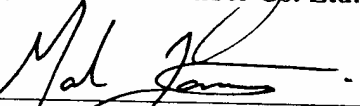
 Atco Lumber Ltd.



 Bell Pole Company



 Kalesnikoff Lumber Co. Ltd.



 Riverside Forest Products Ltd.



 Slocan Forest Products Ltd.

IFPA HOLDERS SHARE AGREEMENT OF
ARROW IFPA AAC UPLIFT REQUEST**Innovative Forest Practices Agreement Holders**

	Share Allocation %
Atco Lumber Ltd	34.2%
Bell Pole Canada Inc.	2.7%
Kalesnikoff Lumber Co. Ltd.	7.8%
Springer Creek Lumber Ltd.	44.6%
Tolko Industries Ltd.	10.7%
	<u>100.0%</u>

Agree to by the Members this 16th day of September , 200

Atco Lumber Ltd

Bell Pole Canada Inc.

Kalesnikoff Lumber Co.Ltd.

Springer Creek Lumber Ltd.

Tolko Industries Ltd.

APPENDIX 4 Inventory of Inventories 2008 - 2011

Note: All inventories predating June 1998 are in the 1999 Arrow IFPA Forestry Plan, inventories from 1999 to 2006 are in the 2006 Forestry Plan amendment.

Arrow TSA Inventory of inventories							
Organizational name	Landscape units	Licensee	Drainage	Type of inventory (cat)	Title	Date	
Tolko Industries Ltd.	Arrow TSA 01	Tolko	Eagle LU	Public Involvement	Okanagan Sustainable Forest Management Public Advisory Group Annual Report	31/03/09	
Tolko Industries Ltd.	Arrow TSA 01	Tolko	Eagle LU	Public Involvement	Okanagan Sustainable Forest Management Public Advisory Group Annual Report	31/05/10	
Tolko Industries Ltd.	Arrow TSA 01	Tolko	Eagle LU	Public Involvement	Okanagan Sustainable Forest Management Public Advisory Group Annual Report	31/05/11	
Springer Creek Forest Products	Arrow TSA 01	Springer	Caribou & Idaho LUs	Wildlife	Preliminary Avalanche Track Mapping and Grizzly Bear Habitat Ratings for Koch, Hoder, Caribou & Idaho LUs	30/09/08	
Springer Creek Forest Products	Arrow TSA 01	Springer	Kuskanax River & Caribou Creek	Fisheries	Fish and Fish Habitat Inventory Digital Update on the Kuskanax River and Caribou Creek in SCFP's operating area	31/03/10	
Springer Creek Forest Products	Arrow TSA 01	Springer	Rodd Creek	Fisheries	Fish Passage Works – Rodd Creek	31/12/10	
Springer Creek Forest Products	Arrow TSA 01	Springer	Tillicum Creek	Fisheries	Fish Passage Works – Tillicum Creek	31/03/10	
Springer Creek Forest Products	Arrow TSA 01	Springer	Lemon & Idaho LUs	Forest Planning	Harvest Flow Planning in Springer's Operating Areas in Lemon & Idaho LUs	31/03/10	
Springer Creek Forest Products	Arrow TSA 01	Springer	Wensley Creek	Recreation	Recreation opportunities development	31/03/10	
Springer Creek Forest Products	Arrow TSA 01	Springer	Kimbol Lake	Fisheries	Fish Passage Works – Rodd Creek	30/09/10	
Kalesnikoff Lumber Co. Ltd.	Arrow TSA 01	Kalesnikoff	Wolverton Creek	Water/Hydrology	Wolverton Creek Water Quality Monitoring	31/03/09	
Atco Wood Products	Arrow TSA 01	Atco	Norns Creek	Water/Hydrology	Norns Creek Water Quality Monitoring	31/03/09	
Atco Wood Products	Arrow TSA 01	Atco	Norns Creek	Water/Hydrology	Norns Creek Water Quality Monitoring	31/03/10	
Min of Forest, Lands & Natural Resource Operations	Arrow TSA 01	MFLNRO	TSA Wide	Vegetation Resource Inventory	Arrow Phase 1 VRI Calibration	31/03/09	
Min of Forest, Lands & Natural Resource Operations	Arrow TSA 01	MFLNRO	TSA Wide	Vegetation Resource Inventory	Arrow Phase 1 VRI Accuracy Assessment Sampling	31/03/10	
Ministry of Environment	Arrow TSA 01	MOE	Central Selkirks	Wildlife	Caribou census for Central Selkirk herd	31/03/10	

APPENDIX - 5 IFPA Sustainable Forest Management Projects 1999 - 2011

Project Title	Type of Project	Date
Review of Operability lines for the Arrow TSA for the Arrow IFPA Members	Forest mgmt opportunities	Mar-99
Interim Silviculture Strategy	Forest Productivity	Aug-99
Analysis of Forest to Product Planning & Log Allocation Activities	Research - Utilization	Jan-00
Improving Green-up Inputs for the Arrow TSA A Compilation of ISIS/Licensee Data	Forest mgmt opportunities	Mar-00
Arrow TSA Viewscapes Review -Analysis of select viewscapes within the Arrow Timber Supply Area	Visual Quality	May-01
Arrow IFPA Fertilization Strategy	Forest Productivity	Aug-00
Impact of the current and planned seed orchard program on timber flow in the Arrow TSA	Forest Productivity	Sep-00
Impact of Forest Cover Constraints on Timber Availability in the Arrow TSA	Forest mgmt opportunities	Sep-00
Fume Impact - Ecosystem Rehabilitation Overview Plan	Forest Productivity	Nov-00
Fume Impact Rehabilitation Project – Brushing Treatment	Forest Productivity	Mar-01
Summary & Review of water quality monitoring studies: Arrow Forest District, 1996-1999	Water/Hydrology	Apr-01
Habitat Attributes in the Arrow IFPA Non-harvestable Landbase	Forest mgmt opportunities	Nov-01
Rationale for Development of Criteria and Indicators of Sustainable Forest Management in the Arrow TSA	Research - SFM	Dec-01
The Use of Hemispherical Imagery in Assessing Hydrological Recovery	Water/Hydrology	Mar-02
Access Structure Netdown Review	Forest mgmt opportunities	Mar-02
Wildlife Tree Retention Project	Forest mgmt opportunities	Mar-02
Communication		
Deer IWRP Carryover	Water/Hydrology	Mar-01
Rialto IWRP Carryover	Water/Hydrology	Mar-01
In-stream rehabilitation	Water/Hydrology	Mar-01
Deer FHAP	Forest Health	Mar-01
Deer WQT Monitoring	Water/Hydrology	Mar-01
Deer FHAP	Forest Health	Mar-02
Deer Creek Weir Removal - Watershed Restoration	Watershed Restoration Program	Mar-02
Deer and Elk winter habitat selection and deer winter food habits in the northern B.C.	Wildlife	Apr-03
Predictive Ecosystem Mapping - Accuracy Assessment	PEM	Apr-03
Predictive Ecosystem Mapping - Structural Stage Model and QA	PEM	Apr-04

Project Title	Type of Project	Date
Wolverton Creek water quality/ quantity	Water/Hydrology	Apr-04
Wolverton Creek water quality/ quantity	Water/Hydrology	Dec-04
Fish and Fish Habitat- Deer Creek Phases 4-6	Fisheries	Mar-05
Wolverton Creek water quality/ quantity	Water/Hydrology	Apr-05
Vegetation Resource Inventory Phase 2	Research - Forest Productivity	Dec-05
Wolverton Creek water quality/ quantity	Water/Hydrology	Apr-06
Terrain Stability Mapping- Goose Glade Terrain (Digitizing)	Terrain Stability	Apr-06
Fish and Fish Habitat- Fish Inventory Phases 4-6	Fisheries	Apr-06
Wolverton Creek water quality/ quantity	Water/Hydrology	Aug-06
Fish and Fish Habitat- Fish Inventory Phases 1-3, 1:20,000, Recon. Inventory	Fisheries	Aug-06
Wildlife and Wildlife Habitat-Grizzly Bear Cap./Suitability Mapping	Wildlife	Sep-06
Terrain Stability Mapping- Phase 2 Goose, Gander and McDermid Creeks	Terrain Stability	Nov-06
Preliminary Avalanche Track Mapping and Grizzly Bear Habitat Ratings for Koch, Hoder, Caribou & Idaho LUs	Wildlife	Sep-08
Okanagan Sustainable Forest Management Public Advisory Group Annual Report	Public Involvement	Mar-09
Wolverton Creek Water Quality Monitoring	Water/Hydrology	Mar-09
Norns Creek Water Quality Monitoring	Water/Hydrology	Mar-09
Arrow Phase 1 VRI Calibration	Vegetation Resource Inventory	Mar-09
Fish and Fish Habitat Inventory Digital Update on the Kuskanax River and Caribou Creek in SCFP's operating area	Fisheries	Mar-10
Fish Passage Works – Tillicum Creek	Fisheries	Mar-10
Harvest Flow Planning in Springer's Operating Areas in Lemon & Idaho LUs	Forest Planning	Mar-10
Recreation opportunities development	Recreation	Mar-10
Norns Creek Water Quality Monitoring	Water/Hydrology	Mar-10
Arrow Phase 1 VRI Accuracy Assessment Sampling	Vegetation Resource Inventory	Mar-10
Caribou census for Central Selkirk herd	Wildlife	Mar-10
Okanagan Sustainable Forest Management Public Advisory Group Annual Report	Public Involvement	May-10
Fish Passage Works – Rodd Creek	Fisheries	Sep-10
Fish Passage Works – Rodd Creek	Fisheries	Dec-10
Okanagan Sustainable Forest Management Public Advisory Group Annual Report	Public Involvement	May-11

APPENDIX - 6 Arrow IFPA Timber Supply Project Review –April 2001



Arrow IFPA Timber Supply Project Review

April 2001

IFPA timber supply projects	Description	Status as of April 2001	TSR II AAC Rationale Comments	Suggested Action
Conventional Operability	Update operability line for harvest history.	Completed March 10/99	Accepted, included as an area adjustment, not available in time to be incorporated in analysis.	Include in GIS data base to define operability for any further analysis.
Alternate operability	Identification of a potential land base for alternate harvest systems.	Completed March 31/00	Not submitted as TSR II input.	Could be tested in alternative management scenarios if desired.
ESA/terrain map comparison	GIS/database comparison of terrain mapping to inventory ESA's for soils and terrain.	Completed March 31/00	A revised approach, based on the existing IFPA base case data base was submitted as TSR II input. Use of TSIL B/C mapping instead of the ESA's was accepted, no net down for ES2's was not.	-Include additional B & C terrain mapping in GIS data base. -Develop an accepted method for using it to define the THLB. -Examine the relationship between the old ESA data and the terrain mapping where there is only TSIL D.
Terrain map digitizing	Digitizing additional terrain mapping	In progress	N.A.	Include this in the new GIS analysis data base. Identify boundaries of mapped areas or label all polygons.
Fish Habitat Assessment Modelling	Piloting predictive model for mapping stream class and fish habitat	Data prep in progress	TSR II used 1:50000 watershed atlas	Incorporate new 1:20000 watershed atlas with model outputs for improved TSR input information
Trail rehab. Retrospective	Determine area of rehabilitated trails vs. non rehabilitated.	Curran SCBC proposal	A lower deduction for future roads was suggested as TSR II input.	Conduct project similar to MoF proposal if SCBC does not fund it.
WTP GIS analysis	Spatial application of stand level biodiversity requirements.	Nearly completed	It was noted that the area left in WTP's is higher than directed by policy or modeled in TSR II.	-Ensure operational requirements for stand level biodiversity are consistent with provincial policy. -Consider a tracking project or field project to support GIS
Ecological representation in the NHLB	Examines potential contributions of non THLB areas to meeting resource constraints.	Completed	Not submitted but a sensitivity analysis about disturbance in non-contributing forests was done.	Further examination of alternative approaches – see text of report for details.
Fume impact area	Determines area suitable for stand rehabilitation considering non timber resource values and implements the program.	In progress	There was some discussion about the size of the area suitable for rehab.	-Add area definition information to the data base if possible. -Develop project to examine status of impacted area eg SR, NPBr, NP, private land etc
SIBEC	TEM mapping and sample based adjustments to S.I. values	Nearly completed	Not submitted, but it was acknowledged that the potential site productivity of managed stands has likely been underestimated by the data in the inventory file.	The Chief Forester recommended collecting improved site productivity data. Test impact of SIBEC on timber supply. Could impact short term through faster green-up.
Improved seed	Analyze the effect of using improved seed on wood flow	Completed	Submitted as TSR II input, accepted in accordance with expected future seed supply.	Incorporate in the new base case.
OAF1	Surveys to localize estimates for OAF1	Under consideration	Defaults are OAF1 15% OAF2 5%	Develop project to support possible reduction of OAF1, to offset expected increase in OAF2
Early height growth	Early height growth based on silviculture surveys	Completed, March 2000	Not submitted, since MOF revised their figures during the TSR II process.	Check to see if there are any further gains beyond what was used in the TSR.
Kuskanax fertilization trials	Fertilization trial established in Kuskanax CW in spaced pruned unit.	Completed	No effect	-It will be some time before gains can be measured at Kuskanax. -Get interim results from R Brockley
Type II	Test potential	Not started	--	Greg Rowe and Erik Wang are lined up to

silviculture strategy	treatments through timber supply analysis	yet.		do this. They have to update the basecase first.
IFPA timber supply projects	Description	Status as of April 2001	TSR II AAC Rationale Comments	Suggested Action
VQO project	Compare % alteration in existing practice to TSR assumptions	Initiated	Analysis assumptions are less constraining than operational practices.	-complete the project -extend to other areas -examine management alternatives
UBC visuals project	Lemon Unit scenario planning visual modelling	In progress	--	-similar to VQO project but focusing on different area, more intensive project
Watershed ECA's	Compare ECA's in existing practice to TSR assumptions	Initiated	TSR assumptions are reasonable	Review these two projects, develop and test alternative modeling approaches appropriate.
Redfish Creek project	Continue this hydrology project in KL District to measure impacts on stream flow of various practices.	Ongoing	--	-Apply principles to a hydrology trial in Arrow.
Constraint report	Examined factors constraining short term timber supply	Completed Sept./00	Not submitted but used for prioritizing potential IFPA projects	
ATLAS & SIMFOR project	Lemon, Caribou, and Blueberry LU's	In progress	--	Review results for approaches that can be applied to the Arrow IFPA
Lemon optimization modeling	Apply a spatial optimization model to the Lemon LU	Initiated	--	-Test model in other LUs
Partial cutting project	Define existing partial cutting practices and run PROGNOSIS scenarios	Not completed	--	Analysis portion of original project not completed. Fund project to do analysis and comparison of various model outputs.
Natural disturbance project	Examine alternative natural disturbance regimes	In progress	--	Bridget Dorner. Links with SFM.
Alternative harvesting study	Examine alternative harvesting practices	Not started yet	--	This could link with the visuals and alternate operability

APPENDIX - 7 IFPA Planned Projects Descriptions (2011- 2015)

IFPA planned project descriptions.

In some cases the details of how projects will be carried out are not yet determined because at time of writing (August 2011) there is no funding available for planning IFPA projects.

The next pages present information on the projects planned for the IFPA 2011-2015, subject to funding availability and project approval.

Okanagan Sustainable Forest Management Public Advisory Group

Background

One component of the Okanagan Sustainable Forest Management (SFM) process is public involvement in the SFM plan development and monitoring and general public education. The SFM Plan serves as a “roadmap” to current and long-term management in portions of the Okanagan, Boundary and Arrow TSA’s; setting performance objectives and management strategies that reflect the ecological and social values of the Defined Forest Area. It is consistent with the Okanagan-Shuswap Land and Resource Management Plan (LRMP) and the Kootenay Boundary Land Use Plan (LUP).

Methodology

Tolko is the IFPA lead on this project and an active participant in the public advisory group. The SFMP Monitoring Report period ends March 31st. The advisory group conducts an annual survey of the satisfaction level of the Public Advisory Group (PAG) participants. The survey is conducted in April for the preceding 12-months and reported out in May in the annual SFM monitoring report.

Outputs

The 2009 Okanagan SFM Annual Monitoring Report was released in May 2010 and can be found at

<http://www.thompsonokanagansustainableforestry.ca/docs/oksfm%202009%20monitoring%20report%20-%20final.pdf> . The average satisfaction level of the Advisory Group is at the highest level in 2009 that it has been since the survey began in 2005. The PAG satisfaction survey is continuing to be conducted and will occur in April/May 2011 for inclusion in the 2010 Monitoring Report. The latest PAG meeting occurred in November 2011.

Assisted Migration Adaptation Trial

Background

Climate change will result in tree populations adapting to new conditions. Researchers are investigating how the adaptations will shift forest productivity. The provincial government is exploring the use of assisted migration of seed during plantation establishment to maintain optimum forest health and productivity and to ensure capture of gains from selective breeding.

Approximately 200 million seedlings are planted in BC each year. When those trees are harvested 60-80 years after they are planted, the climate could be 3-4 degrees warmer than when the seedlings were planted, exposing the trees to maladaptation and health risks. The BC Ministry of Forest and Range has initiated a large, long-term climate change research study - the Assisted Migration Adaptation Trial (AMAT) - to better understand tree species' climate tolerances.

Methodology

Seeds from 15 species growing in BC and neighbouring US states will be planted at 48 reforestation sites from central Yukon to southern Oregon. Their growth and health will be monitored, and related to the climate of the plantations, enabling researchers to identify the seed sources most likely to be best adapted to current and future climates. The information will be used to revise BC's species and seed source selection guidelines, helping to ensure maximum health and productivity of BC's planted forests well into the future.

In 2011, activities planned include survival assessments, downloads of the weather stations and possible brushing as required. A further 12 sites are planned for planting, including one area within Stella Jones operating area in Revelstoke.

Outputs

In 2010, three ATCO sites were planted – Bulldog, Ladybird and Glenmerry. Atco staff assisted Ministry researchers in finding the right BEC/Climate combinations for the local sites.

Broadleaf Management Trial

Background:

This project is part of the PROBE (Protocol for Operational Brushing Evaluations) trials, initiated by the Ministry of Forests in the early 1990s. In 1992 Alan Vyse (Research Group leader with the Kamloops Forest Region) identified management of deciduous species in mixed stands in the southern Interior ICH as potentially highly productive. From an ecological perspective, deciduous forests are known to support a high abundance and diversity of wildlife. For timber supply analysis purposes, deciduous forests are considered “not utilized” in the Arrow TSA, though the 2000 TSR report acknowledges that these stands may be physically operable and exceed low site criteria. Current silviculture standards (i.e. free growing standards) are relatively restrictive in terms of deciduous species.

This project will investigate the potential for deciduous management in the Arrow TSA, expanding on work done by the Kamloops Regional Research dept (Suzanne Simard) and the Columbia Basin Fish and Wildlife Compensation Program (John Krebs).

The project examines four aspects of deciduous management: Deciduous competitive effects in coniferous stands; deciduous grown with coniferous as mixed wood stands; deciduous grown in pure stands; deciduous forests current and historical distribution in the Arrow TSA.

Methodology

Study of deciduous competition in coniferous stands is the aspect of interest to the IFPA. These trials will test conifer growth with varying levels of deciduous competition. Densities tested will include up to 4000 stems per hectare, much higher than standard FG conifer stand levels. The plots would be adaptations of the PROBE plots, monitored over the long term for growth and yield implications. Examination of forest health implications, the value of pruning deciduous, and intermediate harvesting options are components of the trials. The major costs are incurred in the setup of these trials. Atco is particularly interested in this aspect of deciduous management and may contribute a portion of funding towards it from their multi year agreement funds.

Outputs

Outputs from this work could lead to reduced costs through elimination of needless brushing treatments, or reduced losses to forest health agents. Identification of deciduous opportunities could lead to potential timber supply increases through use of mixed or pure deciduous stands. Results could support the advancement of the free growing “gating” concept – i.e. that stands that may not be free growing due to deciduous competition at the traditional free growing window can be left untreated and re-assessed at an older age, such as 30 years. Outputs relate to the value added objective identified by the executive and technical committees at the outset of the IFPA.

Fish Passage Works

Background

Forest Investment Account funded assessments have identified crossings and culverts which present a barrier to fish passage. Certain watersheds are deemed to be important resident fish habitat. The objective of the fish passage projects is to replace the barriers with improved culverts or bridges to provide a natural creek substrate that facilitates fish passage.

Methodology

The fish passage projects work in sequence over a number of years. First, the areas are assessed. Next high priority crossings (those with high habitat gained rankings and important fish species present) are assessed in detail. A site plan and a structure design are developed for the crossing, and then the works are carried out in the field. Commonly, the creek is diverted to allow for the works to be done with minimal impact on the stream. The new culvert fills are excavated, abutments installed and rip rap placed. Then the diversion pipe is removed and water allowed to flow in the new channel. For bridges, girders, rails and approach grade are then installed, often with the use of two excavators to avoid crossings of the creek.

It is recommended to inspect new structures after the next spring freshet to confirm the performance of new structures, including rip rap and channel stabilization. The structures can also be reviewed for any apparent deficiencies in construction work quality.

Springer Creek has carried out fish passage assessments, site plans, structure designs and crossing replacements in past years. The assessments done for Arrow TSA identify a number of crossings which still need treatment. Subject to funding and seasonal conditions, site plans and designs works could be done in 2011-12 (and/or subsequent years).

Outputs

Project outputs are the improved crossings. As-built drawings are documented and put on file at the forest service office.

Forests for Tomorrow

Background

Forests for Tomorrow is a provincial government program aimed at improving the future timber supply and addressing risks to other forest values through the re-establishment of young forests on land that would otherwise remain under-productive. The program focuses on land that is primarily within the timber harvesting land base yet outside of forest industry obligations. The program emphasizes surveying, site preparation and planting. These treatments are guided by strategic level program planning, seed supply planning, silviculture strategies and timber supply analyses.

Government ran the FFT program in Arrow TSA forest license areas through independent contractors up until this year, when they have changed their delivery model, and are now running the program internally, using government staff. On tree farm licence areas, FFT is delivered by the licensee. Springer Creek is starting this year by carrying out an FFT assessment of their TFL 3. The other TFL holder in Arrow TSA, Interfor, is not a member of the AFLG, has a well established FFT program.

Methodology

With assistance from the experienced staff at Interfor, Springer Creek will review their TFL to assess areas for Forests for Tomorrow opportunities. Field review and surveys of candidate areas will follow in subsequent years, followed by treatments. Details of the review method (and other FFT activities) are laid out in standards, posted on the FFT website:
<http://www.for.gov.bc.ca/hcp/fia/landbase/fft/stand-establishment.htm>

Other IFPA members will assist government as needed in carrying out FFT activities on their operating areas. For example, the fire at Springer Creek is being reforested through the FFT program. Licensees have useful historical and access information regarding blocks that can assist the FFT project planners.

Outputs

The FFT activities will improve the future timber supply and reduce risks to other forest values through the re-establishment of young forests on land that would otherwise remain under-productive.

Yellow Cedar Provenance Trial

Background

It is not always possible, either logistically or biologically, to collect local seed for replanting in the same area. It is important to know how seed collected from a certain area will perform when the seedlings are planted anywhere throughout the species natural geographic range. Seed collected from areas hundreds of miles away can grow as well, or sometimes even better than local sources.

Provenance testing is a research technique in which seedlings grown from seed collected from many populations throughout the range of a species are planted together in common-garden trials throughout its range. Yellow-cedar, which is primarily a coastal species, has no provenance information at the present time, though provenance trials have been started for the species.

Interestingly, two areas in the interior of the Pacific Northwest have isolated populations of yellow-cedar. One population occurs in central Oregon, over 250 kms from the nearest coastal population. At least two other populations occur just north of Castlegar; one at the northeast tip of Evans Lake in the Valhalla's, and the other near the headwaters of Dago Creek. These populations are either refugia from the last ice-age, or are remnants from when yellow-cedar possibly had a larger geographic range after the last ice-age. The presence of yellow-cedar in the Arrow Forest District is of interest to IFPA members, in terms of using this species for reforestation.

Methodology

Provenance trials have recently been established throughout coastal British Columbia, with seed sources that were collected from northern California to southern Alaska. Nineteen populations from southern Washington to the Queen Charlotte Islands are included in these trials. Unfortunately, no seed has yet been collected from the two interior populations. The objectives of these two provenance trials are to see how yellow-cedar grows in the interior of British Columbia, and to determine if certain populations are better adapted to the interior climate.

These sites will be intensively managed to ensure successful establishment, and to promote good early growth. Weed competition will be minimized through hand-brushing, and animal browsing and stomping will be reduced through fencing. The main emphasis of these trials is to test if these particular populations are adapted to the climate of the interior.

Survival, growth, and cold-damage information will be collected periodically from these trials throughout the early stages of establishment. By the time these trees are 10-years-old we will have a good idea on how yellow-cedar grows during the early stages of establishment, whether there are any population differences, and whether yellow-cedar will be a good species for reforestation in the southern interior of British Columbia.

The 15-year (2007) measurement of the Arrow site trial is completed, and the next measurement is planned for 2012.

Outputs

Preliminary seed transfer guidelines can be developed from information on growth, survival, and cold-damage collected from these trials within five to seven years. As these trials get older, better information can be collected to help refine these guidelines.

Western Larch Realized Genetic Gain Trials

Background

The realized genetic gain western larch tree improvement program began in 1987 and has progressed since that time. The first crop of improved seedlings from Kalamalka research station's test seed orchards was planted in 1999. Information from the progeny tests is currently being used to rogue the first generation seed orchards to increase their genetic quality, and to develop advanced generation breeding populations.

The proposed realized genetic gain trials are designed to test the assumption "Will productivity gains estimated from young open grown progeny tests be realized in fully stocked plantations planted with genetically improved seedlots over a rotation?"

Methodology

The objective of the project is to establish western larch realized genetic gain trials in the East Kootenay and Nelson seed planning zones. In each zone, four types of seedlots are being tested:

1. Elite full sibling families created from very high breeding value parents;
2. High genetic worth seed orchard seedlots from the 2002 seed crop,
3. Low genetic worth seed orchard seedlots from seed crops produced prior to aggressive orchard rouging, and
4. A composite seedlot comprised of a mix of seedlings grown from five operational wild stand seedlots per zone.

Seedlings were grown in 2003 in Vernon with costs covered by the Forest Service research branch. Field testing will consist of four sites per zone with a range of site productivity. Treatments at each site will consist of 144 tree square plots planted at three spacing (1.5 x 1.5m, 2.5 x 2.5 m, and 3.5 x 3.5 m). Two replicate plots of each seedlot/treatment combination were planted at each site. The interior 64 trees of each plot will be measured and used for estimating unit area productivity.

IFPA members assisted the researchers with site selection and logistics. The Okanagan IFPA assisted with funding the establishment of the sites.

The 6-year height measurement occurred on the Nelson zone Lw plantation (EP 1020) in 2009 and the 10-year re-measurement is planned for 2013.

Outputs

The information from these trials will provide accurate estimates of productivity gains on a per unit area basis. This information will be used in adjustment of growth models and ultimately for timber supply area planning.

IFPA website

Background

Communication and the extension of information have been vital to the success of the Arrow IFPA. Communication to the forest practitioners, policy makers, the general public, stakeholders, academics have promoted the IFPA by encouraging awareness, understanding, and support. Communications is also an integral part of the monitoring and feedback process as it provides all audiences with information on the process and achievements of the IFPA.

The IFPA website was identified as a priority by the IFPA technical committee. It was established in 1999, soon after the IFPA agreements were issued. To set up the website, the AFLG hired contractors who:

- Established the IFPA website, located at www.arrow-ifpa.com
- Drafted a process for update and maintenance of the website
- Established links to other IFPAs and other related sites
- Registered www.sustainabilityproject.com

When funding levels were significantly reduced in the early 2000's, the Arrow IFPA website was discontinued. Communication of information was limited to posting of reports and submission of the annual work plan and report, and exchange of information at Arrow-Boundary Forestry Association meetings, and technical committee meetings and conference calls.

Methodology

The technical committee are in agreement that the website was an efficient, cost effective means of communication, and if IFPA activity increases, that the website should be revived. In the interim the members plan to examine options for "piggybacking" on other sites which focus on forest management issues. For example, the Forest Research Extension (FORREX) program is a potential base which the IFPA could link to, at relatively low cost.

Outputs

The simplified version of the IFPA website would post IFPA project reports and plans and provide a point of contact for the public and stakeholders to reach the IFPA holders.

APPENDIX - 8 AFLG statements regarding Mountain Pine Beetle



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August 26, 2011

Regional Executive Director
Ministry of Forests, Lands & Natural Resource Operations
1902 Theatre Road,
Cranbrook, B.C.
V1C 2G1

Re: Arrow IFPA – Stella-Jones pine beetle management

Dear Sir,

In the recommendations in his "Rationale for Increase in Allowable Annual Cut" issued to the IFPA holders in the Arrow Timber Supply Area dated December 6, 2007, the Regional Manager of the Southern Interior Forest Region stated his expectation that licencees will use the uplift to target stands considered severely impacted in 2010 in their mountain pine beetle modeling. This letter speaks to how that expectation has played out in Stella-Jones Canada Inc.'s operating areas in the Arrow TSA in the time since the Regional Manager's determination.

In 2009, the Arrow Boundary Forest District developed a "Beetle Harvest Strategy" map that identified priority harvesting areas in order to manage the District's mountain pine beetle problem. Priorities were based on areas flagged in the 2008 forest health overview flight, and on stands at least 60 years old with a PI content of 50% or more. All such stands identified for liquidation in Stella-Jones' operating areas occur in its "Caribou Creek" Forest Development Unit (FDU) near Burton. Of the stands at least 60 years old with a PI content of 50% or more, we estimated that 95% of the volume would have to be cable logged, and that the average development cost would be approximately \$9.25/m³, rendering them uneconomical to harvest without the addition of significant areas of conventional harvesting in the cutting permits. Such areas are not readily found in the vicinity of these at-risk PI stands. The single polygon in the Caribou FDU identified in the 2008 overview flight appears to pose a less economically risky candidate for development with an even split between cable and conventional ground and an estimated development cost of \$6.27/m³ if it were to be logged in its entirety. However, in reality, harvesting of the conventional logging portion of the area would have to be scaled back considerably to address domestic watershed and visual issues, and with an average PI content of only 22% on this unit, we have elected not to pursue this development unless markets improve.

Stella-Jones' operating areas in the Arrow TSA have disproportionately little lodgepole pine (PI)





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*"Take Care Of The Land,
And The Land Will Take Care Of You."*

August 24, 2011

Regional Executive Director
Ministry of Forests, Lands & Natural Resource Operations
1902 Theatre Road
Cranbrook, B.C.
V1C 2G1

Re: Kalesnikoff Lumber Lodgepole Pine Harvesting – Arrow IFPA

Dear Tony Wideski:

With respect to recent questions regarding non-recoverable losses as a result of mountain pine beetle infestations in the Arrow TSA, Kalesnikoff Lumber Co. Ltd. (KLC) would like to present our efforts in this regard.

Since the delineation of operating areas in the Arrow TSA, our company has strived to aggressively pursue forest health issues as a priority for harvest within our own forest development units. Since the 1980's KLC has aggressively targeted both the green and infested lodgepole pine profiles in our operating areas, particularly in the Deer Creek, Rialto, and Merry Creek charts. These efforts have proven to be very successful in reducing the level of pest infestations in our operations which has been routinely verified by forest health staff within the Forest Service. Recent forest health mapping efforts have shown a marked reduction in infestations within KLC operating areas.

KLC's aggressive approach to managing pine beetle and the mature lodgepole pine profile has finally resulted in relief for the company in its efforts to target forest health factors for its development priorities. In fact, since 2006, our company has been able to return to developing harvesting profiles that are more reflective of the overall inventory in our operating areas as the most susceptible lodgepole pine stands have been effectively liquidated. Nevertheless, lodgepole pine continues to be a component of many of our mixed species stands, and the company pursues harvesting of the highest pine components as a priority over other healthier sites.


The component of lodgepole pine harvested as a proportion of total volume harvested by the company is summarized as follows (includes BCTS timber sale volumes controlled by the company):

- 2006 – 18%
- 2007 – 36%
- 2008 – 54%
- 2009 – 7%
- 2010 – 2%

Although lodgepole pine harvested as a proportion of total volume harvested has dropped markedly over the past few years, our company demand for this species continues to remain high despite the cut reduction. This demand component has encouraged other license holders in the TSA (including BCTS) to continue to aggressively target their own lodgepole profiles to the extent that the Arrow TSA remains relatively free from large scale pine beetle infestations and non-recoverable losses.

In my professional opinion, Kalesnikoff Lumber Co. Ltd. has fulfilled its obligations with respect to pine liquidation and MPB risk.

Yours truly,


Stan F. Radkin RPF
Woodlands Manager



OKANAGAN REGIONAL WOODLANDS
Lumby Office

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Fax: (250) 547-1274

August 24th, 2011

Regional Executive Director
Ministry of Forests, Lands & Natural Resource Operations
1902 Theatre Road
Cranbrook, B.C.
V1H 2G1

Re: Arrow IFPA – Tolko Industries Ltd. Pine Harvesting

Dear Sir:

A key question that needs to be answered to support the continuation of the Arrow TSA IFPA uplift is whether there have been any substantive changes to the inventory as a result of Mountain Pine Beetle activity, and if licence harvesting has been adequate to deal with the infestation?

Within Tolko's operating area which is located on the west side of the Arrow Lake, we are able to offer the following summary of our harvesting activity since 2005, as well as future cutblocks that are in various stages of development.

Development Stage	Summary by Individual Category			Running Total Summary		
	Total Volume	Pine Volume	Pine Percent	Total Volume	Pine Volume	Pine Percent
Logged 2005 - 2010	329,836	112,215	34%	329,836	112,215	34%
CP Approved	14,308	13,693	96%	344,144	125,908	37%
CP Submitted	82,565	24,143	29%	426,709	150,051	35%
Layout Complete	56,642	21,178	37%	483,352	171,229	35%
Layout in Progress	9,577	3,795	40%	492,928	175,023	36%
FSP Referred	302,111	128,315	42%	795,039	303,338	38%
Future (Recce)	346,310	159,215	46%	1,141,349	462,553	41%

These volumes are based on cruise volumes where they are available, or inventory estimates if the cruise has not been completed yet. You will note that we have harvested 34% pine from 2005 to 2010 and are projecting a similar proportion of pine harvest within our future cutblocks.

In comparison, a summary of the Vegetation Resource Inventory (VRI) data within our operating area indicates that the current pine component of all stands greater than 80 years of age on the timber harvesting land base is 26 percent. Of this pine, 66 percent is found in pine leading stands with the remainder in spruce/balsam (17%), fir/larch (15%), and deciduous (2%) stands.

The VRI data also provides an estimate of the dead pine volume. This dead volume (43,240 m³) is approximately 4% of the live pine volume. Roughly 8,300 m³ of this dead volume is contained within blocks that have a status of FSP referred or higher.

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August 22, 2011

Regional Executive Director
Ministry of Forests, Lands & Natural Resource Operations
1902 Theatre Road,
Cranbrook, B.C.
V1C 2G1

Attn: Tony Wideski


Re: Arrow IFPA – Atco addressing pine harvesting

Dear Tony:

One of the largest concerns surrounding the continuation of the Arrow IFPA – AAC uplift is the verification of adequate pine liquidation to deal with Mountain Pine Beetle (MPB) concerns. This letter has been drafted to address the liquidation of pine from Atco Wood Product's perspective.

Over the past 30 years Atco has taken a very aggressive approach to harvesting pine susceptible to beetle attack. The Nancy Greene area, in particular, consists of patches of pure pine and mixed pine forests. Through the 1980s and 1990s the approach taken, in much of the Nancy Greene and other pine areas, was to focus on removal of pure pine patches and to remove the pine component from mixed stands. Atco's forestry staff worked in concert with the MOF pest management staff to assure that beetle attacked pine was addressed. Most years this involved an annual pest flight in which MOF and Atco agreed on harvesting priorities, pheromone baiting and other measures. Also during this time period Atco had between 100 and 200 salvage sub-permits, whose primary function was to address beetle attacked or susceptible pine.

Moving into the 2000's, it was readily apparent, on a provincial level, that MPB aggressiveness now warranted the MOF to implement a full scale pine liquidation program. As most of the pine had been previously removed from the pine concentrated areas in Atco's EDUs, it was a very manageable job to ensure the remaining pine areas were prioritized for harvesting. During this time and up till today, Atco and MOF have reviewed maps to discuss pine leading polygons (on an individual basis) to discuss appropriate measures.



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September 14, 2011

Tony Wideski, RPF
Regional Executive Director
Kootenay Boundary
1902 Theatre Road
Cranbrook, BC V1C 6A5

Dear Tony,

This letter is written regarding a recent conversation I had with Ron Ozanne from Atco Lumber concerning the Arrow Innovative Forest Practices Agreement. As you may be aware BCTS is not a signatory to this agreement nor the uplift that was provided to the licensees in the Arrow USA. However, from time to time BCTS has been asked to support and or provide information to the IFPA group. The recent discussions focused on performance in harvesting Lodgepole Pine on the Arrow USA. BCTS was asked to provide evidence of performance and the following table indicates BC Timber Sales harvest on the Arrow USA over the last 5 years.



Table 1

Fiscal Year Ending	Pl	Pw	Py	Total Pine	Total Vol	% Pine
2006_03	44226	914	9	45149	89833	50%
2007_03	68623	723	35	69381	135584	51%
2008_03	122885	930	246	124061	223667	55%
2009_03	118092	868	55	119015	175039	68%
2010_03	32624	1158	126	33908	120718	28%
2011_03	37504	2703	417	40624	177321	23%
Total Volume Scaled				432138	922162	
Annual Average				72023	153693.67	47%
Notes						
Does not include FLTC R/W volume for contract built roads						
Includes Section 20 and 21 volume						

Ministry of
Forests and Range

BC Timber Sales
Kootenay Business Area

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***APPENDIX - 9 Timber Supply Analysis Report, Arrow IFPA, Support
& Analysis for Uplift Application, October 2006***

TIMBER SUPPLY ANALYSIS REPORT

ARROW INNOVATIVE FOREST PRACTICES AGREEMENT

Support and Analysis for Uplift Application

Prepared for:
The Arrow Forest License Group

Prepared by:
Timberline Forest Inventory Consultants Ltd.

Reference: SOTSA01 4580001`
October 2006



October 31, 2006

File: 4580001
Arrow Innovative Forest Practices Agreement
c/o Tolko Industries Ltd.
4280 Highway 6
Lumby, BC
V0E 2G7

Attention: Robert Kennett, R.P.F.
Divisional Forester
Planning & Silviculture

Reference: Arrow IFPA 2006 Uplift Analysis Report

Please accept this draft analysis report for the above-mentioned project.

It has been our pleasure working with you.

Yours truly,
Timberline Forest Inventory Consultants Limited

A handwritten signature in dark ink, appearing to read "K. Sherman", is written over a light gray rectangular background.

Kelly Sherman, R.P.F.
Resource Analyst

DOCUMENT HISTORY

Revision Number	Description	Submitted Date	Submitted By:
1	Initial Draft	March 2006	Kelly Sherman
2	OGMA Update	November 2006	Kelly Sherman
3	Caribou Update	January 2006	Kelly Sherman

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1.0 INTRODUCTION

Five forest companies operating in the Arrow Timber Supply Area (TSA) within the Arrow Boundary Forest District have entered into Innovative Forestry Practices Agreements (IFPAs) with the Ministry of Forests (MoF) under Section 59.1 of the British Columbia Forest Act. These five licensees are known collectively as the Arrow Forest Licence Group (AFLG). IFPAs are designed to test and pilot alternative and new approaches to forest resource management. The agreement area lies within the bounds of the Arrow TSA and includes the BC Timber Sales operating areas.

Timberline Forest Inventory Consultants Ltd. (Timberline), completed a series of information and analysis projects in support of a basecase timber supply analysis for the IFPA in March of 1999 (Timberline, 1999). That analysis was used to provide direction for the program of activities outlined in the IFPA *Forestry Plan*. An additional *Options Analysis* (Timberline, 2000a) was completed in June of 2000 to reflect changes made in the *Timber Supply Review Analysis Report* (B.C. MoF, 2000a).

The allowable annual cut (AAC) for the Arrow TSA was set in 1995 at 619,000 m³/year. The *Arrow Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination* was published in April of 2001 (Pedersen, 2001). At that time the AAC was reduced to 550,000 m³/year. This reduction of 11% included the removal of woodlot licences from the TSA. The release of the AAC rationale report and the *Kootenay Boundary Higher Level Plan Order* (Government of B.C., 2001) required a re-evaluation of the IFPA basecase timber supply analysis. The *Updated Arrow Base Case and Spatial Analysis* (Timberline, 2002) was completed to address these changes. In 2004 TSR3 was completed and the AAC remained at 550,000 m³/year (Timberline, 2004).

The IFPA has been working toward submitting an AAC uplift application under Section 59.1 of the Forest Act for the following reasons: the IFPA objective to mitigate downward pressure on the AAC; the AAC reduction in April 2001; and the subsequent completion of a number of key IFPA projects. Three significant IFPA projects were included in TSR 3, which mitigated a considerable downward pressure on the AAC; specifically:

1. Phase 1 new vegetation resources inventory (VRI) for the TSA;
2. Predictive Ecosystem Mapping (PEM) for use in productivity estimation; and
3. SIBEC project to improve productivity estimates for managed stands.

Since TSR 3 the Phase 2 VRI adjustment project has been completed. This report documents the timber supply impact resulting from the phase two VRI adjustment. This analysis shares a *Data Package* (Timberline, 2004) with the TSR 3 analysis. There are multiple sensitivities testing input and application assumptions around the VRI adjustment.

2.0 GENERAL DESCRIPTION OF LANDBASE AND TENURE

The Arrow Timber Supply Area is situated in South-eastern British Columbia in the Southern Interior Forest Region. It is part of the Arrow Boundary Forest District and is administered from the MoF district office in Castlegar.

The total area of the TSA is approximately 605,600 hectares, of which 52% is non-productive or inoperable. Approximately 42% of the total TSA land base is timber harvest land base (THLB).

Figure 2.1 provides an overview map of the Arrow TSA (*Arrow Timber Supply Area Analysis Report*, April 2000).

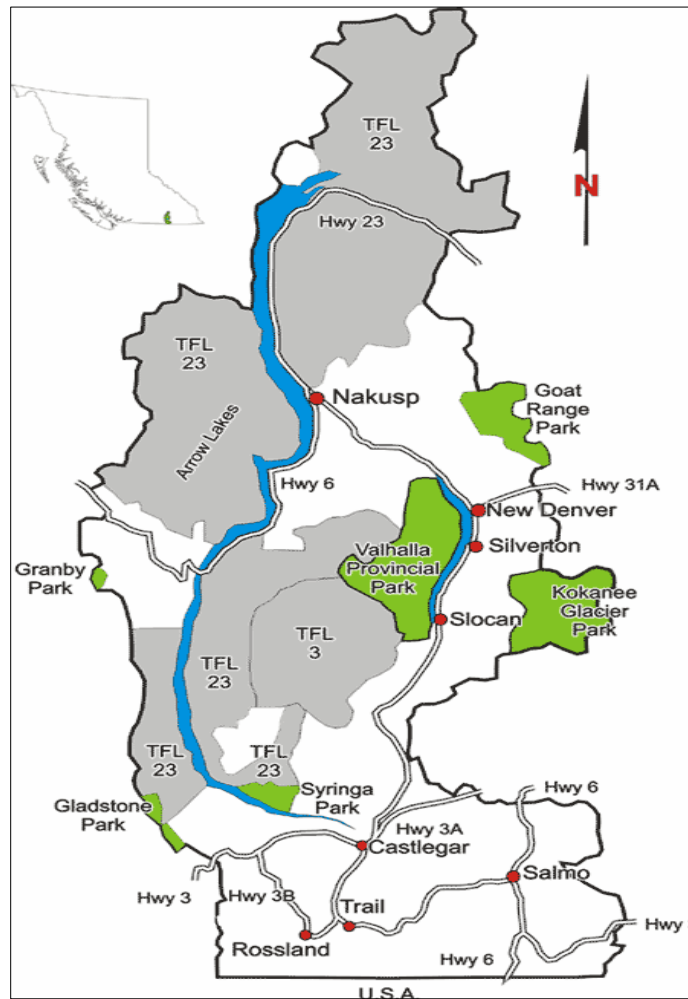


Figure 2.1. Location of Arrow TSA

3.0 TIMBER FLOW OBJECTIVES

Forest cover objectives and the biological capacity of the net timber harvesting land base will dictate the harvest level. However, there are a number of alternative harvest flows possible. In this analysis, the proposed harvest flow reflects a balance of the following objectives:

1. Increase or maintain an initial harvest level of 550,00 m³/year;
2. Decrease the periodic harvest rate in acceptable steps ($\leq 10\%$) when declines are required to meet all objectives associated with the various resources on the land base;
3. Do not permit the mid-term harvest to fall below a level reflecting basic maintenance of the productive capacity of the IFPA (based on VDYP yield estimates); and
4. Achieve an even-flow long-term supply over a 250-year time horizon.

4.0 FOREST INFORMATION

A complete description of the information used for the background to this timber supply analysis is contained in the *Data Package Timber Supply Review 2003/2004 Arrow Timber Supply Area* (Timberline, 2004).

4.1 GROWTH AND YIELD

Forest stand growth and yield refers to the prediction of growth and development of individual forest stands over time. Growth and yield modelling for the 2003/2004 analyses followed standard MoF methodologies, using well-established tools and processes.

An ecosystem inventory, based on predictive ecosystem mapping (PEM), is the foundation for the prediction of stand yields. Preparation of the yield tables falls into the following two categories:

1. Natural stands; and
2. Managed stands.

4.1.1 Natural Stands (age > 20)

Natural stand yield tables (NSYTs) for the timber supply analysis were developed using the batch version of the Ministry of Forests (MoF) program *VDYP* (Version 6.6d).

Partial harvesting was applied within the BCTS chart area. In this chart area, all pine leading stands in the ICH mw2 BEC zone are prescribed to be partially harvested (8,145 ha). These areas were assigned to special yield curves used to represent the first harvest from a natural stand that is to be managed using a partial harvest system. The yield curves were calculated as 75% of the equivalent clearcut volume from *VDYP*.

4.1.2 Managed Stands (age < 21)

Managed stand yield tables (MSYTs) were modelled using *BatchTIPSY* (Version 3.0b). These stands have been managed since establishment and include both natural and artificially regenerated sites. Separate tables were developed for all future managed stands established following the harvest of existing stands.

Site index estimates produced using the MoF SIBEC system (including local data from the IFPA SIBEC sampling project), were used to model the growth of the managed stands. SIBEC site index estimates are assigned to a stand based on the BEC site series classification. For this analysis, the BEC site series information required to use SIBEC was derived from the recently completed PEM project (JMJ Holdings Inc., 2003) for the Arrow TSA.

Managed stands were modelled with genetic gains from tree improvement programs calculated in the report *Impact of the Current and Planned Seed Orchard Program on Timber Flow in the Arrow Timber Supply Area* (Timberline, 2000c). The Forest Practices Code requires the use of improved seed where it is available.

4.2 LANDBASE CLASSIFICATION

Use of the new VRI required the complete reclassification of the land base. This process was complicated by the fact that many of the attributes traditionally used during the land base

classification process were no longer available with the VRI. The use of the VRI for the classification process necessitated many assumptions that are documented in the *Data Package*.

Land is classified based on four broad criteria:

1. It is unproductive for forest management purposes;
2. It is or will become inoperable under the assumptions of the analysis;
3. It is unavailable for harvest for other reasons (e.g. wildlife habitat or recreation); or
4. It is available for integrated use (including harvesting).

The results of the land base classification can be found in Table 6.1 of the *Data Package* and are summarized in Figures 4.1 and 4.2.

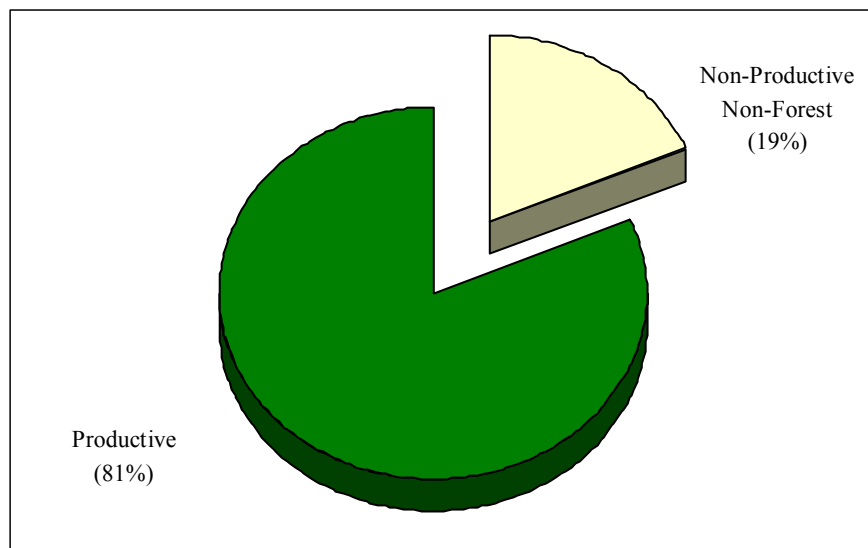


Figure 4.1. Distribution of Total TSA Area (605,648 ha)

The THLB consists of all of the productive land expected to be available for harvest over the long-term. This land base is determined by reclassifying the total land base according to specified land base classification criteria.

The un-harvestable component includes exclusions such as low site removals and deciduous leading stands. Figure 4.2 provides a graphic representation of the land base reductions for the Arrow TSA.

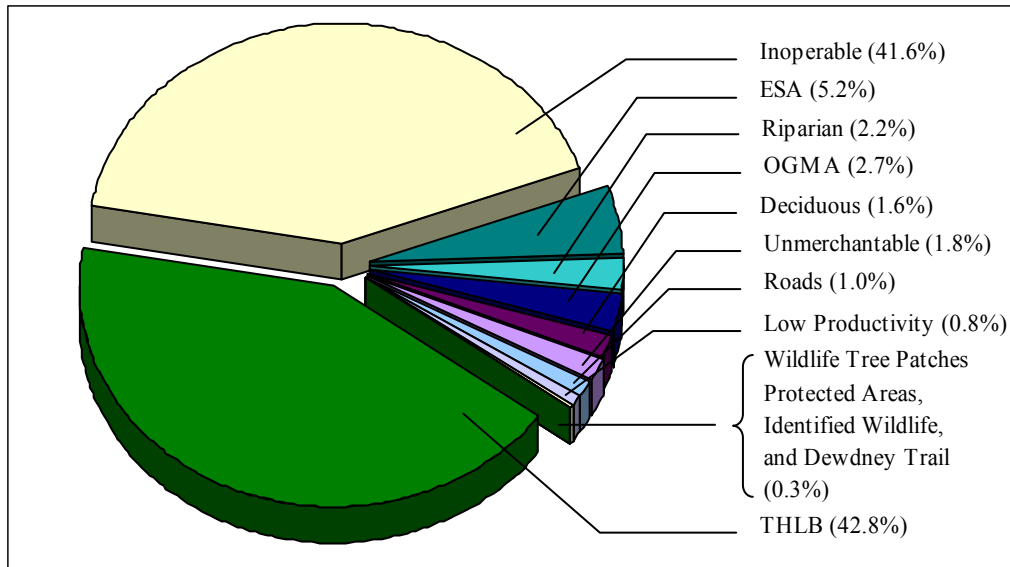


Figure 4.2. Distribution of Productive Area (493,267 ha)

4.3 INVENTORY AGGREGATION

In order to reduce the complexity of the forest description for the purposes of timber supply simulation, considerable aggregation of individual stands is necessary. However, it is critical that these aggregations not obscure either biological differences in forest stand productivity, or differences in management objectives and prescriptions. Management differences are recognized by grouping stands into landscape units and resource emphasis zones on the basis of similarity of management objectives. Grouping stands into analysis units on the basis of similar species and site productivity captures biological similarity.

4.3.1 Landscape Units

For planning purposes, the Arrow TSA has been subdivided into 33 landscape units. Landscape units are defined through a combination of the biogeoclimatic (BEC) zone and natural disturbance type (NDT). Many of the management constraints applied in the timber supply analysis are distributed based on the landscape units. Figure 4.3 shows the distribution of productive area by BEC zone.

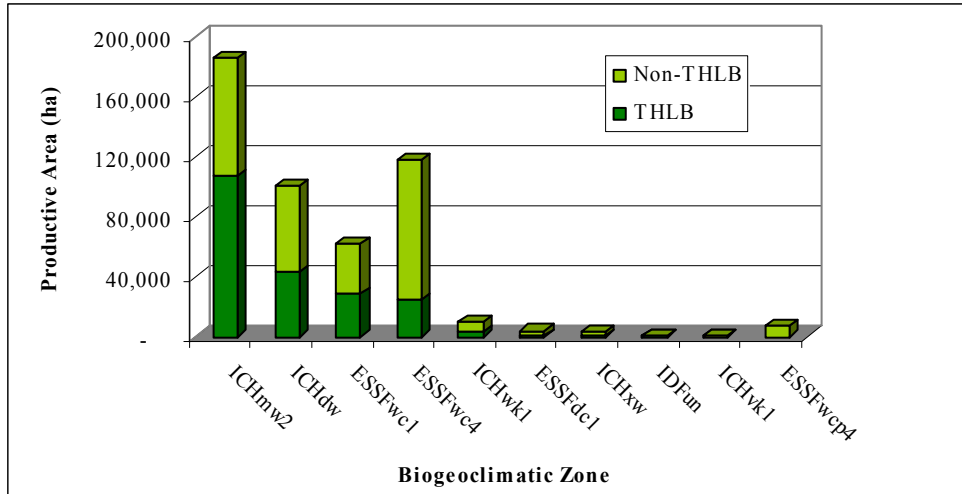


Figure 4.3. Distribution of Productive Area by BEC Zone

4.3.2 Resource Emphasis Areas

The productive land base was assigned to resource emphasis areas (REA) to facilitate the modelling of management requirements. The major REA include:

1. Polygonal-based visual quality objective (VQO) zones;
2. Caribou management areas and ungulate winter range areas (UWR); and
3. Community and domestic watershed areas (CWS).

The distribution of these areas is presented in Figure 4.4. These areas are difficult to summarize due to the overlap that occurs among the REA. Therefore, Figure 4.4 displays a grid summarizing the amount of overlap between every combination of REA. The total area in each REA can be found where the same REA heading from the two sides meet at the diagonal line down the center of the figure. The column titled "no other" indicates the amount of area under an REA that does not overlap with any other REA.

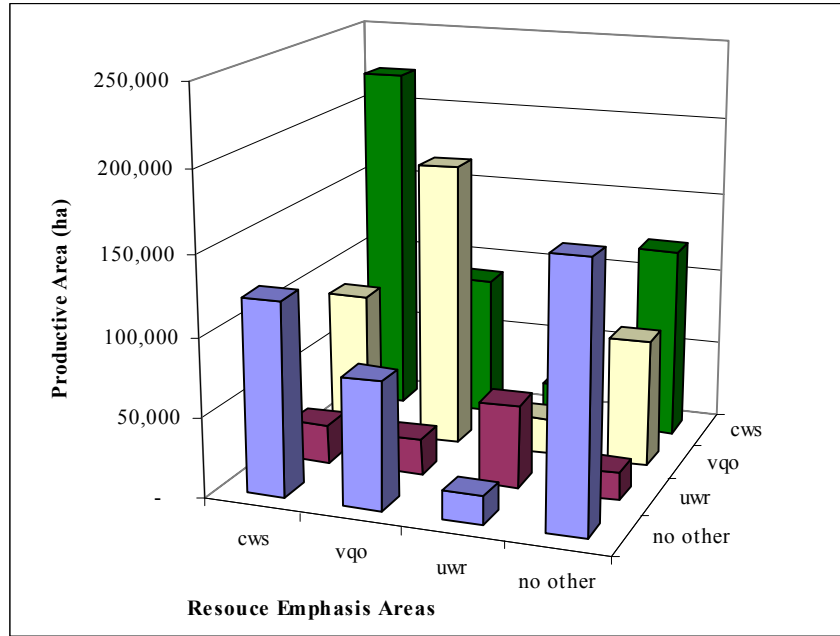


Figure 4.4. Distribution of Resource Emphasis Areas

Figure 4.4 shows that watersheds cover the largest proportion of the land base. They also have the largest amount of productive area with no overlap with other management requirements. The ungulate management areas cover the smallest proportion of the land base. They also have a smaller disturbance requirement than the other REAs, so the impact of the ungulate management requirements is negligible. VQO zones have the most significant disturbance requirement followed by community watersheds. If an area is classified as both VQO and community watershed the VQO forest cover constraint will be the limiting factor in determining access to timber. Figure 4.5 shows the productive area (THLB and non-THLB) that falls within the VQO, watershed, and ungulate management REAs.

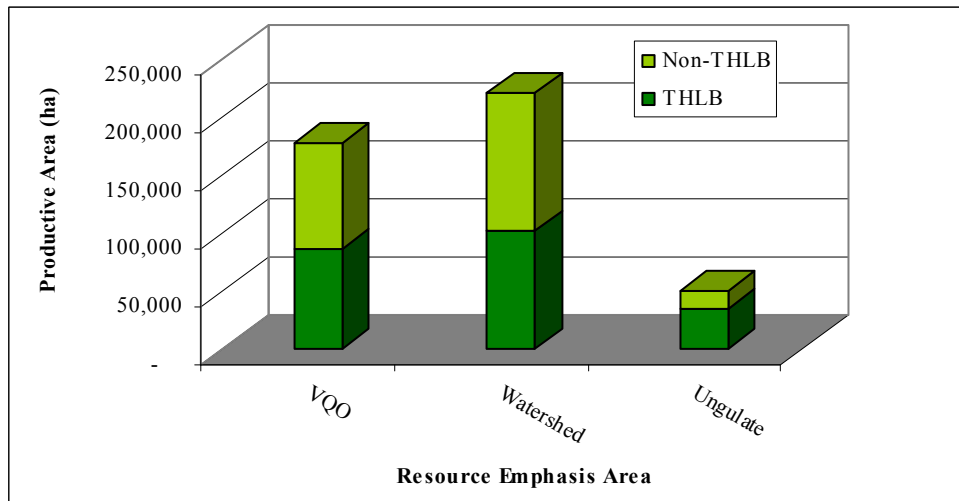


Figure 4.5. Area of Major REAs

4.3.3 Analysis Units

To capture biological similarity, the inventory has been assembled and aggregated into analysis units. An ecologically based system for aggregating stands into analysis units was introduced. Stands were grouped based on their BEC ecosystem classification and leading species. For complete details see Section 4.2 of the *Data Package*.

5.0 TIMBER SUPPLY ANALYSIS METHODS

Timberline's proprietary simulation model CASH6 (Critical Analysis by Simulation of Harvesting), Version 6.2l was used to develop spatial harvest schedules in the Arrow IFPA timber supply analysis. This model uses a spatial geographic approach to land base and inventory definition in order to adhere as closely as possible to the intent of forest cover requirements on harvesting. CASH6 can simulate the imposition of overlapping forest cover objectives on timber harvesting and resultant forest development.

These objectives are addressed by placing restrictions on the distribution of age classes, defining maximum or minimum limits on the amount of area in young and old age classes found in specified components of the forest.

The model projects the development of a forest, allowing the analyst to impose different harvesting and silviculture strategies on its development, in order to determine the impact of each strategy on long-term resource management objectives. CASH6 was used to determine harvest schedules that incorporate all integrated resource management considerations including spatial feasibility factors, for example, silviculture block green-up.

A 250-year time horizon was employed in these analyses, to ensure that short and mid-term harvest targets do not compromise long-term growing stock stability. Also, modelled harvest levels included allowances for non-recoverable losses. Harvest figures reported here exclude this amount unless otherwise stated.

Unless otherwise stated in the timber supply forecasts that follow, the decadal rate of decline was limited to 10%, and the mid term harvest level was not permitted to drop below a level reflecting the basic productive capacity of the landbase. The long term steady harvest level will always be slightly below the theoretical long term level, attainable only if all stands are harvested at the age when mean annual increment (MAI) maximizes.

5.1 INTERPRETING TIMBER AVAILABILITY

Harvest flow has been the traditional indicator used to evaluate timber supply impacts of various management scenarios however this may not reveal the complete timber supply picture. Another useful indicator is timber availability which is the total volume of merchantable timber that could be harvested in any given period without violating any forest cover requirements. In general, the periods with the least amount of timber available control the resulting harvest flow.

When comparing management scenarios using timber availability profiles the same harvest request is used in both scenarios. In doing so, the differences in the timber availability profiles can be entirely attributed to differences in the management assumptions and not clouded by differences in the modelled harvest. Generally this harvest flow request is the Basecase harvest flow unless otherwise specified.

6.0 TSR3 ANALYSIS

6.1 HARVEST FLOW

The maximum sustainable timber flow for the TSR 3 base over a 250-year time horizon is presented in Figure 6.1.

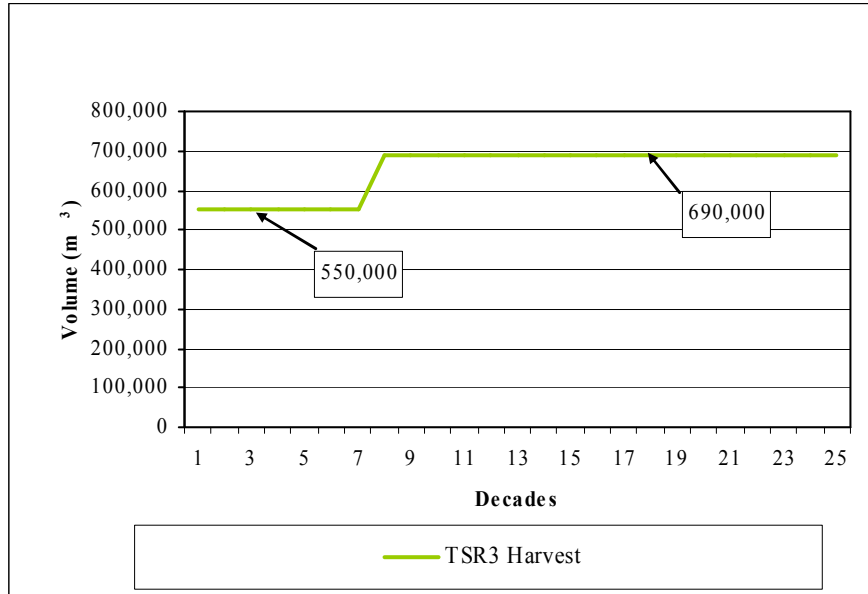


Figure 6.1. Base case Harvest Flow for TSR 3 and TSR 2

The TSR 3 base case harvest flow starts at the current AAC of 550,000 m³/yr and maintains this level for seven decades. Subsequent to the seventh decade, the harvest level increases dramatically to a long-term maximum sustainable harvest level of 690,000 m³/yr.

The location of the timber supply shortages is most clearly demonstrated by studying the availability of merchantable volume that could be harvested in a given decade without violating forest cover constraints. Figure 6.2 displays the 250-year growing stock (inventory) profile including a line indicating the volume available for harvest at each decade.

The available volume is very limited in the first decade due to the spatial adjacency constraints which are applied during the first two decades. The significant increase in available volume in decade three is associated with the removal of the adjacency constraint. The growing stock then declines as the natural stands are harvested at a level that is greater than their natural rate of growth. This continues until a critical point at decade seven where the first of the regenerating stands become available for harvest. This transition from the harvest of natural stands to the harvest of managed stands is the most limiting point in the available harvest volume.

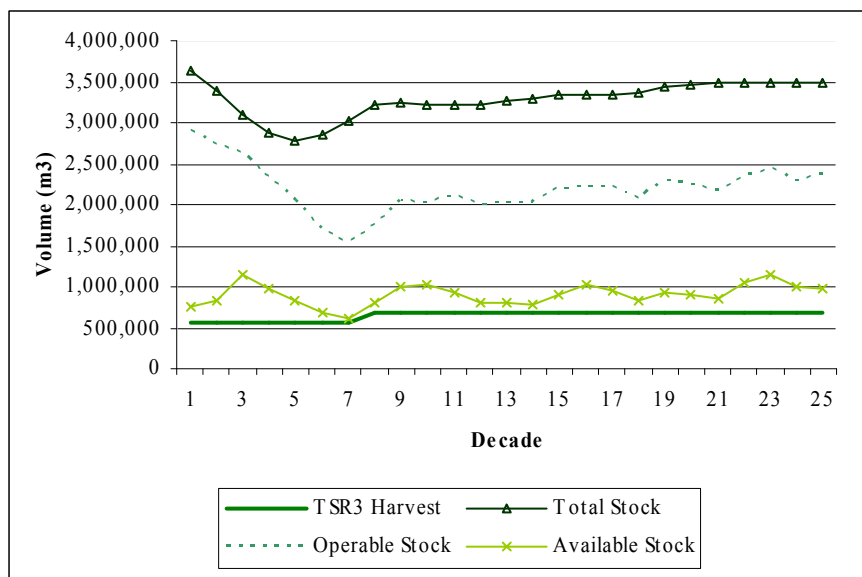


Figure 6.2. TSR 3 Basecase Growing Stock Profile

As more of the higher yielding managed stands reach minimum harvest age, Figure 6.2 shows the available volume increasing. There is a slight drop again around decade fourteen which appears to be an echo of the shortfall at decade seven occurring roughly one 80 year rotation period later. The long-term available volume eventually stabilizes at a level where management constraints, managed stand growth and harvest level are more or less balanced. There is a slight increase in growing stock at the end of the modelled time horizon. This was not captured in the harvest level because of the harvest flow objective to maintain a consistent long-term harvest level. The long-term harvest level selected was limited by the decrease in available volume around decade fourteen.

6.2 HARVEST TRENDS

Figure 6.3 shows the sources of the basecase timber harvest over the modelled time horizon. For the first six decades, the majority of the harvest comes from the existing natural stands. A small proportion of the harvest over this time comes from managed stands. At decade seven, the first major harvest from the regenerated managed stands begins. For the remainder of the modelled time horizon, the majority of the harvest is produced from managed stands through their subsequent rotations. Small harvests of natural stands occur late in the modelled time horizon as natural stands that were reserved from harvest to meet management objectives are freed through the recruitment of managed stands in their place.

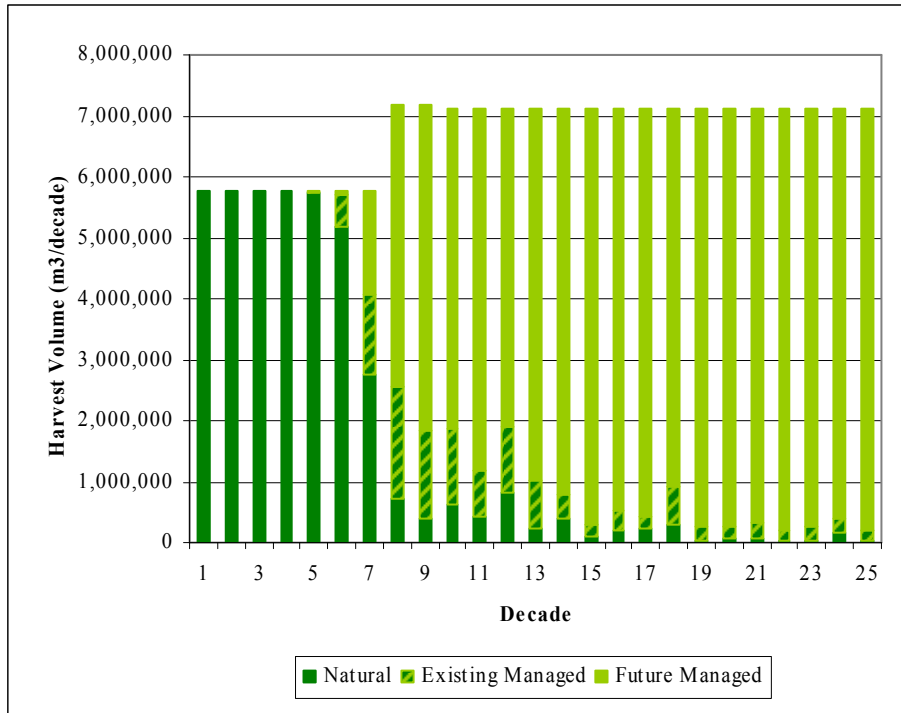


Figure 6.3. TSR3 Basecase Timber Supply Sources

The following figures show the average harvested age, volume per hectare and area harvested per year in the basecase scenario. Figure 6.4 shows a sudden shift in average harvest age starting at decade six. This occurs as the harvest shifts from the older natural stands to the regenerated managed stands. The managed stands tend to be harvested at approximately their minimum harvest age resulting in a much lower average harvest age.

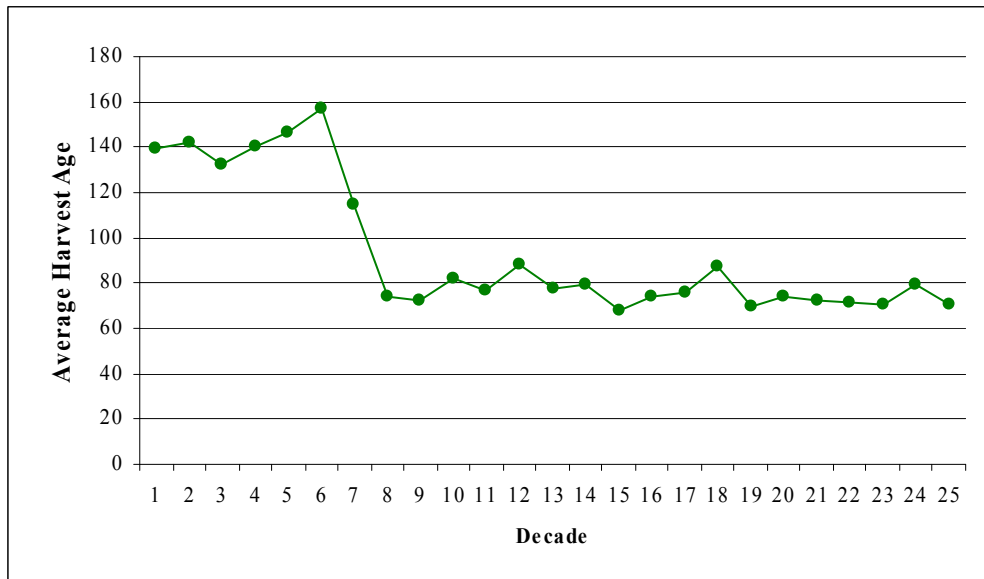


Figure 6.4. TSR 3 Basecase Average Harvest Age

Figure 6.5 shows that the average volume per hectare harvested increases over the modelled time horizon. Although the average harvested age drops during the shift to managed forest, the volume per hectare increases due to significantly higher managed stand yield expectations.

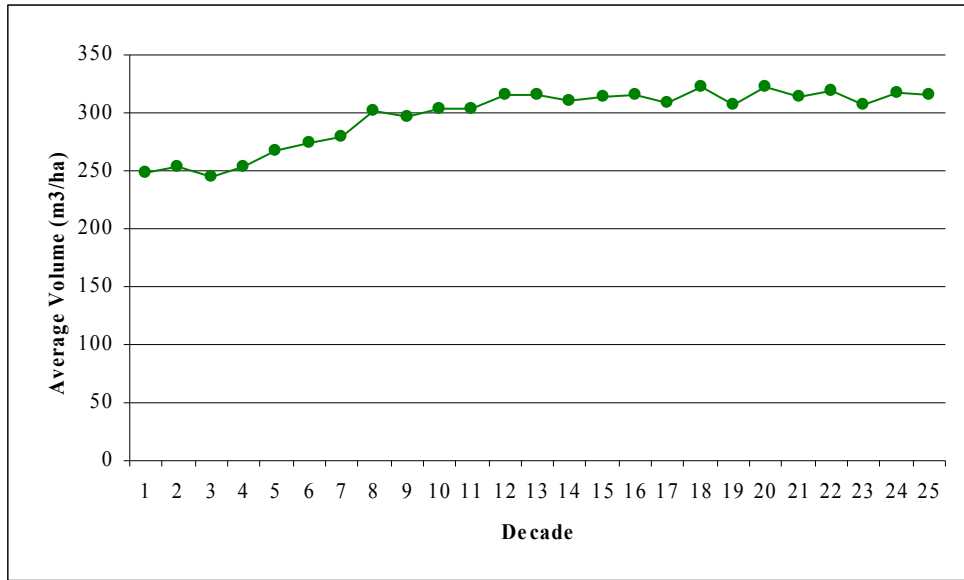


Figure 6.5. TSR 3 Basecase Average Harvest Volume per Hectare

As the average harvest volume per hectare increases, it can be expected that a smaller harvest area would be required to produce the same harvest. Figure 6.6 displays this downward trend between decades three and seven. There is a sudden increase at decade eight that results from the step up in total harvest volume that occurs at this point. Thereafter, the average harvest area remains relatively constant.

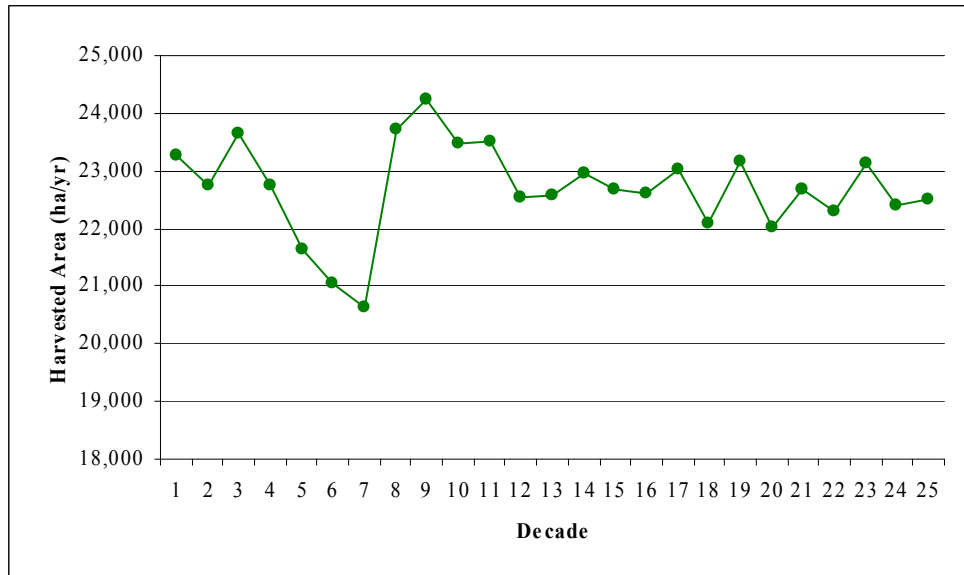


Figure 6.6. TSR 3 Basecase Average Area Harvested

6.3 AGE CLASS DISTRIBUTION

Figure 6.7 displays the changes in forest structure over the modelled time horizon. Each graph reports on the productive area within the Arrow TSA divided into THLB and non-THLB. The stands are categorized into age classes. Age class 1 represents ages 0 - 10 years, age class 2 represents ages 11 - 20 years, *etc.* These classes continue through to age 350 years.

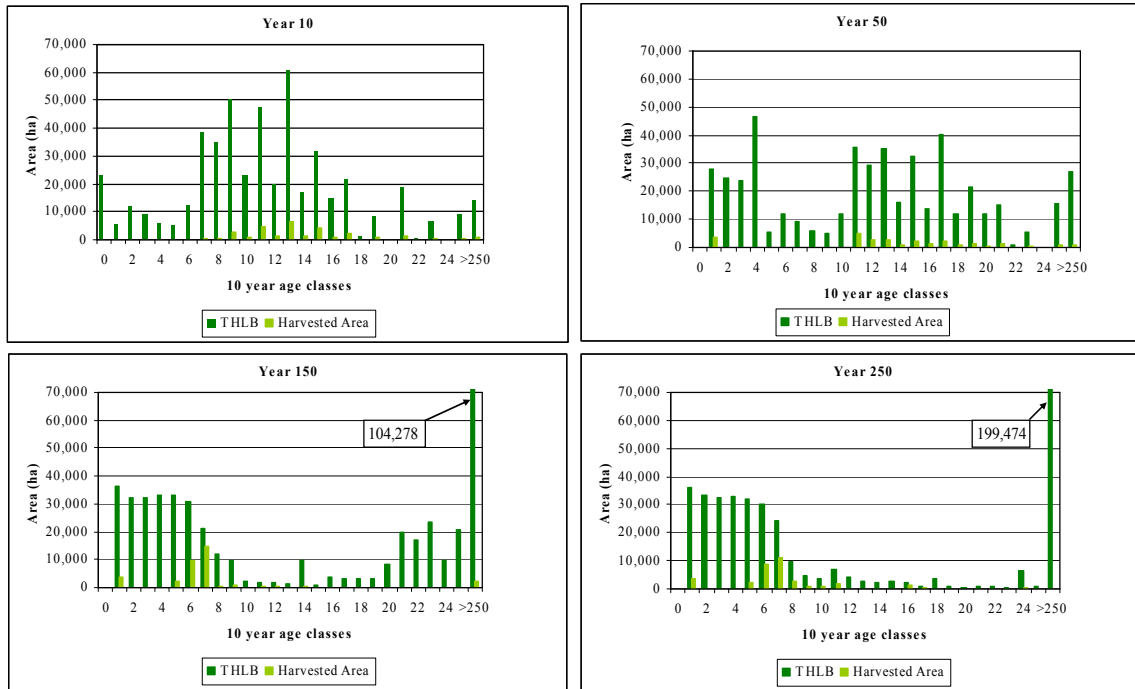


Figure 6.7. TSR 3 Basecase Age class Distribution at Decade 5, 10, 15 and 25

Decade 5:

The age class distribution in decade 5 shows some very important patterns that influence the short-term timber supply. The Arrow TSA currently has a very large age class gap resulting from the absence of stands several consecutive age classes. By decade five, this gap has moved to the region between age class five and age class ten. At this point it becomes problematic because this is the range of ages at which stands are typically harvested. At decade five, it is possible to see that a shortfall is imminent as the regenerated stand area currently in age classes four and below are still several decades below their minimum harvest age. Harvesting of the natural stands in the older age classes helps to fill this gap but it eventually contributes to the shortfall at decade seven. The large spike in age class four represents the combination of the harvest from the first decade and all stands that returned to the land base within the first decade such as TSR and Timber Licences.

Decade 10:

At decade ten, the harvest of managed stands is well underway. The steady supply of THLB in the younger age classes represents the rotation of managed stands. The impact of harvesting the older natural stands to fill the age class gap can be seen in the low levels of THLB in the older age classes. The implementation of modelling disturbances in the inoperable areas can be seen in relatively uniform occurrence of non-THLB in each of the younger age classes.

Decade 15:

At decade 15, there is a reduced supply of THLB area in the age classes typically representing minimum harvest age. This is an echo from the shortfall at decade seven that appears one rotation length later. The distribution of stands in the older age classes does not appear to have changed significantly except that it has shifted up five age classes. These stands represent the old stands reserved for management objectives such as habitat and biodiversity. The proportion of THLB in these stands is very small.

Decade 25:

At the end of the modelled time horizon (decade 25) a large amount of the stand area has accumulated in the oldest age classes. It appears that modelling the disturbance of the inoperable areas has succeeded in distributing the non-THLB across the age classes. However, there is still a large gap in age classes 20 to 30 and an over abundance of area still accumulated in age class 35.

6.4 TSR3 LRSY

The maximum sustainable harvest level is determined in part by the productive capacity of the harvestable landbase. The theoretical productive capacity of the landbase is measured in terms of long term sustainable yield (LRSY). This is calculated from the culmination mean annual increment (MAI) of the stands within the THLB. The LRSY for both the existing natural stands and the future managed stands are shown below in Figure 6.8.

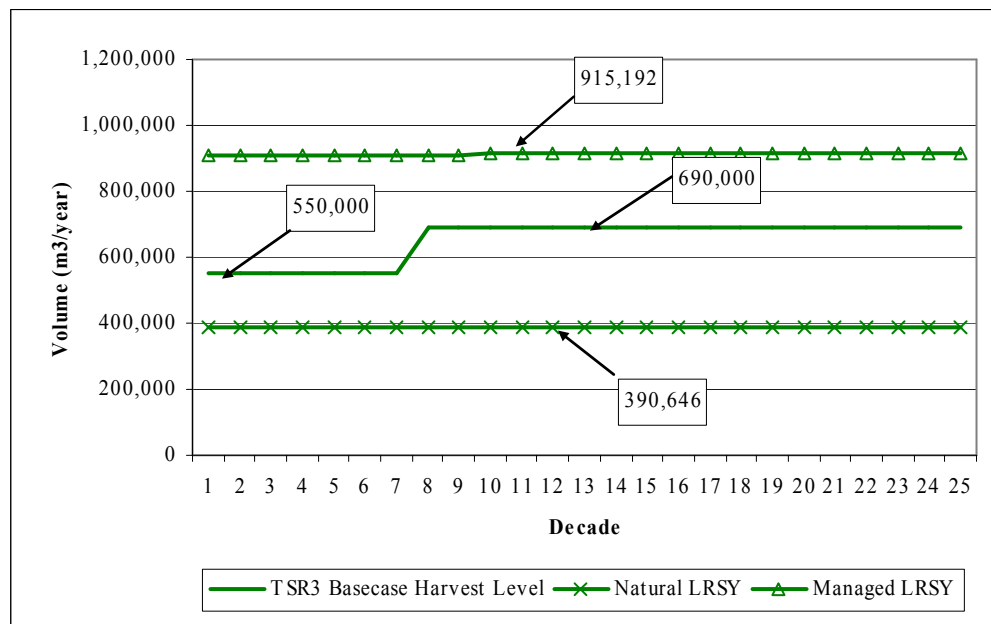


Figure 6.8. TSR 3 Harvest Flow and LRSY

The theoretical LRSY for natural stands is approximately 390,000 m³/year. This is 29% less than the TSR3 short term harvest level of 550,000 m³/year. The difference indicates that the short term harvest level is well above the productive capacity of the natural stands. This theoretical over harvest is done in anticipation that the harvest level will be sustained by the higher yields produced by future managed stands.

The managed stand LRSY is approximately 915,000 m³/year, 2.4 times greater than the natural stand LRSY, providing a strong indication that natural stand productivity is underestimated. The managed stand LRSY is also 36% greater than the TSR3 long term harvest level of 690,000

m³/year. The difference indicates that the full productive capacity of the managed stands is not being captured. The loss of potential harvest can be fully attributed to the many management objectives that reserve stands from harvest in the long term.

7.0 VRI UPLIFT BASECASE

A Vegetation Resources Inventory (VRI) Phase I Inventory was completed for Arrow TSA in 2002. VRI Phase II ground sampling was carried out in 2004 and 2005, with destructive sampling for Net Volume Adjustment Factor (NVAF). This data was incorporated in the analysis for VRI statistical adjustment carried out in late 2005 by *Jahraus & Associates Consulting Inc* (Jahraus, 2006). The Phase 2 VRI analysis provides the age, height and volume adjustment ratios that are used in this analysis. The population of interest was defined as all vegetated treed polygons in the operable landbase, greater than 29 years of age. They were pre-stratified into 5 strata based on leading species. Post stratification by age was examined but found to be inappropriate- it will be investigated in a further sensitivity. The height, age and “attribute-adjusted” volume adjustment ratios from the analysis of the Phase I and II data is shown below in Table 7.1.

Table 7.1. Set of Adjustment Factors for the Arrow TSA

Inventory Leading Species Stratum	Height Adjustment Ratio of Means	Age Adjustment Ratio of Means	"Attribute-Adjusted" Volume of Adjustment Ratio of Means
Cedar/Hemlock	0.978	1.059	1.145
Deciduous	0.959	1.004	1.183
Fir	0.996	0.984	1.212
Larch/Pine	0.961	0.887	1.264
Spruce/Balsam	1.035	1.010	1.125

7.1 HARVEST FLOW

The maximum non-declining harvest level for the VRI Uplift basecase over a 250-year time horizon is presented in Figure 6.1. The TSR3 harvest level is shown for comparison.

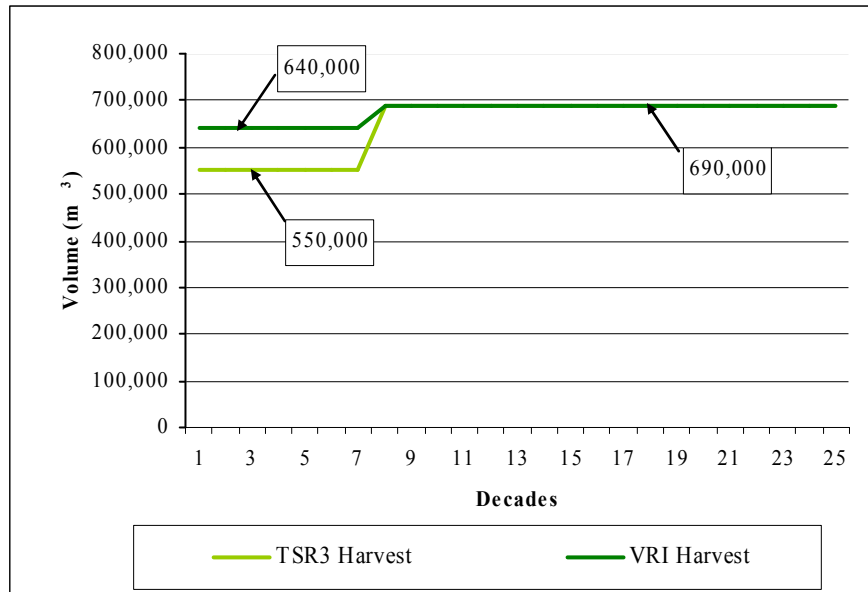


Figure 7.1. Harvest Level- VRI Uplift and TSR3

The VRI basecase harvest flow starts at 640,000 m³/yr and maintains this level for seven decades. Subsequent to the seventh decade, the harvest level increases to a long-term maximum

sustainable harvest level of 690,000 m³/yr. Consistent with the non-declining philosophy of the TSR3 harvest level, no mid term harvest decrease was sought. This means that the initial harvest level was not as high as is theoretically possible- this trade off is illustrated in the alternate harvest levels in section 7.4. Also consistent with TSR3, there was no increase in long term harvest level above 690,000 m³/year. The reason for this was to simplify the analysis and sensitivities in illustrating the short term nature of the VRI impact on timber supply. If a long term harvest increase was forced, a 2% increase in the long term harvest to 704,000 m³/year could be achieved. This was deemed small enough to disregard in this analysis in the interest of simplicity and impact clarity.

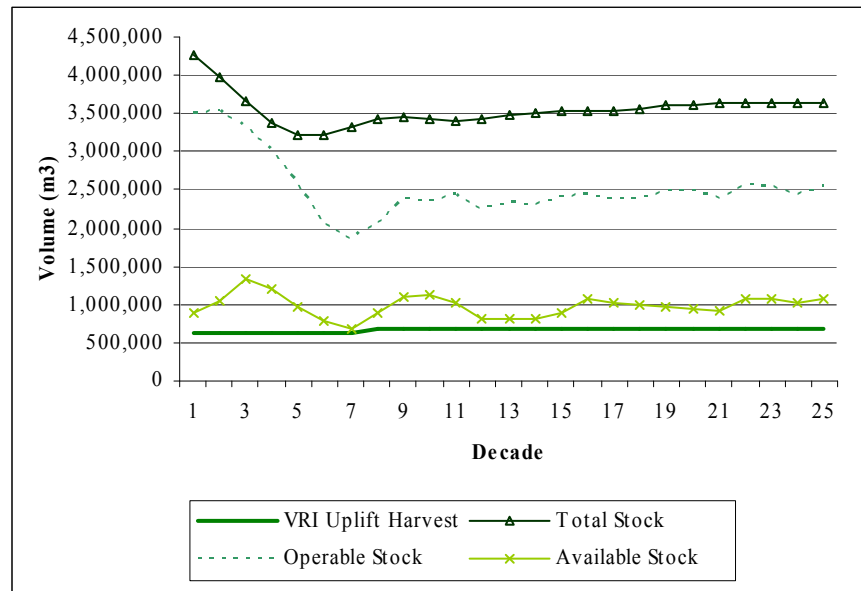


Figure 7.2. VRI Uplift Growing Stock Profile

Figure 6.2 shows that there is a slight drop again around decade fourteen which appears to be an echo of the shortfall at decade seven occurring roughly one rotation later. The long-term available volume eventually stabilizes and even slightly increases in the long term where management constraints, managed stand growth and harvest level are more or less balanced. This is reflective of the fact that the long term harvest level was not completely maximised.

7.2 HARVEST TRENDS

Figure 7.3 shows the sources of timber over the modelled time horizon. For the first six decades, the majority of the harvest comes from existing natural stands. From decade 7, a major conversion to harvest from managed stands and their subsequent rotations occurs- first existing managed and then future managed. Throughout the time frame, small amounts of timber are harvested from exiting natural stands as those stands are freed from management objectives.



Figure 7.3. VRI Uplift Timber Supply Sources

The following figures show the average harvested age, volume per hectare and area harvested per year for both the TSR3 and VRI Uplift Scenarios. Figure 7.4 shows the average harvest age for both scenarios. It illustrates the similarities between the two scenarios and again the sudden shift in average harvest age starting at decade six as the harvest shifts from older natural stands to regenerated managed stands.

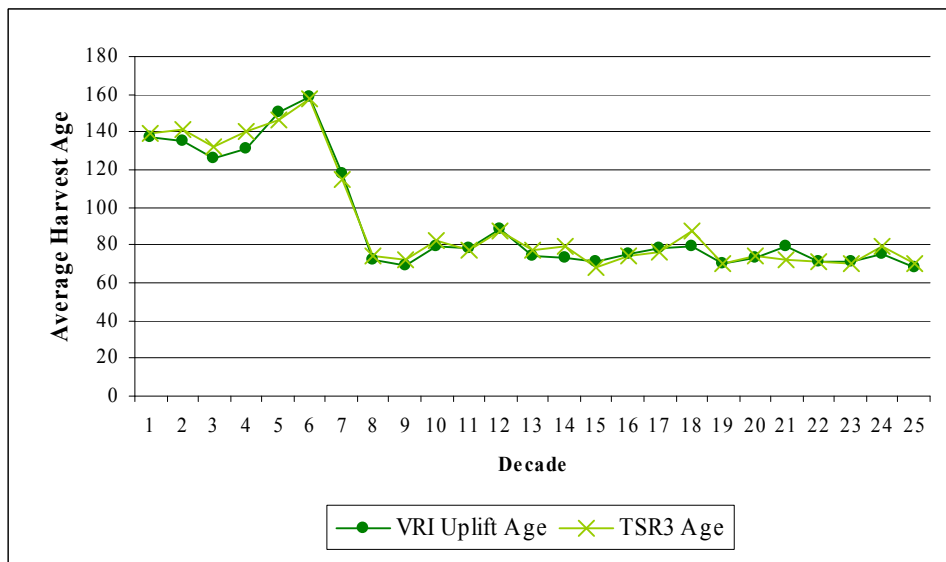


Figure 7.4. TSR3 and VRI Uplift Average Harvest Age

Figure 7.5 shows the average volume per hectare harvested in the two scenarios. It illustrates the initial short term volume impact of the VRI adjustment. This difference becomes minimal around

period 7 when the harvest moves into managed stands that are not affected by the VRI adjustment. The magnitude of this short term difference is shown in Table 7.2 for the first 6 periods.

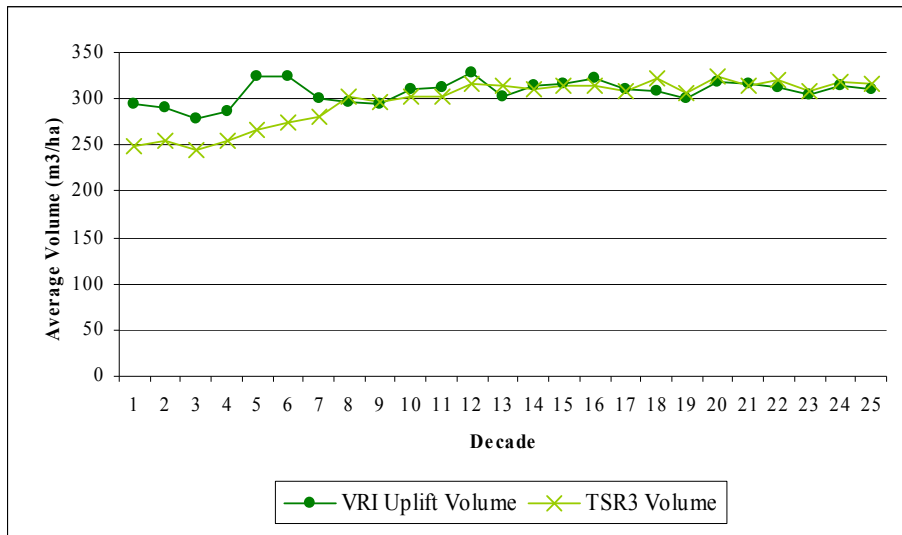


Figure 7.5. TSR3 and VRI Uplift Average Harvest Volume

Table 7.2. Harvested Volume Impact between TSR3 and VRI Uplift

Period	Difference (%) VRI Uplift to TSR3
1	16
2	12
3	12
4	12
5	17
6	15

Figure 7.6 shows the area harvested for both scenarios over 250 years.

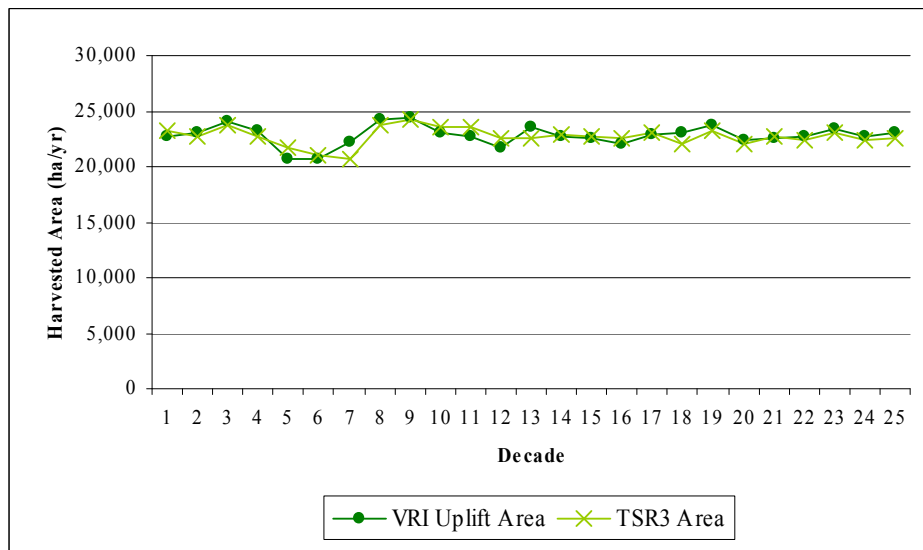


Figure 7.6. TSR3 and VRI Uplift Average Area Harvested

7.3 AGE CLASS DISTRIBUTION

Figure 6.7 displays the changes in forest structure at intervals over the modelled time horizon. Each graph is a snapshot of the productive area within the Arrow TSA divided into THLB and non-THLB by 10 year age classes at that given year. The trends and amounts are very similar to that shown for the TSR3 basecase in Figure 6.7.

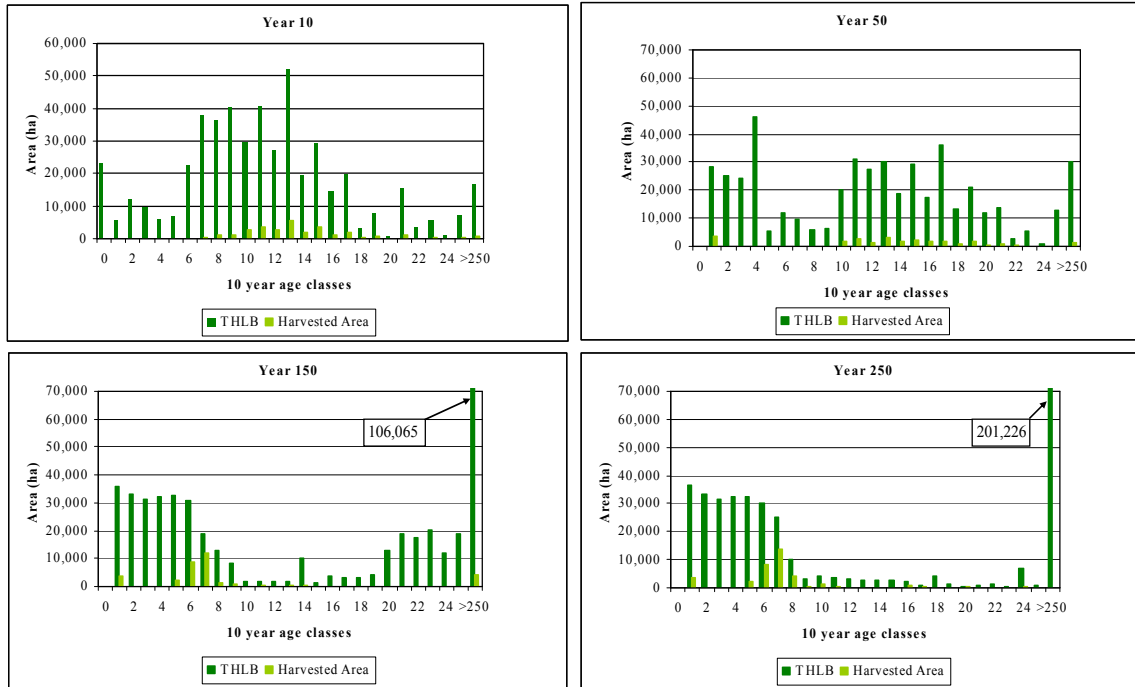


Figure 7.7. VRI Uplift Age class Distribution at Decade 5, 10, 15 and 25

7.4 ALTERNATIVE HARVEST LEVELS

Prior to selecting the VRI Uplift Basecase, a number of alternative harvest profiles were investigated to analyze the potential timber supply for the Arrow TSA. Figure 7.8 presents some of these alternate harvest profiles.

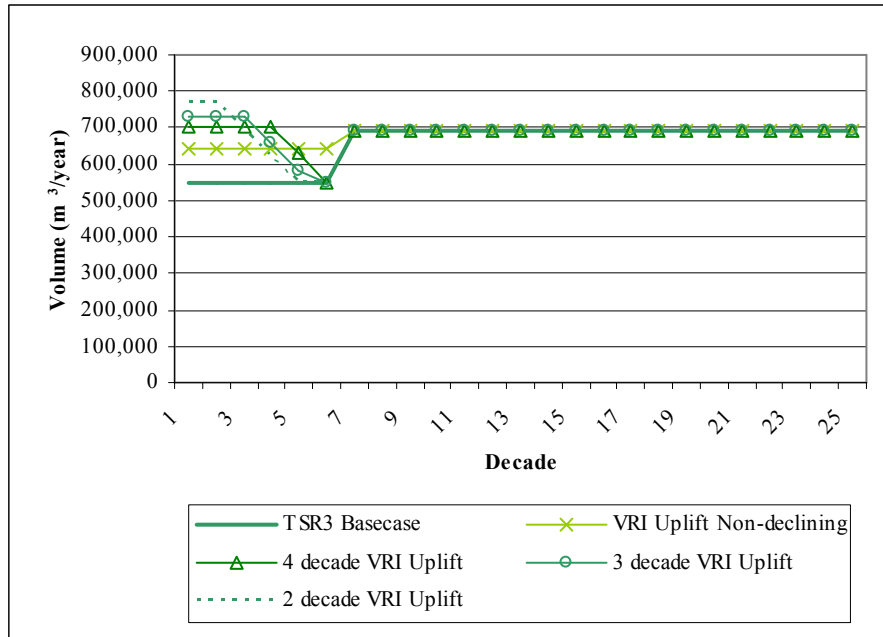


Figure 7.8. Alternative Harvest Flows for VRI Uplift Scenario

The TSR3 Basecase and VRI Uplift Basecase are shown for comparison. The alternate harvest profiles shown above and in Table 7.3 investigate different short term harvest levels that the VRI adjustment can sustain. This involved increasing the harvest as much as possible for the given number of decades (2, 3, 4 or non-declining), then stepping down to no lower than the current AAC of 550,000 m³/year. The long term harvest level from period 7 onwards was maintained as a constant to simplify the analysis as mentioned before. The VRI Uplift Basecase was chosen to maintain the non-declining philosophy of TSR3.

Table 7.3. Initial Harvest Levels for Alternate VRI Uplift Harvest Flows

Harvest Profile	Initial harvest level	Number of Decades sustained
TSR3 Basecase	550,000	Non-declining
VRI Uplift Non-declining	640,000	Non-declining
4 yr VRI Uplift	700,000	4
3 yr VRI Uplift	730,000	3
2 yr VRI Uplift	770,000	2

7.5 VRI UPLIFT LRSY

The VRI Uplift LRSY for both the existing natural stands and the future managed stands are shown below in Figure 7.9.

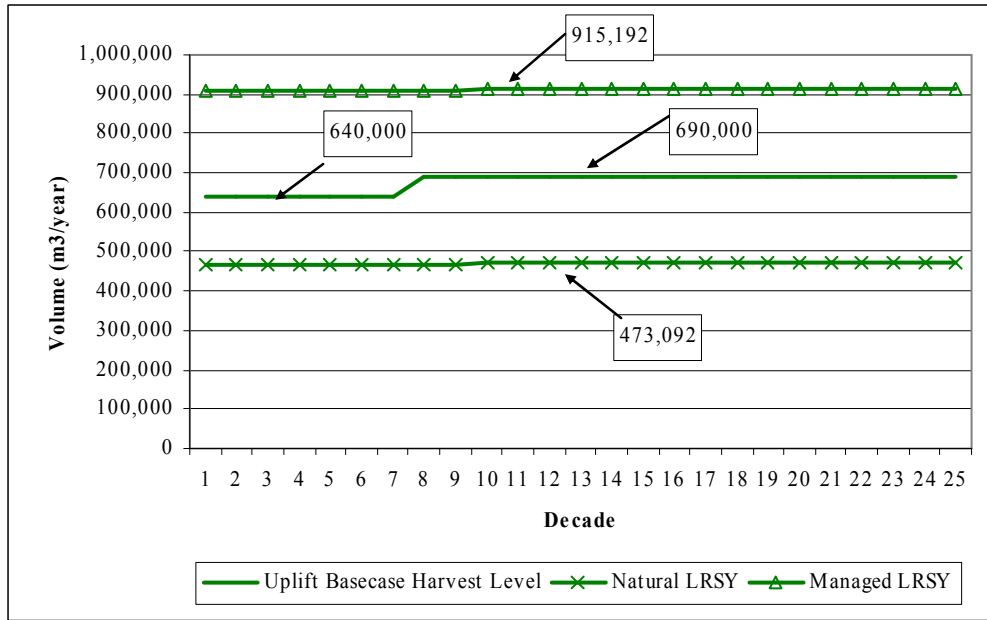


Figure 7.9. VRI Uplift Harvest Flow and LRSY

The theoretical LRSY for natural stands is 473,092 m³/year. This is 26% less than the VRI Uplift short term harvest level of 640,000 m³/year. The managed stand LRSY is 915,192 m³/year, 1.9 times greater than the natural stand LRSY. The managed stand LRSY is also 33% greater than the long term harvest level of 690,000 m³/year.

Table 7.4 presents the CMAI and LRSY (after NRLs are removed) for natural and managed stands. With the VRI Uplift, the natural stand CMAI increased by 0.39m³/year/ha compared with no impact for the managed stands.

Table 7.4. Natural and Managed CMAI and LRSY

Scenario	THLB Area (hectares)	CMAI		LRSY	
		Natural	Managed	Natural	Managed
TSR3	211,312	1.96	4.44	390,646	915,192
VRI Uplift	211,312	2.35	4.44	473,092	915,192

8.0 MPB 2010

The MPB 2010 scenario uses the VRI Uplift basecase as a starting point- i.e. includes the age, height and volume adjustments. The MPB modelling followed the methodology used in previous MPB analyses such as the Okanagan TSR3 timber supply review and is in line with MoF procedures and assumptions. A brief synopsis of the modelling assumptions follows- for complete details of the modelling assumptions used see: *An Urgent Timber Supply Review for the Okanagan Timber Supply Area* (TSR3) (MoF, 2005).

The ministry has set a precedence of using the five year projected MPB impact to establish the five year AAC. The total volume in stands projected to be very severely affected in 2010 becomes a starting point for the timber supply analysis. The area projected to be severely impacted by MPB in 2010 is targeted for harvest. When stands are targeted for harvest they:

1. Are made the highest priority for harvest, which will ensure they are harvested unless restricted by a landbase requirement;
2. Minimum harvest age is reduced to age 60 to ensure that stands are not inappropriately limited from harvest;
3. If harvested, stands regenerate on managed stand yield curves;
4. If not harvested, stands regenerate on natural stand yield curves with a 15 yr regeneration delay; and
5. Visual zones and IRM requirements are not enforced for targeted stands;

The MPB stands are able to be harvested for 10 years, but the increased harvest level is only for 5 years. Following the 10 year period the volume from the affected pine that was not harvested is removed and the landbase requirements are all restored to normal. NRLs that were reduced by 10,000 m³/year to account for an increase in MPB salvage (already accounted for) and are reinstated to their full value of 28,720 m³/year from years 1-90 (and 23,000 m³/year from 90 years onwards).

8.1 HARVEST FLOW

The maximum sustainable timber flow for the MPB scenario is presented in Figure 8.1. The VRI Uplift harvest level is shown for comparison.

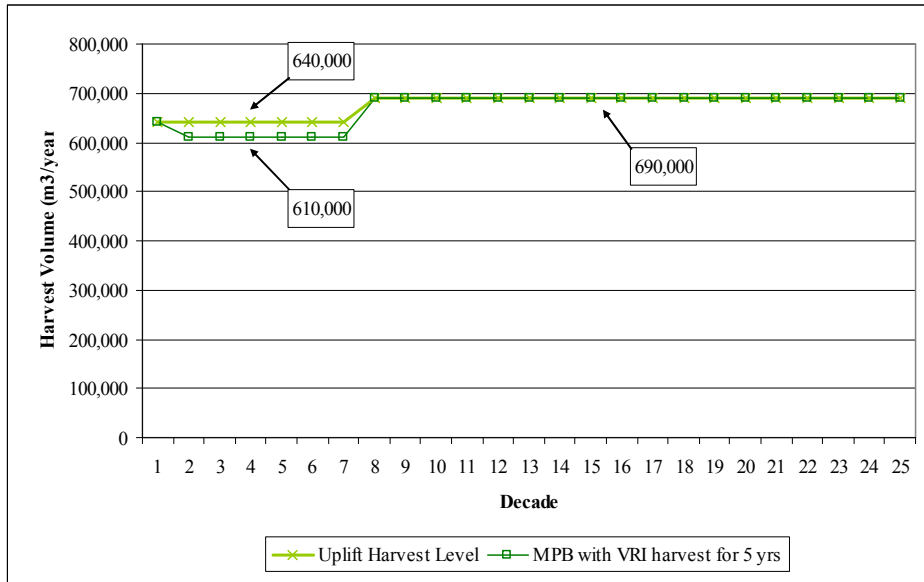


Figure 8.1. Harvest Level- MPB 2010 and VRI Uplift

The MPB 2010 harvest flow was initially set at 640,000 m³/yr for five years- the VRI uplift level. This resulted in a reduction to 610,000 m³/yr until decade seven and subsequent to this a long-term maximum sustainable harvest level of 690,000 m³/yr. Alternate harvest flows were investigated prior to choosing this harvest profile and are detailed in section 8.3.

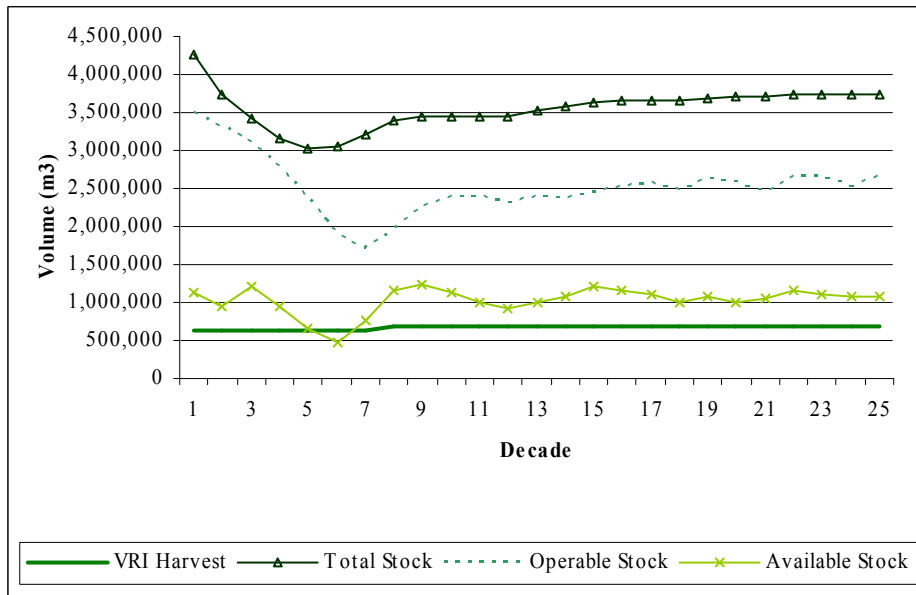


Figure 8.2. MPB 2010 Growing Stock Profile

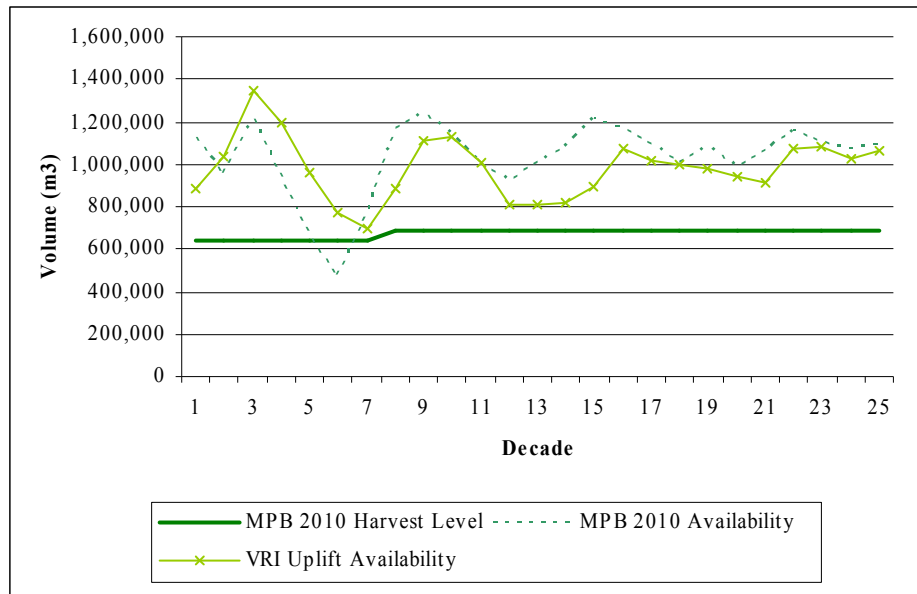


Figure 8.3. MPB 2010 and VRI Uplift Timber Availability

Figure 8.2 shows the total, operable and available stock present in the MPB 2010 scenario when modelled using the VRI Uplift harvest level. Figure 8.3 compares availabilities between the MPB 2010 scenario and the VRI Uplift scenario. Initially, MPB 2010 available stock is at 1.126 million m³ compared with 0.886 million m³ in the VRI Uplift scenario. This increase in availability is due to the relaxation of IRM and VQO requirements in MPB affected areas. The availability decreases after these controls are fully reinstated after 10 years. The availability line drops below the VRI Uplift harvest level in period 6 and is a visual representation of the downwards pressure that resulted in the short term harvest level dropping from 640,000 m³/year to 610,000 m³/year.

8.2 HARVEST TRENDS

Figure 8.4 shows the sources of timber over the modelled time horizon. For the first six decades, the majority of the harvest comes from existing natural stands. From decade 7, a major conversion to harvest from managed stands and their subsequent rotations occurs- first existing managed and then future managed. Throughout the time frame, small amounts of timber are harvested from exiting natural stands as those stands are freed from management objectives.



Figure 8.4. MPB 2010 Timber Supply Sources

The following figures show the average harvested age, volume per hectare and area harvested per year the MPB 2010 scenario. Figure 8.5 shows the average harvest age and again illustrates the sudden shift in average harvest age starting at decade six as the harvest shifts from the older natural stands to the regenerated managed stands.

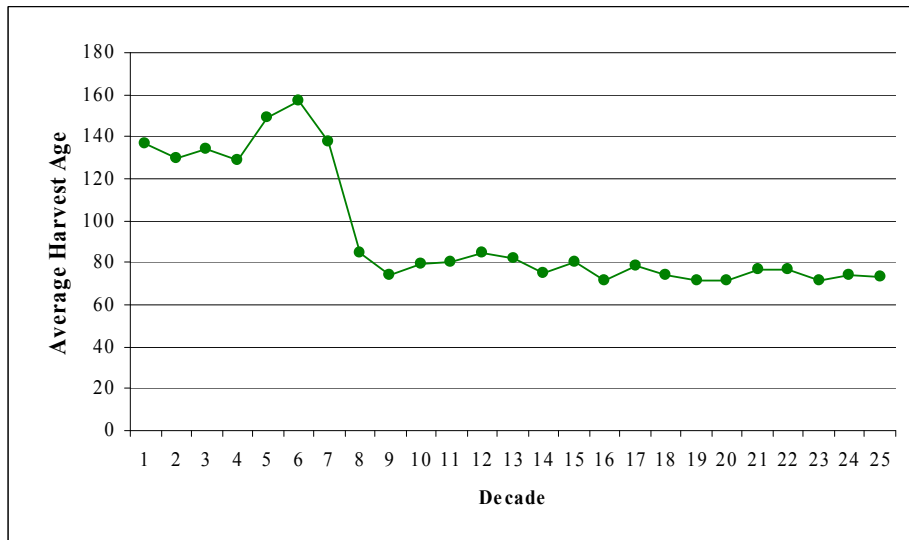


Figure 8.5. MPB 2010 Average Harvest Age

Figure 8.6 shows the average volume per hectare harvested and Figure 8.7 shows the area harvested.

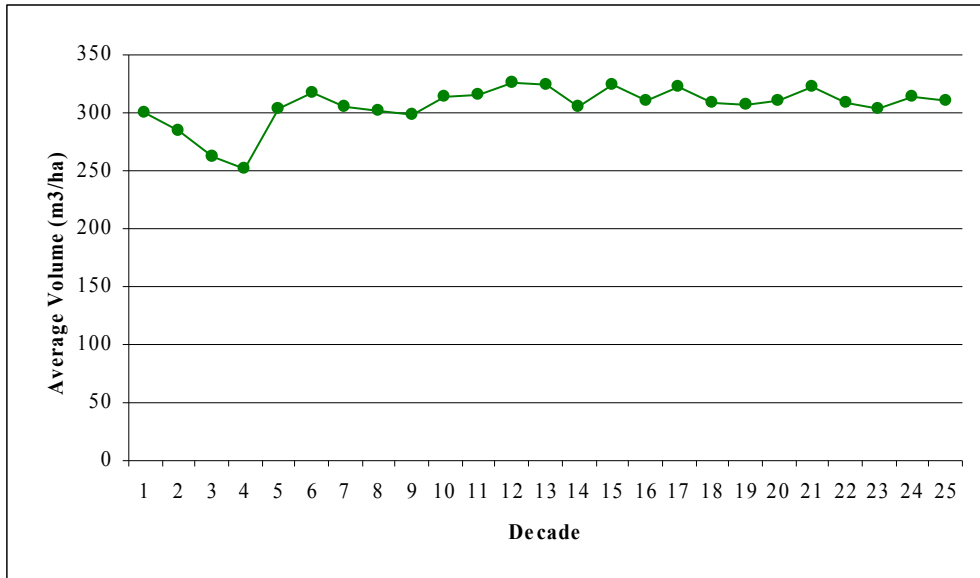


Figure 8.6. MPB 2010 Average Harvest Volume

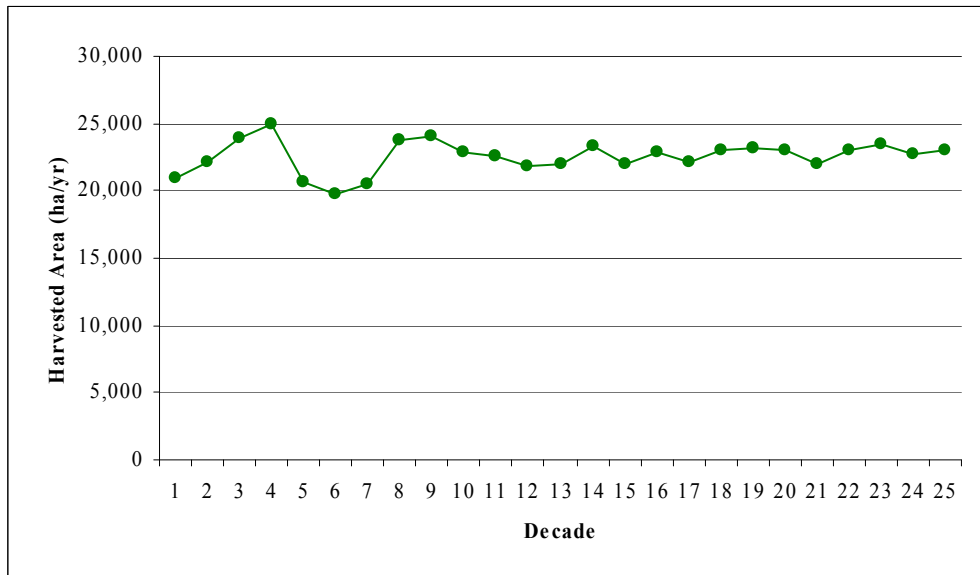


Figure 8.7. MPB 2010 Average Area Harvested

8.3 ALTERNATIVE HARVEST LEVELS

Prior to selecting the MPB 2010 harvest flow that is presented above, a number of alternative harvest profiles were investigated to analyze the potential timber supply for the Arrow TSA. Figure 8.8 presents some of these alternate harvest profiles.

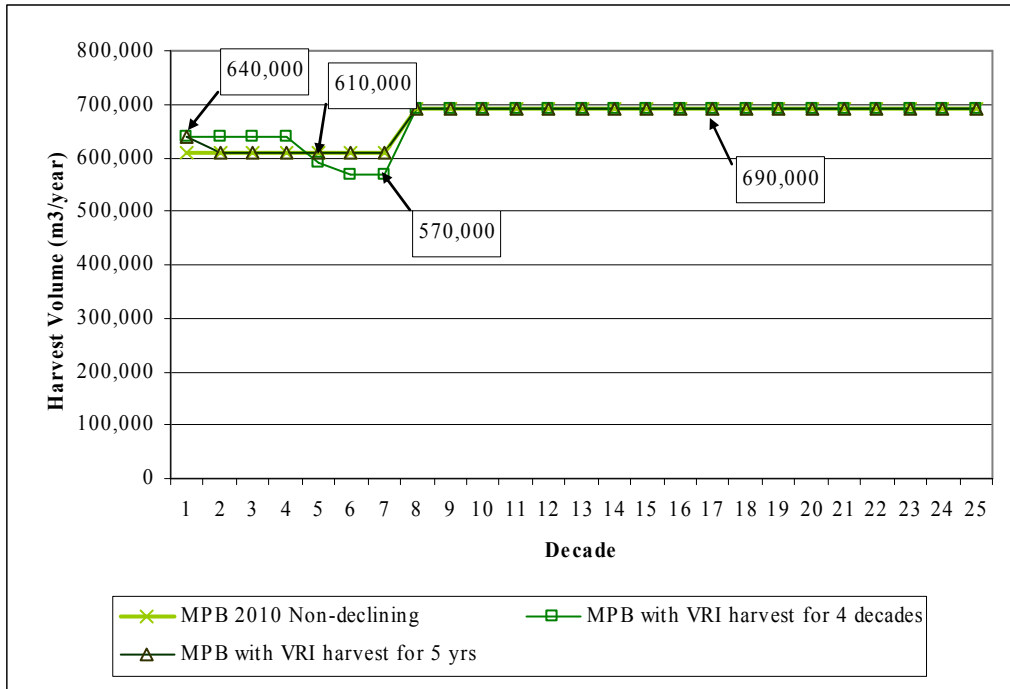


Figure 8.8. Alternative Harvest Flows for Uplift Scenario

9.0 SENSITIVITIES

This section outlines the timber supply impact of changing important assumptions. These sensitivities are built around the VRI Uplift scenario and are outlined in Table 9.1 below.

Table 9.1. Sensitivity Analyses and Corresponding Section

Sensitivity	Section
Volume Adjustment Using Population Ratio	9.1
Volume Adjustment Using Plot Ratio	9.2
Overall Volume Impact of Adjustment	9.3
Phase 2 Adjustment 95% Confidence Limits	9.4
Phase 2 Adjustment 95% Confidence Limits of the Species Strata	9.5
Spruce-Balsam Age Stratification	9.6
MPB 2010 With Spruce-Balsam Age Stratification	9.7
SARCO Proposed Caribou	9.8
SARCO Proposed Caribou with retention requirements on THLB only	9.9

9.1 VOLUME ADJUSTMENT USING POPULATION RATIO

This sensitivity investigates the timber supply impact of using the population volume impact ratio to adjust TSR3 volumes.

After the VRI adjustment was carried out on all the polygons in the target population (vegetated treed, operable and greater than 29 years), the total volume by stratum was compared with the unadjusted total volume. This ration of adjusted over unadjusted inventory volumes for each strata is referred to as the population ratio. This ratio is applied directly the TSR 3 basecase analysis.

Table 9.2 shows the population ratio (adjusted total volume to unadjusted total volume) by stratum. The overall volume impact is 1.164 which is the weighted average by unadjusted total volume of each stratum and using this ratio is tested in sensitivity section 9.3.

Table 9.2. Population Volume Impact Ratio by Species Stratum

Inventory Leading Species Stratum	Population Volume Impact (adjusted/unadjusted)
Cedar/Hemlock	1.113
Deciduous	1.093
Fir	1.200
Larch/Pine	1.145
Spruce/Balsam	1.185
OVERALL	1.164

Figure 9.1 compares the harvest level of this sensitivity with the VRI Uplift scenario and shows that there is a minimal decrease in harvest level of 2,000 m³/year in the short term and 5,000 m³/year in the long term.

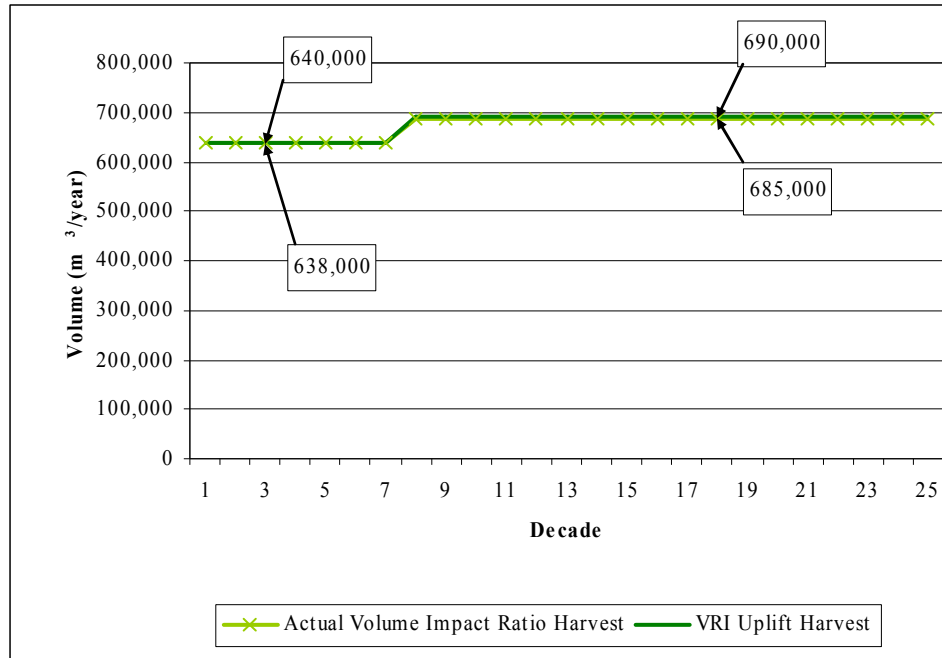


Figure 9.1. Harvest Level-Adjustment using Population Volume Impact Ratio

Figure 9.2 shows the timber availability of the VRI Uplift scenario and adjustment using the population ratio. The two timber availabilities are almost identical in the short term but part in the long term with the population volume impact ratio adjustment availability below the VRI availability.

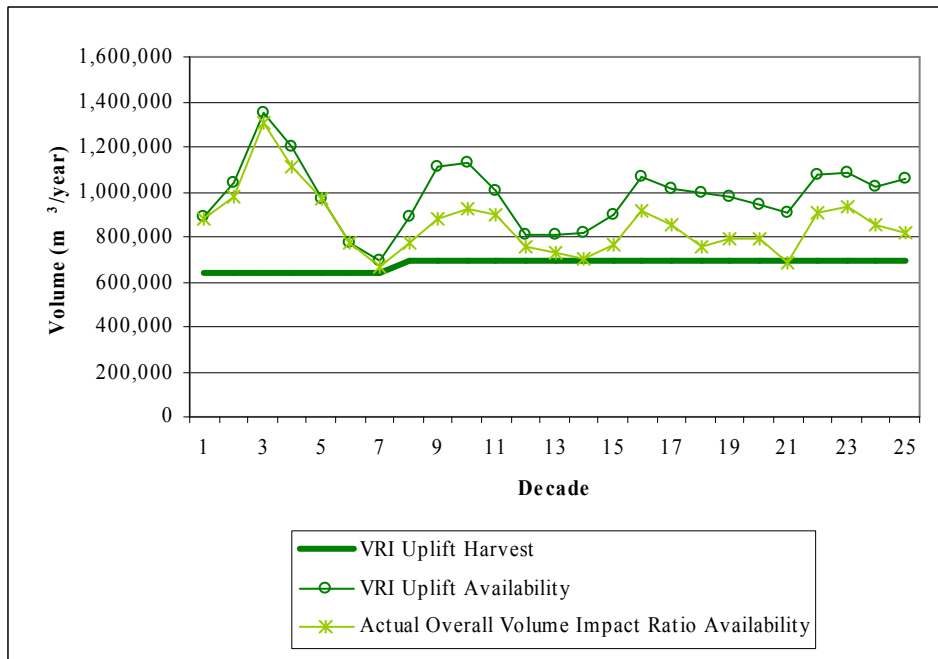


Figure 9.2. Timber Availability-Adjustment using Population Volume Impact Ratio

Since the ratio adjustment is applied to natural stands only, the fact that there is a difference in the long term availability may seem counter-intuitive, especially considering that there is a minimal harvest level impact. This difference is explained in Figure 9.3 and Figure 9.4 that show a larger

area was harvested at a lower age and volume from decade three onwards. These differences are created by the natural stands in the short term where the distance between the two lines is increasing (decades 4 – 6). After this, the managed stands kick in and differences in harvested area, age and volume are consistent- i.e. the lines are parallel.

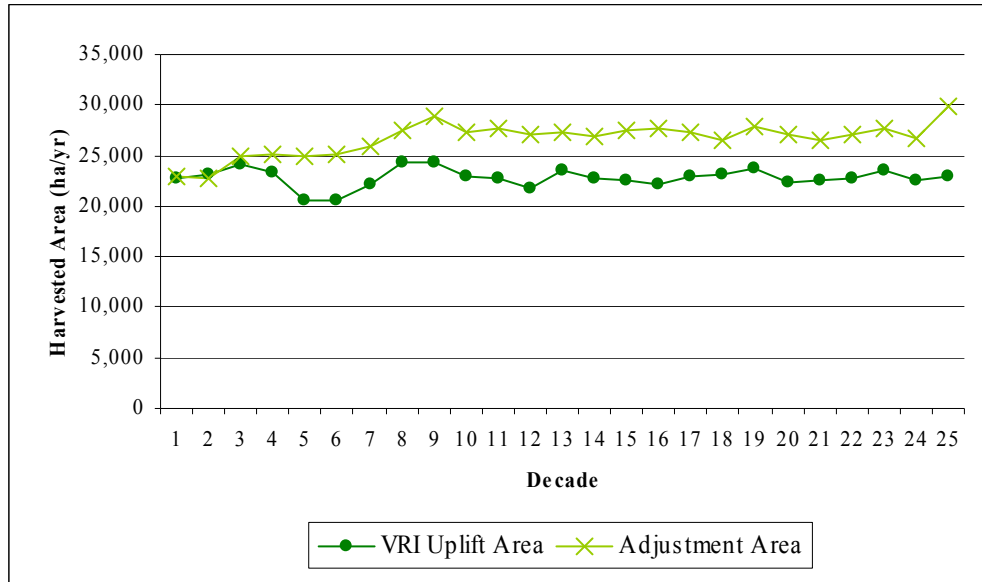


Figure 9.3. Harvested Area VRI Basecase and Population Ratio Adjustment

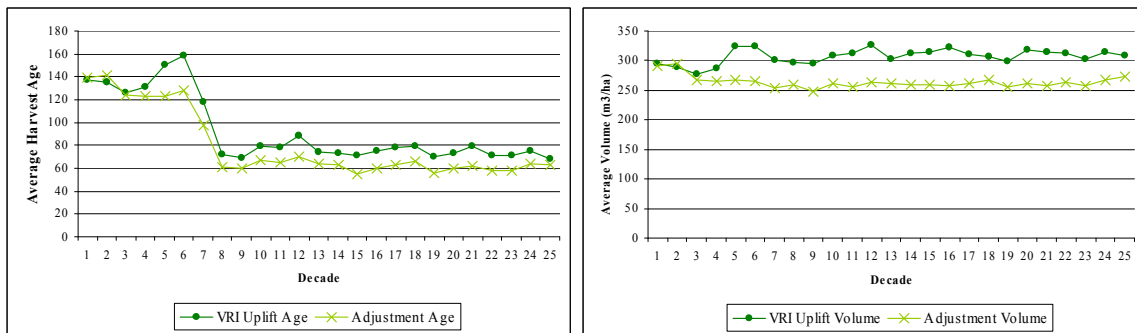


Figure 9.4. Age and Volume at Harvest for VRI Basecase and Population Ratio Adjustment

9.2 VOLUME ADJUSTMENT USING PLOT RATIO

This sensitivity investigates the timber supply impact of using the plot volume ratio to adjust TSR3 volumes. It is distinct from the population ratio in that only the volumes from the survey plots are used- i.e. the ground volumes were compared with the unadjusted inventory volumes for the phase 2 plots only. This ratio is applied directly the TSR 3 basecase analysis.

Table 9.3 shows the volume impact ratio by stratum. The overall ratio is 1.161 (weighted by number of plots in each stratum). This overall ratio compares very closely with the population overall ratio of 1.1.64 (from section 9.1).

Table 9.3. Estimated Volume Impact Ratio by Species Stratum

Inventory Leading Species Stratum	Adjustment Impact Ratio of Means
Cedar/Hemlock	1.125
Deciduous	1.110
Fir	1.200
Larch/Pine	1.137
Spruce/Balsam	1.187
OVERALL	1.161

Figure 9.5 presents the harvest level of this sensitivity with the VRI Uplift scenario and shows that there is a minimal decrease in harvest level of 2,000 m³/year in the short term and 3,000 m³/year in the long term.

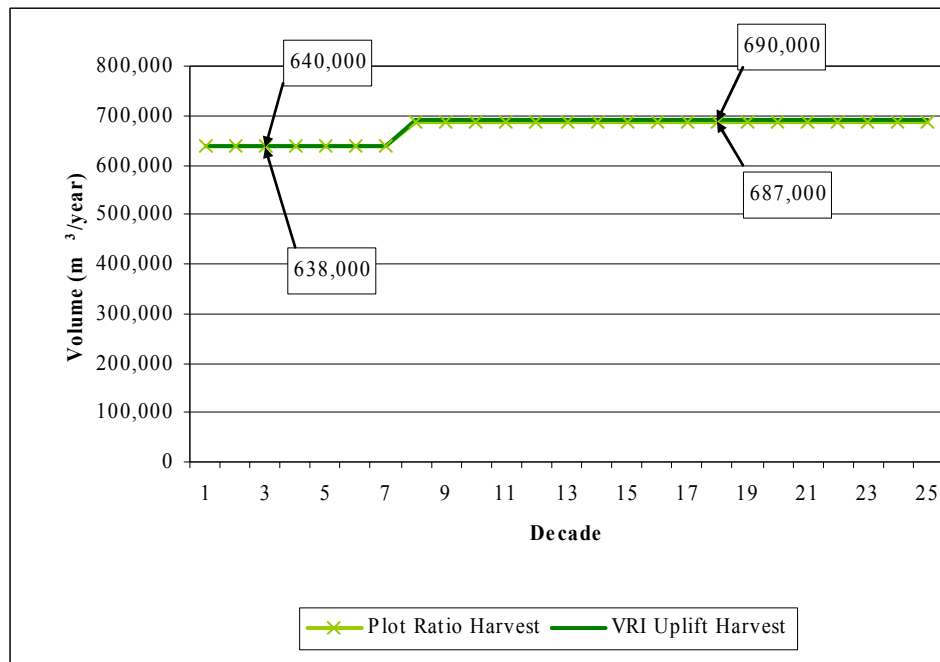


Figure 9.5. Harvest Level- Adjustment Using Plot Ratio Adjustment

Figure 9.6 shows the timber availability of the VRI Uplift scenario and the adjustment using the plot ratio. As in the sensitivity above, the two timber availabilities are very similar to each other in the short term until approximately period 6. After this they begin to diverge with the plot ratio availability becoming significantly lower. This occurs because of the same reasons outlined in section 9.1.

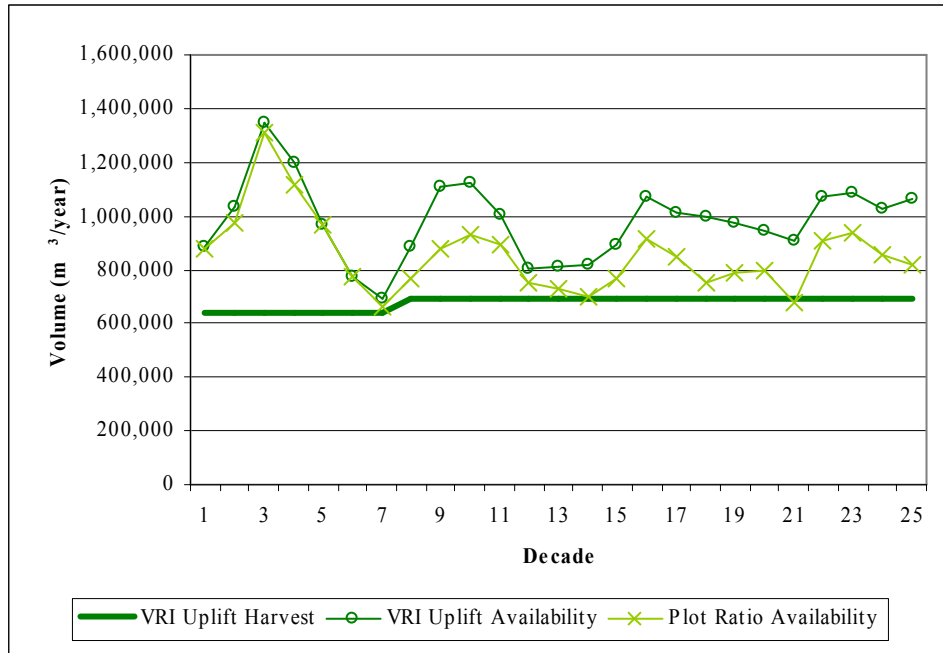


Figure 9.6. Timber Availability- Adjustment Using Plot Ratio Adjustment

Figure 9.7 compares the timber availabilities of the population ratio and the plot ratio. It can be seen that they are almost identical, with the population availability slightly higher- reflecting the slight difference in weighted average overall volume ratio (1.164 versus 1.161).

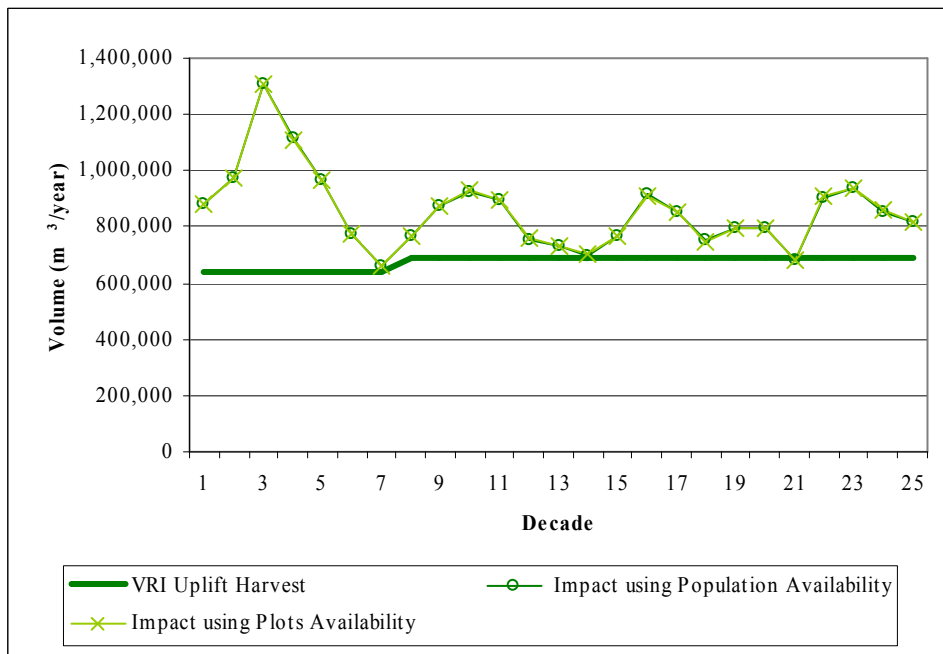


Figure 9.7. Timber Availability- Adjustments using Population and Plot Ratios

9.3 OVERALL VOLUME IMPACT OF ADJUSTMENT RATIO

This sensitivity investigates the timber supply impact of using the overall adjustment impact ratio to adjust TSR3 volumes. This ratio is the average ratio of total adjusted inventory volume over

the total unadjusted inventory volume. It is the average across all species strata and is 1.164 with an 11.6% sampling error at the 95% confidence level (Jahraus, 2006).

Figure 9.8 presents the harvest level of this sensitivity with the VRI Uplift scenario and shows that there is a minimal decrease in harvest level of 2,000 m³/year in the short term.

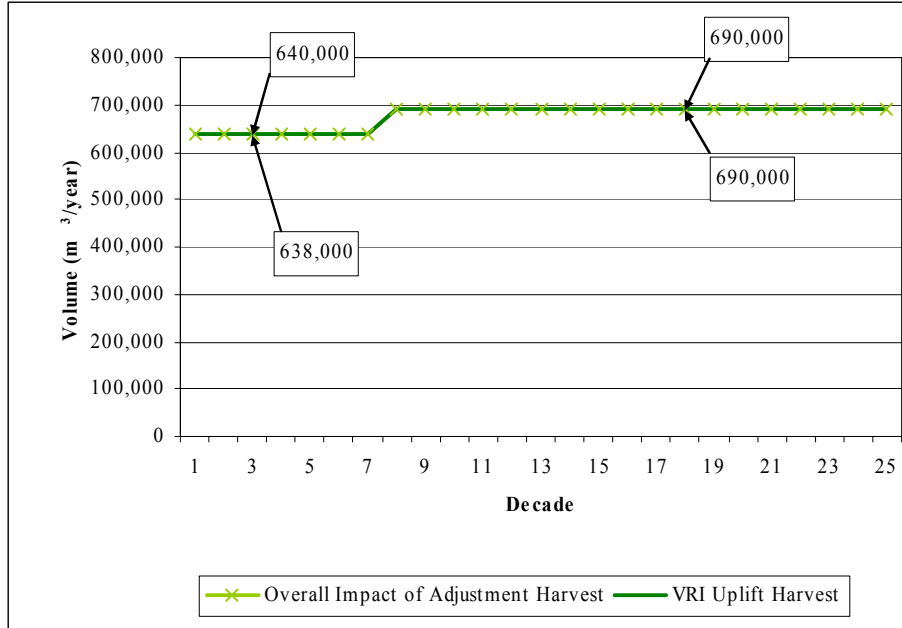


Figure 9.8. Harvest Level- Adjustment Using Overall Volume Impact Ratio

Figure 9.9 shows the timber availability of the VRI Uplift scenario and the overall volume ratio and illustrates their similarities.

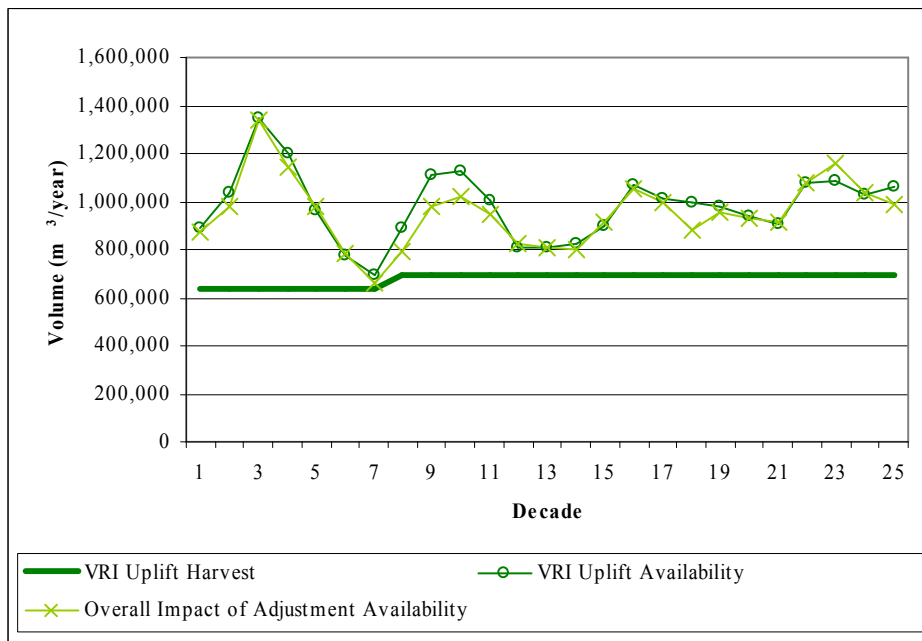


Figure 9.9. Timber Availability- Adjustment Using Overall Volume Impact Ratio

9.4 PHASE 2 ADJUSTMENT 95% CONFIDENCE LIMITS

The Phase 2 adjustment shows a net impact on volume to be 16.4 percent with an 11.6% sampling error at 95% confidence interval (Jahraus and Associates). This sensitivity models the upper and lower limits of the adjustment to help understand the potential range of the adjustment. Table 9.4 and Figure 9.10 show the harvest levels of the 95% confidence limits around the overall volume impact ratio. The upper 95% confidence limit increased the initial harvest level by 1.57% from 638,000 m³/year to 648,000 m³/year. The lower 95% confidence limit was proportional to this, decreasing the initial harvest level by 1.57% to 628,000 m³/year. The long term harvest level remained constant at 690,000 m³/year.

Table 9.4. Harvest Level for 95% Confidence Limits Around the Overall Volume Ratio

Case	Annual Harvest Level (m3/year)		
	Impact of Adjustment Ratio	Impact of Adjustment + 11.6%	Impact of Adjustment - 11.6%
1 - 7	638,000	648,000	628,000
8 - 25	690,000	690,000	690,000

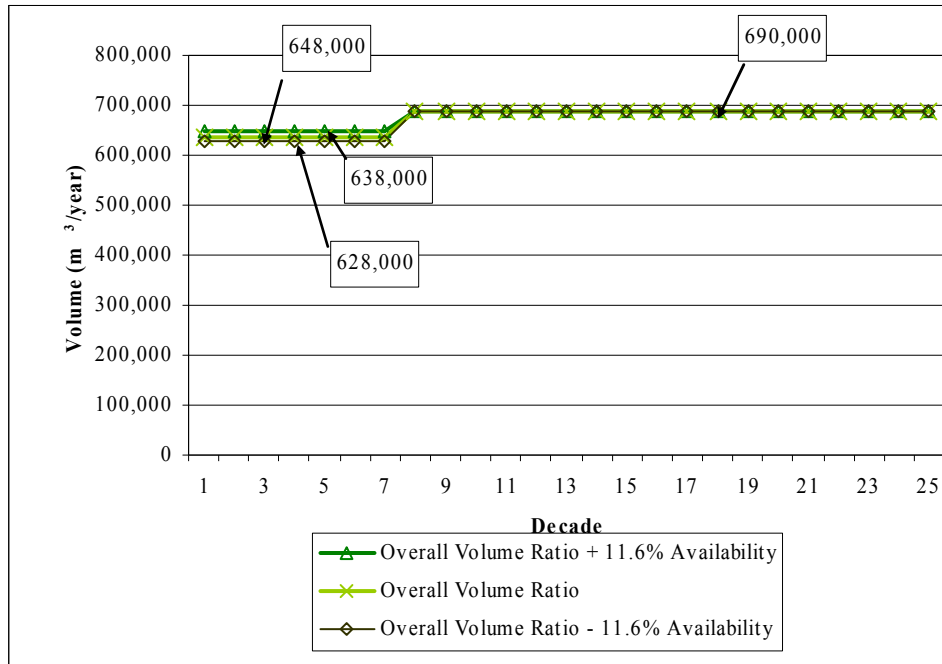


Figure 9.10. Harvest Level- 95% C.L.s Around the Overall Volume Ratio

Figure 9.11 shows the timber availability of the upper and lower confidence limits around the overall volume ratio.

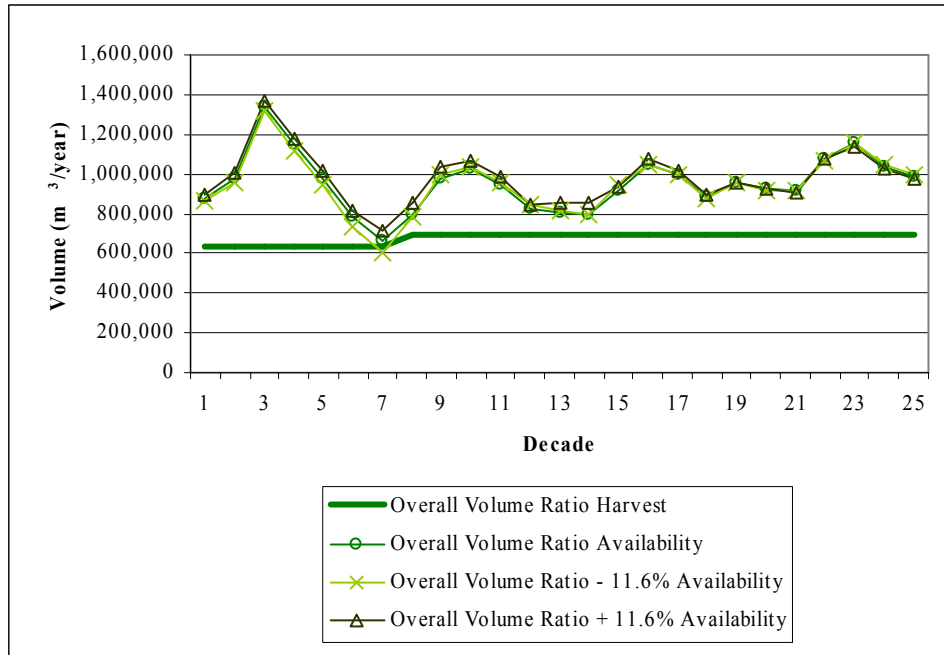


Figure 9.11. Timber Availability- 95% C.I. around the Overall Volume Ratio

9.5 PHASE 2 ADJUSTMENT 95% CONFIDENCE LIMITS OF THE SPECIES STRATA

This sensitivity shows the 95% confidence limits of the net volume adjustment to the strata. The range within the 95% confidence levels is considerably larger because of the low number of plots in each of the stratum. Table 9.5 shows the volume impact ratio and the 95% confidence limits around these points.

Table 9.5. 95% Confidence Limits around the Plot Ratio Adjustment

Inventory Leading Species Stratum	Adjustment impact ratio of means	95% Confidence Interval (%)	Lower C.L. Adjustment Impact Ratio	Higher C.L. Adjustment Impact Ratio
Cedar/Hemlock	1.125	±30%	0.7875	1.4625
Deciduous	1.110	±101%	-0.0111	2.2311
Fir	1.200	±21%	0.9480	1.4520
Larch/Pine	1.137	±23%	0.8755	1.3985
Spruce/Balsam	1.187	±27%	0.8665	1.5075

Figure 9.12 illustrates the impact that using the upper and lower 95% confidence adjustment ratios has on timber supply. This sensitivity shows a massive range of potential harvest levels which indicates that the strata based adjustment is questionable. The sensitivity that uses the net volume adjustment for the entire population provides certainly that the adjustment is within 11.6 % of the 16.4%, which is much more reasonable. As before, the VRI impacts are natural stand-based so the short term harvest level (during which natural stands harvesting occurs) was altered to reflect this.

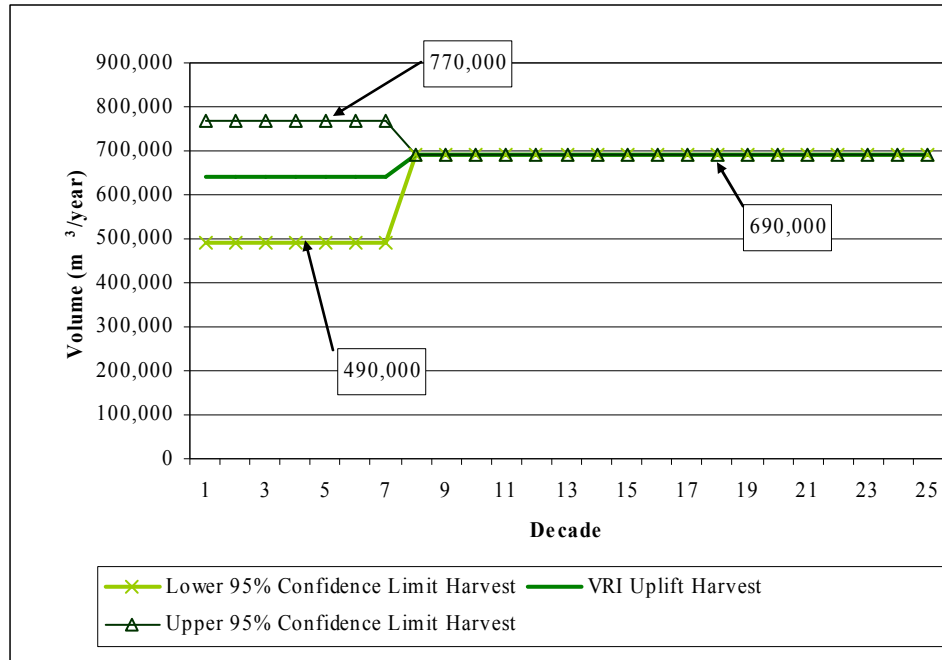


Figure 9.12. Harvest Level- 95% Confidence Limits around Plot Ratio Adjustment

Figure 9.13 shows the timber availabilities of the upper and lower confidence limit around the plot ratio adjustment. In the short term they follow parallel patterns and then converge in the long term. The lower confidence limit availability dips far below the harvest level in periods 5, 6 and 7 and then becomes higher than the plot ratio availability. This is due to the way the availability was modelled- since less wood was available in periods 5, 6 and 7 that was being requested, there was a timber shortfall modelled in those years and the model did not harvest as much wood as in the other scenarios. This is represented by the area of the polygon between the lower confidence level availability line and the VRI Uplift harvest line. In the subsequent years, this un-harvested timber becomes available, pushing up the availability line and causing a misleading comparison.

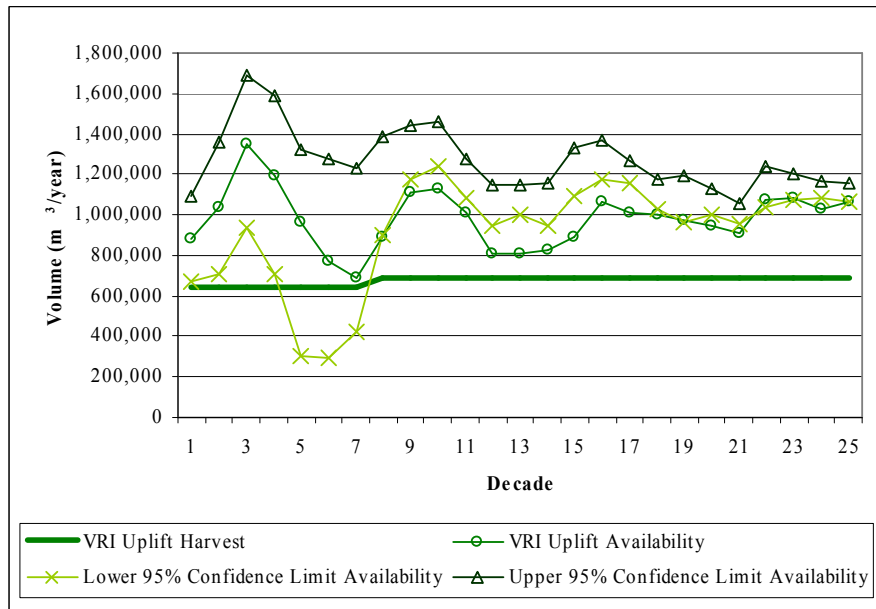


Figure 9.13. Timber Availability- 95% Confidence Limits around Plot Ratio Adjustment

9.6 SPRUCE-BALSAM AGE STRATIFICATION

In the VRI statistical adjustment, further post-stratification by age was examined for the spruce/balsam species strata. In the statistical analysis it was not considered appropriate with the given sample because of concern regarding the impact of the large difference in ratios across the age break coupled with the uncertainty associated with the small sample size in the sub-strata (Jahraus, 2006). However, results were supplied as an option of alternative adjustment and this sensitivity investigates the impact of using these adjustment factors with age stratification of the spruce/balsam strata.

An age break of 150 years was chosen instead of the standard inventory maturity break of 120 years because using 120 resulted in an extremely small sample size for the younger sub-stratum (Jahraus, 2006). Table 9.6 presents the height, age and volume adjustment ratios for the total spruce/balsam strata and the age stratified sub-stratum. The overall volume impact is also presented.

Table 9.6. Height, Age, Volume Adjustment Ratios and Overall Volume Impact of the Spruce/Balsam Total and Sub-Stratum

Strata	Height Adjustment Factor	Age Adjustment Factor	Volume Adjustment Ratio	Overall Volume Impact
Spruce/Balsam Total	1.035	1.0101	n.a.	1.187
Spruce/Balsam < 150 years	1.133	1.0131	1.151	1.435
Spruce/Balsam ≥ 150 years	0.966	0.8410	1.118	1.058

Figure 9.14 shows the harvest level impact resulting from age stratification of the spruce/balsam strata. An increase from 640,000 m³/year to 670,000 m³/year in the short term (until period 7) was found.

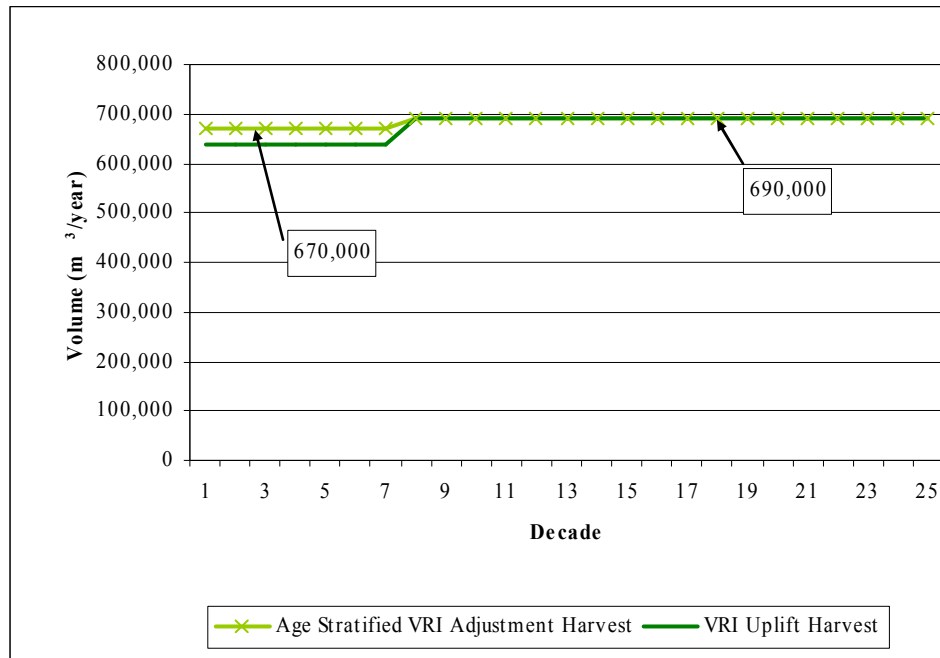


Figure 9.14. Harvest Level- Spruce/Balsam Age Stratification

Figure 9.15 shows the timber availability of the stratified VRI adjustment compared to the un-stratified VRI adjustment. The stratified availability is consistently higher than the un-stratified availability with a noticeable easing in pinch point at period 7.

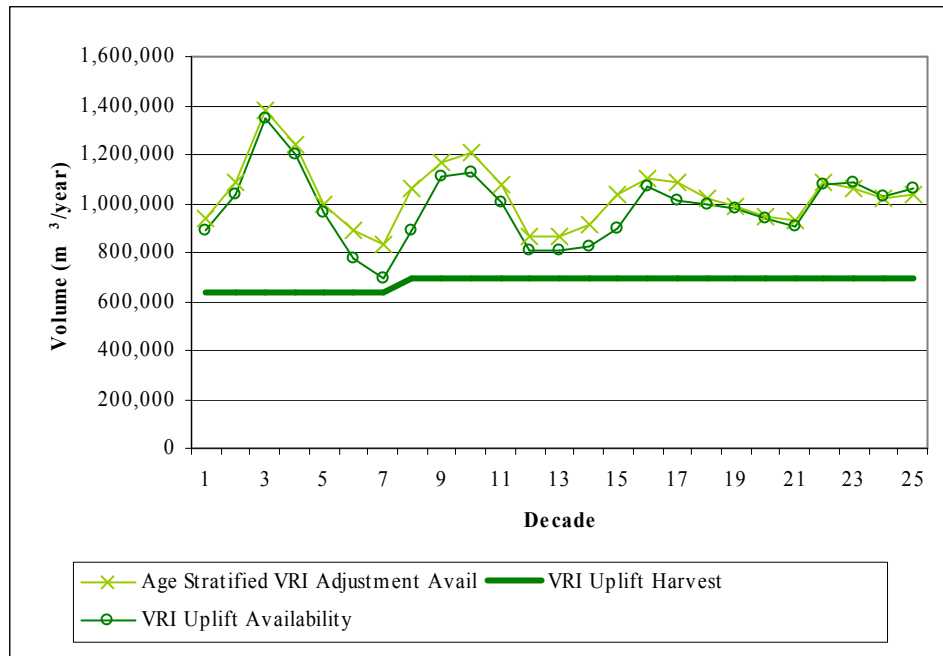


Figure 9.15. Timber Availability- Spruce/Balsam Age Stratification

9.7 MPB 2010 WITH SPRUCE-BALSAM AGE STRATIFICATION

This sensitivity investigates the timber supply impact of combining the upwards pressure from the spruce/balsam age stratification with the downwards pressure of the MPB 2010 modelling. Table 9.7 and Figure 9.16 show the harvest levels of the MPB 2010 non-declining scenario, the MPB 2010 with stratification sensitivity and the VRI adjustment with stratification sensitivity. When combined, the upwards pressure from the stratification and the downwards pressure from the MPB result in the same non-declining harvest level as the VRI Uplift scenario- 640,000 m³/year.

Table 9.7. Harvest Levels- MPB 2010 with Spruce/Balsam Age Stratification

Decades	MPB 2010 Scenario (Non-declining)	MPB with Age Stratification	VRI Adjustment with Stratification
1 - 7	610,000	640,000	670,000
8 - 25	690,000	690,000	690,000

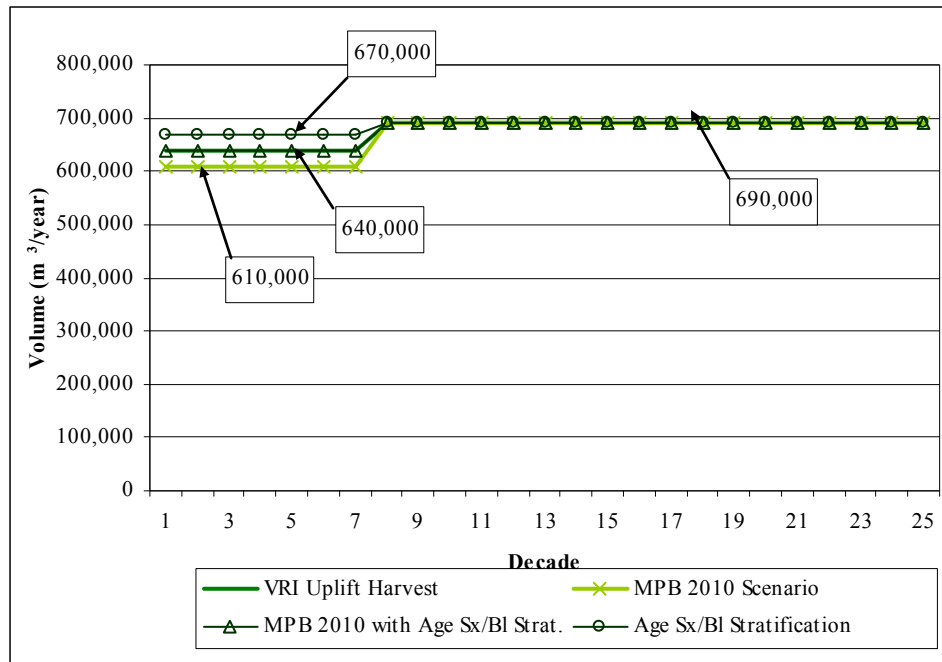


Figure 9.16. Harvest Levels- MPB 2010 with Spruce/Balsam Age Stratification

Figure 9.17 shows the timber availabilities of the three sensitivities. Combining the two pressures results in a timber availability similar in pattern to the MPB 2010 scenario with a higher pinch point at period 6 from the spruce/balsam age stratification. The timber availabilities are similar in the long term.

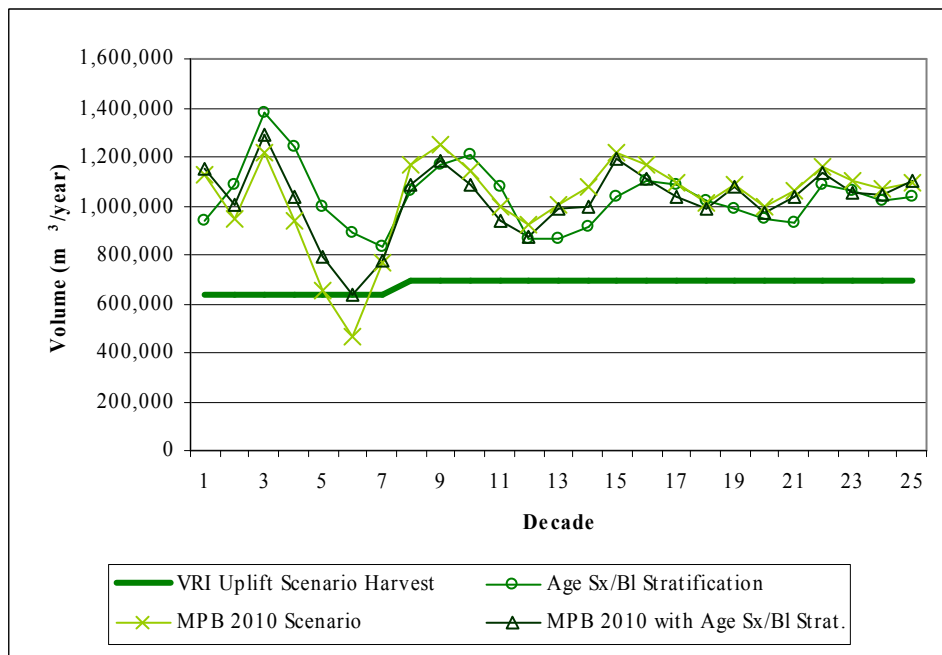


Figure 9.17. Timber Availability- MPB 2010 with Spruce/Balsam Age Stratification

9.8 2006 SPATIAL OGMA S

Since TSR 3 there have been many versions of proposed OGMA S. This analysis tests the timber supply impact of using the latest round of spatially defined OGMA S. The TSR3 OGMA S have been moved into the THLB and the 2006 OGMA S have been excluded as shown in Table 9.8. The net impact to the THLB is an additional 1,851 ha (0.9%) has been removed from the THLB.

Table 9.8 THLB Impact of New OGMA S

Impact of New OGMA S	Compared to TSR 3 OGMA S
THLB Removed	4,682
THLB added	2,831
Net Impact	1,851

Table 9.9 and Figure 9.18 show the change in harvest level associated with this change. The short term harvest level has dropped by 10,000m³/year from 640,000m³/year to 630,000m³/year which is a 1.6% decrease resulting from a 0.9% decrease in the THLB.

Table 9.9 Harvest Levels- 2006 Spatial OGMA S

Case	Annual Harvest Level (m ³ /year)	
	VRI Uplift	2006 OGMA S
1 - 7	640,000	630,000
8 - 25	690,000	693,000

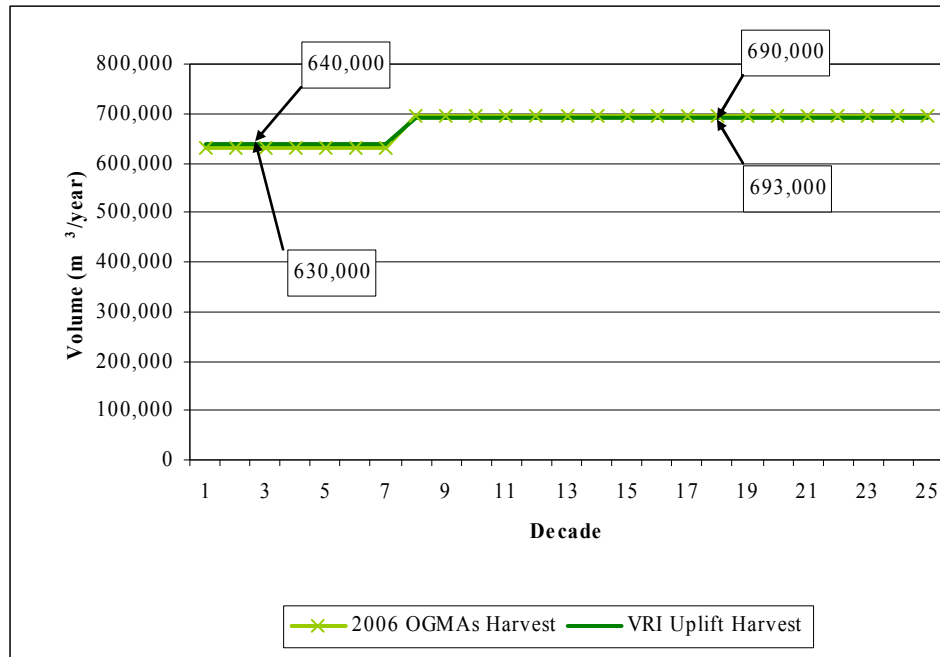


Figure 9.18 Harvest Levels- 2006 Spatial OGMA S

Figure 9.19 shows the associated timber availability of the 2006 spatial OGMA S against the VRI basecase availability and harvest level. The slightly lower harvest level shown above corresponds

to a slight drop in timber availability in this sensitivity- especially the lower pinch point in period 7

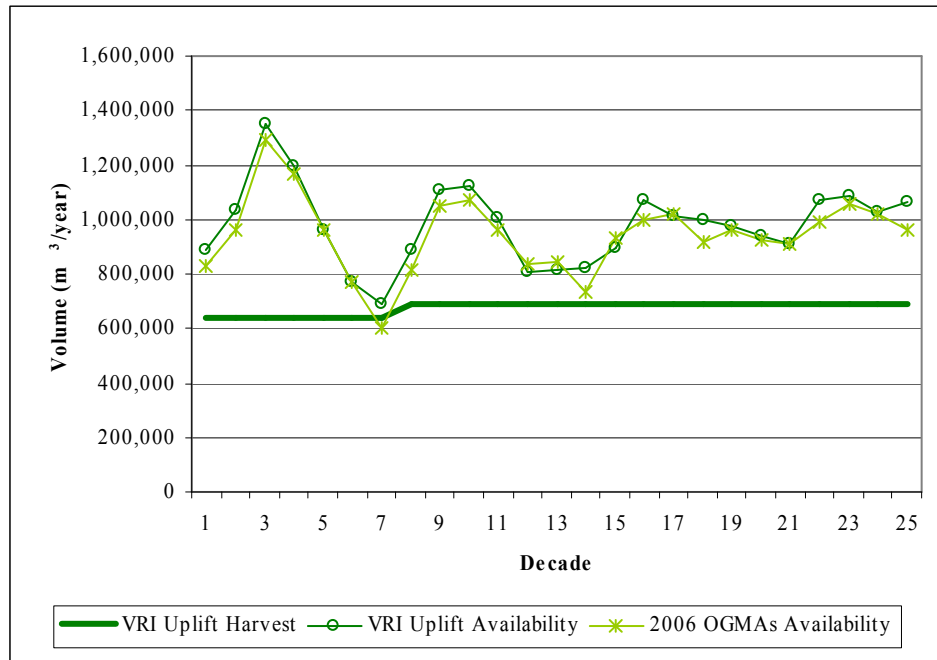


Figure 9.19 Timber Availability- 2006 Spatial OGMA's

9.9 SARCO PROPOSED CARIBOU

The Species at Risk Coordination Office (SARCO) has developed a draft Mountain Caribou Recovery Strategy. The strategy includes a map outlining planning units and management objectives for each planning unit. An analysis has been completed to assess the timber supply impacts of the proposed strategy on the Arrow TSA. The analysis involved:

1. Rebuilding the resultant database to include the updated caribou coverage;
2. Rebuild the analysis files including the blocks split by the additional caribou linework;
3. Benchmark the VRI Uplift Analysis to ensure consistency (unreported scenario);
4. Model Caribou as proposed by SARCO, which involves:
 - a. Turn off the previous caribou retention and disturbance requirements;
 - b. Remove the Caribou priority 1 and 1a from the THLB for the Central Selkirk herd;
 - c. Remove the Caribou zone 1,2 and 3 for the Southern Selkirk herd;
 - d. Assign caribou zones by LU for the priority 2 areas;
 - e. For each priority 2 zone have at least 40% over the age 140; and
 - f. For each priority 2 zones have no more that 25% less than 2.5 meters in height.

The areas that have been removed from the THLB were 2,103 ha for the Central Selkirk herd and 1,631 ha for the Southern Selkirk herd. The priority 2 areas for the Central Selkirk herd are subject to the 40% retention requirement and 25% disturbance requirement are shown in table 9.10. For the Southern Selkirk herd the THLB area subject to these requirements was negligible.

Table 9.10 Priority 2 Caribou Zones

LU	Productive	
	THLB	Productive
Hills	14	695
Wilson	4,683	17,788
Kuskanax	3,703	17,318
Halfway	116	127
Trout	413	3,584
Fish	10	19
Total	8,939	39,531

Table 9.11 and Figure 9.20 show the change in harvest level associated with this change. The short term harvest level has increased by 1,000m³/year from 640,000m³/year to 641,000m³/year which is a 0.2% increase.

Table 9.11 Harvest Levels- Proposed Caribou

Case	Annual Harvest Level (m ³ /year)	
	VRI Uplift	Proposed Caribou
1 - 7	640,000	640,000
8 - 25	690,000	688,000

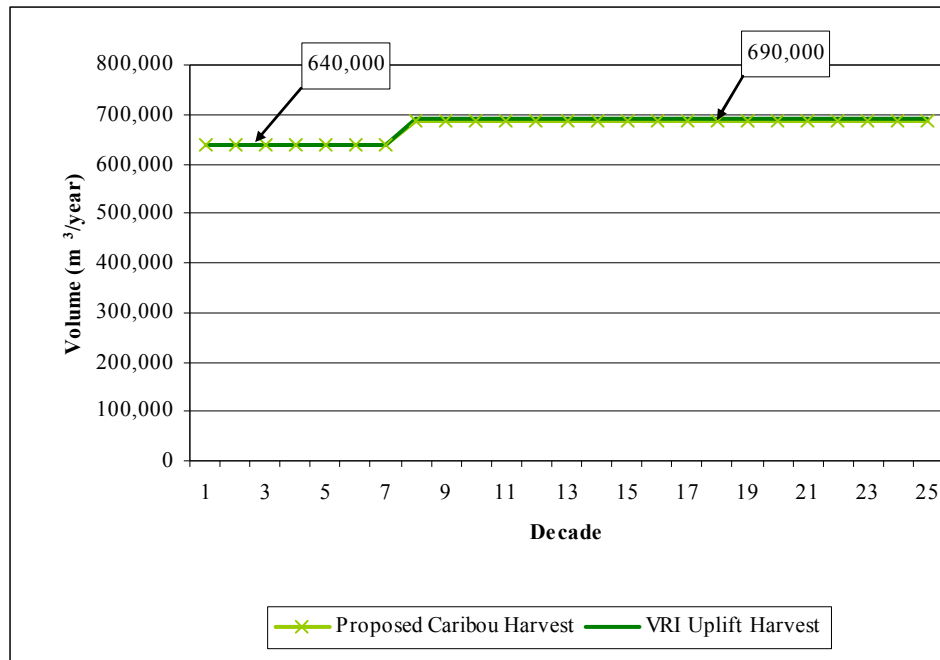


Figure 9.20 Harvest Levels- Proposed Caribou

Figure 9.19 shows the associated timber availability of the proposed caribou scenario against the VRI base case availability and harvest level. The impact on timber supply of the proposed caribou is negligible compared to the caribou modelled in TSR 3.

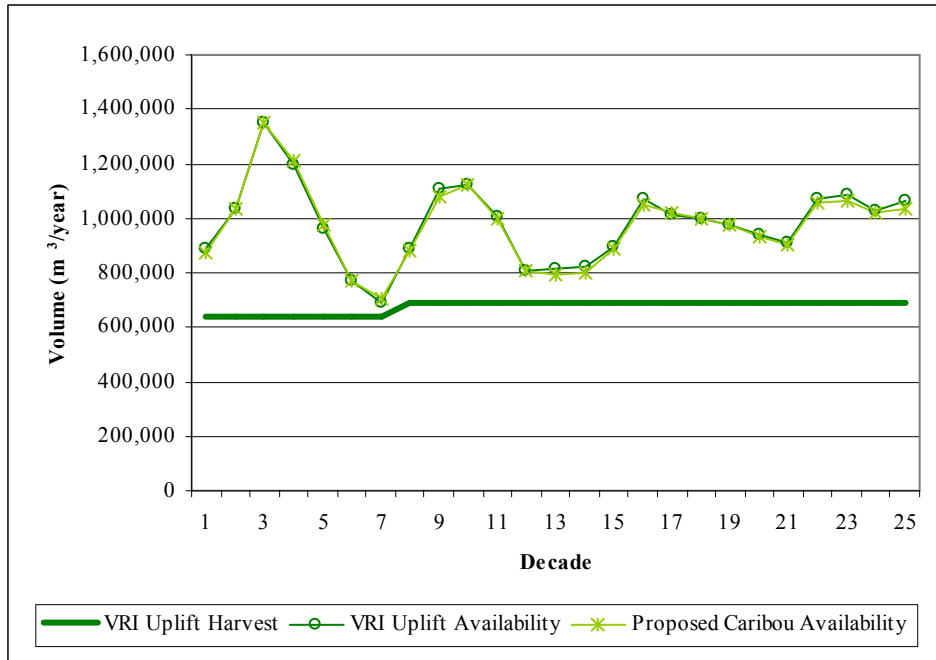


Figure 9.21 Timber Availability- Proposed Caribou

9.10 SARCO PROPOSED CARIBOU – PRIORITY TWO ZONES THLB ONLY

The SARCO proposed caribou management allows for the 40% retention in the priority two areas to be met within the productive forest. This scenario tests the timber supply impact of meeting the 40% retention in the THLB only.

Table 9.12 and Figure 9.22 show the change in harvest level associated with this change. The short term harvest level has decreased by 1,000m³/year from 640,000m³/year to 639,000m³/year which is a 0.2% decrease.

Table 9.12 Harvest Levels- Proposed Caribou Priority Two zones THLB Only

Case	Annual Harvest Level (m3/year)	
	VRI Uplift	Proposed Caribou Priority two zones THLB Only
1 - 7	640,000	639,000
8 - 25	690,000	689,000

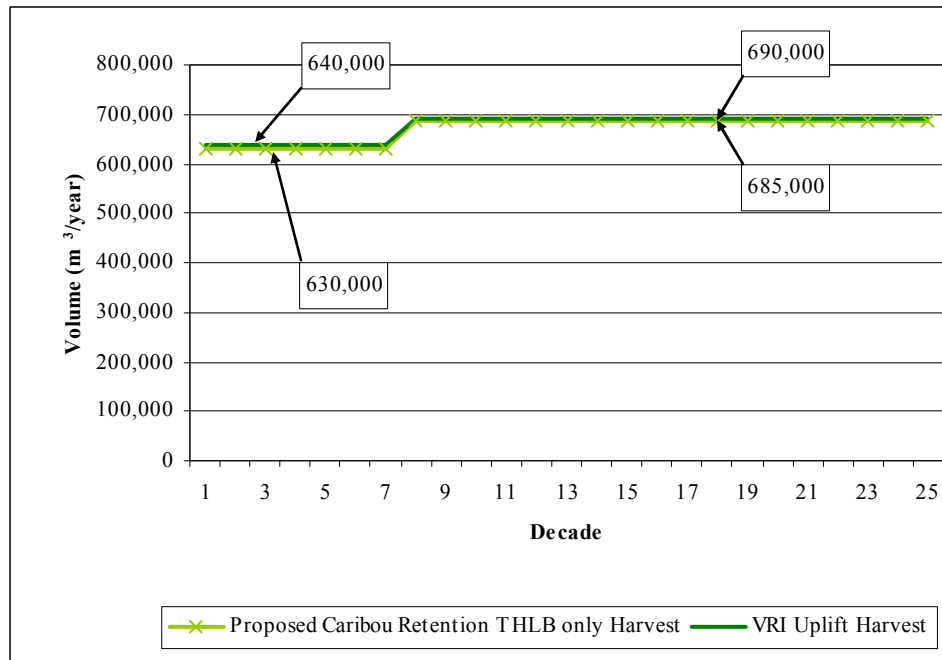


Figure 9.22 Harvest Levels- Proposed Caribou with Priority Two Zones THLB only

Figure 9.19 shows the associated timber availability of the proposed caribou with priority two zones in THLB only scenario against the VRI basecase availability and harvest level. The lower harvest level shown above corresponds to a decrease in timber availability.

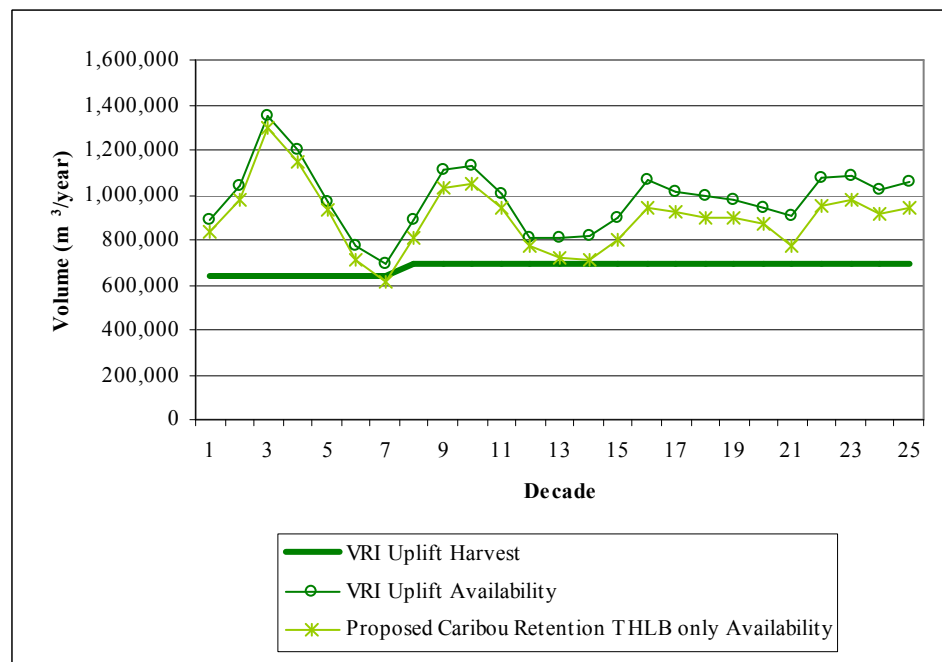


Figure 9.23 Timber Availability- Proposed Caribou

10.0 TSR3 RATIONALE ADDITIONAL IDENTIFIED PRESSURES

In addition to those that were modelled in the TSR3 analysis, the rationale identified 2 upward and 8 downward pressures. These pressures are outlined in approximate order of significance in Table 10.1 and are talked about in more detail in the following sections.

Table 10.1 Additional Timber Supply Pressures Identified in the TSR3 Rationale

Description	Magnitude	Duration	Direction
VRI estimate for volume in existing stands	10%	Short term	+
Disturbing the inoperable	Unquantified	Whole horizon	-
Unsalvaged losses increased by MPB	Unquantified	Mid term	-
Armillaria in regenerating stands	7%	Long term	-
OGMA uncertainty	5%	Whole horizon	-
Increase in inoperable area by harvest isolation	0.5%	Whole horizon	-
Increase in area excluded for small (S4) streams	0.3%	Whole horizon	-
Protected area strategy area allowance	0.14%	Whole horizon	+

10.1 VRI ESTIMATE FOR EXISTING STANDS

The VRI is an extremely significant issue for many forest management aspects including timber supply analysis. The TSR 3 Rationale stated that the VRI was expected to be an upward pressure. This increase was quantified in this analysis with an increase in short term harvest level from 550,000m³/year to 640,000m³/year (16%).

The Phase 2 inventory adjustment was the main focus of this analysis with the intentions of providing the statutory decision maker with the technical support required to confidently adjust the cut level. Table 10.2 shows the six adjustment methods that have been modelled, with consistent results.

Table 10.2 Phase 2 VRI Adjustment Scenarios

Phase 2 Adjustment Scenario	Short-term harvest level (m ³ /year)
Fraser Protocol - Basecase	640,000
Volume Adjustment Using Population Ratio	638,000
Volume Adjustment Using Plot Ratio	638,000
Overall Volume Impact of Adjustment	638,000
Phase 2 Adjustment 95% Confidence Limits	628,000 to 648,000
Spruce-Balsam Age Stratification	670,000

10.2 DISTURBING THE INOPERABLE

When modelling, the entire productive landbase is available to fulfill various landbase requirements (i.e. UWR and CWS requirements). In the Arrow TSA, over half (57%) of the entire TSA is productive non-THLB area. Traditionally, the only form of disturbance modelled is timber harvesting in the THLB. This is a concern because eventually in the model all the non-THLB becomes old and can lead to the non-THLB fulfilling an unrealistic portion of forest cover requirements, thereby reducing the impact on the THLB. In reality, there will be some level of natural disturbance within the non-THLB.

In TSR2 disturbances were not modelled across all the inoperable landbase- it assumed that stands needed to fulfill forest cover requirements would not be disturbed. This was identified in the rationale as an unquantified downwards pressure and was recommended for inclusion in the next analysis. In TSR 3 and this analysis the simulation of disturbances in the inoperable landbase has been modelled according to the methodology described below.

The intentions are to achieve the early, mature and old seral percentages for each BEC variant in accordance with the natural range of variation (NROV) defined in the Biodiversity Guidebook. The method used in TSR3 and for this analysis is to: impose a seral requirement on the non-THLB of each BEC variant, which will force the non-THLB to achieve a seral zone distribution similar to the NROV from the *Biodiversity Guidebook*. From the non-THLB, the model will recruit the oldest stands first in order to achieve seral requirements as soon as possible. Then, the model forces an annual harvest disturbance to the non-THLB of each BEC zone using the oldest first harvest rule. The size of the disturbance will be determined from the disturbance frequency in the *Biodiversity Guidebook*

This process has been carried out by:

1. Determining the BEC zones and their area breakdown TSA wide;
2. Using the *Biodiversity Guidebook* to determine the NDT, disturbance interval, mature and old age for each BEC zone;
3. Estimate the seral stage distribution following the *Biodiversity Guidebook* procedure;
4. Determine the appropriate seral requirement (mature and old) for each BEC zone; and
5. Determine the annual disturbance for each BEC zone using the disturbance interval.

10.3 UNSALVAGED LOSSES INCREASE DUE TO MPB

Unsalvaged losses are timber volumes destroyed or damaged by such agents as fire or disease, that are not recovered through salvage operations. Estimates for unsalvaged losses account for abnormal infestations and for factors that result in losses that are not recovered through salvage harvest programs and are not recognized in yield estimates. The volume lost per year in TSR3 by disturbance agent is given in Table 10.3 and sums to a total of 27,820m³/year.

Table 10.3 TSR3 Unsalvaged Loss Allowances

Disturbance Agent	Volume Loss (m3/year)
MPB	14,200
Fire	5,800
White Pine Blister Rust	5,720
Windthrow	2,500
Douglas fir bark beetle	500

The rationale raised the issue of increased activity in the following areas:

- Bark beetles- mainly MPB with a small component of Grand fir engraver beetle; and
- Fires.

Fire activity was perceived in the rationale to be reasonably reflected in the fire component of unsalvaged losses (5,800m³/year).

The major change in unsalvaged losses is due to bark beetle infestation. This has increased in the TSA since the last determination- mainly credited to MPB activity. Despite licensee salvage and small scale salvage of damaged pine leading stands in order to reduce potential unsalvaged losses, there will still be some pine leading and mixed species stands that will experience volume loss due to MPB. These losses were not accounted for in the TSR3 analysis and were identified as an unquantified downwards pressure in the mid-term in the rationale but the MPB losses are dealt with in great depth in this analysis. The sensitivity “9.7 MPB 2010 With Spruce-Balsam Age Stratification” uses the MoF projected MPB spread along with well documented and accepted MPB modelling assumptions to determine the amount of unsalvaged losses and the timber supply impact. Table 10.4 shows the modelled volume lost (an unsalvaged loss) because of MPB activity.

Table 10.4 Volume loss due to MPB 2010 Infestation

MPB Severity at 2010	Reduction	Volume
Low	5%	26,049
Moderate	20%	80,861
Severe	40%	52,118
Very Severe	100%	24,641
Total		183,669

Stands were grouped by severity class (% infestation) using groupings from the forest health overview flight surveys of Low (1-10%), Moderate (10-30%), Severe (30-50%) and Very Severe (50-100%). In the analysis, stands that were infested by the MPB at 2010 and were unharvested, had their volumes reduced at the rates indicated in Table 10.3 for each severity class.

This type of MPB modelling is considered a more appropriate method of understanding the impacts of this catastrophic and unpredictable event and therefore attempts to take into account the downward pressure associated with the factor as identified in the rationale.

10.4 ARMILLARIA LOSSES IN REGENERATING STANDS

Armillaria is a root disease that is common in most managed and natural forest stands in the southern third of B.C. (Snetsinger, 2005). Six species of *Armillaria* cause root disease in B.C. but *Armillaria ostoyae*, is the only significantly damaging species causing reduced growth and mortality (CFS, 2005). *A. ostoyae* is a facultative parasite, gaining nutrition from the host during its saprophytic phase and killing hosts during the parasitic part of its life cycle by girdling the root collar. Its principal hosts are conifers (Douglas fir drawing a lot of attention) with Ponderosa pine, western larch, and birch having the greatest tolerance to infection (CFS, 2005).

Commonly, only coniferous trees with greater than two-thirds of their roots affected by *A. ostoyae* show symptoms (CFS, 2005) however this varies with climatic region. *A. ostoyae* affects conifers in both plantations and natural stands beginning at age 5-7 years. Mortality averages 1-2% per annum and does not stop but declines with age in the southern interior. This mortality creates openings that may occupy as much as 30% of the stand area (CFS, 2005).

In Arrow, *A. ostoyae* is of primary concern in the ICH zone and to a lesser degree, Douglas-fir and other species outside the ICH zone. A 2004 study estimated that growth losses could range from 30-63% from low to high severity sites at 100 years. Potentially susceptible ICH Douglas-fir stands make up approximately 20% of the THLB. In TSR3, to assess possible TSA-wide impacts, 3 severity levels were investigated in sensitivities where managed ICH Douglas-fir stand

volume losses ranged from 42-50%. All three scenarios maintained the short term harvest level and were decreased the long term harvest level by 7-8% (Snetsinger, 2005).

The rationale identified the issue that, normal volume losses due to insects and diseases (such as *A. ostoyae*) are accounted for in inventory sampling for existing yield estimation. However, for potential volume losses, the standard OAFs used may not be high enough. This uncertainty associated with using standard OAFs is consistent with both previous TSR analyses and other TSAs throughout the southern interior. The sensitivities mentioned above gave a certain amount of confidence that the short term timber supply would not be affected by *A. ostoyae*.

10.5 OGMA UNCERTAINTY

The timber supply impact of this increase in OGMA was estimated in the rationale to be a 5% downwards pressure. This analysis quantifies this estimation and found that there was a downward pressure of 1.6% (see section 9.8 2006 Spatial OGMA).

10.6 INCREASE IN INOPERABLE AREA BY HARVEST ISOLATION

It was identified in the rationale that some THLB area in the TSR3 analysis have been (or will be) isolated due to previous (or future) harvesting that renders them operationally and/or economically inaccessible for harvesting.

These isolated areas are believed to be either narrow bands of timber between cutblocks and the operability line, or areas unlikely to ever be harvested due to access constraints. Four LUs were reviewed by BCFS staff and it was found that the isolated areas represented about 0.5% (1,000 ha) of the THLB. It was also found that these areas are now unlikely to be harvested and should not be part of the THLB.

In the rationale, a decrease of 0.5% was attributed to the increase in inoperable area by harvest isolation. The need was identified to monitor harvesting above and below the operability line and to monitor and minimize the creation of new isolated areas.

10.7 INCREASED RIPARIAN EXCLUSION

Riparian areas provide key habitat for fish and wildlife, help conserve water quality and biodiversity and are important in cultural considerations. There are provisions by law for riparian reserve zones (RRZs) in which harvesting is excluded and riparian management zones (RMZs) that restrict harvesting.

In TSR3, the default RRZ and RMZ provisions were used. These don't take into account reserves around S4 streams (small streams that are fish bearing or are in a CWS), the creation of which is current practise. It was estimated that the removal of these area would incur a 0.3% (685 ha) reduction in the THLB and timber supply across the whole modelling horizon.

10.8 PROTECTED AREA STRATEGY AREA ALLOWANCE

B.C.s protected areas strategy has two goals; goal 1 is to protect viable representative examples of the natural diversity and goal 2 is to protect special natural, cultural heritage and recreational features of the province that are not otherwise captured.

Initially in the Arrow TSA, 10,500 ha were retained as goal 2 areas and a second follow-up process recommended in 2001 that an extra 1,150 ha be retained. This follow-up area corresponds to 298 ha THLB area not already deducted for other netdown factors- approximately 0.14% of the THLB. In TSR3, this 298 ha was removed from the THLB but in the rationale, because the decision was not set in stone at that time, a small 0.14% upwards pressure was recognised.

11.0 REFERENCES

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APPENDIX - 10 Key Issues or Changes since the 2006 submission of the AAC Uplift Request

A8.1 Vegetation Resource Inventory

Since the implementation of the VRI product in early 2000's, questions were raised regarding the accuracy of the forest cover information. Two projects have been undertaken by the AFLG and led by the MFLNRO inventory forester; VRI Phase I Calibration & Accuracy Assessment Sampling. These projects verified that the forest cover information was accurate for TSA level analyses.

Additionally, the Regional Inventory Forester stated that, in his opinion, the Phase 2 adjustments that were made in 2006 to address an underestimation of heights/ages & volumes are still valid.

A8.2 Fires

Since the Uplift Request, there have been two major fires in the TSA that would affect the AFLG operating areas, both occurring in 2007; they were the Pend Oreille and Springer fires. These two fires represent approximately 1% of the THLB (based on TSR 3 area). However, it should be noted that these are not removals from the THLB, but age class adjustments (recognizing that there will likely be delayed stand establishment in both areas).

The Springer fire covered approximately 2400 ha with 1400 ha of being within the timber harvesting landbase. Very little salvage harvesting has occurred due to terrain issues and severity of burn.

The Pend Oreille fire covered just over 3000 ha with slightly less than 1400 ha being within the timber harvesting landbase. However, approximately 400 ha of the THLB were relatively recent logged areas (aged 0-25 years old) and Atco has subsequently harvested 170 ha of fire salvage; this reduces the THLB impact to approximately 800 ha.

A8.3 Old Growth Management Areas (OGMAs)

The Support and Analysis for the Uplift Request utilized a more current version of OGMAs than was used in the TSR 3 analysis. Since the Uplift Request there have been no significant changes to the OGMA mapping.

A8.4 Caribou GAR Order

In December 2010, two GAR orders were established for the protection of Caribou that impact the Arrow TSA. These were for:

- the Southwest Kootenay Planning Unit (uwr_id u-4-012) that encompasses areas in both the former Arrow Boundary & Kootenay Lake Forest Districts. Of the total management area of 62,498 ha, 18,691 ha are within the Arrow TSA. Of the area within the Arrow TSA, approximately 2600 ha were within the timber harvesting landbase.
 - the Central Kootenay Planning Unit (uwr_id u-4-014) that encompasses areas in the former Arrow Boundary, Kootenay Lake, Columbia & Rocky Mountain Forest Districts. Of the total management area of 277,431 ha, 164,195 ha are within the Arrow TSA. Of the area within the Arrow TSA, approximately 9400 ha were within the timber harvesting landbase
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The caribou areas represent almost a 6% impact to the THLB. However, both the TSR 3 & Uplift Request Analyses utilized the caribou management parameters from the KBHLPO. While the data package identifies the caribou habitat Resource Emphasis Zone to cover 13,669 hectares of the THLB, the THLB impact from TSR 3 could not be clearly identified since harvesting was permitted whereas under the GAR order no harvesting is allowed, thus an increased impact is expected but cannot be clearly defined.

A8.5 Grizzly GAR Order

In August 2010, the Grizzly GAR order was legislated to protect and conserve grizzly bear.

The ten General Wildlife Measures contained in the order have no impact on the Timber Supply Availability. The most notable effects are understory protection around riparian sites/wetlands and constrained season of harvesting (i.e. winter to protect *Vaccinium* and other important grizzly bear forage species).

A8.6 Global Economic Conditions

Since the IFPA uplift was granted in 2008, economic conditions have caused some of the AFLG to have slowdowns or stoppages in their operations. These have had quite severe impacts on harvest levels for a few in the group, particularly Springer Creek. While this issue is not related to environmentally available volume or timber harvesting landbase, economics does play a role in when stands can be harvested.
