BRITISH COLUMBIA
MINISTRY OF FORESTS

Fraser
Timber Supply Area

Rationale for
Allowable Annual Cut (AAC)
Determination

Effective August 1, 2004

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Objective of this Document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Fraser timber supply area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the Fraser Timber Supply Area

The Fraser TSA, located on the southern mainland portion of British Columbia's Coast Forest Region, covers approximately 1.4 million hectares and is administered from the Chilliwack Forest District office. It is the most densely populated TSA in the province, encompassing major population centres in the Lower Mainland and Fraser Valley. The population of the Chilliwack Forest District, already increased by 8.3 percent since 1996 to more than 2.2 million persons in 2001, is expected to grow by another 8.2 percent between 2001 and 2006.

First Nations: Thirty-five First Nations Bands and five tribal organizations have asserted traditional territories in the Chilliwack Forest District; eight groups are in the process of treaty negotiation.

Environment: A description of the environment of the TSA, including its biogeoclimatic zones, major tree species, vulnerable, threatened or endangered species—notably including the northern spotted owl—and the fish, bird and mammal species identified under the province's Identified Wildlife Management Strategy, is given in the December 2003 *Fraser Timber Supply Area Analysis Report* ('the timber supply analysis report').

In brief, the TSA is one of the most biologically diverse regions in the province, with five biogeoclimatic zones providing habitat for more than 300 species of resident and migratory birds, 45 species of mammals, 11 species of amphibians, and five species of reptiles. The TSA is bordered by the Coast Mountains to the north and to the east, from which tributaries and lakes drain into the Fraser River, flowing through the broad, riverine plain lying between the community of Hope to the east and the city of Vancouver to the West, on toward the extensive delta of the Fraser estuary and into the saltwater of Georgia Strait. While the coastal western hemlock zone is the most abundant zone in the TSA, the diverse landscapes support thirteen commercial tree species.

Socio-economics: A description of the socio-economic profile of the area, with which I am familiar, is provided in the 2003 timber supply analysis report. In brief, the TSA includes both major urban population centres, where various service sectors combine to provide about 70 percent of the region's employment, and smaller rural communities, where primary sectors including forestry provide important sources of employment and economic activity.

History of the AAC for the Fraser TSA

Allowable Annual Cuts have been determined for the Fraser TSA as follows:

1978: 1 643 000 cubic metres; 1979: 1 700 000 cubic metres; 1985: 1 700 000 cubic metres; 1987: 1 765 000 (including 65 000 cubic metres of predominantly deciduous forest stands); 1995 ('TSR 1,' the first in the current round of timber supply reviews): 1 550 000 cubic metres (including 57 000 cubic metres attributable to predominantly deciduous stands)—an overall reduction of about 12 percent;
April 1, 1999 ('TSR 2'): 1 270 000 cubic metres, including up to 32 500 cubic metres of deciduous-leading stands, an overall reduction of about 18 percent from the previous AAC.

The AAC of 1 270 000 cubic metres is currently apportioned by the Minister of Forests as follows:

Form of Agreement	Cubic Metres	Percent of AAC
Forest licences, replaceable	939,509	73.98
Forest licences, non-replaceable	20,001	1.57
Timber sales >10000, replaceable	13,597	1.07
Timber sales <=10000, replaceable	16,055	1.26
BC Timber Sales	246,745	19.43
Woodlot Licences	10,000	0.79
Forest Service Reserve	24,093	1.9
Total = current AAC	**1,270,000**	**100.00**

New AAC determination

Effective August 1, 2004, the new AAC for the Fraser TSA will be 1 270 000 cubic metres, which maintains the current AAC. No volume figure is specified as attributable to predominantly deciduous stands. The AAC volume excludes all volumes allocated to woodlot licences. This AAC will remain in effect until a new AAC is determined, which must take place within five years. Please note the possibility of an earlier re-determination, depending on several factors, as discussed in 'Reasons for Decision.'

Information sources used in the AAC determination

The information sources used in this determination include but are not limited to:

- British Columbia (BC) Ministry of Forests (MoF) Timber Supply Branch, May 2003: *Fraser Timber Supply Area (TSA) Data Package*;
- BC MoF, Forest Analysis Branch, December 2003: *Fraser TSA Analysis Report*;
- BC MoF, Timber Supply Branch, June 1998, *Fraser TSA Analysis Report;*
- BC Ministry of Forests, December 2003: *Fraser TSA Public Discussion Paper*;
- BC Ministry of Forests, February 2, 1999: *Fraser TSA Rationale for AAC determination effective April 1, 1999;*
- BC MoF, Research Branch, 1999: *Biogeoclimatic Ecosystem Classification, Update*;
- Spotted Owl Management Inter-Agency Team. 1997a. Spotted Owl management plan: Strategic component. B.C. Minist. Environment, Lands and Parks and B.C. Minist. Forests, Victoria, BC. 81pp.

- Spotted Owl Management Inter-Agency Team. 1997b. Managing Spotted Owl Habitat: Operational Guidelines Component of the Spotted Owl Management Plan. B.C. Minist. Environment, Lands and Parks and B.C. Minist. Forests, Victoria, BC. 39pp.
- Spotted Owl Management Inter-Agency Team. 1999. Spotted Owl Management Plan: Resource Management Plans. B.C. Minist. Environment Lands and Parks and B.C. Minist. Forests, Victoria, BC.
- Blackburn I.R. and S. Godwin. 2003. *Status of the Northern Spotted Owl in British Columbia*. BC MWLAP, Surrey, BC.
- BC MoF, Forest Practices Branch, 1998: *Procedures for factoring visual resources into timber supply analyses*. Victoria, B.C. REC-029.
- British Columbia Forest Service (BCFS) Chilliwack Forest District, May, 1999: Resource Management Plans;
- BC Ministry of Sustainable Resource Management (BC MSRM) *Chilliwack Forest District VRI – Documentation of Analysis for VRI Statistical Adjustment* March 2002;
- BC Ministry of Sustainable Resource Management (BC MSRM), March 2003: *Chilliwack Forest District – Documentation of Analysis for Vegetation Resources Inventory Statistical Adjustment – Addendum;*
- BC MSRM, Fraser TSA Vegetation Resource Inventory;
- Deputy Ministers of Forests and of Environment, Lands and Parks, August 25, 1997: Letter conveying government's objectives regarding the achievement of acceptable impacts on timber supply from biodiversity management;
- Fall, J. and A. Fall. 1996. *SELES: A Spatially Explicit Landscape Event Simulator*. http://www.sbg.ac.at/geo/idrisi/GIS_Environmental_Modeling/sf_papers/ fall_andrew/fall.html. Third International Conference/Workshop on Integrating GIS and Environmental Modelling. Santa Fe, NM.
- McWilliams, J., March, 2003. *Evaluation of the timber supply impacts of using the retention system in the Chilliwack Forest District*.
- Minister of Forests, July 28, 1994: Letter to the chief forester, stating the Crown's economic and social objectives for the province;
- Minister of Forests, February 26, 1996: Memorandum to the chief forester, stating the Crown's economic and social objectives for the province regarding visual resources;
- Province of BC, July 1995: *Forest Practices Code of British Columbia Act*;
- Province of BC, April, 1995: *Forest Practices Code of British Columbia Act Regulations and Amendments*;
- Province of BC, 1995: Forest Practices Code of British Columbia Guidebooks;
- Province of BC, 1995: Forest Practices Code of British Columbia, *Biodiversity Guidebook;*
- Province of BC, 1995: *Riparian Management Area Guidebook*;
- Province of BC, 1999: *Landscape Unit Planning Guide;*
- Thrower, J.S, et. al. 2003: Site index adjustment of the coastal western hemlock zone in the Fraser TSA – Final Report. Project: FLC–005. March 2003.
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in Chilliwack, March 2 and 3, 2004.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester, in determining AACs, to consider biophysical, social and economic information. Most of the technical information used in determinations is in the form of a timber supply analysis and its inputs of inventory and growth and yield data. These are concerned primarily with biophysical factors—such as the rate of timber growth and the definition of the land base considered available for timber harvesting—and with management practices.

The computerised analytical models currently used to assess timber supply unavoidably simplify the real world and also involve uncertainty in many of the inputs, due in part to variations in physical, biological and social conditions. While ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of these uncertainties, technical information and analytical methods alone cannot incorporate all the social, cultural and economic factors relevant to forest management decisions, nor do they necessarily provide complete answers or solutions to the forest management problems addressed in AAC determinations. However, they do provide valuable insight into potential outcomes of different resource-use assumptions and actions—important components of the information that must be considered in AAC determinations.

In determining the AAC for the Fraser TSA I have considered and discussed known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider a number of specified factors in determining AACs for timber supply areas and tree farm licences. Section 8 is reproduced in full as Appendix 1 of this document.

Guiding principles for AAC determinations

Rapid changes in social values and in the understanding and management of complex forest ecosystems mean there is always uncertainty in the information used in AAC determinations. In making the large number of periodic determinations required for British Columbia's many forest management units, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. In any specific circumstance where I may consider it necessary to deviate from these principles, I will explain my reasoning in detail.

Two important ways of dealing with uncertainty are

(i) minimizing risk, in respect of which in making AAC determinations I consider particular uncertainties associated with the information before me and attempt to assess and address the various potential current and future, social, economic and environmental risks associated with a range of possible AACs; and

(ii) re-determining AACs frequently, in cases where projections of short-term timber supply are not stable, to ensure they incorporate current information and knowledge—a principle

that has been recognized in the legislated requirement to re-determine these AACs every five years. This principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs I attempt to reflect, as closely as possible, operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect to factors that could work to *increase* the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or with respect to factors that could work to *reduce* the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the Forest Practices Code—'the Code'—which is now in transition to the Province's *Forest and Range Practices Act*.

In many areas the timber supply implications of some legislative provisions, such as those for landscape-level biodiversity, remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

As British Columbia progresses toward the completion of strategic land-use plans, in some cases the eventual timber supply impacts associated with land-use decisions resulting from various regional and sub-regional planning processes remain subject to some uncertainty before formal approval by government. In determining AACs it has been and remains my practice not to speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government.

In some cases, even when government has made a formal land-use decision, it is not necessarily possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. Many government land-use decisions must be followed by detailed implementation decisions requiring for instance the establishment of resource management zones and resource management objectives and strategies for those zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. In such cases the legislated requirement for frequent AAC reviews will ensure that future determinations address ongoing plan-implementation decisions. Wherever specific protected areas have been designated by legislation or by order-in-council, these areas are deducted from the timber harvesting land base and are not considered to contribute any harvestable volume to the timber supply in AAC determinations, although they may contribute indirectly by providing forest cover to help in meeting other objectives, for example for biodiversity or community watersheds.

Where appropriate, I will consider information on the types and extent of planned and implemented intensive silviculture practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of their timber supply effects.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to

re-determine many outdated AACs between 1992 and 1996. In any case, the data and models available today are superior to those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from decisions in recent years in the Supreme Court of Canada. The AAC that I determine should not be construed as limiting the Crown's obligations under these decisions in any way, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Fraser TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

Overall, in making AAC determinations, I am mindful of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under Section 8 of the *Forest Act*, under the Code, and under the new *Forest and Range Practices Act*.

Because the new regulations of the *Forest and Range Practices Act* are designed to maintain the integrity of British Columbia's forest stewardship through responsible forest practices, it is not expected that the implementation of the legislative changes will significantly affect current timber supply projections made using the Code as a basis for definition of current practice.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review program for TSAs and TFLs.

For each AAC determination for a TSA, a timber supply analysis is carried out using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model—in this case the spatially explicit model 'SELES' noted below and explained further in the 2003 timber supply analysis report—a series of timber supply forecasts is produced, reflecting different decline rates where appropriate, starting harvest levels, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen in which an attempt is made to avoid both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for a TSA is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which any adjustments to its predictions of timber supply must be made, if necessary, to more properly reflect the current situation.

Such adjustments are made on the basis of informed judgement, using current available information about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, or during the implementation of new policies, procedures, guidelines or plans. Thus it is important to remember that while the timber supply analysis with which I am provided is integral to the considerations leading to the AAC determination, the AAC is not determined by calculation but by a synthesis of judgement and analysis in which numerous risks and uncertainties must be weighed. Depending upon the outcome of these considerations, the resulting AAC may or may not coincide with the base case forecast. Moreover, because some of the risks and uncertainties considered are qualitative in nature, once an AAC has been determined, further computer analysis of the combined considerations may not confirm or add precision to the AAC.

Base case for the Fraser TSA

The base case in the 2003 timber supply analysis incorporates significant changes in input data and methodology from those of the June 1998, timber supply analysis supporting the AAC determination effective April 1, 1999. Main differences include:

- the use of new forest cover inventory information—the new photo-interpreted Vegetation Resources Inventory (VRI), adjusted through ground sampling, has resulted in higher estimates of volume per hectare than those from the previous adjusted inventory file. The new inventory, which also includes volume adjustments in young stands that were not sampled to calibrate the previous inventory file, indicates that overall, the timber harvesting land base supports about 10 percent more volume than estimated for the June 1998 analysis;
- the use of new information on post-harvest site productivity for the Fraser TSA, described in the final report *Site Index Adjustment of the Coastal Western Hemlock Zone in the Fraser TSA* by J.S. Thrower and Associates, completed in March, 2003, which provides post-harvest site indices for Douglas-fir and western hemlock. When the adjustments are applied after the first harvest in the timber supply model, the average site index for the TSA is expected to increase by 3.2 metres from 20.4 to 23.6 metres. The site index for stands adjusted using the JTS study results, which make up about half of the timber harvesting land base, increases from 22 metres to about 28;

- the use in this analysis of a spatial timber supply computer simulation model using the Spatially Explicit Landscape Event Simulator, SELES, developed by Fall and Fall in 1996—this facilitates spatial and temporal modelling. A spatial timber supply model patterned after the Forest Service Simulator (FSSim) was created using SELES by Dr. Andrew Fall in collaboration with the Forest Analysis Branch of the BC Forest Service. The basic model has been benchmarked against FSSim. The SELES model allows for the modelling of spatial relationships among areas (for example cutblock adjacency), as well as for control of the size and shape of spatial units such as harvest units and reserve areas. Using SELES, the approximate spatial location of road and riparian networks can be tracked. The additional information provided by this kind of analysis is helpful in ensuring that the harvest levels projected in 'non-spatial' analysis are consistent with sustainable forest operations in the field.

I am advised by the timber supply analyst that if the first two new sources of information listed above were not applied, the resulting timber supply projection would be similar to that shown in the 1998 timber supply review analysis for the Fraser TSA, as shown in section 5.3 of the timber supply analysis report.

With the new information applied, the base case forecast projected that the current AAC of 1.27 million cubic metres per year can be maintained for 140 years, followed by a 20-percent increase to a sustainable long-term level of 1.52 million cubic metres per year, stable under present assumptions to beyond 250 years from now. This base case harvest forecast, incorporating new inventory volumes and site index adjustments, and benefiting from spatial analysis, represents a significant increase in timber supply over previous analyses for the TSA.

From my review of the analysis and its methodology, including detailed discussions with Forest Service analysts, I see no reason why the base case forecast should not provide a suitable basis of reference for use in my considerations in this determination; in fact the spatial aspects of the model provide additional support that the projected timber supply will be achievable operationally over time through a pattern of harvests configured in compliance with today's complex regime of planning guidelines and requirements.

Moreover, I note that, from the relatively even distribution of the area projected to be harvested annually over the forecast period, this TSA could be considered for future regulation of the allowable harvest by *area*, rather than by *volume*. This form of administration lends itself readily to assessment of the sustainability of both the timber harvest and the range of other values requiring careful management in the TSA. I have noted below, in 'Implementation,' that if the District Manager and licensees are willing to consider this in the future, then with enabling legislation it could be beneficial to confirming and demonstrating the sustainability of BC's forest management to include this TSA among the management units considered for area-based forest management.

In addition to the base case forecast, I was provided with a number of sensitivity analyses and projections of alternative harvest flows carried out using the base case as a reference. These analyses and others as noted have been helpful in specific considerations and reasoning in my determination as documented in the following sections.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area

Land base contributing to timber harvest

- *general comments*

The total area of the Fraser TSA is 1 420 432 hectares. After deducting from this total all the land that is not managed by the BC Forest Service, all the non-forest land, and all the forest land that is not considered productive, a total of 636 675 hectares of productive (Crown) forest, comprising 44.8 percent of the TSA area, are managed by the BC Forest Service to meet objectives for a wide range of values in the TSA.

Of this Crown forest area, 375 757 hectares are unavailable for harvesting, primarily due to being either physically or economically inoperable, being required for long-term spotted owl habitat, being held in riparian areas or in wildlife tree patches for stand-level biodiversity, being in environmentally sensitive areas, or having low productivity. After the deductions required for these reasons and for others detailed in the 2003 timber supply analysis report and discussed in my considerations below, the area currently estimated to be economically and biologically available for harvesting, known as the 'timber harvesting land base,' covers 260 918 hectares; this represents 18.4 percent of the total TSA land base or 41 percent of the productive forest managed by the BC Forest Service.

The series of deductions from the productive forest land base made in deriving the timber harvesting land base accounts for those factors that effectively reduce the suitability or availability of the productive forest area for economic or ecological reasons. In the timber supply analysis, specific assumptions, and if necessary, projections, must be made about these factors prior to quantifying appropriate areas to be deducted. A detailed accounting of these areas is provided in Appendix A of the timber supply analysis report and is summarized in Table 3 of that report. My consideration of these deductions follows.

- *inoperable areas*

In deriving the timber harvesting land base, those portions of the TSA which are not physically accessible for harvesting, or which are not feasible to harvest economically, were excluded. In the analysis, a total of 246 751 hectares, or 38.8 percent of the productive forest managed by the BC Forest Service, were excluded as inoperable.

The currently available assessment of operability was conducted in 1996 by licensees, the BC Forest Service and a consultant, and is based on the presence or absence of physical

barriers or limitations to harvesting, on the use of appropriate logging methods including cable or helicopter, and on the merchantability of the stands.

All forest stands that have ever been harvested in the TSA, or that were in the forest development plan in 2001 as 'approved,' 'proposed' or 'information,' were considered operable, regardless of the operability code assigned in the new VRI inventory.

District staff advise that the extensive urban-forest interface in the TSA has contributed over the last 10 years to a growing public desire to protect forest lands near or adjacent to private or rural residential lands; plans or harvesting proposed for these areas consistent with the second growth strategy in the TSA increasingly give rise to public concern. Noting that about 4880 hectares of Crown-owned land that is not in the provincial forest are included in the timber harvesting land base in potentially contentious areas—such as Bowen Island, Burke Mountain, Indian Arm, Hatzic Lake, and Elk Creek—staff question whether these areas will make their full assumed contribution to the timber harvesting land base over the long term.

In the public input to the determination process, a licensee suggested that the operability lines used in the 2003 analysis are based on the same information as that used for the previous (1998) analysis process and should be updated; this has been done to the extent that the lines have been revised to include all 'approved', 'proposed' and 'information' blocks from the 2001 Forest Development Plan.

A licensee association advised that it is currently conducting an assessment of operability to 'better define the supply parameters on the land base;' this assessment is not yet complete, but when it becomes available it will be a welcome addition to the current information base.

In assessing the appropriateness of the assumptions in the analysis with respect to operability, I conclude as follows. My review of a detailed mapping of the roads in the TSA satisfies me that an extensive access network is in place throughout the timber harvesting land base to support harvesting by conventional means. I am advised that only 3 percent of the timber harvesting land base is assumed to be harvestable by helicopter; any changes in the associated economics—due to fluctuating fuel costs for example—will therefore not greatly affect operability.

The inclusion of some areas above the operability line in specific blocks in development plans, that would otherwise be excluded on the basis of inventory classification, raises the question of whether a complementary study might not also find some included areas that will in fact prove inoperable. Specific adjustments at this scale can never fully resolve uncertainties in the overall operability at the TSA level. Nonetheless, they are helpful in contributing additional, updated information, and for this TSA at this time no better estimate of operability has been provided. I note that the derived timber harvesting land base, comprising just over one-third of the total productive forest, is already the product of extensive exclusions and in my judgement is unlikely to be significantly overestimated by including the identified cutblock areas without having sought offsetting exclusions. The main point is that the current operability line has benefited from the attempt to reflect current operations, and in this respect it provides the best currently available information.

The issues respecting harvesting in contentious areas adjacent to population centres are difficult to manage and may be expected to intensify. Nonetheless, the courts have found that

the authority for the making of land-use decisions of a broad social nature, such as those that may be required to effect the removal of some or all of these affected areas from the timber harvesting land base, rests properly with elected representatives of government through decisions of Cabinet, and not with the chief forester through AAC determinations under Section 8 of the *Forest Act*. Until government designates some or all of the affected areas as parks or as otherwise off-limits to timber harvesting, I must assume that each continues to contribute to the timber supply. I have discussed this further below, under Complex Operating Areas.

From these considerations I am satisfied that the operability assumptions in the timber supply analysis are based on the best currently available information and that this information provides a suitable basis on which to analyse the timber supply for the purpose of this determination.

- *deciduous stands and stands currently not considered harvestable*

In my rationale for the April 1999 AAC determination, I noted my concern that the continued avoidance of harvesting and conversion of deciduous stands could reduce mid-and long-term levels by up to two percent, and recommended careful monitoring of this component. Over the past four years an average of 8648 cubic metres of deciduous timber have been harvested each year under a Forest Licence in the TSA. In the analysis for the 1999 determination, stands of predominantly alder were included in the timber harvesting land base while stands of aspen, birch and maple, which are not normally used commercially, were excluded. For the 2003 analysis, a total of 10 329 hectares of forest stands of predominantly aspen, birch or maple were excluded from the timber harvesting land base; this is appropriate as these species are essentially unused in the TSA.

District staff suggest that, considering current harvest levels, the specification in the current AAC of a ‘partitioned’ harvest level of 32 500 cubic metres per year attributable to alder-leading stands may no longer be necessary. I note that the extensive development of deciduous species in recent years in coastal forests has proven the commercial viability of the limited amount of available alder. I note also that the licence for alder in this TSA is being operated essentially at full volume and at a harvest rate for the short term that is commensurate with achieving its assumed contribution to the timber supply. I therefore conclude that this commercially viable component of the deciduous forest is appropriately included in the projected harvest and that a specified harvest level attributable to the species is no longer required.

- *environmentally sensitive areas*

Environmentally sensitive areas in the Fraser TSA were identified for the 2003 timber supply analysis by transferring and overlaying the sensitive area attributes from the Forest Cover inventory used for the previous determination onto the new VRI inventory, which currently does not maintain those attributes. From my experience in working with both inventories I am satisfied that until the VRI supports suitable attributes for sensitive areas, the process employed here provides the best currently available means of identifying the environmentally sensitive areas in the TSA.

The process identified 100 953 hectares of productive forest in environmentally sensitive areas in the TSA, and resulted—after accounting for overlaps with exclusions from to the harvestable land base for other reasons—in reductions to the timber harvesting land base totalling 21 562 hectares, or about 3.4 percent of the productive forest, specifically to account for areas with sensitive soils, areas requiring special management for water quality, areas with an avalanche hazard and areas with severe regeneration problems. Additional areas that are environmentally sensitive due to wildlife habitat values are discussed below under Integrated Resource Management Objectives.

The resulting net deduction is of roughly the same order as in the previous determination, and no public input was received questioning the treatment or its result. I do note that the reduction for sensitive soils has increased slightly from the 90 percent used previously to 100 percent. I understand this is due to the difficulty of spatially locating the small amount of harvesting activity that will likely occur in these areas. Recognizing the inevitability of some degree of uncertainty in any method of assessing the full extent of a large number of sensitive locations on various terrains, I consider the application of the information from the older inventory to be a suitable and adequate means of assessing the environmentally sensitive areas in the TSA, and I conclude that, in context of the many other land base reductions applied, the uncertainty associated with the method used presents little risk to the validity of the base case projection.

- *sites with low timber productivity and sites with low timber volume*

Some treed areas are not assumed to contribute to timber supply because their low timber productivity is expected to prevent their producing a merchantable stand by 150 years of age. This may be due to factors inherent in the growing site—such as a poor availability of nutrients, a disadvantageous exposure, or the presence of excessive moisture—or because the site is not fully occupied by commercial tree species. In deriving the timber harvesting land base for the 2003 timber supply analysis, a total of 16 168 hectares were excluded to account for low productivity as defined by specific criteria and characteristics for the range of species described in Table A-8 of the analysis report.

Other forest stands covering a total of 6745 hectares as detailed in Table A-11 of the analysis report were excluded despite adequate productivity estimates where, in consideration of stocking class, species composition, crown closure or other factors, they were not expected to reach, by 150 year of age, the minimum volume per hectare required for merchantable harvesting.

In public input, two major licensees pointed to demonstrated operational performance in forest stands of lower volume than the minimum 350 cubic metres per hectare required in the analysis. In one case, such stands were held to comprise a significant portion (18 percent) of the stands in the forest development plan. One of the licensees suggested that such performance should be reflected in a lowering of the assumed minimum harvestable ages, and that this would increase the timber supply forecast.

Forest Service staff note that in the analysis none of the area excluded from the timber harvesting land base for low-volume stands was in the forest development plan area, and that staff are satisfied with the nature and extent of the areas deducted for sites of low productivity and low timber volume.

I have reviewed with Forest Service staff the criteria and characteristics applied in these land base exclusions. Clearly timber supply analysis necessitates the identification of threshold levels of productivity and of expected volumes per hectare in order to assess the potential merchantability of forest stands. Just as in estimating operability, however, in my experience it is less clear how much additional certainty or precision may be gained through debating numerical specifics of components of the applied criteria, or by departing from their consistent application to make adjustments in respect of particular observed conditions or circumstances. More important is the establishment of a reasonable, generally applicable average value, and in this TSA, stands at the cut-off volumes of 300 to 350 cubic metres per hectare are clearly at the very low or marginal end of the productivity of merchantable stands.

Therefore, despite the acknowledged uncertainty, I consider the exclusion of stands with productivities at or about the levels identified in the analysis to be appropriate and necessary. I also consider the inclusion of those sites in forest development plans or with a history of harvesting operations as a legitimate attempt to account for some of the uncertainty present. However, I do not believe that efforts to continue to 'fine tune' the timber supply indefinitely through adjustments to the average applied threshold levels will increase certainty in a more legitimate or a more exact cut-off level. Currently I do not have sufficient information to justify any such general adjustment, and I am satisfied that the exclusions as applied are reasonable and appropriate.

- *roads, trails and landings*

In the timber supply analysis, separate estimates were made to reflect the losses to the productive forest already incurred by existing roads trails and landings, and those to be expected in the future.

Using GIS to assign a 7.5-metre buffer to each side of all existing unclassified roads as an average for all existing roads trails and landings, a total of 11 512 hectares of productive forest were identified. After considering previous reductions, 9746 hectares were removed specifically on this account. To assess the necessary deduction for future roads, the average figure of 5 percent that has been taken up by road networks in areas logged since 1996 was applied in the computer model as a reduction, after the first harvest, to all pixels representing forest stands greater than 120 years of age and further than 200 metres from an existing road. The long-term timber harvesting land base was consequently reduced by 1389 hectares.

In the absence of conflicting information, I consider the methods used in these deductions to be reasonable and acceptable for use in this determination.

- *areas of archaeological importance*

In the 2003 timber supply analysis, in respect of known archaeological sites recorded under the *Heritage Conservation Act*, one hectare surrounding each site was excluded from the timber harvesting land base, resulting in a total excluded area of 252 hectares of productive forest. After accounting for overlaps with areas already excluded for riparian management and other objectives, 125 hectares were deducted specifically for archaeological sites.

For the past two years, forest district staff have been working with First Nations bands, using a predictive model now converted to a GIS product, to better predict where important archaeological sites might be found and to create a map showing areas of high potential which would be suitable locations for Archaeological Impact Assessments. This model, reviewing about 90 percent of the TSA, predicts about 152 540 hectares of the TSA will have a high potential for culturally important sites, of which 19 985 hectares lie in the timber harvesting land base. Of this area, 2702 hectares are already heavily constrained from harvesting, lying in visually sensitive areas, ungulate winter range, old growth management areas (OGMAs) or in spotted owl habitat. The balance of 17 283 hectares in the timber harvesting land base will require Archaeological Impact Assessments or field reconnaissance before harvest plans can proceed.

Forest district staff note that the predictive model only identifies areas with a high *potential* for archaeological sites and suggests locations for Archaeological Impact Assessments, following which much of the required area is expected to be accommodated in exclusions for wildlife tree patches, thus avoiding significant operational difficulties. No public input was received on this issue. In the absence of conflicting information, I see no reason not to accept that this work in progress will continue to identify areas of interest that will then be managed operationally without significant impact to the timber supply. With respect to the known, recorded sites, I accept that the best currently available information was appropriately incorporated in the analysis for this determination. Any emerging new information can be accounted for in future determinations as appropriate.

- *hydro-electric transmission lines and independent power producers*

Since the new VRI inventory does not yet maintain a set of attributes to distinguish power lines from productive forest, in the interest of locating these areas spatially, information from the old Forest Inventory Planning (FIP) file was transferred to the model file, and the appropriate areas identified. As a result, 1259 hectares were removed from the timber harvesting land base to account for areas under power lines and unavailable for harvest.

Some independent power producers' proposed projects could displace productive forest for dams, reservoirs and transmission lines, and could in some cases block access to harvesting in certain stands. Emerging information on any impacts from new projects can be incorporated in future analyses as it becomes available. For the present determination I am satisfied that appropriate means were employed to represent the land base implications of existing power lines.

- *woodlot licences*

The *Forest Act* requires AACs determined for TSAs to be exclusive of the areas and timber volumes allocated to woodlot licences. When woodlot licences are issued from a TSA, the required volumes are first allocated from an appropriate apportionment under the AAC for the TSA. Then, in the next AAC determination for the TSA, the TSA land base is reduced by the area of Crown land in all the woodlot licences issued since the previous determination, and the total volume in the issued woodlot licences is excluded from contributing to the AAC for the TSA. Since the last AAC determination for the Fraser TSA, effective April 1, 1999, no new

woodlot licenses or 'top-ups' have been issued, although minor boundary changes have occurred. In the analysis, all Schedule B woodlot licence areas were removed from the crown forested land base. I am therefore satisfied that the base case projection accounts appropriately for all woodlot licence areas.

- *timber licence reversions*

Timber licences (TLs) are old tenure arrangements that give a licensee exclusive rights to harvest merchantable timber within the licence area. Once these areas have been harvested, all future harvesting rights revert to the Crown and future harvests from the area will then contribute to the harvest for the TSA which contains the timber licence area. In the 2003 analysis, timber licence areas supporting stands younger than 103 years (two-thirds of the remaining timber licences in the TSA) were assumed to have already been harvested and thus to have reverted, and so were immediately included in the analysis. The remaining 3096 hectares were modelled to be harvested and then revert over the next 10 years. To any extent that these licences may be harvested earlier than assumed in the analysis, this would not directly affect the projected timber supply, but could do so indirectly by reducing the contributions of these areas to forest cover and adjacency requirements. However, considering the relatively small area involved, the assumption applied in the analysis is a reasonable means of incorporating the uncertainty in the reversion schedule and I see no need to adjust the corrected base case on this account.

Existing forest inventory

- *current inventory*

As described in the 2003 *Fraser Timber Supply Area Analysis Report* at page 8, the land base information used in the analysis came in a number of formats:

> The forest cover information was compiled in 2001 by the Resource Information Branch, Ministry of Sustainable Resource Management. Additional information such as harvest depletion, stand age in very young plantations and resource emphasis mapping (e.g. spotted owl areas, mule deer winter range areas, etc.) was supplied or obtained by the Chilliwack Forest District, Ministry of Forests. These files were combined by Forest Analysis Branch staff. The resultant file contains a considerable amount of information on the forest land in the Fraser TSA including general geographic location, area, nature of forest cover (such as presence or absence of trees, species, number of trees, age, and timber volume), nature of land forms and other notable characteristics such as environmental sensitivity and physical accessibility (operability). Stand characteristics such as tree height, stocking and age have been projected to January 2001. The inventory file has been updated to account for timber harvesting up to December 31, 1998 for the majority of the Fraser TSA; however, some harvesting activities between 1999 through 2001 are also recorded.

The forest cover inventory used in the 2003 timber supply analysis combined attributes from the new VRI inventory (with a photo date of 1996 and a Phase 2 ground sampling) with historical data from the Forest Inventory Planning (FIP) Forest Cover inventory (FC1) file which was current for most disturbances to 1998. Stands younger than 35 years were assigned

ages based on the FIP file, because district staff considered the stand ages derived from regeneration surveys more reliable than those assigned by photo-interpretation. For the analysis, logging information was updated to 2000 from the FC1 file. Other data sources and updates consulted (including, for example, more recent mapping of goat winter ranges and mule deer winter ranges) are listed in the 2003 timber supply analysis report at page 55. Forest service staff note that about 21 000 hectares of land classified in the VRI as non-treed are actually young plantations, based on logging history, and thus were considered for eligibility to the timber harvesting land base. Areas classified as Not Satisfactorily Restocked (NSR) from the FIP file were also incorporated into the file for the analysis. Because the starting point for the analysis was assumed to be 1998, the first five years of the forecast have already occurred.

I am satisfied from discussions with Forest Service staff that the inventory file used for the analysis was updated adequately to incorporate the necessary historical information identifying years of logging, planting, silviculture treatments, wildfires and prescribed burns. However, the official forest cover map is based on 1996 photography with no updates for depletion and, for future timber supply analysis, on-going work is required to incorporate the necessary information, which is available in the Integrated Silviculture Information System (ISIS), into the corporate VRI data set.

In public input, the Sierra Legal Defence Fund (SLDF) criticised the reliability of the VRI inventory on a number of counts which I have referred to staff of the Ministry of Sustainable Resource Management (MSRM) for clarification. In response, I have obtained complex technical advice from MSRM which satisfies me that the VRI information does indeed provide a suitable basis for my consideration in respect of the points raised by SLDF. I have included brief responses to the matters in question in the following paragraph, in *volume estimates for existing mature stands* and in Decay, waste and Breakage.

The SLDF questioned the ability of the VRI to adequately assess tree heights in regenerating forests. Specialists at MSRM advise that for the current analysis, where available, the information from photo-interpretation by certified contractors was combined with ground-based information from silvicultural surveys and plantation histories available from the FC1 inventory. I am satisfied that the information so produced, which incorporates ground-based information as far as possible, is the best currently available for use in this determination.

- *age and species distributions*

The timber harvesting land base is dominated by hemlock and balsam, which cover 51 percent of the area, and Douglas-fir, covering 36 percent. Small amounts of cedar, spruce, pine and alder are also present. About 40 percent of the timber harvesting land base area currently supports stands above the minimum harvest criteria, many of which, nearly 40 percent, are second-growth stands younger than 105 years that have already reached the minimum criteria. About 60 percent of the timber harvesting land base area supports stands currently below 60 years of age, and 11 percent supports stands currently above 250 years, some of which have not reached minimum harvest criteria by age 105.

Outside the timber harvesting land base, the forests include fairly even representation from a wide range of age classes, but relatively few stands are below 20 years of age, due to the small number of stand-replacing natural disturbances in recent years.

The dynamics of the transition in the timber harvest from older stands to second-growth stands as these become ready for harvest is a key factor in assessing the timber supply in the Fraser TSA, and in making this AAC determination I have remained mindful both of this and of the assumptions regarding the aging of forests outside the timber harvesting land base, as discussed in *landscape-level biodiversity*.

- *volume estimates for existing mature stands*

In the 2003 timber supply analysis, estimates of timber volumes in existing natural stands were projected using the new VRI adjusted inventory attributes and the Variable Density Yield Prediction (VDYP) model version 6.6, developed and supported by the MSRM's Resource Information Branch. In general, the adjusted volumes in the new VRI for these stands as reported in the current analysis are about 10 percent higher than the adjusted volumes from the old inventory used in the 1998 analysis, and when applied in the 2003 analysis, these new volumes contribute to the projection of a significantly more robust timber supply than was projected in 1998.

As discussed in my rationale for the 1999 AAC determination for the Fraser TSA, a ground sampling audit carried out prior to the 1998 analysis to examine the attributes in the old FIP-FC1 inventory showed that, when loss factors were applied to account for decay, waste and breakage for trees of all species aged 60 years or more and with a minimum diameter at breast height of 17.5 centimetres in the operable productive forest, the volumes in the old inventory were overestimated by a mean value of 23 percent,[1] and were therefore adjusted downward, to a mean value of 425 cubic metres per hectare.

More recent ground sampling, carried out in Phase 2 of the VRI to examine attributes in the new inventory, showed that for the timber harvesting land base vegetated treed area, when net volume adjustment factors (NVAF) and net factoring were applied to account for decay, waste and breakage, for trees aged 60 years or more with mixed utilization (i.e. minimum diameters at breast height of 17.5 centimetres and 12.5 centimetres for appropriate species), the volumes in the VRI were overestimated by a mean value of 11 percent[2] and were therefore adjusted downward, to a mean value of 469 cubic metres per hectare. This is roughly 10 percent higher than the adjusted volume from a similar set of stands in the old FC1 inventory.

The sampling errors in the two audits were 11.6 percent for the first inventory audit, and 20 percent for Phase 2 of the VRI. Staff of the Resource Information Branch of MSRM have identified a number of reasons, too complex for explanation here, why the error margin in the VRI sample could be expected to be greater than that in the earlier audit.

[1] This is the ratio of the weighted mean inventory audit ground volume divided by the weighted mean inventory audit sample volume = 0.77.

[2] 11 percent is the ratio of the weighted mean ground sample volume divided by the weighted mean inventory volume = 0.89. (See the VRI adjustment report for more detail.)

The important information is that, comparing the two error margins—11.6 percent[3] on the old mean of 425 cubic metres and 20 percent on the new VRI mean of 469 cubic metres—shows that each of these two mean volume figures lies within both sets of error margins. This is shown schematically, though not to scale, as follows:

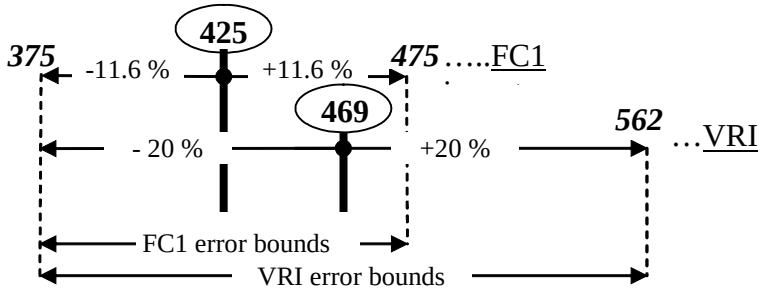

Figure showing how the adjusted mean volumes from
both inventories lie within both sets of error bounds

This information is consistent with a principle of statistical inference that the adjusted population means from different samples will tend to cluster around the true population mean. Thus, while neither of the two mean values identified by the two studies may show the true mean value of the volumes per hectare in the existing mature natural stands on the timber harvesting land base of the Fraser TSA, the two values, which differ only by approximately ten percent, both lie inside the latest confidence interval, without a statistically significant difference, confirming with a 95-percent probability that the true mean value lies somewhere within that interval.

Both ground samples—the earlier audit and the more recent VRI Phase 2—indicated the need to adjust the volumes downward in their respective inventories. The question is, which of the two ground sampling estimates do we believe is more reliable, the earlier audit indicating 425 cubic metres per hectare or the VRI sample indicating 469 cubic metres per hectare? Since the original audit sample had a larger number of samples and a more intense sampling at each location, there remains a possibility that the associated audit mean of 425 cubic metres per hectare is closer to the true mean of the existing mature volumes on the timber harvesting land base. As a result, the latest VRI inventory mean of 469 cubic metres may overestimate the true mean. In view of the tendency toward clustering in means it is likely, though not inevitable, that the true mean lies somewhere between the new adjusted volume estimate of 469 cubic metres per hectare and the older—and roughly 10 percent lower—adjusted estimate of 425 cubic metres per hectare that was used in the 1998 analysis. Thus there is a low probability of an overestimation at the maximum value of 10 percent, and a higher probability of a smaller, less extreme overestimation, if the true mean volume figure lies somewhere in the mid-range between the two estimates.

[3] This is the sampling error percentage at the 95-percent level of probability.

In the 2003 timber supply analysis, a sensitivity analysis was carried out to examine the implications for timber supply if the volume estimate were reduced by 10 percent (and if site index adjustments, discussed below under *site productivity estimates*, were not applied). The sensitivity results showed that under these conditions, corresponding to assuming the highest or most extreme level of overestimation in the volumes, the current AAC could still be maintained for one decade.

Uncertainty here is inconvenient but inevitable. Considering the funds spent over the past 30 years in attempting to obtain a true estimate of these volumes in this TSA, and considering the diversity of the growing sites and forest stands with their wide ranging productivities, soil depths, slopes, canopy closures, limb characteristics and so forth, it is unlikely that we will ever have better information at the TSA level on which to base a conclusion about volumes at the stand level than the results we now have from the two audits of the two inventories. I cannot foresee an average statistic that will ever accurately describe the 'middle' of such a range of heterogeneity. We now have two estimates within 10 percent of each other, and a decision must be made that recognizes and incorporates the present level of uncertainty.

Assuming that the true mean value of the volume estimates lies somewhere between the two adjusted values obtained to date implies acceptance of a degree of overestimation in the estimate that was used in the current timber supply analysis. Such a conclusion would be consistent with the statistical analysis and would also apply some caution in the AAC determination in the event that some overestimation in the volumes is actually present. In the absence of more precise information, it is therefore my intention to place weight on assuming that the actual mean value does lie between the two adjusted estimates, such that some degree of overestimation—probably less than 10 percent—is likely present in the volume estimates. From the above-noted sensitivity analysis I conclude that such an overestimation, possibly in the range of 5 percent, when considered separately from other factors, does not warrant an immediate reduction in the AAC, but rather suggests that the timber supply, although likely more stable than indicated in the 10-percent sensitivity scenario, is somewhat less resilient than projected in the base case. I have considered this conclusion in conjunction with the implications of other factors in 'Reasons for Decision.'

In public input, the SLDF submitted that

> 'the VRI approach to growth and yield predictions is highly suspect—instead of basing future growth on forests at 60 years of age, when their productivity has stabilized, forests were instead assessed at age 30. These younger forests were then compared to a yield model (developed for the older 60 years old forests) and were found to have more volume of wood than expected. Thus, harvest rates were increased by 13 percent.'

In response, staff of MoF and MSRM determined that trends in yield model volume assignment and attribute accuracy must consider age-related trends. Staff of MSRM advise that the application of age- and species-related adjustment factors ensures the temporal integrity of the inventory. I am also advised by Forest Service staff that only stands with identical forest cover attributes and inventory volume adjustments were aggregated into the same yield table for use in the timber supply analysis. This ensured that any strata-based yield impacts were associated with the appropriate forested land base.

The SLDF also submitted that relying almost exclusively on a model with high sources of error and based on inconclusive data and ecological uncertainty cannot constitute a foundation for reasoned judgement. I have addressed earlier, in 'Role and limitations of the technical information used,' both the inevitable need to rely on uncertain data and the acknowledged incompleteness of models in representing the 'real world.' In every AAC determination, including this one, documented efforts are made to ensure the use of the best information currently available and to test and account for the implications of identified uncertainties. The frequent re-determination of AACs, a protracted and complex process involving many specialists from many disciplines including ecological specialists, is intended to keep timber supply projections current with, and informed by, evolving data and knowledge.

The SLDF viewed the new VRI data as suspect due to the primary location of the 'limited ground truthing' in low elevation, fertile, valley bottom areas where growth would be expected to be higher. I am advised that the VRI Phase 2 sampling process ensured that a statistically valid sample of forest stands was selected from throughout the operable and inoperable forest and that the adjustments were applied appropriately. Appropriate age adjustments must also be applied in inoperable stands in order to address biodiversity concerns, and it is crucial to understand that the adjustments applied to the operable and inoperable strata are unique and do not influence each other.

Expected rate of growth

- *volume estimates for regenerated stands*

In the 2003 timber supply analysis, WinTIPSY (the Windows™ version of the Table Interpolation Program for Stand Yields, version 3.2, supported by the BC Ministry of Forests' Research Branch, was used to estimate growth and yield for existing and future managed regenerated stands. Volume predictions using TIPSY are based on the management of stocking density, full site occupancy and the absence of significant brush competition. The TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition. However, certain operational conditions, such as a less-than-ideal distribution of trees, the presence of small non-productive areas, endemic pests and diseases, or age-dependent factors such as decay, waste and breakage, may cause yields to be reduced over time. Two operational adjustment factors (OAFs) are therefore applied to yields generated using TIPSY, to account for losses of timber volume resulting from these operational conditions. OAF 1 is designed to account for factors affecting the yield curve across all ages, such as small stand openings, and OAF 2, for factors whose impacts tend to increase over time and whose influence on a stand may be reduced through management practices—such as decay, waste and breakage. In the 2003 analysis for the Fraser TSA, the standard default provincial modelling reductions of 15 percent for OAF1 and 5 percent for OAF2 were applied.

Data from the Tree Improvement Branch of the Ministry of Forests indicate that Class A seed has been employed in regenerating cedar, fir and spruce stands. On average, the volume gains to be expected at or near harvest age from the use of Class A selected seed are roughly 2 percent. For the base case projection, stand yields were altered to reflect the planting of

genetically improved stock in accordance with seed planning zones, using only the information up to the start of the simulation in 2001. A sensitivity analysis was performed to examine the implications if the projections for the next ten years of seed use and genetic gain actually occur; this showed a five-percent increase in the projected long-term harvest level.

In public input, the Sierra Legal Defence Fund stated:

> '…the increase in AAC is based, in part, on anticipated advances in genetics of tree seedlings, allowing them to grow more quickly. Future speculative advances in tree genetics were factored in to the determination to increase the current rate of cut. Although trees in the future may indeed grow faster and result in a higher quality of wood, the are so many assumptions implicit in such a consideration as to question the validity of basing current timber harvest rates on future genetic conditions. In short, the application of such assumptions is extremely speculative.'

As noted above, only those rates of application of Class A seed already experienced up to 2001 were included in the base case and the sensitivity analysis shows that the effects of higher or ongoing rates apply to the long term only and do not affect the short-term timber supply or current rates of harvest.

Information on fertilization was extracted from the 2002 FIP file as a spatial coverage to identify those stands (covering about 7000 hectares) expected to receive an increase in stand volume due to this treatment. This increase was applied to the appropriate stands in the timber supply model (rather than in the yield tables), producing a one-time increase of 30 cubic metres per hectare.

From my review of the methods of projecting regenerated stand volumes, including the assumptions applied with respect to genetic gains, fertilization and operational adjustment factors, I am satisfied that the base case accounts adequately for expected rates of growth in the regenerating, managed stands in the TSA.

- *site productivity estimates*

Inventory data include estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In general, forest stands between 30 and 150 years of age provide the most accurate measurement of site productivity. Site indices determined from younger stands (i.e. less than 31 years old), and older stands (i.e. over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where old-growth site index (OGSI) studies suggest that actual site indices may be higher than those indicated by existing data from mature forests.

In my 1999 AAC determination for the Fraser TSA, I noted a critical need for more information to be gathered to bring clarity to the possible need for adjustments to site indices. The licensee association in the Fraser TSA hired the growth-and-yield specialists J.S. Thrower & Associates (JST) to investigate the potential site productivity in the Coastal Western Hemlock (CWH) portion of the TSA, focussing mainly on Douglas-fir and hemlock-leading stands. JST conducted a study and produced the document "Site index adjustment of the Coastal Western Hemlock zone in the Fraser TSA: Final Report," from which the following is an excerpt from the executive summary:

> "…in response to the Provincial Chief Forester's request that better site productivity estimates be included in TSR3 for the Fraser TSA…The goal of this project was to develop reliable estimates of potential site index (PSI) for Douglas-fir(Fd) and western hemlock(Hw) in the Coastal Western Hemlock (CWH) biogeoclimatic (BGC) zone in the Fraser TSA.
>
> The Fraser Site Index Adjustment project was completed in 3 steps. The PSI of Fd and Hw was estimated across the CWH using a biophysical model developed by JST. The model used BGC subzone, slope position, elevation, solar radiation, bedrock geology, and expert opinion to predict the PSI of Fd and Hw. Next, 58 randomly selected plots were installed in Fd- and Hw-leading stands 21-60 years of age in the CWH, where height and age measurements were collected from suitable Fd and Hw site trees to estimate PSI. Using the ratio of means adjustment method, the preliminary PSI estimates from the biophysical model were adjusted using the ground measurements. The results showed that on average the biophysical model under-predicted Fd and Hw PSI by about 8% and the overall average adjusted PSI was 30.4 for Fd and 25.4 for Hw."

These biophysical Potential Site Indices were compared with other, similar projects in the Hope Innovative Forest Practices Agreement (IFPA) and in Tree Farm Licence (TFL) 38, and were shown to have consistent trends with these units. Comparison was also made with SIBEC (Site Index Biogeoclimatic Ecosystem Classification) estimates which for the most part were higher than those produced from the biophysical model.

Ministry of Forests' growth and yield staff have reviewed and accept the methods used in this project and have reviewed the final report. In applying the results to the 2003 timber supply analysis, once stands of Douglas-fir and hemlock-leading stands in the CWH biogeoclimatic zone had been harvested for the first time in the model, the potential site indices for the respective analysis units were then assigned to those growing sites.

In public input, the Ch-ihl-kawy-uhk First Nation expressed concern that the 18-percent reduction in the 1999 AAC determination seemed countered by the results of a new study conducted by industry, and questioned whether the Ministry had had the ability to gather reliable information prior to the previous AAC reduction. In response, I note my own expression of concern, in my 1999 AAC rationale, over the reliability of the site index information and the need to acquire better information—in response to which the Fraser Association and the IFPA have now conducted studies under the Forest Investment Account, with the results appropriately incorporated in this timber supply analysis.

The licensee Interfor suggested that other zones such as the Interior Douglas-Fir (IDF), Mountain Hemlock (MH) and Engelmann Spruce-Subalpine Fir (ESSF) should collectively receive a 20-percent increase in yield. However, at present adequate localized data do not exist to quantify appropriate site index adjustment for these other zones.

Nonetheless, I agree that the need for adjustments in other zones may well arise in the future as more ground-based information is gathered. Since the JST study did not examine all zones and sub zones, and since the provincial trend is toward higher site indices for regenerated stands in most areas, I must place some weight on the likelihood that the site indices for other zones and species, including balsam and the IDF, ESSF and possibly MH zones, are underestimated to some degree. In this case, the timber supply may be slightly higher than projected by the base case for the longer term. However, any associated adjacency implications will likely have little or no effect in the short or medium terms, given the already noted uncertainty in the volume estimates for existing mature stands. I have noted the potential for an addition to the long-term supply on this account in my 'Reasons for Decision.'

- *minimum harvestable ages*

Minimum harvestable ages as used in the analysis are estimates of the earliest age at which a forest stand will have grown to a harvestable condition. The assumed minimum harvestable age mainly affects when second growth stands will be available for harvest. This in turn affects how quickly existing stands may be harvested such that a stable flow of timber harvest may be maintained. In practice, many forest stands will be harvested at much higher ages than the minimum harvestable age, due to economic considerations and constraints on harvesting that arise from managing for such values as visual quality, wildlife and water quality.

In the 2003 Fraser timber supply analysis, stands were considered to be eligible for harvest upon reaching a defined merchantable volume. For most stands in the base case the minimum volume requirement was 350 cubic metres per hectare. The minimum harvestable age required to reach the desired condition was defined implicitly in the model for each of the analysis units, based on a yield table at the stand level. At lower site index values, stands must be held beyond the age where maximum average growth occurs (culmination age), while in more productive analysis units, stands will achieve the minimum volume at much younger ages. This is summarized in Table A-16 of the appendix to the analysis report. In this way, minimum harvestable ages ranging from as low as 40 years to as high as 350 years were established for the range of merchantable species in managed stands operable by conventional means and by helicopter logging, with the minimum volume requirement being increased by 100 cubic metres per hectare for areas identified as harvestable by helicopter.

In the analysis, consistent with spatial and other management considerations affecting the availability of stands, many stands are 'harvested' in the model at volumes and ages considerably above their identified minimum values, reflecting conditions in the real world. This is a critical point, since attempting to harvest all stands at their indicated minimum volumes—if this were operationally possible—could significantly reduce the long-term timber supply. For this reason, the minimum ages used in the analysis are not meant as operational rules requiring licensees to harvest stands as soon as they reach the identified ages or merchantability conditions; if this were the case, a consequently lower projected timber supply could lead to lower AAC.

A sensitivity analysis was performed to examine the effect of raising the minimum merchantable volume requirements by 100 cubic metres per hectare. The result was a medium-term level about 4 percent lower than the base case and a long-term level reduced by

about 3 percent. This shows that the base case is not highly sensitive to a significant increase—roughly 33 percent—in the volume required for a stand to be considered harvestable.

I have reviewed the minimum harvestable ages and merchantability criteria assumed in the analysis. In view of the many associated variables it is often difficult to assess future minimum harvestable ages with precision, but from my discussions with forest district staff I am satisfied they have carefully reviewed the procedures for establishing the criteria used for the species, growing sites and market conditions in the TSA. No public input was received on this factor, and in the absence of conflicting information I consider the assumptions to be a reasonable reflection of current practice and a suitable basis on which to project the timber supply.

Section 8 (8) (a) (ii) the expected time that it will take the forest to become re-established on the area following denudation:

Regeneration delay and impediments to prompt regeneration

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In the 2003 timber supply analysis, assumptions about regeneration methods (planting or natural regeneration) and about the length of regeneration delay were included as inputs to the 'TIPSY' model used to estimate volumes in regenerating stands (along with assumptions about genetic gains and fertilization where appropriate; see above – *volume estimates for regenerated stands*). For about 7000 hectares of young plantations in the VRI which do not yet carry a species label, an analysis unit derived from historical records in the old FIP inventory file was used.

The assumed regeneration delays ranged from 4 and 3 years respectively for lower productivity sites growing hemlock/balsam or fir, and 3 years for older cedar, spruce, and hemlock/balsam on medium productive sites, to 2 years for good sites growing hemlock/balsam or fir, younger cedar, pine/larch, and alder.

The VRI shows that the average live-stem density in young hemlock/balsam stands is about 1700 per hectare, and the general regeneration method for these stands is natural regeneration with in-fill planting of gaps. In the base case it was assumed that balsam stands are predominantly regenerated naturally; however, reviews of current practice indicate that most of these sites are now planted. This is expected to slightly reduce the time expected for stands to reach a merchantable size, which will add marginally to the longer-term timber supply but will not affect the short term.

In reviewing regeneration assumptions in context of all aspects of timber supply for successive AAC determinations in all TSAs in the province as well as many TFLs over the past nine years, I have found a steady trend toward reduced regeneration delays. Two- and three-year delays were common in the first timber supply review, but more recently, and especially on the more productive sites, prompt planting and brushing have reduced these delays to one to two years. Licensees have confirmed that fir-leading stands are usually planted within 1½ years, rather than the 2 years assumed, depending on the time of year when the harvest is completed,

and from this I conclude that the base case projection may tend to underestimate the longer term timber supply to a small extent. However, this slightly earlier regeneration of new stands will have no effect on the short-term timber supply.

Not-satisfactorily-restocked areas

Not-satisfactorily-restocked (NSR) areas are those where timber has been removed, either by harvesting or by natural causes, and a stand of suitable forest species and stocking has yet to be established. Areas where the standard regeneration delay has not yet elapsed since harvesting are considered 'current' NSR and fluctuate with the amount of logging currently taking place. Where a site was harvested prior to 1987 and a suitable stand has not yet been regenerated, a classification of 'backlog' NSR is applied.

For the 2003 timber supply analysis for the Fraser TSA, data on recent logging not yet contained in the VRI was obtained from the FIP file, and areas in the VRI that were photo interpreted as bare ground (recently harvested) or as vegetated but having few trees were given stand ages from the FIP file. A harvest depletion update was obtained by overlaying the FIP file with the VRI. Areas totalling 11 124 hectares identified as NSR in the FIP file were given ages based on a standard regeneration delay and the year of logging.

Importantly, the total area without tree cover differs considerably from the total area labelled 'current' NSR. Because silvicultural surveys are often not completed by licensees until new stands are 3 or 4 years old, the inventory carries many stands aged zero until some of them are assigned an age of 3 or 4 years. Thus the area meeting the legal definition of current NSR frequently exceeds the actual area without tree cover. Logically the amount of current NSR (or land without any trees) should roughly equal the total area harvested every year times the regeneration delay, but in the current case the NSR from the FIP file exceeds this number by almost 5 times. The method used in the analysis to assign 'current ages' to very young stands reflects standard district practice, distributing the ages to reflect the ages at which the stands are likely to be recorded in the inventory as 'satisfactorily restocked'. This method does not affect the legal status of NSR stands.

With the introduction of the VRI, backlog stands have been assigned new forest cover labels and the district has significantly updated and reduced the backlog recorded in district records. Any information from the FIP file (for example, year of logging) was used to augment the information for these areas. Some inconsistencies in the VRI remain; for instance, the timber harvesting land base includes 21 180 hectares of land which have a logging history but are currently labelled as 'vegetated non-treed.' While the data behind all this information is detailed and complex, the important point is that shortcomings in maintaining records of both current and backlog NSR were carefully accounted for in the analysis, and in this respect I am satisfied that the best available information has been used for the timber supply projection.

Section 8 (8) (a) (iii) silvicultural treatments to be applied to the area:

Silvicultural systems

For the past several years, the Chilliwack Forest District has been committed to implementing the principles of variable retention. The retention system is designed to retain individual trees, or groups of trees, to maintain structural diversity over the area of a cutblock for at least one rotation, and to ensure that more than half the total area of the cutblock remains within one tree height's distance from the base of a standing tree or group of trees, whether or not that tree or group of trees is inside the cutblock.

In the 2003 timber supply analysis, due to the difficulty of quantifying the amount of partial harvesting carried out in the district, only clearcutting was reflected in the base case projection. To examine the impact on the projection that may be expected from the variable retention practices, a number of assumptions and data methods were employed in undertaking a sensitivity analysis, as explained in detail in the analysis report. This analysis was assisted by the Research Branch of the Ministry of Forests through the provision of a number of models of varying complexity to estimate the impact of residual trees on the growth of regenerating trees. Very briefly, in the sensitivity analysis, consideration was given to: the leaving of dispersed trees at 15 per hectare or 40 per hectare in some areas of spotted owl habitat; the adjustment of yields according to tree species, percent reduction, the extent of cutblock edge occupied by the trees, and stand attributes such as site index and tree height; and consequent implications for the volumes in existing mature stands.

The results of this analysis showed that the timber supply impact associated with variable retention based on the simplest form of the yield model was a reduction of about 3 percent in the mid term, which accounts for the volume of retained trees left within blocks. The long-term impact was about 8 percent, which consists of 3 percent in veteran trees left during the first harvest which occurs in the short- and mid-terms, and 5 percent due to the impact on the regenerated, managed forest.

An analysis of forest development permits for the three biggest licensees in the TSA showed that, of the area proposed for harvesting, 67 percent will be by partial cutting and 33 percent by clearcutting, although the licensees' definition of partial cutting is very broad and currently covers a range from single-tree selection to clearcutting with reserves. An analysis of the last five cutting permits of the same licensees shows that most (80 percent) of the area is clearcuts with reserves, and 19.3 percent of the area is harvested by other types of partial cutting, identified as single- and group-tree removal. I am advised that BC Timber Sales has adopted a retention silviculture system strategy for application across their program in this TSA.

The Chilliwack Forest District has carried out two studies related to variable retention practices in the district. A review in 2003 of the retention patches in cutblocks showed that the estimated volume planned for retention within the blocks reviewed was only 6.4 percent of the estimated harvest volume. A review in 2004 of partial cutting showed that: most 'partial cutting' entries were not consistent with true uneven-age management; many entries were really variations of clearcuts with retention and commercial thinning; in many cases where Douglas-fir is planted, the shade and other conditions will likely cause the site to revert to hemlock; although treatments themselves may be done well, future entries may have to wait a

full rotation; and in some cases the ‘retention’ consisted of poor quality trees that had little future potential as merchantable timber. Forest district staff expect the extent of partial cutting to decrease following the February 29, 2004 change in stumpage appraisal policy, which eliminated operating cost allowances for single and group tree selection.

To review this situation, the salient points are twofold: First, in the base case analysis, only clearcutting was modelled for all stands. This means the maximum contribution of productivity was assumed from all of the areas harvested, with no reduction to account for any shade effects. It also assumes all the trees will be harvested from each site at once, with the site being regenerated within 2 or 3 years to full productivity, with an even-age forest of a single species that continues to make a full contribution to the timber supply. In reality, studies show that, acknowledging uncertainty in definitions, most current clearcutting is actually clearcutting with reserves, with much of the rest of the harvest being by some form of partial cutting. This inevitably means that the base case forecast, in assuming the full availability of the productivity of the forest as if all stands were harvested by clearcutting, has overestimated the timber supply to some extent.

Second, from the 2004 study it appears that management objectives for the partially cut areas may not be fully realized. Licensees may not maximise returns on investment if planted Douglas-fir is overcome by hemlock and, if no future entry objective is specified, or if the retention consists only of poor quality trees, projected timber supplies will not be available at the times, or with the volumes, species or quality currently assumed. I understand a more recent review identifies current retention levels of 40 percent, implying levels of shade that would certainly impede fir regeneration. This may reflect attempts by licensees to deal with the complexities of management for spotted owls, ungulate winter range, visual sensitivity and opposition to conventional logging in areas adjacent to population concentrations. Whatever the management objective for retention, the consequent reduction in productivity from that assumed in the base case forecast requires an accounting. Even if there were no loss of overall productivity in partial retention versus clearcutting (which all growth and yield specialists agree there is) an unclear or unmet silvicultural objective, including unintended species conversion, could reduce the productive potential of partially cut sites.

In conclusion, since the sensitivity analysis examining retention does show significant sensitivity in the mid- and long-terms, I have remained mindful in my determination that the base case may possibly have overestimated the mid- to long-term timber supply to an unquantifiable extent respecting the accuracy of reflecting the diversity of silvicultural systems and regeneration strategies in the field as noted in ‘Reasons for Decision.’ However, as also noted there, the short duration of this situation to date has precluded its examination in context of the extent to which the forest cover so retained may be accounted for by overlapping with or contributing to other forest cover requirements.

Before the timber supply can be more accurately modelled in respect of these silvicultural systems in the future, the associated forest management objectives must be clarified for specific areas. Complicating this are the difficulties of predicting both the capacity of residual stands to retain a stable structure, and their capacities to continue to develop into healthy, multilayered stands that include some degree of regeneration. Accurate timber supply projection requires clear statements about the operational motives of forest management, to clarify the objective of a harvest entry and to clearly describe the structure of a residual stand

consistent with the desired objective. Definitions of this kind are required to assess the productivity of residual stands, a proper assumed age for the regeneration at the time of the second harvest, and the likelihood of a stand continuing into the future under either a partial-cut or clear-cut harvesting system. To achieve this, as noted below in 'Implementation,' I encourage licensees to specify and clarify as far as possible the operational objectives for each stand identified for harvesting by partial cutting. This will permit a much greater level of certainty in capturing the associated implications for the projected timber supply.

Incremental silviculture

In general, incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning, fertilization, and genetic improvement, that are not part of the basic silviculture activities required to establish a free-growing forest stand.

In the Fraser TSA, very limited funds were allocated by licensees from Forest Investment Account funds for silvicultural activities. Information on fertilization, discussed earlier in *volume estimates for regenerated stands*, was extracted from the old FC1 inventory file and used to identify stands to receive an increase in volume. In the timber supply model this increased volume was applied at a rate of 30 cubic metres per hectare. I am satisfied with this treatment in the analysis, as noted in the referenced section.

Section 8 (8) (a) (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area:

Utilization standards

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. In the timber supply analysis, the utilization standards assumed for pine, larch and white spruce at all ages, and for all other species under 121 years, were a 12.5-centimetre diameter at breast height (dbh) with a 30-centimetre maximum stump height and 10-centimetre minimum top inside bark. For all other species over 121 years, the minimum dbh was 17.5 centimetres, and the minimum top height was 15 centimetres.

The volume compilation used in the VRI inventory adjustment process reflected these utilization standards (detailed in Table A-14 of the analysis report), but the VDYP model only provides data based upon 17.5 cm minimum dbh. It was assumed that the inventory volume adjustment factors derived with the appropriate utilization level accounted for the volume differences between the two standards.

Forest district staff note that the values in Table A-14 are not completely consistent with the current merchantability specifications in Forest Licence and Cutting Permit documents in that the minimum dbh requirement is not used in licence documents. I am advised that any consequent discrepancy would be small, since cruise volumes are based on the values in the table. There may therefore be some minor implications for satisfactory administration of a 'take-or-pay' policy in the future, and also for accurate timber supply projection in view of the need to ensure that actual volume depletions are consistent with the assumptions used in AAC

determinations. For the current determination I am satisfied that the utilization assumed in the analysis is a reasonable approximation to current practice.

Decay, waste and breakage

The timber volumes projected for existing mature stands in the VDYP model are based on ground-sample data from which gross tree volumes are calculated and then reduced to reflect utilization respecting stump height and top removal, then further reduced to account for decay, waste and breakage. Prior to the development of the VRI ground-sample inventory system, the volume deductions for decay and waste were based on a series of tables derived from destructive tree sampling across the province. This process, developed and implemented in the 1970s, employed the best science of the day but involved a less statistically rigorous process than that now used in the VRI. The VRI process involves 'net factoring,' by which the merchantable sound wood volume on a ground sample 'tree' basis is estimated in the field and then corrected by a statistically based destructive 'tree' analysis phase known as net volume adjustment factor sampling, NVAF. The results of this process are applied to all the trees within the ground samples, which are then applied as a correction to the yield model component for the entire inventory. This VRI/NVAF process was used in projecting volumes for the 2003 timber supply analysis for the Fraser TSA.

From the VRI ground sampling studies using the net factoring and NVAF for the Hope Innovative Forest Practices Agreement and Fraser-Chilliwack sub-units, it was found that in the volumes compiled in the previous timber supply review (TSR 2)—for which 1976 loss factors for decay and waste were applied to the VDYP model—the amount of decay and waste in mature trees had been marginally overestimated. Although the overall difference between the ground volumes from the inventory audit sample used to adjust the TSR 2 population (using the 1976 loss factors) and the volumes obtained through the standard VRI/NVAF process, is negligible on a broad scale, there were substantial variations for particular strata. These variations account for some of the difference between the current volume estimates and the TSR 2 estimates.

In assessing uncertainty in the estimates of net merchantable mature volume obtained from the current VRI process, the associated sampling error of the ratio of the estimated net factor value to the actual NVAF must be accounted for. A desirable NVAF target sampling error of the overall mature forest population is 10 percent at the 95 percent level of probability. In the current samples for the Fraser TSA, this target was not achieved; the NVAF sampling error for mature volumes was 17 percent at the 95 percent level. Reducing this sampling error would be costly and would require a large number of additional samples. Nevertheless, I will defer to the MSRM to determine what constitutes an affordable or cost effective inventory program. Thus some uncertainty is inevitably present in the current estimates of merchantable mature volumes respecting the accounting for decay and waste. Regardless of the level of statistical risk associated with these estimates, the values provided by the current process are considered to be statistically unbiased. The VRI process does not, however, provide an unbiased assessment of the amount of breakage to be deducted; the breakage factors used in the 2003 analysis are the same as those used in the TSR 2 analysis.

From discussions with analysts, I agree it is not possible to conclude with certainty whether the information before me indicates either an under- or overestimation in the volume estimates for existing mature stands used in the 2003 analysis in respect of decay and waste. The former loss-factor/VDYP process and the current VRI/NVAF process produced results that are not different overall. I conclude that the current process, which is the provincial standard and is considered to be unbiased, provides the best information currently available and I accept it for use in this determination. In any case, the volume variations primarily affect mature stands and, assuming that the use of standard default OAFs with the TIPSY model in accounting for stand gaps, decay and waste in future regenerated stands is reasonable, the noted uncertainty would not necessarily affect the timber supply in the short term.

The SLDF submitted that the volumes of timber available in old forests are artificially inflated because losses to decay, waste and breakage are not adequately accounted for. Staff of MSRM note that the approach used in the VRI is similar to that used in BC's historic inventories, with an additional correction applied in the form of the 'Net Volume Adjustment Factor' based on ground sampling. I note that the general loss factor approach is also used by Revenue Branch in stumpage appraisal, and I am satisfied that the losses in question are adequately accounted for.

Section 8 (8) (a) (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production:

Integrated Resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

- *cutblock adjacency, forest cover and green-up*

To manage for resources such as water quality, various habitats for wildlife, and for aesthetics, and to avoid concentrating harvesting-related disturbance in particular areas, operational practices limit the size and shape of cutblocks and maximum disturbances (areas covered by stands of less than a specified height), and prescribe minimum green-up heights required for regeneration on harvested areas before adjacent areas may be harvested. Green-up requirements help to achieve objectives for water quality, wildlife habitat, soil stability and aesthetics. Adjacency, green-up and forest cover objectives guide harvesting practices to provide for a distribution of harvested areas and retained forest cover in a variety of age classes across the landscape.

In the Fraser TSA, several management objectives may apply to one area; for example, requirements for a visually sensitive area may overlap with requirements to meet a spotted owl objective. In the 2003 timber supply analysis these objectives are all tracked separately, and

the means by which the resulting complex overlapping of forest cover requirements is represented is described in detail in the analysis report. In brief summary, roughly 59 percent of the timber harvesting land base is subject only to cover requirements for cutblock adjacency and for retention of old forest for biodiversity requirements; on the other 41 percent, at least one additional resource emphasis must be considered in planning timber harvesting activities. These resource management emphases include spotted owl habitats and matrix areas; various levels of retention or modification for visual quality management; mule deer winter range; goat winter range; and community watersheds. In addition, landscape-level biodiversity requirements were applied to the entire productive forest outside the nine landscape units that include old-growth management areas.

- *cutblock adjacency and green-up in the integrated resource management (IRM) zone*

As noted in the 2003 timber supply analysis report, the timber supply model used in this analysis allows for a spatial representation of cutblocks subject to adjacency requirements. This approach was not used in generating the base case projection, due to the difficulty in defining what spatial adjacency means and other methodological complexities; however, the implications of explicit adjacency considerations were evaluated in a sensitivity analysis, as discussed below. For the base case, as a surrogate for modelling spatially-explicit cutblock adjacency, a general forest cover constraint was applied to each landscape unit in the IRM zone, limiting the amount of disturbance such that no more than 25 percent of the area not already covered by a constraint for visual sensitivity was permitted to be covered at one time by forest stands less than 3 metres high. A sensitivity analysis showed that reducing the maximum allowable disturbance from 25 percent affected the projected timber supply only when the allowable disturbed area was reduced to 18 percent or lower.

In a sensitivity analysis examining the effects of spatially explicit adjacency requirements, cutblocks were allowed to range in size from 2 to 40 hectares, with the target size of a particular cutblock being chosen from a uniform probability distribution. Forest within 200 metres of each cutblock could not be cut until the post-harvest regeneration in the cutblock had grown to 3 metres high. Although the target applied in the base case respecting the harvesting of second-growth was not applied in this sensitivity analysis, the same level of harvest of second-growth occurred as in the base case.

The results of this analysis showed that with this explicit adjacency regime applied, the short- and mid-term harvest levels projected in the base case could still be maintained. The projected long-term timber supply was about 11 percent lower than in the base case, in good part because the harvest scheduling rules used in the base case could not be applied during cutblock building, so the adjacency regime introduced a wider range of harvest ages than assumed in the base case. The result was that the sequencing of harvests related largely to cutblock size criteria, which led to harvests further from the age of maximum average productivity than did the queuing priorities used in the base case. This information, which reflects the way the analysis model was constructed, is important and useful operationally in that it suggests that additional spatial harvest restrictions could lead to more isolation and fragmentation of old growth, reducing its availability for harvest. However, equally importantly, this information does not imply that the series of cutblocks necessary to realize the short- and medium-term harvest level projected in the base case analysis may only be

properly configured and sequenced across the landscape at the expense of the long-term timber supply.

In the 1998 timber supply analysis, potentially high levels of disturbance necessitated adjustments to the assumed general cover requirement in the Pitt landscape unit. In the 2003 analysis, this adjustment was not required as this area contributed in proportion to its overall fraction of the timber harvesting land base with a harvesting pattern similar to that in the forest development plan.

From all the foregoing information I conclude as follows. The spatially explicit sensitivity analysis uses a more transparent process, and gives a more easily understood progression of harvesting on the ground, than does the FSSim analysis used in support of previous AAC determinations for the Fraser TSA. The new method provides an opportunity to visually observe both the configurations of harvest on the ground, and the areas that are legitimately available while meeting the range of defined management objectives for spotted owl habitat, ungulate winter range, visual sensitivity, and so on. As noted, the results do not imply that meeting spatial requirements will necessarily lower the long-term timber supply, but they do provide an indication that the more land base becomes fragmented in a non-strategic way, the higher will be the eventual impact on the timber supply. This is not a reflection of operational trends in the Fraser TSA at this time, but rather a source of helpful guidance for managers to apply in the ongoing development of the landscape.

- *visually sensitive areas*

Careful management of scenic areas along travel corridors and near recreational sites, parks and major communities, is an important IRM objective that requires visible evidence of harvesting to be kept within acceptable limits in specified areas. Currently, the Code provides for scenic areas to be identified and made known, and for visual quality objectives (VQOs) to be established to limit the amount of visible disturbance permitted in sensitive areas. Visual landscape inventories are carried out to identify, classify and record those areas of the province that are visually sensitive, and appropriate visual quality classes (VQCs) are recommended—for example ‘Preservation,’ ‘Retention,’ ‘Partial retention,’ ‘Modification’, or ‘Maximum Modification’—to identify levels of alteration appropriate to particular areas. Guidelines to meet the VQOs include setting a maximum percentage of a specified area or ‘viewshed’ that is allowed to be harvested at any one time, and setting a ‘visually effective green-up’ or ‘VEG’ height at which a stand of reforested timber is perceived by the public to be satisfactorily greened-up.

In the Fraser TSA, district staff have expanded the ‘Partial Retention’ classification; the range of recommended VQCs in the TSA now includes: Preservation (P); Partial Retention with High sensitivity to alteration (PR/H); Partial Retention with Moderate sensitivity (PR/M); Partial Retention with Low sensitivity (PR/L); and Modification (M). For the PR/H, PR/M and PR/L areas, the permissible alterations in Visual Sensitivity Units are, respectively, at the lower end, the middle, and the higher end of a range from 5 to 15 percent. No VQOs have been formally established in the TSA; licensees operate under the recommended VQCs within the scenic areas that have been made known by the district manager. A documented, standard

operating procedure for the district has been issued to help licensees meet recommended VQCs.

In the 2003 timber supply analysis for the Fraser TSA, for each recommended VQC a different forest cover requirement was applied to the forested area in each visual polygon, limiting the percentage maximum allowable disturbance and specifying the required green-up height, as detailed in the analysis report. Allowable disturbances and associated volume removals were assessed in consideration of the reduced visual sensitivity (from the ground or lake level) of disturbances at lower elevations on sloping terrain. At the less visible lower elevations, greater volumes may be removed acceptably than from the more readily visible higher elevations. Sensitivity analysis helped to determine and account for the respectively higher, and lower, visually effective green-up heights required for the higher and lower slope elevations. The spatial model permitted the application of appropriate plan-to-perspective ratios for particular geographic areas, species and sites.

From a detailed review with Forest Service staff I am satisfied that the current model, with its geographically sensitive spatial and site-specific capabilities, and its ability to incorporate terrain-slope data, provides a more reliable representation of the constraints on timber supply in visually sensitive areas than the former model with its aggregated, non-spatial approach. I am also satisfied that the use of this new, comprehensive approach answers a concern expressed by a licensee in public input that the analysis underestimates the volumes that licensees are actually able to harvest in some sensitive areas.

The facts that visually sensitive areas are made known, but not yet formally established in law, and that the legislative authority for establishing VQOs is changing, do introduce a degree of uncertainty in foreseeing and analysing the eventual extent of associated constraints on timber supply. However, I am advised by forest district staff that it is the current practice of all licensees to manage operations sensitively in all areas made known to date. This is consistent with practice in the recent past and, given all current indications of the value placed by the public on natural, visual resources, I consider it reasonable to expect that this current practice will continue into the future, even under a changing regulatory environment. It is unlikely, for instance, that in coming years the visual sensitivity of the Trans-Canada Highway corridor will cease to be respected and managed. If significantly different information does become available with respect to the areas declared to be sensitive or to the objectives for their management, this information can be incorporated in future timber supply analyses.

For the current AAC determination, from the above considerations I am satisfied that the reasonably foreseeable constraints on timber supply from managing visual resources in the Fraser TSA are adequately represented in the base case analysis.

- *riparian habitat*

Riparian habitats occur along streams and around lakes and wetlands. Both the Forest Practices Code and the *Forest and Range Practices Act* require the establishment of riparian *reserve* zones that *exclude* timber harvesting, and riparian *management* zones that *restrict* timber harvesting, in order to protect riparian and aquatic habitats.

For the 2003 timber supply analysis for the Fraser TSA, to estimate the area needed in riparian reserves and riparian management zones, riparian features were classified using water features from Terrain Resources Information Mapping (TRIM) and either the percentage slope in the case of streams, or areas in the cases of lakes and marshes, and the classifications in the Forest Practices Code's *Riparian Management Area Guidebook*. Buffer widths for stream features were developed by staff of the Ministry of Forests' Research Branch, both to reflect limitations in the TRIM data and to capture recommended practices in riparian reserve zones and riparian management zones. A detailed description of the process was published in the May 2003: *Fraser Timber Supply Area (TSA) Data Package and Information Report*.

Riparian areas covering a total of 22 911 hectares of forest were identified. In deriving the timber harvesting land base, after accounting for exclusions for overlapping management objectives, a total of 13 026 hectares of forest were excluded specifically to account for riparian features across a range of biogeoclimatic sub zones as detailed in Table A-13 of the 2003 analysis report. The current analysis method, which relies on local data from the TSA, improves considerably on the generalized methodology applied in the previous timber supply review; it is also geographically explicit such that the forest cover implications of all inventory polygons affected by riparian objectives may be carried forward throughout the timber supply analysis. Inevitably, the requirements for the larger stream classes are more readily and fully captured than are those for the less distinct, smaller streams. However, because the cover requirements for larger streams impose the majority of the overall constraint on timber supply associated with riparian management, any underestimation in the lesser constraint associated with uncertainty in capturing all of the smaller streams is correspondingly reduced in significance.

The specific deduction for riparian areas in this analysis represents about 5 percent of the timber harvesting land base, compared to the deductions of 4.8 percent for the timber harvesting land base and 4.2 per cent for volume retention in the previous analysis—overall a decrease in the area of forest retained for riparian management. I am satisfied that the improved, more rigorous methodology combined with the use of local data indicates an acceptable representation of riparian management requirements in the base case analysis.

- *community and domestic watersheds*

The TSA includes 85 community watersheds defined by the Code, covering 28 534 hectares, of which 13 248 hectares lie in the timber harvesting land base. In the analysis, it was assumed that 5 percent of the forested area of these watersheds could be harvested every five years. The harvest contribution from these areas is about 5 percent to the timber supply in the TSA and average harvest ages generally exceed 100 years in the long term.

The actual levels of harvesting in these watersheds, which are consistent with the Coastal Watershed Assessment Procedure (CWAP), are currently slightly higher than the modelling assumption of 1 percent per year. However, the level of constraint applied in the model was high, and even if harvesting were to proceed in practice at slightly higher rates than assumed this would by no means imply that the timber supply in the TSA is being maintained on the basis of permitting high rates of logging in community watersheds. I am satisfied that the assumption applied in the analysis is a reasonable approximation to current practice, and that

any reasonably anticipated variation from this in the field represents a negligible risk to the projected timber supply.

- *ungulate winter range*

In August, 2003, a Memorandum of Understanding (MOU) on the Establishment of Ungulate Winter Ranges and Related Objectives was developed between the Ministry of Water, Land and Air Protection (MWLAP), the Ministry of Forests (MOF) and the Ministry of Sustainable Resource Management (MSRM). The purpose of the MOU is to expedite and facilitate the orderly confirmation and establishment of ungulate winter ranges (UWR) and related objectives across the province, in order to support the Forest Practices Code and the new *Forest and Range Practices Act* (FRPA). The MOU created three categories of ungulate winter range; Type 1 which are UWR that were incorporated in provincial timber supply analysis before April 1998, Type 2 which reflect UWR identified through strategic land-use plans and Type 3 which are new UWR identified by WLAP, licensees or other parties as necessary for the winter survival of ungulates.

In the analysis, a total of 8723 hectares of classic UWR within the timber harvesting land base was used. The information was supplied by WLAP in May 2001 as the first approximation of Type I eligible winter range. A forest cover requirement was applied to the UWR within the timber harvesting land base such that at least 50 percent of the mapped UWR in each landscape unit must provide significant habitat attributes which were assumed to occur in forest stands above 100 years of age. This was used as a surrogate for the complete removal of 3500 hectares of Type 1 areas from the timber harvesting land base. Coast Forest Region staff determined this amount of area to be equivalent to the UWR modelled using a cover constraint in TSR 1 for the Fraser TSA.

In January 2003, the Ministry of Water, Land and Air Protection (MWLAP) released two new sets of maps of UWR for the Fraser TSA. The first set identified a total about 3500 hectares of spatially defined Type 1 UWR within the timber harvesting land base, consistent with the August MOU. The second set of maps identified a total of about 6400 hectares of Type 3 UWR within the timber harvesting land base. This Type 3 newly defined UWR will require further consultation. To date, none of the UWR has been approved by the deputy minister of MWLAP.

The new inventory of deer winter range defined by MWLAP supersedes the environmentally sensitive area (ESA) inventory classification of deer habitat (used in the 1998 timber supply analysis) in terms of management direction to licensees and maintaining critical UWR. While both inventories are reasonably similar in terms of total area, in some cases the new and the old classifications cover different areas.

In approving operational plans, forest district staff have afforded the spatially defined Type 1 UWR the fullest protection possible under the Code, even though the areas have not been ‘made known’ to licensees in the forest development planning process. The second set of maps showing the Type 3 UWR has so far been treated generally by forest district staff as a proposal, such that areas may or may not be released for harvesting approval depending on the availability of other UWR in close proximity. The MWLAP has indicated it is in the process of redrafting the UWR proposal.

For mountain goat winter range, of the total of 34 453 hectares of habitat MWLAP has identified, only about 1979 hectares are in the timber harvesting land base, with almost all of the balance in inoperable areas. In consideration of the very small impact to timber supply that would be imposed by applying forest cover requirements to this limited area of the timber harvesting land base, in the 2003 analysis no specific requirements were modelled specific to goat winter range. I note that goat winter range represents about 0.5 percent of the timber harvesting land base and that while no official management requirements currently exist for these areas, staff of MWLAP are requesting that these areas be reserved from timber harvesting although no final decisions have been made on the management regimes for these areas. In public input, the SLDF submitted that the goat winter range plan should be 'approved' and 1644.9 hectares should be included as a constraint. My responses to these requests and to other concerns expressed by MWLAP are the subject of the next three paragraphs.

Staff of MWLAP have expressed concern through the public input process that in the previous timber supply review (TSR) an accurate accounting was not made for the way deer winter ranges are currently managed in the TSA, and that the chief forester had given assurance that their concerns would be addressed in the current review. In response, I note that for the 1999 determination, information was presented to me regarding then pending work by MWLAP on UWR, and in my rationale I indicated that once the UWR becomes established by regulation, it can be incorporated into an AAC determination, without unanticipated risk to the (then) projected timber supply. This conclusion is of course now dependent upon the declared UWR map areas being consistent with the MOU, with respect to impacts on timber supply. However, none of the new UWR map areas has yet been declared. The statutory authority to declare these areas rests not with the chief forester but with the Deputy Minister of MWLAP; when the areas are formally declared, they can be fully reflected in a timber supply analysis, with any outstanding implications taken into account in an AAC determination.

Staff of MWLAP also indicated concern over the approval of harvesting in the identified UWR. I understand from forest district staff that while none of the proposed UWR areas in either map set has been approved under the MOU, the approval of harvesting plans anywhere in the 3500 hectares of the first map set incorporates the full protection possible under the Code, and approval for harvesting in any area within the 5223 hectares of the second map set is only given when an alternate winter range lies in close proximity.

Staff of MWLAP have also stated that the chief forester's accounting for deer winter range (DWR) will be instrumental in achieving legal designation of the UWR plan and its implementation on the ground, and that unless corrections are made in the current TSR with respect to the accounting for DWR and associated types of land base exclusions employed in the model, MWLAP will not be able to sustain viable populations of deer in the Fraser TSA. This expression of concern identifies a common misconception of the function of the timber supply review (TSR); it is the purpose of the analysis and the AAC determination, i.e. the whole TSR, to *reflect and account for* the requirements of the Code or the FRPA, including those necessary to meet the goals and objectives established for areas formally declared as UWR; it is not the mandate of the chief forester to establish such areas, goals, or objectives in the TSR. Earlier, before the authority for declaring UWR was established in law, some areas of UWR were indeed agreed and enacted upon through policy decisions taken by the chief

forester. However, now that the statutory authority has been clarified, it is no longer appropriate for the chief forester to exercise discretion in these matters. To reiterate, the Deputy Minister of MWLAP now has the authority to define the areas and objectives for UWR that the chief forester will then take into account as current practice when the formal declaratory processes are complete. Significantly, even if I were to account for the timber supply impact associated with informally established additional habitat, and even if this were to lead to a reduced AAC, this would still not give such areas any protection from harvesting—that would first require a decision from the appropriate authority, the consequence of which I would then reflect in assessing the timber supply.

Meanwhile, I consider that the analysis adequately reflects the current requirements and practices associated with the management of ungulate winter range habitat, to the extent that such areas are formally identified.

- *identified wildlife*

Identified Wildlife are those wildlife species and plant communities that have been approved by the Ministry of Water, Land and Air Protection as requiring special management. On February 19, 1999, the province announced its Identified Wildlife Management Strategy (IWMS) for dealing with endangered, threatened, vulnerable, and regionally significant species that have not been accounted for by existing management strategies for biodiversity, riparian management or ungulate winter range, or through the application of other forest cover constraints.

In the Fraser TSA, a Wildlife Habitat Area (WHA) of 50 hectares has been established under the IWMS, for Mountain Beaver. Most of this area lies outside the timber harvesting land base. Other WHAs totalling about 250 hectares have been proposed, but not yet established, for Northern Goshawks. Recovery plans are in the process of being created in the TSA for the Grizzly Bear (though not formally approved by government), the Giant Pacific Salamander, the Tall Bug Bane, the Pacific Water Shrew and the Phantom Orchid.

In the base case harvest forecast, no accounting was made for any WHAs, or for any management or policy considerations for the IWMS or for any species at risk, other than the Spotted Owl. In all management units where specific measures have not yet been completed to identify and provide for species at risk, either directly or through other explicit provisions in approved land-use plans, and where no accounting has therefore been made in the timber supply analysis respecting identified wildlife, it is my customary approach to account for future land base exclusions and other strategies through an assumed corresponding one-percent overestimation in the timber supply throughout the forecast period, even though official designations of habitat areas may not yet have been made. I consider this practice to be a reasonable expectation for forest management in general, particularly in view of the large number of requests for designations throughout the province. The one-percent impact is in the nature of a general and provisional estimate rather than a ‘cap’ that may not be exceeded; this is evident in the current case where the one-percent estimated impact is being accounted for in addition to the impacts associated with the specific management requirements for the Spotted Owl—a prominent species of identified wildlife.

Therefore, particularly in view of the positive indications of red-and blue-listed species present in the Fraser TSA, even though some of the potential habitat provisions may overlap with existing constraints, I consider it appropriate to remain mindful of the risk to timber supply associated with the management of suitable habitats for all of these species, and I will assume a one-percent overestimation in the timber supply throughout all periods of the base case forecast, to account for future habitat designations, as noted in 'Reasons for Decision.'

- *management of Spotted Owl habitat*

The Northern Spotted Owl is found exclusively within the temperate coniferous forests of western North America, with its entire Canadian distribution limited to the southwest portion of British Columbia, including the Fraser TSA. In 1986, the Spotted Owl was designated by the Committee on the Status of Endangered Wildlife in Canada, COSEWIC, as 'Endangered;' that is, the owl was considered to be 'threatened with imminent extirpation throughout all or a significant portion of its Canadian range.' In its May, 2000 Assessment Summary, COSEWIC reconfirmed the endangered status and noted that at that time there were estimated to be less than 100 resident pairs of Northern Spotted Owls in BC. Recent assessments by MWLAP report that the owl population has been declining significantly in recent years; in 2003, I.R. Blackburn and S.Godwin estimated in *Status of the Northern Spotted Owl in British Columbia* that there are now less than 33 pairs.

In May, 1997, the Provincial Cabinet released its approved Spotted Owl Management Plan (SOMP), developed jointly by MoF and the Ministry of Environment, Lands and Parks (now called the Ministry of Water Land and Air Protection). The SOMP was based on a 60-percent chance of stabilizing and increasing the spotted owl population as the amount of habitat stabilizes and then increases. The SOMP provides policy direction for operational forest activities, but has not yet been declared a Higher Level Plan, which would impart legal force to its direction. Obtaining this declaration is the responsibility of MSRM.

The SOMP includes the incorporation of protected areas for permanent protection of potentially suitable owl habitat, as well as Special Resource Management Zones (SRMZs) where forestry and owl management are integrated, and a strategy to address 'matrix areas,' which are areas where Spotted Owls are found outside both protected areas and SRMZs.

The SRMZs include long-term owl habitat (LTOH, where habitat requirements significantly restrict conventional timber harvesting with the goal to retain 67 percent permanent forest cover), and forest management areas (FMA) including replacement areas (RPA) which are held in reserve until recruitment areas (RCA) within the LTOH have reached 100 years of age. In accordance with direction from the SOMP, Resource Management Plans were developed and completed in May 1999 for each SRMZ in the TSA, to define the FMAs, LTOH and RPAs. Matrix Areas, outside SRMZs, where harvest sequencing will be managed, were also established under the SOMP as temporary protection for known owl sites. Matrix Areas are intended to be phased out within a 50-year period.

Since 1999, harvesting in the Fraser TSA has been guided by Spotted Owl Resource Management Plans and consequently harvesting within SRMZs has been limited to activities that will create, maintain or enhance spotted owl habitat. Harvesting in owl habitat has declined very markedly since 1992, the first year of implementation of the interim

conservation strategy for the Spotted Owl. From 1992 to 1995, the year in which government directed development of the SOMP, just 147 hectares were logged in the approximately 135 500 hectares of what are now SRMZs. From 1995 to 2001, in the SRMZ and Matrix areas, only 400 hectares were logged.

Harvesting today in SRMZs is by retention systems in the FMAs, leaving 40 stems per hectare and by partial cutting in the LTOH with a 30-percent volume removal with the objective of creating, maintaining and enhancing spotted owl habitat. Each SRMZ has several Long-Term Activity Centres, each for one pair of owls.

The Province's multi-disciplinary Spotted Owl Recovery Team (SORT) is currently developing a draft recovery strategy and associated action plan for the owl. When these plans are completed, government will assess them and make relevant management decisions. Since the SOMP was approved, 7 unprotected Long-Term Activity Centres (LTAC) have been identified outside the SRMZs and Matrix Areas in the Fraser TSA; the SORT recommended these areas for protection in June 2003, but to date government has not approved any protection. These areas represent about 21 000 hectares of forest and about 8 361 hectares, or 3 percent, of the timber harvesting land base.

In the 2003 timber supply analysis, Management of Spotted Owl habitat was represented as detailed in the *Fraser Timber Supply Area Analysis Report* at pages 65-66. To summarize, in keeping with the May, 1999 Spotted Owl Resource Management Plans, approximately 67 percent of all the area in SRMZs was assumed to be LTOH. The 1999 plans allow for one-third of the timber volume on one-third of the LTOH to be harvested, in order to improve spotted owl habitat, consistent with socio-economic objectives; however, in the analysis, in view of the relatively small timber volume associated with this activity, and in the absence of specific plans and timing for any such harvest, the entire LTOH in each SRMZ was assumed to be unavailable for harvest. To ensure this, from a total of 63 828 hectares of Crown productive forest identified as LTOH, after accounting for overlapping land base exclusions, 33 616 hectares, or 5.3 percent of the Crown forest land base, were entirely excluded, specifically for LTOH. In practice, the licensees in the Fraser TSA have begun developing innovative practices to operate within the LTOH inside the SRMZs, and I have viewed some of these operational areas personally. I am advised that these activities are included in Forest Development Plans and will continue; if there are any implications for the timber supply, these will be assessed and accounted for in the next analysis and determination.

Table A-10 of the analysis report outlines the LTOH, the replacement areas and the remaining FMAs for the TSA, along with Matrix Areas. In the analysis, each Matrix Area was assumed to be released for harvest over a fifty-year period by progressively moving harvest activities inward from the periphery of the Matrix Area toward its centre until the matrix was harvested.

The analysis reflected guidelines from the Spotted Owl Resource Management Plan, which identifies the current owl habitat with the goal towards eventually allowing harvest in the replacement areas (RPAs), which are currently serving as owl habitat until recruitment areas in the LTOH reach 100 years of age. Of the 135 494 hectares indicated on the inventory file in the SRMZs listed, only about 22 percent were expected to be available for harvest. Forest cover requirements were applied to Long-Term Activity Centres to reflect this objective.

From my review with district staff and with the timber supply analyst of the complex requirements for the management of Spotted Owl habitat as described in the SOMP, and the representation of these requirements in the 2003 analysis, I am satisfied that very careful efforts were made to account for the various aspects of the requirements in a suitable technical way, in order to obtain as close a consistency with the SOMP as may reasonably be expected. The maintenance of 67 percent of the owl's habitat in perpetuity as LTOH with only minimal harvesting to augment the habitat—in fact none assumed in the analysis—the recruitment of forest cover in FMAs until adequate areas of LTOH have reached 100 years, and the slow phasing out of the Matrix Areas were all included as constructs of the model. In addition, the retention of 40 stems per hectare in appropriate areas of the FMA was examined in a sensitivity analysis examining the variable retention harvesting system. In all the respects I have reviewed in detail, I am satisfied that the analysis adequately reflects the intention, objectives and strategies of the SOMP.

In public input, the Sierra Legal Defence Fund SLDF made a very substantial submission that brings a number of points to the public attention in the almost 20 pages that pertain to Spotted Owls. It is incumbent upon me as chief forester both to respond briefly in this rationale to those points in the SLDF brief which I have a statutory mandate to address, and to identify the other agencies that hold the responsibilities to address those points over which I do not have such a mandate.

I have summarized main points from the SLDF brief as follows:

- The spotted owl population in BC has declined by 67 percent between 1992 to 2002; fewer than 33 pairs remain, and populations in the United States continue to decline despite a plan superior to the BC SOMP.
- Surveys after the implementation of the SOMP have discovered owls at 17 other locations in BC, including reproducing pairs, but no steps have been taken to protect them or their habitat.
- The continued loss of suitable habitat due to harvesting is the most limiting factor on the survival of the Spotted Owl.
- Trees for Spotted Owl habitat should be 140 years old, not 100 years as in the SOMP.
- The Province of BC, instead of enacting binding legislation, relies on ancillary legislation and a series of patchwork policies, plans, processes and political discretion, to guide the protection of Spotted Owls; the *Wildlife Act* has only limited protection, SRMZs have not been designated as a Higher Level Plan, and the interpretation of Section 41 (1) (b) of the *Forest Practices Code*, i.e. that logging plans must 'adequately conserve and manage,' has been limited by the courts.
- The SOMP is ineffective in preventing owl extirpation.
- The enactment of the federal Species at Risk Act (SARA) poses implications for BC, particularly in the Fraser TSA.
- The newly established SORT has recommended interim habitat management guidelines which call for cessation of logging in all known occupied sites within SRMZs, matrix activity centres and otherwise currently unprotected sites; given this, it is not at all

speculative to anticipate that SORT's interim strategy will be given effect shortly and certainly within the term of this forthcoming AAC determination.

• The chief forester must reduce the amount of old-growth timber available for harvest or fail to account for the Spotted Owl, because:

the assumptions underlying the SOMP have no scientific merit; the best available science for the purposes of the current AAC determination is works cited by SLDF and the findings of the recently reconstituted SORT; the locations of all known sites occupied by the Spotted Owl in the Fraser TSA have been mapped and a draft spatial analysis of potential timber supply impacts of the SORT's anticipated interim Spotted Owl guidelines are readily determinable; Implementation of SORT's recommendations of emergency measures should be considered likely; the Supreme Court of Canada has recently recommended the precautionary principle; a federal government intervention under the SARA is appropriate because BC lacks laws protecting endangered species and approves logging notwithstanding the risk to the Spotted Owl.

• In assessing the 'rate of timber production that may be sustained' the chief forester should consider (through the use of sensitivity analyses) not just existing but potential constraints on the timber supply that reasonably can be expected by use of the area for purposes other than timber production; to do otherwise constitutes an arbitrary limitation on discretion inconsistent with the *Forest Act*; therefore the chief forester must consider the *likely* implications of the obligations of SARA and recommendations of the SORT.

• Accordingly, the chief forester should calculate AAC based on: 100 percent of occupied SRMZs not being available for logging, not 67 percent; Matrix Activity Centres not being available for logging in the TSA; volumes not being made available within SRMZs as replacement stands reach 100 years of age; appropriate sensitivity analysis not assuming an expansion of the timber harvesting land base, where to do so would conflict with the requirements of the owl; and additional area withdrawn from the timber harvest land base to reflect the discovery of owls outside Lillooet, outside the SOMP areas.

• Other red- and blue-listed species are old-growth dependent and are sensitive to the harvesting of spotted owl habitat; the future needs of these red- and blue-listed species are not addressed in the AAC determination.

In responding to these many points I must first reiterate the intent of the SOMP as summarized by MWLAP in its conclusion respecting the management of Spotted Owls, at: *http://wlapwww.gov.bc.ca/sry/fwh/wildlife/srmz.htm:*

> The Spotted Owl Management Plan follows key principles of conservation ecology that are considered essential for the stabilisation of the owl population. It attempts to balance spotted owl requirements with social and economic concerns, and thus, there are some risks to the spotted owl population both within the SRMZs and outside of the SRMZs. The spotted owl population is predicted to decline over the short-term (20 to 30 years), as suitable habitats outside of the SRMZs are harvested. Over the long-term, the population has a 60% chance of stabilising, or possibly improving. It is important to recognise that SORT would only support a management plan that provided greater than a 70% chance of the population stabilising. The Spotted Owl Management Plan is thus a compromise between economics and conservation which may or may not save the spotted owl.

It is in the context of the existence of the SOMP and in context of this guidance from the publicly declared intent and principles on which the SOMP is based, that I must make my determination of an AAC for the Fraser TSA. In so doing, I must remain mindful also of interpretations expressed in judgements from previous decisions from courts of law respecting the delineation of statutory responsibilities in the management of Spotted Owl habitat, particularly insofar as these judgements help to define those factors over which I may exercise discretion, and those factors which, being of a broad, social nature, are more properly the responsibility of elected representatives of government.

In consistency with those observations I will respond generally to the comments by SLDF as follows. The SOMP, while not having been declared a Higher Level Plan, is a well established indication of policy direction that has provided guidance to current practice respecting the management of owl habitat in BC for a number of years. As such, I consider it to provide a reasonable basis upon which to examine the timber supply in this TSA at this time. Further direction may well be forthcoming in the near future when Cabinet reviews, and decides how to implement, new recommendations from the SORT. It is also possible that, depending on the timing and nature of the Provincial response to such recommendations, the SARA may provide new guidance or direction to the Province in the management of owl habitat, likely through or in conjunction with the SORT. Either or both of these eventualities could involve a range of management changes for my consideration upon their approval by Cabinet, and could, but may not, lead to decisions to place large areas of owl habitat completely off-limits to any harvesting, as suggested by SLDF, and possibly including the new areas outside the SRMZs. In either of these cases, my understanding from previous court rulings is that it would be improper for me to decide that I am the appropriate authority, and that this AAC determination provides the appropriate mechanism, to both assume the immediate implementation and anticipate the outcomes of, such potentially far-reaching decisions on behalf of society.

The SOMP is acknowledged as a balance between social and economic concerns and the protection of owl habitat. As such, questions of its effectiveness, and of how that effectiveness might be altered in response to potential changes in society's values or to potential changes in scientific understanding, may well arise repeatedly over time. This could involve changing assessments of the ability of 100- or 140-year old stands to provide suitable habitat. Resolving these and related questions embraces a wide set of considerations—wider, I believe, than those that I may make appropriately as chief forester in attempting to assess possible future changes in the constraints on timber supply that may reasonably be expected to occur as a result of decisions affected with a broad public interest and not yet made on behalf of society. These decisions should properly be made by scientists in the case of the required age of trees to provide suitable habitat, and by society's elected representatives in the case of how much land is to be given over completely for Spotted Owl habitat. When such decisions are made by appropriate authorities, they can be incorporated in AAC determinations. These determinations can be made, if necessary, at earlier junctures than currently required by statute. In the meantime, the need for decisive action to be taken by appropriate government authorities is itself becoming urgent in the day-to-day activities of forest managers who must interpret government's intentions for the development of the landscape with or without adequate formalized guidance.

Respecting the other red- and blue-listed old-growth-dependent species noted by SLDF, my consideration of these is addressed in the previous section, *identified wildlife*.

- *recreation values*

While many recreation-based concerns are addressed through both the creation of parks and the maintenance of forested viewscapes in visual areas, a small amount of Crown forested area (102 hectares) is classified in the recreation inventory as provincially significant recreation features. This resulted in a total removal of 39 hectares of forest after taking into account other considerations. In view of the large proportion of the TSA that has been excluded in deriving the timber harvesting land base (i.e. 82 percent and including over half the productive forest managed by the BCFS in the TSA) I am satisfied that this deduction is an adequate reflection of the need to exclude further forested area specifically for high value recreation features.

- *pine mushrooms*

An assessment of the potential for pine mushroom habitat in the Fraser TSA (outside the Nahatlatch IRMP Pine Mushroom Habitat Area), carried out by a Chilliwack Forest District GIS analyst, identified 5322 hectares of potential pine mushroom habitat, of which 1564 hectares are in the timber harvesting land base. So far, identified areas are logged around where possible, with no attendant implications for timber supply. If in future the avoidance of harvesting in these or other identified areas cannot be managed without an impact on the timber supply, this can be accounted for in a subsequent analysis and AAC determination.

- *stand-level biodiversity*

Biological diversity, or biodiversity, is defined as the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at stand and landscape levels. Stand-level biodiversity is managed in part by retaining reserves of mature timber or wildlife tree patches within cutblocks to provide structural diversity and wildlife habitat. The amounts of forest cover required to be retained in wildlife tree patches are derived from the Province's *Biodiversity Guidebook* and the *Landscape Unit Planning Guide.*

In the Fraser TSA, wildlife-tree retention values were developed and communicated to licensees for each draft landscape unit and biogeoclimatic variant. The values, listed in the May 2003 *Fraser Timber Supply Area (TSA) Data Package and Information Report*, were derived from Table 20b of the Biodiversity Guidebook (Table A3.2 in the Planning Guide) which assumes a higher level of retention in wildlife trees where old growth management areas (OGMAs) have not been assigned. For areas with OGMAs in place, Table 20a requires proportionally less retention in wildlife trees. Since draft OGMAs have been advertised for public review for nine landscape units in the TSA, and since these were incorporated in the 2003 timber supply analysis together with OGMAs dynamically created during the simulation for other areas, the wildlife tree retention figures listed in the data package were reduced by three percent in the analysis, to reflect the difference between the two sets of tables. Importantly, this analytical procedure does not affect the current operational requirements for

licensees to leave a higher level of wildlife tree retention until the OGMAs are officially designated.

In the analysis, a spatial exercise identified all areas of the timber harvesting land base lying within 200 metres of forest stands not considered part of the timber harvesting land base, where the proximity to this existing forest would meet retention requirements without further wildlife tree contributions. The exercise showed that for the timber harvesting land base 145 000 hectares are already within 200 metres of suitable stand structure, while 115 000 hectares will need the full wildlife tree retention requirement.

In the base case analysis, wildlife tree patches were assumed to contribute to old-forest requirements on the basis of age alone with no minimum size consideration. Since wildlife tree patches less than two hectares in size should not be assumed to contribute to old-seral biodiversity requirements, the contribution of wildlife tree patches to landscape-level biodiversity might have been slightly overstated. However, the assignment of wildlife tree patches in the analysis was largely random within the areas requiring retention and thus reflected the general age-class distribution of stands on the timber harvesting land base. Since much of the forest on the timber harvesting land base in the Fraser TSA does not the meet age-dependent conditions for old-seral requirements, the contributions to these requirements from randomly assigned wildlife tree patches would thus be limited in any case. A sensitivity analysis confirmed that that placing a minimum area requirement of 2 hectares on each wildlife tree patch did not affect the projected timber supply.

In conclusion, I consider that this analysis provides more refined examination and modelling of wildlife tree retention requirements than earlier analyses, by accounting for the contributions from the edges and perimeters of forest areas outside the timber harvesting land base in their spatial relationships to cutblocks, rather than by assuming the full impact of required retention on the entire timber harvesting land base. The sensitivity analysis provides reassurance that any overestimation in the contribution of wildlife tree patches to seral stage requirements and any consequent overestimation in the timber supply present very little risk to the base case projection. The net exclusion of 3 to 4 percent from the timber harvesting land base for stand-level biodiversity objectives is within the range experienced in the previous timber supply review, and I am satisfied that on this account the base case projection provides a reliable basis for my considerations.

- *landscape-level biodiversity*

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest-stand attributes and structures across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that these components together with other provisions in the Forest Practices Code—such as riparian management, maintenance of wildlife trees, and other forest cover objectives as discussed throughout this document—will provide for the habitat needs of most forest and range organisms.

- seral stage cover requirements

A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of forest cover at various ages or 'seral stages', including old-growth forest, for species that depend on or are strongly associated with these forests. Although some general forest management practices can broadly accommodate the forest cover needs of most ecosystems, more often a variety of practices is needed to represent the different natural disturbance patterns under which ecosystems have evolved. Natural disturbance types (NDTs) vary from frequent wildfires in the dry interior regions to rare stand-initiating events (from wind, fire, and landslides) in the wetter coastal regions.

In accounting for seral stage cover requirements in the 2003 timber supply analysis for the Fraser TSA, the significant progress already made in delineating old growth management areas (OGMAs) in nine landscape units—the Ainslie, Anderson, Coquihalla, Manning, Mehatl, Nehatlatch, Silverhope, Spuzzum and Yale—was incorporated in the base case. To examine the timber supply implications of retaining forest cover in fixed OGMAs, a sensitivity analysis was carried out in which a forest cover requirement for biodiversity was applied to all landscape units to permit the continual recruitment of generalized areas of old forest, instead of assuming the reservation of fixed, specific OGMAs as assumed in the base case. The results showed harvest levels higher than in the base case by about 2 percent in the mid term, and by 3 percent in the long term, indicating the respective 'costs' in those periods, in timber supply terms, of establishing and maintaining area-specific OGMAs.

In another sensitivity analysis, the implications were examined of requiring that the stands that are expected to contribute to old-seral requirements in landscape units where draft OGMAs have not yet been assigned, must be at least 4 hectares in size. The result was a small disruption in the mid-term timber supply, showing that if contiguous areas of old forest over 4 hectares are used to create future OGMAs, some areas on the timber harvesting land base will likely need to be reserved, which will reduce the timber supply in those landscape units currently without OGMAs.

- disturbances in stands outside the timber harvesting land base

In the base case forecast, no allowance was made for natural disturbances that would interrupt the assumed continuous contribution to seral stage requirements from indefinitely aging forest stands outside the timber harvesting land base. In a sensitivity analysis, the effects were examined of incorporating appropriate stand-replacing events based on return intervals estimated for each biogeoclimatic variant. The results showed reductions in the timber supply of 4 percent and 3 percent in the mid- and long-terms respectively, relative to the base case, although the area indicated as disturbed in this scenario was greater than actually experienced in the past 20 years, so the impact may also have been overestimated.

- contribution to OGMAs from parks

Although stands outside the timber harvesting land base do not contribute to any harvest schedule or harvest target, they can contribute to old seral stage forest cover targets for biodiversity and wildlife habitat and therefore may affect the pattern and extent of harvesting

within the Fraser TSA. For establishing OGMAs, the Provincial *Landscape Unit planning Guide* recommends first determining how much suitable old forest exists for each landscape unit variant in the land base that does not contribute to the timber supply, up to a maximum of the full target area for each landscape unit variant. Then, where the OGMA target for the variant cannot be met entirely in the 'non-contributing' land base, areas on the timber harvesting land base that are already partially constrained should be considered. In the Fraser TSA, the MSRM has been establishing OGMAs based on limiting the contribution of available old growth from within the parks system, such that the old growth in parks may only contribute to the proportional extent that it is represented in the landscape unit.

In public input, the Ch-ihl-kway-uhk Forestry Limited Partnership expressed concern with MSRM's process, contending that OGMAs determined in this way will result in an impact on timber supply larger than the provincially accepted 4.1 percent. The partnership expressed concern about replacing OGMAs if they become destroyed by fire, particularly in view of the hazard from the lack of management in these old-growth stands. Recognizing that strategic land-use decisions are outside the mandate of the AAC process, the partnership noted that any timber supply impact due to the establishment of OGMAs in this way will affect the economic component of their aboriginal interests. In response, I note that the establishment of OGMAs is indeed the responsibility of MSRM, and for this AAC determination the provincial standards have been modelled, which are accurate except for the proportional representation issue in MSRM's current practice, as identified above, and which I will discuss further in the summary below.

- *summary of landscape-level biodiversity*

From the above information, I conclude that the base case projection has overestimated the actual timber supply with respect to landscape-level biodiversity objectives on the following two counts.

First, only those OGMAs defined in the nine identified landscape units were modelled spatially. When these spatial definitions were removed, it was shown that the spatial definition had constrained the timber supply by 2 percent in the mid term. These nine landscape units comprise roughly 100 000 hectares or 45 percent of the TSA. The OGMAs in the remaining 55 percent of the TSA were modelled without spatial definition and assuming a full contribution to forest cover requirements from areas outside the timber harvesting land base. Assuming that modelling these OGMAs spatially would similarly impose additional constraint in each of the remaining landscape units, the timber supply has been overestimated on this account by up to a maximum of roughly 3 percent. However, because the new OGMAs may or may not be established by MSRM in consistency with Provincial policy respecting the priority of non-contributing areas, and because the establishment of the OGMAs may or may not be able to take advantage of overlaps with areas already constrained to meet other objectives, such as visual quality, ungulate winter range, or spotted owl habitat, it is reasonable to expect the 3-percent figure will represent the maximum value of a range of uncertainty in the associated impact. Without further guidance I will assume a mid-range value for the impact; that is, that the mid-term timber supply has been overestimated by about 1.5 percent due to the absence of spatial constraints in the modelling of the OGMAs yet to be identified in the remaining landscape units.

Second, by assuming in the base case that the forest cover outside the timber harvesting land base would continue to age and thus to contribute to biodiversity requirements indefinitely, rather than experience periodic disturbances from fire, wind or insects, the timber supply has been overestimated. However, the overestimation is somewhat less than the 4 percent indicated for the mid term in the sensitivity analysis, because the level of disturbance identified in the scenario was greater than that actually experienced over the past 20 years, so that the unavailability for recruitment of the forest cover in these areas was exaggerated. Again, without further guidance, I consider it reasonable to place weight on a value in the middle of the range of the uncertainty; that is, that the mid-term timber supply has been overestimated on this account by approximately 2 percent.

Thus in consideration of these two factors combined—the aging of the non-contributing forest and the spatial definition of future OGMAs—I conclude that the base case has overestimated the mid-term timber supply by approximately 3.5 percent, and I have taken this into consideration in my determination as discussed in 'Reasons for Decision.'

Section 8 (8) (a) (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber:

Harvest Profile and Second-Growth Strategy

Since 1999, Chilliwack Forest District staff have been managing a strategy to effect a transition from harvesting old-growth stands to harvesting second-growth stands. Licensees support the strategy and have steadily increased the proportion of the harvest taken from second-growth stands. The rapid increase in demand by licensees for access to second-growth stands now concerns district staff in view of possible future implications for the timber supply. For instance, if in seeking to maximise the volume harvested in the short term, licensees continually avoid old-growth stands with merchantable volumes of 500 cubic metres per hectare in order to harvest second-growth stands that already hold 600 cubic metres per hectare, but which at their future culmination age could have reached 1000 cubic metres per hectare, the foregone productivity and the delay before all harvestable stands are converted into managed, more productive stands could reduce future harvest levels significantly below current projections. Analysis also showed that if the harvest were concentrated in the short term on Douglas-fir stands, a fir harvest of about 1 million cubic metres per year could be sustained for about 15 years, but would then necessitate harvesting a high proportion of hemlock and balsam in the medium term, with potential economic implications for the TSA.

Analysing the separate effects of limiting the second-growth harvest contribution to 20 percent for 30 years and of removing any such limitation showed that in both cases after about 70 years almost the entire harvest in the TSA will come from second-growth stands. However, without the measured rate of introduction, the loss of productivity noted above reduces the long-term harvest from the level of 1.52 million cubic metres per year projected in the base case to about 1.27 million cubic metres per year.

The importance of this information is that while a transition toward increasing—and eventually full—dependence on second growth is indicated for the TSA, the rate of implementing the transition can have beneficial or restrictive implications for the timber

supply in various time periods. Social choices and responsible decisions must be made between the various benefits and costs, and fortunately we already have the benefit of good data and analytical techniques to inform options and planning for those decisions. If choices are made that reduce the future productivity and timber supply in the TSA, these consequences will be reflected in AAC determinations. For the moment, while I recognize the potential risk to future harvest levels from too rapid an acceleration of the harvest into second-growth stands, there are no immediate implications on this account that would invalidate the short-term harvest level projected in the base case analysis.

Complex Operating Areas

The Fraser TSA surrounds and includes some of the largest population concentrations in the province. As noted earlier in *inoperable areas*, District staff have observed that for a decade, managing forest lands adjacent to the communities and in rural areas in the TSA has given rise to complex and difficult planning issues. As second-growth stands close to populated areas become ready for harvest, these issues intensify as individuals, interest groups, non-government organizations, First Nations and communities voice opinions often opposed to harvesting. Consequently, licensees undertake very limited harvesting in these areas, although it is assumed that with sensitive planning they will continue to contribute to the harvest. The areas include Bowen Island, Blue Mountain, Hatzic Valley, Mount Woodside, Echo Island, Elk Creek, and Sumas Mountain.

The difficulty of operating in such ‘urban interface’ areas, where communities have grown up following a first harvest and where a second harvest is now nearing readiness, is typified by the fact that the forest stands now often comprise relatively small, fragmented pockets of timber in close proximity to residents of subdivisions who have come to view the forest as a scenic backdrop rather than an integral part of a timber supply area. However, the stands in these areas are still included within the TSA and I must therefore assume that they will continue to make some contribution to the timber supply until a land-use decision by an appropriate authority designates them under a different zoning.

Until such decisions are made, I expect the associated management difficulties—which can be both caused by and have implications for the transition to second growth harvesting—to intensify. Timber contributions from these areas will clearly need to be obtained by very sensitive means, perhaps by managing some areas by partial harvesting or variable retention which may include single-tree tree removal. Such forms of adaptive management may be reflected in future analyses as information becomes available. For the present determination I have insufficient information to guide me in attempting to assess any specific associated implications for the projected timber supply.

First Nations

Thirty-five First Nations Bands and five tribal organizations have asserted traditional territories in the Chilliwack Forest District; eight groups are in the process of treaty negotiation.

- *consultation process*

Data Package: To initiate consultation with all First Nations in the Chilliwack Forest District on the data package for the Fraser TSA, letters explaining the TSR process were sent on May 15th, 2003, with copies of the TSR Brochure and the draft data package. The letter invited First Nations to meet to discuss any related interests or concerns, or to respond in writing. Each First Nation community was phoned to ensure the letter was received. Several meetings were held with First Nations communities to explain the TSR process.

Analysis report: Letters were again sent out on December 4, 2003 to all First Nations communities in the Chilliwack Forest District with an offer to meet and discuss the Timber Supply Analysis Report. Copies of the report were included with an offer to meet and discuss interests or concerns. Written comments were again invited. Several presentations were made regarding the analysis.

From these consultations and from the three letters of comment received from First Nations, the following main concerns and responses are identified.

First, the Ch-ihl-kway-uhk Forestry Limited Partnership, which claims aboriginal title over the Chilliwack Valley, has an interest in long-term management of Valley and is currently negotiating an Interim Measures Agreement, expressed concern (a) that the AAC not be reduced as this would impact the Ch-ihl-kway-uhk Tribe's economic accommodations. The Tribe has a concern (b) with MSRM's Landscape Unit planning procedures with respect to OGMAs and the potential impact on timber supply, and has a concern (c) over the quality of data in the previous TSR, given the 13-percent increase in the mature volumes. In response: I note (a) that AACs are determined solely in consideration of the requirements of section 8 of the *Forest Act*, which contains no provision for considering the needs of individual licensees; (b) while I too noted earlier the difference between Provincial policy as established in the *Landscape Unit Planning Guide* and MSRM's current process for identifying OGMAs, and while I must account for the timber supply implications of that process, I have no influence over the process, and any related concerns must be expressed directly to MSRM; and (c) as far as possible timber supply analyses use the best available information; the quality of the data supporting the current estimates of mature volumes is addressed earlier in this document, under *volume estimates for existing mature stands*.

Second, the Cheam Indian Band expressed a number of concerns through legal representation on matters related to accommodation of the Band's aboriginal rights and title. While I have no statutory authority to address concerns of this nature in an AAC determination, or indeed in any other way, I do consider it appropriate to record for public information a brief summary of these concerns, which follows. The Cheam Band claims its aboriginal title over part of TSA includes: the right to exclusive use and occupation of land; the right to choose the uses to which the land can be put; and the right to derive economic benefits from the land. The Band is concerned: that a reduction in the cut level will impact its future economic interests; that timber harvesting may impact traditional activities such as hunting, fishing and berry gathering; and that future harvesting will have an impact on the Cheam Band's rights and title.

Third, The Boston Bar Band wrote to reiterate earlier expressions of the need for assessing sustainable logging levels in traditional territory; and to advise that the Band is concerned that accessible and suitable timber will not be available in the Fraser Canyon to support a future

wood-products industry; and that the harvest level in Nlaka'pamux traditional territory must be set at a sustainable level. In response, I note that a main purpose of the timber supply review is to establish AACs at levels that will help to avoid undesirable fluctuations in the future timber supply and will provide for sustainable harvest levels in the long term. The *Forest Act* provides for the determination of only one AAC for each TSA, and in fact establishing sustainable, non-declining harvest levels for a series of smaller areas within the TSA, such as individual landscape units, typically reduces the available harvest over time both in the individual areas and in the overall area. In the absence of the inclusion of a related policy in the Minister of Forests' expression of the social and economic objectives of the province, I cannot account for a land-use restriction of that nature in an AAC determination.

The Hope Innovative Forestry Practices Agreement

In 1997, International Forest Products (Interfor) obtained an Innovative Forestry Practices Agreement (IFPA) covering an area near Hope within the Fraser TSA. An IFPA allows the holder to undertake approved innovative practices and, if supported by analysis, to request an increase in the AAC related to the innovative practices. Based on such agreements, the Forest Service Regional Manager may determine increases to the AACs assigned to replaceable forest licences.

While the IFPA process itself is not part of the timber supply review in which I as chief forester determine an AAC for a TSA or a TFL, much of the information gathered as part of the Hope IFPA has been reviewed by BC Forest Service staff and is reflected in the data inputs to the timber supply analysis supporting this determination, in the form of inventory adjustments and site index adjustments.

Section 8 (8) (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area:

Alternative harvest flows

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short term, the presence of large, long-accumulated volumes of timber in older forests often permits the harvesting of greater volumes each year now than in the long term, without jeopardizing the future timber supply. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

In addition to the base case harvest forecast for the Fraser TSA, alternative forecasts were produced to show the results of applying the same management assumptions as in the base case, but under different configurations of harvest flow. In each case, to minimize disruption, the starting level was assumed to remain constant at the current AAC.

In one alternative forecast, noted earlier in Harvest Profile and Second-Growth Strategy, the target of obtaining just 20 percent of the harvest from second-growth stands in the near term, as applied in the base case, was removed. The results indicated both a reduction in the long-term harvest level from 1.52 million cubic metres to 1.27 million cubic metres and a significant increase in second-growth harvest. In that section it was also noted that analysis showed that targeting Douglas-fir stands for harvest in the short term could have economic implications for the medium term.

In another alternative forecast, completed as part of the sensitivity analysis, the maximum achievable long-term harvest level was determined by assigning minimum harvestable ages based on achieving 95 percent of the maximum average growth rate. The maximum achievable long-term harvest level for the TSA in this case was 1.6 million cubic metres per year; however, by requiring stands to achieve 95 percent of their maximum growth rate, the medium-term timber supply was reduced by 13 percent.

Another analysis showed that attempting to reduce the time period before the increase in the harvest level to the long-term level necessitated a reduction of 8 percent in the medium-term harvest level.

All of these forecasts and the published sensitivity analyses have been helpful to me in this determination, and I have further considered the implications to the province of alternative rates of harvest as follows.

- *community dependence on the forest industry*

In 2001 the population of the Fraser TSA was over 2.2 million people, an 8.3-percent increase since 1996, and between 2001 and 2006, the population of the Chilliwack Forest District is expected to increase by 8.1 percent, with the growth projected to be spread fairly evenly between the Greater Vancouver Regional District (at 8.3 percent) and the Fraser Valley Regional District (at 7.9 percent). In this rapidly growing population, the importance of forestry to the local economies in the TSA increases markedly toward the east of the TSA, away from Greater Vancouver. In the Hope-Fraser Canyon area, forestry alone accounts for about 17 percent of total income. In all areas of the forest district, the public sector, including health, education and government services, accounts for the largest share of income.

The forest sector supports less basic employment than tourism in the TSA, but generates a higher basic income level such that each job in the forest sector has a greater impact on the local economy. Each 100 direct forestry jobs also supports a further 74 to 110 indirect and induced jobs, while 100 tourism jobs support a further 20 jobs. Continued forestry employment is clearly very important to the more rural, eastern areas of the TSA. Since the AAC for the TSA is currently harvested to its fullest extent, any reduction at this time would inevitably reduce related employment, both directly and indirectly.

- *summary of implications*

The base case forecast indicates that, under current management assumptions—and subject to the vagaries of markets and changing ownerships—the timber supply in the Fraser TSA is capable of continuing to generate economic activity and associated employment for many

decades at levels comparable to those of today. Related analysis shows that the area projected to be harvested annually over the forecast period in support of this economic activity maintains a relatively even distribution over time, such that the general environmental implications of the harvest may also be foreseen, to the extent of the capabilities and the limitations of current science and knowledge. In this projected climate of relative operational stability, if any previously unforeseen and undesirable changes become manifest, any adaptive changes in management can be taken into account in one of the relatively frequent, periodic AAC determinations.

Section 8 (8) (c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities:

This section of the *Forest Act* has been repealed [2003-31-2 (B.C. Reg. 401/2003)]

Section 8 (8) (d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia:

Minister's letter and memorandum

The Minister has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester—a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996, (attached as Appendix 4).

This letter and memorandum provide a government view on forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that 'any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.' He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

In the current case of the Fraser TSA, the non-declining timber supply projection, subject to the considerations in this rationale, does indicate a potential for stability in forest-dependent communities. As discussed in Land base contributing to timber harvest, I have reviewed the operability assumptions in the timber supply analysis and I am satisfied that they are based on the best information currently available, with little if any further opportunity at this time for harvesting in previously uneconomic areas, with or without establishing specific harvest levels attributable (i.e. partitioned to) particular areas, species, or terrains.

The Minister's memorandum addressed the effects of visual resource management on timber supply, asking that the constraints applied to timber supply to meet VQOs not be allowed to unreasonably restrict the timber supply. This provides me with guidance respecting

government's views on the trade-off between the social objective of retaining attractive scenic views and the economic objective of minimizing the associated loss of commercially viable timber. In this regard, in Silvicultural systems, I noted the commitment by district staff to the use of variable retention, which permits the unobtrusive harvesting of some timber in visually sensitive areas. I have also noted in *visually sensitive areas* the expansion in the TSA of the 'Partial Retention' recommended VQC to reflect high, moderate or low sensitivity, which increases flexibility in managing an appropriate balance between timber production and scenic values. From my considerations in that section, and from my familiarity with the extensive work undertaken in coastal TSAs to ensure appropriate line work for visually sensitive areas, I am satisfied that the Minister's expression of government's social and economic objectives with respect to minimizing the associated constraint on timber supply wherever possible has been appropriately implemented on the ground and that the consequent management regime has been suitably reflected in the 2003 timber supply analysis.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. The BCFS took a number of steps to provide opportunities for public review through the timber supply review process for the Fraser TSA. These included public advertisements of, and opportunities to review, the data package and the timber supply analysis, and invitations to respond to a public discussion paper. In response, a number of submissions (listed in Appendix 5) were received from First Nations, the forest products industry and environmental interest groups. MWLAP also provided a formal submission on the data package. Wherever possible, and wherever appropriate to my considerations under Section 8 of the *Forest Act*, I have attempted throughout this rationale to respond briefly to the views expressed in the substantial submissions received. Consideration of this material has been helpful in this determination.

Section 8 (8) (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area:

Unsalvaged losses

Unsalvaged losses are timber volumes destroyed or damaged by such agents as fire or disease, that are not recovered through salvage operations. In regenerated forests, a number of parasites, fungi or plants can kill trees or degrade the quality and value of logs. Estimates for unsalvaged losses account for epidemic (abnormal) infestations and for factors that result in losses that are not recovered through salvage harvest programs and are not recognized in yield estimates. Timber volume losses due to insects and diseases that normally affect stands (endemic losses) are accounted for in inventory sampling for existing timber yield estimation or though other methods. Endemic losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted earlier under *volume estimates for regenerated stands*.

The Fraser TSA lies in an area of the province classified as 'Natural Disturbance Types 1 and 2' meaning it is subject to only relatively low levels of natural disturbance. In the 2003 timber supply analysis, the average annual unsalvaged timber volume lost to fire was reported at 15 925 cubic metres, and the volume lost to wind damage was 2500 cubic metres. The reported average for fire does not include the influence of the volume lost in the Nahatlatch fire just prior to the previous timber supply review. This should be incorporated to maintain an indication of the effect of such events on long-term average figures; however, an adequately long reporting period has not yet elapsed to facilitate reliable changes to the otherwise relatively constant information. In the absence of contrary information, I am satisfied that the average levels of unsalvaged losses incorporated in the timber supply analysis in addition to the adjustments already applied to yield tables are an adequate accounting for the timber supply implications of losses to such catastrophic events as insect epidemics, fires, wind damage and other agents.

Reasons for Decision

In reaching my AAC determination for the Fraser TSA, I have made the considerations documented above, all of which are integral to the reasons for my decision, and from which I have also reasoned further, as follows.

The 2003 timber supply analysis base case projected an initial harvest level maintained at the current AAC of 1.27 million cubic metres per year for 140 years, followed by a 20-percent increase to a sustainable long-term level of 1.52 million cubic metres per year, stable under present assumptions to beyond 250 years from now.

In determining AACs, my considerations typically identify factors which, considered separately, indicate reasons why the timber supply may be either greater or less than the harvest levels projected for various periods in the base case. Some of these factors can be quantified and their implications assessed with reliability. Others may influence the assessment of the timber supply by introducing an element of risk or uncertainty, but cannot be quantified reliably at the time of the determination and must be accounted for in more general terms.

In my considerations, no factors were identified as reasons why the timber supply as projected in the base case may have been underestimated to a degree that may be quantified.

The following factor was identified as indicative of a potential underestimation in the timber supply to a degree that currently cannot be quantified with accuracy:

- *Site index*: In view of the provincial trend toward higher site indices for regenerated stands in most areas, it is likely that gathering more ground-based information will lead to adjustments to site indices for zones and species not addressed in the J.S. Thrower study, and that consequently the timber supply may be somewhat higher in the longer term than projected in the base case. However, potential implications for green-up and adjacency will likely have little or no effect in the short- or medium-terms, given the noted uncertainty in the volume estimates for existing mature stands.

The following factors have been identified as reasons why the timber supply projected in the base case may have been overestimated to reasonably quantifiable degrees:

- *Identified wildlife*: In view of the positive indications of red- and blue-listed species present in the Fraser TSA I am assuming a 1-percent overestimation in the timber supply throughout all periods of the base case forecast to account for future habitat designations for identified wildlife, even though some potential habitat provisions may overlap with existing constraints.
- *Landscape-level biodiversity*: In consideration of two factors—the aging of the non-contributing forest and the spatial definition of future OGMAs—I concluded that the base case has overestimated the mid-term timber supply by approximately 3.5 percent.
- *Volume estimates for existing mature stands*—As discussed in detail in my considerations under that section, a risk is present that the volume estimates for existing stands over 60 years of age are overestimated. The clustering of the mean values produced by independent samplings indicates the overestimation may be in the order of 5 percent. Sensitivity analysis shows that the timber supply, although likely more stable than indicated in the noted 10-percent sensitivity forecast, is probably somewhat less resilient than projected in the base case.

The following factor was identified as indicative of a *potential* overestimation in the timber supply to a degree that currently cannot be quantified with accuracy:

- *Silvicultural systems*: Leaving additional trees on the landscape in the last 2 to 5 years through the use of variable retention silvicultural systems may have led to a productivity loss beyond that considered in the analysis. On first examination, this could imply an unquantifiable overestimation in the mid-to-long-term timber supply. However, because this condition has existed only for a short time, it is not yet clear whether reconciling the contribution of the forest cover so retained with the cover requirements for wildlife tree patches, OGMAs and so on will leave any outstanding overestimation to be accounted for. Even if the condition does persist for several years, the implications arising from affected cutblocks in this relatively short period are unlikely to alter the projected future timber significantly before they can be evaluated and accounted for in a future analysis. At this time I therefore do not consider that this factor presents any risk to the projected timber supply.

In reviewing in combination the implications for the timber supply resulting from the above list of conclusions, I note that the overestimations respecting the management of identified wildlife (1 percent) and landscape-level biodiversity (about 3.5 percent) apply across all time periods in the projections, including the short term, and the overestimation from the estimates for mature volumes in existing stands (about 5 percent) applies in the short- and medium-terms. The combined result for the short-term timber supply projected in the base case forecast is the potential for an overestimation roughly in the range of 9.5 percent. This overestimation is not offset by the potential *under*estimation arising from site index adjustments requiring to be made to species and zones not already addressed, as such an underestimation would act mainly in the longer term.

As noted earlier, when the estimated yields for existing natural stands were reduced by 10 percent in a sensitivity analysis, and the new site index increases were not applied, the harvest level could still be maintained at the current AAC for one decade (before a modest decline to a projection similar to that obtained in the base case forecast in the June, 1998

analysis, as described in the 2003 analysis report at page 29). In the current situation, the indicated possible overestimation of roughly 9.5 percent in the short-term supply is slightly lower than that examined in the sensitivity analysis. From the results of that sensitivity analysis, I believe it is safe to assume that the timber supply in the Fraser TSA is sufficiently resilient to be able to accommodate the currently identified level of overestimation for at least the five-year effective period of this determination.

In reaching this conclusion, I am mindful of five specific issues that I have identified and discussed earlier, all of which have the potential to further constrain the timber supply, and in respect of all of which responsible stewardship indicates a need for appropriately authorised action that, in my judgement, does not fall within my mandate as chief forester in determining this AAC under section 8 of the *Forest Act*. In summary, these issues are as follows.

- First, the MWLAP suggests that a larger area than assumed in the analysis should be accounted for as ungulate winter range (UWR) habitat. The current accounting for UWR in the timber supply analysis includes forest constraints applied to 8723 hectares, equivalent to the full removal of 3500 hectares of Type 1 areas identified in the MOU referred to earlier. Although the 6400 hectares of Type 3 areas identified in MWLAP's second map that were not part of the MOU are now being given consideration operationally as UWR habitat before being formally declared as such, the statutory authority for declaration of the area lies with the Deputy Minister of MWLAP under the mandate of that ministry. I do not consider that the discretion of the chief forester in the timber supply review process extends to judgements on how much of this or other areas will eventually be declared as UWR habitat. I will therefore note that, because I remain aware of the potential risk to the timber supply associated with this factor, if and when additional areas are formally declared as UWR, I will ensure that they are accounted for at the appropriate time in a timber supply analysis and in an AAC determination.
- Second, a similar situation obtains with respect to the Spotted Owl, as detailed earlier in my considerations, where I noted that if the Provincial Cabinet makes significant changes to the extent of Spotted Owl habitat or the associated management objectives, I will ensure that suitable and timely timber supply analysis is undertaken and, if necessary, I will revisit this AAC at an earlier date than required by statute.
- Third, there exists a need for the appropriate municipal governments and provincial land use authorities to recognize, and to make decisions that reflect, the implications for land use and zoning within the complex operational environment of 'urban interface' areas in which conventional timber harvesting has already become constrained by competing social values. Again, while the constraints on timber supply in these areas are real, and while they have been recognized with concern by First Nations who do not wish to see the AAC in this TSA unreasonably supported by unsustainable assumptions about the contributions from these areas, it is not within my discretion to choose which of the areas in question the provincial government may decide to remove in whole or in part from the TSA. Such decisions are deeply affected by a broad public interest, and until they are made by the appropriate authority I must consider these areas to be a part of the same TSA to which in many cases their first-time harvest has already contributed.

- Fourth, Forest District staff and licensees should collaborate to clarify the objectives and strategies underlying the use of the variable retention silvicultural system, both to ensure the viability of future stands and their contribution to the timber supply, and to ensure that the identified objectives and strategies are integrated—and thereby minimize any duplication—with those for meeting biodiversity requirements at the stand and landscape levels.
- Fifth, Forest District staff and licensees should collaborate in using the extensive data and analytical techniques available to clarify objectives and strategies in order to achieve the transition to harvesting in second-growth stands in ways that avoid unintended losses of productivity and do not necessitate unwanted reductions in future harvest levels.

In some situations, the identified overestimation in the short-term timber supply, combined with these five potential risks to the timber supply, might persuade me to reduce the AAC at this time, and I have considered this as a possible course of action. However, in the two most recent AAC determinations the Fraser TSA has already experienced two very significant reductions in harvest level. As noted in *community dependence on the forest industry*, the AAC is currently harvested to its fullest extent, such that any reduction now would inevitably reduce related employment, both directly and indirectly. In this situation, I have reviewed the management options carefully in context of alternative harvest flow pathways to the future for the TSA. In the event that early decisions are made on habitat management for the Spotted Owl, on the UWR, and on the urban interface areas, any new information can be analysed and if necessary accounted for in an early re-determination, in which case it may become necessary to contemplate the careful management of a series of declines similar to those forecast in previous analyses. Without the imposition of significant new constraints, I am reassured by the combination of the spatially explicit cutblock analysis and the reduced-yield sensitivity analysis that the current harvest level can be maintained for 10 years and certainly for the next 5 years on the basis of a reasonable distribution of harvest openings.

For all of the above reasons, in mindfulness of recent decisions of the court respecting the limitations of my authority in matters of land use, in mindfulness of the inevitable loss of employment that would accompany an AAC reduction at this time, and in mindfulness of the tested ability of the timber supply to support the current harvest level for ten years when all the considerations I have identified are accounted for, I consider that the requirements of section 8 of the *Forest Act* are most suitably and fully addressed at this time by the determination of an AAC at a level that continues the current harvest level, that is, 1.27 million cubic metres.

Having made this determination, in view of the potentially compounding risk to the short-term supply that may arise from forthcoming decisions by other authorities, I re-iterate my commitment to return if necessary to re-determine this AAC before the statutorily required period is complete.

Determination

Having considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided, it is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years and that

reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the TSA by establishing an AAC of 1.27 million cubic metres.

This determination is effective August 1, 2004, and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff and licensees to undertake the tasks and studies noted below that I have also mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects is dependent on available staff resource time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the TSA.

- *Area-based management*: The relatively even distribution of the area projected to be harvested annually over the forecast period indicates that this TSA could be considered for future regulation of the allowable harvest by area, rather than by volume. If the District Manager and licensees are willing to consider this in the future, then with enabling legislation, the Fraser TSA could be among those management units considered for harvest regulation by area.
- *Variable retention objectives*: Forest District staff and licensees should collaborate to clarify the objectives and strategies underlying the use of the variable retention silvicultural system, both to ensure the viability of future stands and their contribution to the timber supply, and to ensure that the identified objectives and strategies are integrated—and thereby minimize any duplication—with those for meeting biodiversity requirements at the stand and landscape levels.
- *Second-growth harvest strategy*: Forest District staff and licensees should collaborate in using the extensive data and analytical techniques available to clarify objectives and strategies in order to achieve the transition to harvesting in second-growth stands in ways that avoid unintended losses of productivity and do not necessitate unwanted reductions in future harvest levels.
- *Inventory attributes*: A recurring difficulty in preparing information for AAC determinations is the current inability of the VRI to support and maintain particular attributes that are indispensable in assessing the timber supply. These attributes include for instance harvest depletions, environmentally sensitive areas, power line areas and other non-timber, volume-related features that must be represented and kept current in the inventory in order to maintain the level of integrity in the data necessary to accurately project the timber supply—particularly where spatial modelling is available. Communications with MSRM staff should be undertaken at appropriate levels to ensure that these attributes are represented and regularly updated.

- *Site index*: To maintain accurate projections of future timber supplies I encourage licensees and District staff to carry out local field studies to refine estimates of the site indices for those zones and species not already addressed in the previous study.

Larry Pedersen
Chief Forester

July 27, 2004

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the Forest Act, Revised Statutes of British Columbia 1996, c. 157 Consolidated to November 4, 2003, reads as follows:

Allowable annual cut

8 (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest agreement areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish a result set out under section 39 (2) or (3),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(3.1) If, in respect of the allowable annual cut for a timber supply area or tree farm licence area, the chief forester considers that the allowable annual cut that was determined under subsection (1) is not likely to be changed significantly with a new determination, then, despite subsections (1) to (3), the chief forester

(a) by written order may postpone the next determination under subsection (1) to a date that is up to 10 years after the date of the relevant last determination, and

(b) must give written reasons for the postponement.

(3.2) If the chief forester, having made an order under subsection (3.1), considers that because of changed circumstances the allowable annual cut that was determined under subsection (1) for a timber supply area or tree farm licence area is likely to be changed significantly with a new determination, he or she

(a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and

(b) must give written reasons for setting the earlier date.

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to
  (a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and
  (b) different types of timber and terrain in different parts of private land within a tree farm licence area.
  (c) Repealed. [1999-10-1]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with
  (a) the community forest agreement, and
  (b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider
  (a) the rate of timber production that may be sustained on the area, taking into account
    (i) the composition of the forest and its expected rate of growth on the area,
    (ii) the expected time that it will take the forest to become re-established on the area following denudation,
    (iii) silviculture treatments to be applied to the area,
    (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,
    (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and
    (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,
  (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,
  (c) Repealed. [2003-31-2 (B.C. Reg. 401/2003)]
  (d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and
  (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (Consolidated to June 20, 2003) reads as follows:

Purposes and functions of ministry

4 The purposes and functions of the ministry are, under the direction of the minister, to do the following:
(a) encourage maximum productivity of the forest and range resources in British Columbia;

(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

(d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia;

(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

Appendix 5: List of Public Submissions received